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.

The Ninth Edition of *The Digital Economy Fact Book* provides a factual basis from which analysis of the digital economy can begin. 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 Worldwide 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, Piracy, Social Networking, 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 2006 and 2007.

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

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The Digital Economy Fact Book **NINTH EDITION, 2007** **The Progress & Freedom Foundation**

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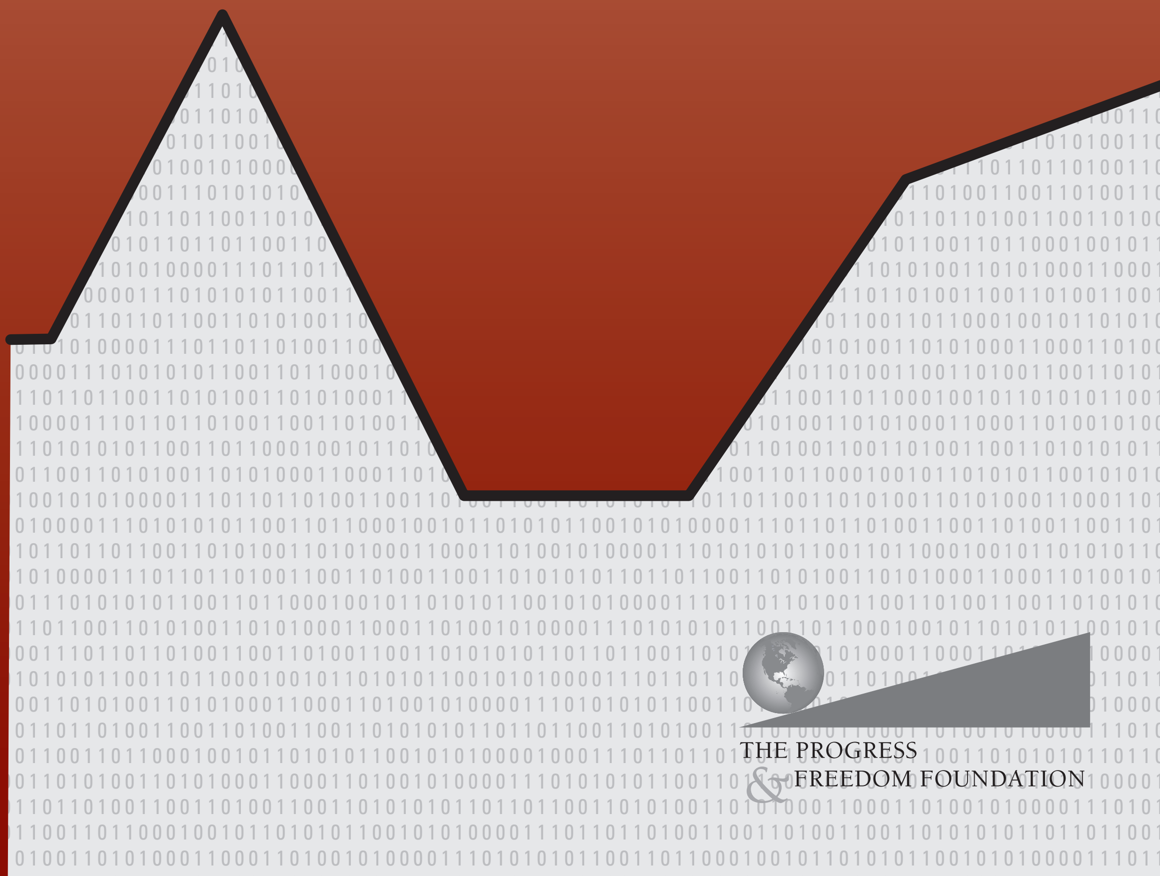
Stephen McGonegal



THE PROGRESS & FREEDOM FOUNDATION

The Digital Economy Fact Book

NINTH EDITION, 2007

Daniel B. Britton
Stephen McGonegal

with
Samuel Eckman
Grant Eskelsen
Amy Smorodin

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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

The Progress & Freedom Foundation is proud to publish the ninth edition of *The Digital Economy Fact Book*. As information technologies permeate the world economy, it becomes more challenging to condense pertinent information into the *Fact Book*. In addition, we have tried this year to provide a more thorough overview of activities involving communications, media, e-commerce, and threats to the digital economy than in past years, and we have included more international data than we have in the past. As a result, this year's *Fact Book* is longer than previous editions.

The year just concluding has witnessed many events with important policy implications involving intellectual property, communications, and e-commerce. Business models for the distribution of digital content remain in flux and a landmark intellectual property case has spurred policymakers to consider reform of the patent system. In January, the largest data breach in history prompted Congress to consider what oversight role it should assume, if any, vis-à-vis private data protection efforts. Developments in communications technology have called into question the accepted historical rationales for content regulation, while legal battles surrounding the largest fines ever levied by the Federal Communications Commission relating to the broadcast of allegedly indecent programming have reanimated debates regarding the scope and substance of the First Amendment. This past year also saw Congress, once again, extend its legislative reach into cyberspace when it passed a controversial ban on Internet gambling. The fallout from these events is sure to shape future policy and clarify the government's role in e-commerce for years to come.

The global nature of the digital economy will continue to present policy makers with challenges and opportunities alike. With *The Digital Economy Fact Book*, The Progress & Freedom Foundation hopes to provide an accurate assessment of a variety of sectors that make up the digital economy. We would like to thank our friends and supporters for taking an interest in the work done at PFF, and for making the ninth edition of the *Fact Book* possible.

This book was compiled and edited by Dan Britton and Steve McGonegal. Sam Eckman and Grant Eskelsen provided valuable research assistance for this volume, and Amy Smorodin offered many suggestions to improve the readability of the book. Their efforts made this volume a reality.

Ken Ferree
President
The Progress & Freedom Foundation
November 9, 2007

Chapter 1
The Growth of the Internet

The Internet has been a major economic and social force since the early 1990s, when Internet use began growing dramatically and email became a common substitute for more traditional forms of communication. The Internet is affecting a broad range of activities. The growth in the popularity of blogging, online video, and news websites, for example, is changing the ways people are entertained and informed, and technological improvements are making Internet access an increasingly ubiquitous convenience. The recent dramatic surge in traffic to social networking sites such as MySpace, used primarily by young people, illustrates that the Internet will be an increasingly important part of people's lives, and that new trends will emerge that we are not able to anticipate now. The metaverse "game" Second Life demonstrates that virtually all aspects of life as we know it can be affected by the Internet, as well as microcosmically represented within it. One survey found that 43 percent of Internet users who belong to online communities "feel as strongly" about their lives on the Internet as they do about the real world.[1]

Growth rates of Internet usage in the developing world are higher than those in the developed world.[2] The Internet Corporation for Assigned Names and Numbers (ICANN), the manager of Internet domain names, has historically been the main overseer of all Internet activity. Although ICANN once had very close ties to the U.S. Commerce Department, those connections are being phased out, and the organization could become fully autonomous in 2009.[3] These changes are unlikely to have a significant impact on most Internet users, but they symbolize that although the Internet was created in the U.S., it is now used virtually everywhere, enabling people from all over the world to communicate with each other instantaneously and inexpensively.

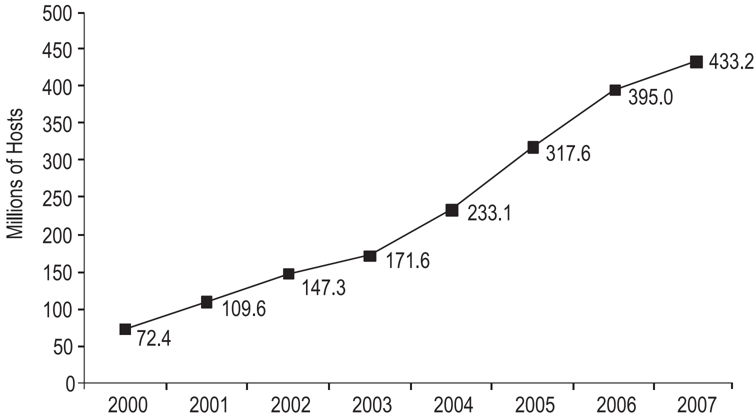
The digital economy continues to grow in both size and scope. *Time* magazine named the Internet user their person of the year in 2006,[4] and the expansion in user-generated content means that the more than one billion worldwide Internet users (a landmark passed in 2005 by some estimates)[5] will be creating more content than ever before. Traffic at the Amsterdam Internet Exchange, the world's largest Internet hub and carrier of 20 percent of Europe's Internet traffic, grew at a compound monthly average of 7.4 percent in 2006, with daily traffic forecast to exceed two petabytes (equivalent to one trillion pages of standard printed text) per day by October 2007.[6] This chapter is about the usage of the Internet and the various interfaces that allow its users to access the information it contains.

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.[7] 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. By 1993, the number of hosts connected to the Internet had grown to 2 million.[8]

- After the 1993 release of Mosaic, the first graphical web browser, the number of hosts advertised in the Domain Name System grew at an average rate of about 50 percent per year from 1994 to 2006, but it grew at a slower rate in 2006 than it did during 2005. The total number of hosts increased from about 395 million in January 2006 to about 433 million in January 2007, a growth rate of about 10 percent, down from 24 percent in 2005.[9]
- According to the most recent data from *The CIA World Factbook*, the United States has far more hosts than any other nation or the European Union. The U.S. has about 195 million hosts, with the EU in second place with 50 million, followed by Japan with 28 million.[10]
- The U.S. also leads the world in the number of IP addresses with 1.38 billion, while the U.K. is in a distant second place with 236 million, followed by Japan with 152 million, and China with 105 million.[11] The current IP standard (IPv4) only allows for 4.29 billion possible unique addresses, of which more than 3 billion are already taken. The updated IP standard (IPv6) would allow for a much, much larger number of addresses (about 5,000 addresses for every square micrometer of the earth's surface), but would require massive upgrades.[12]
- GoDaddy.com had the most domain name registrations at the end of the third quarter of 2006, with 13.5 million, followed by 16 other registrars with at least one million domain names each. There were 292 other registrars with at least 1,000 domain names each.[13]
- The total number of registered top-level domain (TLD) names increased 32 percent during 2006 to pass 120 million by the end of the year. About 44 million of them were country code top-level domains (ccTLDs), and 76 million of them were generic top-level domains (gTLDs) such as .com and .net. The top ten ccTLDs as of early 2007 were .de (Germany), .uk (United Kingdom), .eu (European Union), .nl (The Netherlands), .cn (China), .it (Italy), .ar (Argentina), .us (United States), .br (Brazil), and .ch (Switzerland).[14]

Number of Hosts on the Internet



Data are from January of each year.
Source: Internet Systems Consortium[15]

Active and Deleted Domain Names, April 2007 (millions)

TLD	Active	Deleted
.com	64.8	200.8
.net	9.4	21.1
.org	5.9	17.4
.info	4.3	4.1
.biz	1.7	1.0
.us	1.2	0.9

Source: Domain Tools[16]

Domain Name Registrations, 2003-2006 (millions)

TLD	2003	2004	2005	2006
.com	26	33	43	56
other ccTLDs	11	7	20	26
.de	7	8	9	10
.net	5	5	7	9
.uk	5	3	4	6
.org	3	3	4	5
.info	2	3	3	4
.eu	n/a	2	2	3
.biz	1	n/a	n/a	2
.name	n/a	1	1	1
other TLDs	n/a	n/a	n/a	1
Total	**60**	**65**	**92**	**121**

Source: VeriSign[17]

The U.S. Online Population

According to Internet World Stats, of the estimated 302 million Americans in 2007, 211 million of them (70 percent) are using the Internet. This represents 19 percent of the estimated 1.11 billion Internet users worldwide. In contrast, Americans make up only about 5 percent of the world's total population.[18] The Internet is becoming an important part of the everyday lives of Americans. As of early 2007, parents spent an average of 33 hours per month (about one hour per day) using the Internet, and children between the ages of 8 and 14 spend over 19 hours per month online.[19]

- According to a December 2006 Pew survey, 69 percent of U.S. women and 71 percent of U.S. men use the Internet. About 83 percent of Americans aged 18 to 29, 82 percent of Americans aged 30 to 49, 70 percent of Americans aged 50 to 64, and 33 percent of Americans aged 65 and above use the Internet. About 49 percent of Americans with a household income less than $30,000 a year, 75 percent of Americans with a household income between $30,000 and $49,999 a year, 90 percent of Americans with a household income of between $50,000 and $74,999, and 93 percent of Americans with a household income of $75,000 and above use the Internet. About 36 percent of Americans with less than a high school education, 59 percent of Americans with a high school education, 84 percent of Americans with some college education, and 91 percent of Americans with a college education or more use the Internet.[20]
- According to a study from early 2007, about 31 million U.S. households (29 percent of the total number of U.S. households) did not have Internet access and did not plan to obtain Internet access over the next year. A survey of these households asked why they were not interested in getting Internet access and found that 44 percent were not interested in anything on the Internet, 17 percent were not sure how to use the Internet, 14 percent had Internet access at work, 14 percent could not afford a computer, 8 percent could not afford service, and 3 percent said Internet service was not available for their home.[21]
- According to eMarketer, 51.7 percent of U.S. Internet users in 2007 were females.[22] U.S. Census data from 2000 found that females made up 50.9 percent of the U.S. population.[23]
- Although improvements in wireless and mobile technology have made Internet access through handheld devices easier, Americans are not necessarily using them very often. More than 60 percent of U.S. broadband users own a mobile device capable of accessing the Internet, but only about 5 percent of them use the mobile Internet.[24]
- The abundance of media has increased the prevalence of multitasking. Some 70 percent of U.S. adult Internet users watch TV while online, 61 percent listen to the radio while online, 36 percent read magazines while online, and 33 percent read the newspaper while online.[25]

Internet Activities of U.S. Adults with Access to the Internet, Fall 2006

Activities Performed in Previous 30 Days	All Adults Fall 2006 (%)	Change From Fall 2005 (%)	Change From Fall 2002 (%)
Emailing	70.5	+1.6	+9.7
Obtaining News/Current Events	40.2	-4.6	+12.3
Personal Shopping	34.2	+5.7	+57.7
Bill Paying	30.7	n/a	n/a
Instant Messaging	26.8	+20.6	n/a
Obtaining Financial Information	24.8	-5.2	+21.4
Obtaining Sports News	23.8	-7.0	+15.1
Online Gaming	22.4	-1.3	+22.4
Personal or Business Travel Planning	19.8	-.5	+24.9
Obtaining Medical Information	17.4	-2.5	+26.2
Downloading Music	15.7	+23.3	n/a
Visiting TV Network/Program Websites	14.1	-1.7	+35.1
Job Hunting	12.1	-7.7	+11.3
Viewing Online Video	11.4	+123.7	n/a
Listening to Online Radio	10.9	+3.8	+25.6
Visiting Blogs	6.7	+163.9	n/a
Telephone Calling	2.6	+197.7	n/a

Source: Clickz Stats[26]

Internet Use Among U.S. Hispanics, Whites, and Blacks, 2007

Demographic	Percent Using Internet
Black College Graduates	93
White College Graduates	91
Hispanic College Graduates	89
Whites, Ages 18-29	86
English-Dominant Hispanics	78
Blacks, Ages 18-29	77
Native-Born Hispanics	76
All Whites	71
Hispanics, Ages 18-29	67
All Blacks	60
All Hispanics	56
Foreign-Born Hispanics	43
Spanish-Dominant Hispanics	32
Whites, No High School Degree	32
Hispanics, No High School Degree	31
Whites, Ages 71+	27
Blacks, No High School Degree	25
Hispanics, Ages 71+	17
Blacks, Ages 71+	7

Source: Pew Hispanic Center[27]

The Worldwide Online Population

ComScore estimated that in 2006, 21 percent of the world's Internet users were in the U.S., down from 65 percent ten years earlier.[28] Among the countries with the fastest-growing Internet user bases from January 2006 to January 2007 were India (33-percent growth), Russia (21-percent growth), and China (20-percent growth).[29]

- In January 2007, 747 million people aged 15 and over used the Internet worldwide, a 10-percent increase over the number who did so in January 2006.[30]
- A 2006 survey of online buying habits in Brazil, China, France, Germany, Japan, Russia, Spain, and Turkey found that 52 percent of consumers in those countries only bought products at websites where the information was presented in their native language; more than 60 percent of consumers in France and Japan behaved in this way.[31]
- One study found that Canadian Internet users spent the most time on the Internet in January 2007, with an average of 39.6 hours over the course of the month. Israelis came in second with 37.4 hours, followed by South Koreans at 34.0 hours, and Americans with 31.6 hours.[32]
- In the countries of the EU-25, 47 percent of the population used the Internet at least once a week in the first quarter of 2006. The countries with the highest Internet penetration rates were the Netherlands (80 percent), Denmark (79 percent), Sweden (77 percent), and Luxembourg (70 percent). The lowest Internet penetration rates were those of Greece (23 percent), Slovakia (27 percent), Hungary (32 percent), Lithuania (35 percent), and Portugal (35 percent).[33]
- Internet use from mobile phones was more common in Europe than the U.S in September 2006. Only 19 percent of U.S. Internet users regularly accessed the Internet from a mobile phone during that month, compared with 34 percent of German Internet users, 34 percent of Italian Internet users, 28 percent of French Internet users, 26 percent of Spanish Internet users, and 24 percent of Internet users in the U.K.[34]
- According to a 2006 OECD report, English is still the dominant language on the Internet, as 32 percent of worldwide Internet users are native English-speakers, followed by Chinese at 13 percent, Japanese at 8 percent, Spanish at 6 percent, and German at 6 percent.[35]
- The OECD found that the most popular Internet activity in the countries of the EU and Norway in 2006 was searching, performed by 86 percent of the Internet users in those areas. The next most popular Internet activities were instant messaging (performed by 32 percent of Internet users in those areas), downloading music (29 percent), listening to Internet radio (24 percent), participating in online forums (20 percent), and online gaming (15 percent).[36]

World Internet Usage, 2007

Region	Internet Users (millions)	Internet Users (% of population)	Percent of World Users	User Growth Since 2000 (%)
Africa	33.3	3.6	3.0	638.4
Asia	398.7	10.7	35.8	248.8
Europe	314.8	38.9	28.3	199.5
Middle East	19.4	10.0	1.7	491.4
North America	233.2	69.7	20.9	115.7
Latin America/Caribbean	96.4	17.3	8.7	433.4
Oceania/Australia	18.4	53.5	1.7	142.0
Total	**1,114.3**	**16.9**	**100.0**	**208.7**

Source: Internet World Stats[37]

Internet Usage Statistics for Select Countries, 2007

Country	Internet Users (millions)	User Growth Since 2000 (%)	Population (millions)	Internet Users (% of population)
Argentina	13.0	420	38.2	34.0
Bangladesh	0.4	270	137.5	0.3
Brazil	32.1	543	186.8	17.2
Canada	22.0	73	32.4	67.8
China	137.0	509	1317.4	10.4
Egypt	5.0	1,011	72.5	6.9
France	30.8	263	61.4	50.3
Germany	50.5	110	82.5	61.2
India	40.0	700	1129.7	3.5
Indonesia	18.0	800	224.5	8.0
Iran	7.5	2,900	70.4	10.6
Israel	3.7	191	7.2	51.1
Italy	30.8	133	59.5	51.7
Japan	86.3	83	128.6	67.1
Mexico	20.2	645	106.5	19.0
Morocco	4.6	4,500	30.5	15.1
Nigeria	5.0	2,400	162.1	3.1
Pakistan	12.0	8,862	167.8	7.2
Poland	11.4	307	38.1	29.9
Russia	23.7	665	143.4	16.5
South Africa	5.1	113	49.7	10.3
South Korea	34.1	79	51.3	66.5
Spain	19.8	267	45.0	43.9
Turkey	16.0	700	75.9	21.1
Ukraine	5.3	2,539	45.8	11.5
U.K.	37.6	144	60.4	62.3
U.S.	211.1	121	302.0	69.9

Source: Internet World Stats[38]

Websites on the Internet

As of early 2007, there were an estimated 113.7 million active websites,[39] up from around 10,000 at the end of 1994.[40]

- According to comScore, from December 2005 to December 2006, some of the fastest-growing sites were YouTube (growing 1,972 percent to 120 million worldwide visitors), MySpace (growing 159 percent to 90 million worldwide visitors), Blogger (growing 90 percent to 93 million worldwide visitors), Google Gmail (growing 71 percent to 60 million worldwide visitors), Yahoo! News (growing 44 percent to 104 million worldwide visitors), and New York Times Digital (growing 20 percent to 68 million worldwide visitors).[41]
- Most pageviews of prominent American websites are from non-U.S. Internet users. For example, Google gets 89 percent of its pageviews from non-U.S. users. About 75 percent of pageviews of Microsoft's sites and 67 percent of pageviews of Yahoo!'s sites are from non-U.S. Internet users.[42]
- In January 2007, Wikipedia broke into comScore's list of the top ten most popular websites in the U.S. for the first time, coming in ninth place with 42.9 million unique visitors for the month.[43]
- In January 2007, the top website categories and their respective market shares of U.S. visits were adult websites (12.2 percent), email services (9.4 percent), net communities and chat (9.2 percent), entertainment websites (8.4 percent), business and finance websites (7.7 percent), shopping and classifieds (7.6 percent), search engines (7.5 percent), portal frontpages (6.3 percent), and news and media websites (3.5 percent).[44]
- According to comScore, the leading U.S. Internet company by average visits per visitor in February 2007 was Yahoo!, with an average of 28.6 visits per visitor for the month, followed by Facebook at 23.6, Microsoft at 21.8, and Time Warner at 19.4.[45]
- Many estimates of website visits use the number of unique cookies (small text files inserted on a user's computer by a server) as a proxy for unique visitors. However, a portion of Internet users delete their cookies very frequently, which means that estimates of unique visitors relying on cookies can yield inaccurate numbers.[46]

Top Web Properties According to comScore

Top U.S. Properties, May 2007	U.S. Unique Visitors (millions)	Top Worldwide Properties, Feb. 2007	Worldwide Unique Visitors (millions)
Yahoo! Sites	130.5	Microsoft Sites	507.3
Time Warner Network	122.7	Google Sites	503.0
Google Sites	120.0	Yahoo! Sites	459.0
Microsoft Sites	113.9	Time Warner Network	256.2
Fox Interactive Media	82.3	eBay	248.6
eBay	79.4	Wikipedia Sites	192.2
Amazon Sites	51.6	Amazon Sites	143.1
Ask Network	50.1	Fox Interactive Media	140.5
Wikipedia Sites	48.7	CNET Networks	116.4
New York Times Digital	43.6	Apple, Inc.	111.9
Apple, Inc.	41.9	Ask Network	108.7
Viacom Digital	40.5	Adobe Sites	98.7
Weather Channel	38.5	Lycos, Inc.	86.6
CNET Networks	31.0	Viacom Digital	76.6
Gorilla Nation	29.5	New York Times Digital	71.0
U.S. Total	**177.5**	**Worldwide Total**	**739.8**

Source: comScore[47]

Top 20 Websites According to Alexa.com, June 2007

Rank	U.S.	Worldwide
1	Yahoo!	Yahoo!
2	Google	Microsoft Network
3	Myspace	Google
4	Microsoft Network	YouTube
5	YouTube	Windows Live
6	eBay	Myspace
7	Facebook	Baidu.com
8	Live.com	Orkut
9	Craigslist.org	Wikipedia
10	Wikipedia	www.qq.com
11	Amazon.com	Yahoo! Japan
12	AOL	Microsoft Corporation
13	Blogger.com	Megaupload
14	Go	sina.com.cn
15	CNN.com	Hi5
16	Microsoft Corp.	Blogger.com
17	Comcast.net	Facebook
18	Megaupload	Rapidshare.com
19	The Internet Movie Database	eBay
20	Photobucket	Sohu.com, Inc.

Source: Alexa.com[48]

Internet Service Providers and Web Browsers

An Internet Service Provider (ISP) is a business or organization that provides access to the Internet. Phone and cable companies are the main providers of Internet access.[49] A web browser is a piece of software that allows users to navigate the Internet and view web pages. Since the early 1990s, there have been three dominant browsers: Mosaic (used by most Internet users until about 1995), Netscape (used by most Internet users from around 1996 to 1998), and Internet Explorer (used by most Internet users from 1999 to the present time). Firefox emerged as a new browser in 2002, but its usage rates are still very small compared to Internet Explorer's.[50]

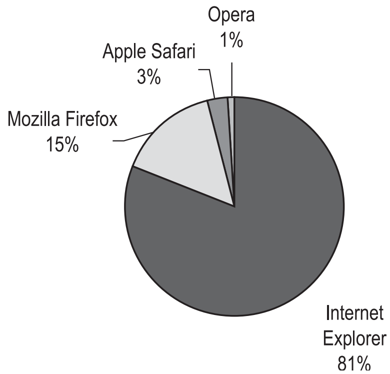
- In 2006, 78 percent of U.S. households subscribed to an Internet Service Provider, up from 69 percent in 2005.[51]
- Dial-up Internet connections have download speeds that usually range from 2,400 bps to 56 kbps. There are two main types of DSL (digital subscriber line) for home subscribers: ADSL, most common in North America, with download rates of 1.5 to 9 mbps and upload rates of 16 to 640 kbps; and SDSL, more common in Europe, with download and upload rates of up to 3 mbps. Cable speeds typically range from 512 kbps to 20 mbps. T-1 lines support data transfer rates of 1.544 mbps. T-3 lines support speeds from 43 to 45 mbps.[52]
- In late 2006, AOL successfully underwent a transformation from a subscription-based service to a free service supported by advertising. Advertising sales rose and subscriptions declined by almost equal amounts, leaving overall revenue down just 3 percent year-over-year at the end of the third quarter of 2006.[53]
- Worldwide, Microsoft's Internet Explorer has almost eight times as many users as Firefox, but Internet users in Germany, Australia, and Italy have taken to Firefox in higher numbers. In October 2006, Firefox's usage share was highest in Germany, where 33 percent of Internet users used it. Australia (26 percent) and Italy (22 percent) also had large numbers of Firefox users.[54]
- Firefox experienced a slow but steady increase in usage during late 2006 until January 2007, when its worldwide share declined from 14 percent to 13.7 percent. In the same month, Apple's Safari browser's share experienced an increase from 4.2 percent to 4.7 percent, probably due to an increase in Mac OS X use.[55]
- Internet Explorer had 92 bugs during 2006, while Firefox had 87 bugs.[56] In the second half of 2006, Symantec found 54 vulnerabilities in Internet Explorer, 40 in the Mozilla browsers, 4 in Apple Safari, and 4 in Opera.[57]

Top Ten U.S. ISPs by Subscriber, Q4 2006

ISP	Subscribers (millions)	Market Share (%)
America Online (all U.S. AOL brand accounts)	13.2	13.9
Comcast (cable broadband)	11.5	12.1
SBC (AT&T) (business/consumer DSL, U-Verse, and satellite)	8.5	9.0
Verizon (FiOS and DSL)	7.0	7.4
Road Runner (cable broadband)	6.9	7.3
EarthLink (DSL, dialup, cable, satellite, PLC, and webhosting)	5.3	5.6
Charter (cable broadband)	2.4	2.5
United Online (paid access only)	2.3	2.4
Qwest (DSL only)	2.1	2.3
Cablevision (cable broadband)	2.0	2.1

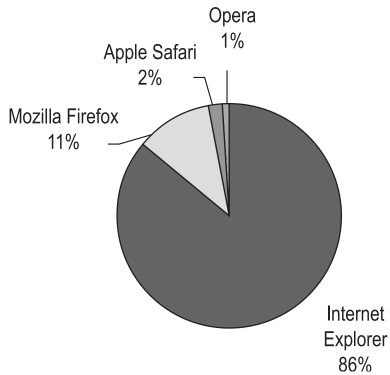
Source: ISP Planet[58]

Top U.S. Browsers, October 2006



Source: Clickz Stats[59]

Top Worldwide Browsers, October 2006



Source: Clickz Stats[60]

Internet Search Engines

Search engines, primarily supported by advertising revenues, help users find websites on topics they are interested in. They have become the primary gatekeepers of the Internet. The top three Internet properties by unique worldwide visitors as of January 2007 were Microsoft (510 million unique visitors, 68 percent of the total number of Internet users worldwide), Google (502 million unique visitors, 67 percent of the worldwide total), and Yahoo! (468 million unique visitors, 63 percent of the worldwide total). The fourth most visited property was the Time Warner network, owner of AOL, with 262 million unique visitors (35 percent of the world total). These four companies are in many ways the most important Internet companies, each of them combining powerful search engines with a variety of other services.[61]

- In 2006, Google, Yahoo!, MSN, and AOL together received 66 percent of the \$19.5 billion spent on online advertising in the U.S., an increase from the 54 percent they had in 2005. Google accounted for 32 percent, Yahoo! for 19 percent, AOL for 9 percent, and MSN for 7 percent of U.S. Internet advertising spending.[62]
- Goldman Sachs predicted that Google would make operating profits of over \$5 billion in 2007 and grow 36 percent per year until 2010, Yahoo! would make operating profits of \$3 billion in 2007 and grow 20 percent per year, and Microsoft's online businesses would lose \$2 billion in 2007 and even more in the next two years.[63] In the fourth quarter of 2006, Google generated an estimated \$1.1 billion in U.S. search revenues, while Yahoo! generated only about \$190 million.[64]
- In April 2007, Google paid \$3.1 billion to acquire DoubleClick, the leader in putting display advertisements on websites.[65]
- Yahoo! introduced Panama, a system for keyword bidding on searches, in February 2007.[66] In late February, it was predicted that Yahoo! would see an increase in revenue of between 15 percent and 45 percent as a result.[67]
- In an attempt to gain more differentiation for localized markets, Yahoo! struck a deal in late 2006 with 176 newspapers to share various forms of content, including job classifieds and advertising.[68] Yahoo! also reached an agreement with Nokia in November 2006 to offer email and instant messaging on Nokia phones.[69] Google and Yahoo! incorporate instant messaging in their email programs.[70]
- In 2006, Google bought YouTube and partnered with eBay, Yahoo! launched Yahoo! Answers, and MSN worked toward relaunching a new search engine that might be integrated with Word or Excel.[71] Yahoo!, which owns Flickr and del.icio.us, acquired social-networking service Bix.com and video service Jumpcut in early 2007.[72] In December 2006, Google unveiled a service that allows users to search 7 million patents by different criteria.[73]

Share of U.S. Online Searches by Engine

	Apr. 2006	Jun. 2006	Aug. 2006	Oct. 2006	Dec. 2006	Feb. 2007	Apr. 2007
Google	43.1	44.7	44.1	45.4	47.3	48.1	49.7
Yahoo!	28.0	28.5	28.7	28.2	28.5	28.1	26.8
MSN	12.9	12.8	12.5	11.7	10.5	10.5	10.3
Ask	5.8	5.6	5.5	5.8	5.4	5.0	5.1
AOL	6.9	5.1	5.6	5.4	4.9	4.9	5.0

Source: comScore[74]

U.S. Advertising Revenues at the Top Four Search Engines as a Percent of Total Internet Advertising Spending, 2004-2007

	2004	2005	2006	2007*
Google	13.1	19.2	25.0	32.1
Yahoo!	18.4	19.4	18.3	18.7
AOL	6.8	7.2	7.5	9.1
MSN	9.4	7.8	6.7	6.8
Total for Top Four Portals	**47.8**	**53.7**	**57.4**	**66.6**

* Projections
Source: eMarketer[75]

Top Searches by Engine, 2006

Rank	MSN	Google	Yahoo!	AOL
1	Ronaldinho	Bebo	Britney Spears	Weather
2	Shakira	MySpace	WWE	Dictionary
3	Paris Hilton	World Cup	Shakira	Dogs
4	Britney Spears	Metacafe	Jessica Simpson	American Idol
5	Harry Potter	Radio Blog	Paris Hilton	Maps
6	Eminem	Wikipedia	American Idol	Cars
7	Pamela Anderson	Video	Beyonce Knowles	Games
8	Hilary Duff	Rebelde	Chris Brown	Tattoo
9	Rebelde	Mininova	Pamela Anderson	Horoscopes
10	Angelina Jolie	Wiki	Lindsay Lohan	Lyrics

Source: Clickz Stats[76]

Chapter 2
The Hardware Sector

A milestone was reached in 1998 when the volume of global Internet traffic through America passed the amount of voice traffic, and another milestone may soon be reached when the number of devices connected to the Internet outnumbers the people who use it.[1] The range of devices using computing and other advanced technologies is staggering, as are their frequently rapid adoption rates. A late 2006 poll found that the average U.S. family owned 12 media gadgets: three TVs, two PCs, and seven other devices. Respondents spent 3.6 hours a day using the Internet, 2.5 hours watching TV, 1.2 hours using email, and one hour using instant messaging.[2]

U.S. consumers spent $111 billion on consumer technology products in 2006, an increase of 3.6 percent from 2005. However, this growth rate represents a decline from a year before, when sales increased 7.2 percent. Interestingly, consumers were more likely to buy technology products in stores in 2006 than in 2005. Brick and mortar sales revenue of consumer technology products grew 4.6 percent to $85.8 billion in 2006, while online sales grew only 0.5 percent to $25.2 billion.[3] In-Stat predicts that worldwide consumer electronics sales will increase steadily from 2.1 billion units in 2006 to 3 billion units in 2010.[4]

Worldwide revenue for all electronic equipment is expected to grow 6.7 percent from $1.37 trillion in 2006 to $1.47 trillion in 2007. The fastest-growing segment is predicted to be data processing equipment, expected to increase 9.1 percent from $387 billion in 2006 to $422 billion in 2007. Wired communications equipment is also predicted to exhibit strong growth, growing 7.2 percent from $94.6 billion in 2006 to $101.4 billion in 2007. The wireless communications market is expected to grow only 4.9 percent in 2007, much less than the 8.7-percent growth it exhibited in 2006.[5]

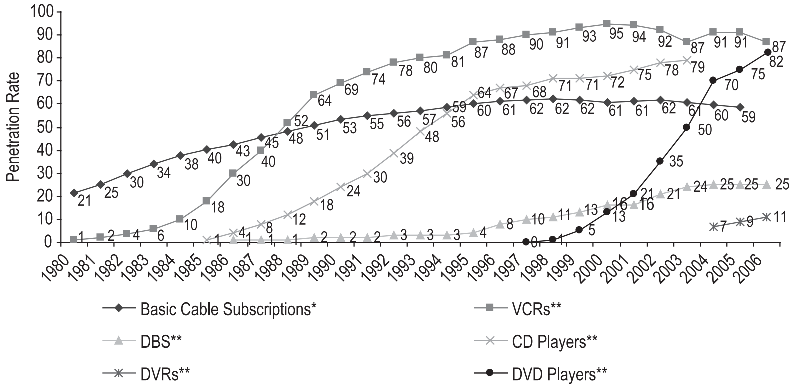
Wireless users often carry redundant devices with them. About 80 percent of the people who have a camera phone say they also routinely carry their digital camera. About 75 percent of smartphone users also carry a PDA, and 50 percent of multimedia phone users carry their MP3 player.[6] By 2011, the number of media-capable mobile devices worldwide (cell phones, gaming devices, etc.) will be more than 3.2 billion, and an additional 1.1 billion are expected to be shipped that year.[7]

Adoption Rates of Entertainment and Communications Technologies

The adoption rate of innovations by a population normally rises slowly at first, then quickly, and finally levels off, often but not necessarily near 100 percent. Many communications and entertainment devices have followed this pattern of adoption.

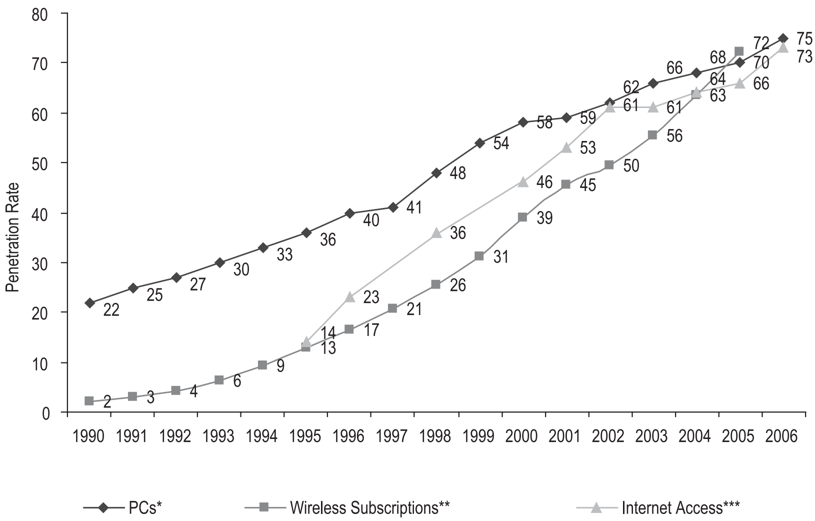
- New products and services are becoming widely adopted more quickly. Telephones were not adopted by most U.S. households until 71 years after their introduction, and it took 52 years for electricity to be available to a majority of U.S. households.[8] By contrast, PCs, VCRs, CD players, and DVD players each took less than 20 years to pass the 50-percent adoption threshold. DVD players were adopted by 50 percent of the U.S. population about 7 years after their introduction, even though similar devices (VCR players) were already in about 90 percent of American homes at the time.[9]
- Americans often adopt entertainment products and services more rapidly than communication devices. Since about 1985, the penetration rate of television sets has been higher than that of telephones, in spite of numerous government programs to increase telephone adoption rates.[10]
- The penetration rates of media players such as VCRs, CD players, and DVD players have followed very similar paths, rising very quickly soon after their introduction and leveling off after only a few years of growth.[11] Subscription-based services, such as basic cable and dish-based satellite (DBS) services, however, follow a much more gradual path and level off at a much lower rate of adoption than the packaged media-oriented devices.[12]
- The penetration rates of personal computers, wireless subscriptions, and Internet access seem to be converging, possibly due to the increasingly interrelated nature of the Internet and wireless communications.[13] The rates might level off well below 100-percent adoption, with many of the same individuals avoiding all three technologies.

U.S. Penetration Rates for Entertainment Products and Services



* Source: NCTA[14] (number of basic cable subscriptions as a percent of U.S. households)
** Source: CEA[15] (household penetration rates)

U.S. Penetration Rates for Communications Products and Services



* Source: CEA[16] (household penetration rate)
** Source: CTIA[17] (U.S. wireless subscriptions as a percent of U.S. citizens)
*** Source: Pew[18] (percent of U.S. adults online)

Semiconductors

Semiconductors are ubiquitous in a whole range of consumer and business products, in addition to their use in computers and communications devices. Semiconductors are usually made of silicon and come in many types, including transistors, memory chips, and microprocessors. 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.

- The Semiconductor Industry Association estimated that worldwide semiconductor sales reached $249 billion in 2006, an increase of 9.4 percent over 2005's $228 billion. Worldwide semiconductor sales are projected to be $321 billion in 2009.[19] Gartner estimated that worldwide semiconductor revenue was $263 billion in 2006, a 10.2-percent increase from 2005's $238 billion.[20] iSuppli estimated that worldwide semiconductor revenue was $259 billion in 2006 and predicted that it would reach $286 billion in 2007, a 10.6-percent increase.[21]
- In 1995, 50.6 percent of semiconductor revenues were from computers, 17.5 percent from consumer products, 14.7 percent from communications products, 10.3 percent from industrial products, 5.3 percent from automobiles, and 1.6 percent from military equipment. In 2005, 45.4 percent of semiconductor revenues were from computers, 14.7 percent were from consumer products, 25.3 percent were from communications products, 6.3 percent were from industrial products, 7.8 percent were from automobiles, and 0.4 percent were from military equipment.[22]
- The cell phone industry recently became the second-largest consumer of semiconductors, behind personal computers.[23] The computer segment of the industry is expected to account for 42 percent of the worldwide semiconductor market through 2011.[24]
- The average cost of the semiconductor content in a cell phone worldwide fell to around $40 in 2006, due mainly to increased demand for low-end phones in emerging markets.[25]
- The leading worldwide semiconductor manufacturer in 2006 was Intel, but its dominance in the market slipped significantly. Revenue fell 11.1 percent to $31.5 billion, making Intel the only top-five vendor to have a decline in revenue in 2006.[26] Intel laid off 10 percent of its workforce in September 2006.[27]
- Following an increase in chip inventories in late 2006 and early 2007, Semico Research lowered its prediction of growth in semiconductor sales for 2007 from 7 percent to 5.8 percent,[28] and Gartner predicted that semiconductor industry capital equipment spending would decline 0.7 percent for the year.[29]
- As has been well-documented, the computing power of semiconductors tends to double every 18 months, a phenomenon often called "Moore's Law." The electricity requirements of a chip of a given capacity tend to decrease by half every 18 months as well.[30]

Worldwide Semiconductor Sales and Projections by Product Category ($billions)

	2006*	2009*	CAGR* (%)
Discrete	16.6	19.9	6.9
Optoelectronic	16.7	22.1	10.4
Analog	37.3	48.6	11.1
Microprocessor	33.2	41.9	4.7
Microcontroller	12.5	15.3	6.1
Digital Signal Processor	8.6	12.3	12.7
MOS Logic	60.3	78.8	8.1
DRAM	33.0	44.2	14.6
Flash Memory	20.5	25.7	8.4
Total Sales	**248.8**	**321.0**	**9.0**

* Projections
Source: Semiconductor Industry Association[31]

Semiconductor Sales by Region ($billions)

Market	2005	2006*	2007*	2008*	2009*
Americas	40.7	45.6	49.7	54.4	57.3
Europe	39.3	40.1	43.5	47.9	50.3
Japan	44.1	47.3	51.2	56.1	58.5
Asia/Pacific	103.4	115.8	129.4	145.1	154.8
Total	**227.5**	**248.8**	**273.8**	**303.4**	**321.0**

* Projections
Source: Semiconductor Industry Association[32]

Semiconductor Vendors' Worldwide Revenues and Market Shares

	Revenue ($billions)					Market Share (%)				
Company	**2002**	**2003**	**2004**	**2005**	**2006**	**2002**	**2003**	**2004**	**2005**	**2006**
Intel	24.2	26.9	30.7	35.1	30.4	15.5	15.1	14.0	15.0	11.6
Samsung	8.2	10.5	16.3	17.9	20.1	5.3	5.9	7.4	7.6	7.7
Texas Instruments	6.2	7.4	9.7	10.5	12.0	4.0	4.2	4.4	4.4	4.6
Infineon Technologies	5.3	6.9	8.9	8.3	10.5	3.4	3.9	4.1	3.5	4.0
STMicroelectronics	6.3	7.2	8.8	8.8	9.9	4.1	4.0	4.0	3.8	3.8
Toshiba	6.5	7.4	8.5	9.3	9.8	4.2	4.1	3.9	3.9	3.7
Hynix Semiconductor	n/a	n/a	4.6	5.7	8.0	n/a	n/a	2.1	2.4	3.0
Renesas Technology	n/a	7.9	9.0	8.8	7.9	n/a	4.5	4.1	3.7	3.0
AMD	n/a	n/a	5.0	5.7	7.4	n/a	n/a	2.3	2.4	2.8
Freescale Semiconductor	n/a	n/a	n/a	n/a	6.0	n/a	n/a	n/a	n/a	2.3
Total, including others	**155.4**	**178.2**	**220.0**	**235.0**	**262.7**	**100**	**100**	**100**	**100**	**100**

Source: Gartner[33]

Personal Computer Sales

From 1975 to 2004, about 1.4 billion PCs were sold worldwide. It has been predicted that the period from 2006 to 2010 (one-sixth that amount of time) will see almost as many sales–about 1.3 billion. By 2010, there are forecast to have been 2.9 billion total PCs sold worldwide,[34] equal to about 43 percent of the number of people predicted to be alive in the world at that time.[35]

- Some 231 million PCs were shipped worldwide in 2006, and this number is forecast by Gartner to reach 256 million in 2007, an increase of 10.5 percent. Revenue from these shipments, however, is expected to increase by only 4.6 percent, from $204 billion in 2006 to $214 billion in 2007.[36]
- Dell, whose direct-sales model, once its strength, has become increasingly viewed as problematic, lost its leadership in PC market share in 2006 to Hewlett-Packard.[37] Hewlett-Packard's growth was "the most remarkable event in the PC industry in 2006" according to iSuppli.[38]
- In the fourth quarter of 2006, the leading worldwide notebook PC vendors were Hewlett-Packard (5.05 million units), Dell (3.52 million units), Acer (3.37 million units), and Toshiba (2.45 million units). The overall market grew 15.5 percent over the third quarter, with Acer (45.6 percent) and Hewlett-Packard (32.8 percent) exhibiting the most growth in unit shipments.[39]
- Dell and Hewlett-Packard led the U.S. market for PC shipments in the first quarter of 2007, with 27.9-percent and 25.7-percent market shares, respectively, followed by Gateway at 7.7 percent, Toshiba at 5.4 percent, and Apple at 5.0 percent.[40]
- In 2006, 78.8 million notebook PCs were sold worldwide, and sales are predicted to reach about 97 million units in 2007.[41] Notebook PCs are predicted to make up 40 percent of PC unit shipments in 2010, up from 28 percent in 2005.[42]
- The worldwide PC market has been growing much faster than the U.S. market; in the third quarter of 2006, the global market grew 9.1 percent, while the U.S. market saw no growth at all.[43] In the fourth quarter of 2006, worldwide shipments grew an estimated 7.4 percent year-over-year, while U.S shipments declined 3.2 percent.[44]
- The "One Laptop Per Child" initiative, which aims to produce laptop PCs that cost $100, is on course to ship between 5 and 10 million laptops in 2007 to countries including Argentina, Brazil, Libya, Nigeria, and Thailand.[45] In much of the world, a PC costs more than a house.[46]

MS-DOS and Windows PC Sales

	U.S. Units (millions)	Worldwide Units (millions)	U.S. Value ($billions)	Worldwide Value ($billions)
1981-1985	3.8	5.7	10.5	16.9
1986-1990	28.1	60.3	76.4	181.0
1991-1995	64.3	172.0	153.0	447.0
1996-2000	162.0	444.0	335.0	1,010.0
2001-8/2006	267.0	855.0	424.0	1,440.0
Total, 1981-8/2006	**525.0**	**1,540.0**	**998.0**	**3,100.0**

Source: Computer Industry Almanac[47]

Worldwide PC Sales and Forecasts by Company (millions)

	1991-1995	1996-2000	2001-2005	2006-2010*
Dell	5.4	42.1	133.0	246.0
HP & Compaq	21.3	95.0	130.0	205.0
IBM & Lenovo	18.0	43.5	64.8	107.0
Acer	1.7	9.5	28.8	79.0
NEC & PB	9.3	25.7	26.5	38.0
Apple	16.2	17.6	17.2	33.0
Toshiba	4.6	15.9	24.2	41.0
Gateway	3.8	18.0	16.5	32.0
Total PC Sales	**201.0**	**492.0**	**810.0**	**1,300.0**

* Projections
Source: Computer Industry Almanac[48]

Worldwide PC Unit Shipments by Company

	Shipments (millions)				Market Share (%)			
Company	**2004**	**2005**	**2006**	**Q1 2007**	**2004**	**2005**	**2006**	**Q1 2007**
Dell	31.0	36.8	38.1	8.7	16.4	16.8	15.9	13.9
Hewlett-Packard	27.6	31.8	38.0	11.0	14.6	14.5	15.9	17.6
Lenovo	12.9	15.1	16.6	4.0	6.8	6.9	7.0	6.3
Acer	6.4	10.2	13.9	4.3	3.4	4.6	5.8	6.8
Toshiba	n/a	n/a	9.2	2.6	n/a	n/a	3.8	4.1
Fujitsu/Fujitsu Siemens	7.1	8.3	n/a	n/a	3.8	3.8	n/a	n/a
Others	104.4	116.4	123.6	32.2	55.1	53.3	51.6	51.3
Total	**189.5**	**218.5**	**239.4**	**62.7**	**100.0**	**100.0**	**100.0**	**100.0**

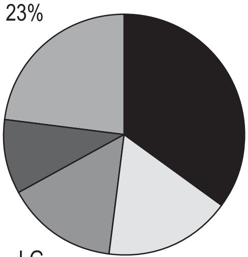
Source: Gartner[49]

Cell Phones

The cell phone is the fastest-selling consumer electronics item in history.[50] The cell phone industry, along with its related fields, such as software developers and network operators, are estimated to have worldwide revenues of about $1 trillion per year.[51] About 1 billion mobile phones were sold worldwide in 2006.[52] As of early 2007, about 2.8 billion mobile phones were in use worldwide, and 1.6 million new ones entered into usage every day.[53] The cell phone has quickly become the principal telecommunications device in the U.S. and around the world, and an increasingly wide range of industries offer services (music, ringtones, Internet service, etc.) that piggyback on the cell phone's convenience.

- According to The NPD Group, mobile phone sales in the U.S. reached 39 million units, a 12-percent increase over unit sales in the first quarter of 2006.[54]
- As of late 2006, 75 percent of North American households had cell phones, and almost half of them made the majority of their long-distance calls on them.[55]
- Mobile handset purchases are increasingly made by upgraders rather than first-time buyers. First-time sales are predicted to be 342 million in 2007 and drop to 201 million by 2010. Upgrade purchases, on the other hand, are predicted to be 712 million in 2007 and reach 1 billion by 2010.[56]
- Over the course of 2006, the largest sales gains by U.S. stores carrying cell phones were experienced by Best Buy (43-percent gain) and Circuit City (40-percent gain). Carrier stores collectively accounted for 63 percent of handset sales in the U.S. in the first quarter of 2007.[57]
- It has been predicted that the average price of entry-level CDMA2000 (a 2.5G/3G transmission protocol) handsets will be about $33 by 2009 and the average price for an entry-level WCDMA (a 3G transmission protocol) handset will be $83 at that time.[58]
- According to iSuppli, cell phone subscription penetration rates in 2006 were 93.2 percent in North America, 83.2 percent in South Korea, 74.2 percent in Japan, 48.3 percent in Latin America, 24.4 percent in China, and 13.5 percent in India.[59]
- Worldwide penetration of handsets is predicted to increase from 25 percent in 2006 to 50 percent in 2011, and sales revenue is projected to grow from $144 billion to $200 billion over that period.[60] ABI Research predicts that almost one out of every four handsets sold worldwide by 2011 will be ultra-low-cost handsets (ULCHs) selling for less than $20. Most of these handsets will be in emerging markets such as India, where the ULCH market is expected to grow from 9 million units in 2006 to 116 million in 2011.[61]

U.S. Cell Phone Market Shares, Q1 2007



Source: The NPD Group[62]

Cell Phone Attitudes by Age Group, 2006 (percent)

	18-24	25-34	35+
High Importance When Selecting a Wireless Carrier			
Text Messaging	57	43	23
Multimedia Messaging	18	18	8
Instant Messaging	25	22	13
High Importance When Selecting a Cell Phone			
Text Messaging	58	46	30
Camera	42	37	30
Trendiness	26	25	10
MP3 Player	20	19	8
I Like My Phone to be Personalized (color, ringtones, etc.)			
Strongly Disagree	13	25	45
Strongly Agree	41	32	19

Source: comScore[63]

Worldwide Cell Phone Sales

	Units Sold (millions)			Market Share (%)		
	2005	2006	Q1 2007	2005	2006	Q1 2007
Nokia	265.0	344.2	92.0	32.6	34.7	35.7
Motorola	144.5	208.8	47.5	17.8	21.1	18.5
Samsung	103.1	116.2	32.1	12.7	11.8	12.5
Sony Ericsson	51.6	73.5	21.7	6.4	7.3	8.4
LG	54.2	61.7	16.0	6.7	6.3	6.2
Sagem	n/a	4.4	n/a	n/a	1.5	n/a
BenQ Mobile	n/a	13.5	n/a	n/a	2.8	n/a
Others	193.7	167.1	48.1	23.9	14.6	18.8
Total	**812.0**	**989.4**	**257.4**	**100.0**	**100.0**	**100.0**

Source: Gartner[64]

Smartphones and PDAs

Any cell phone that has computer-like capabilities can be called a smartphone, though the dividing line is becoming increasingly nebulous. Gartner defines a PDA as a data-centric handheld computer weighing less than one pound that is primarily designed for use with both hands. Smartphones offer all the attributes of a PDA, except that smartphones are voice-centric, with data access as a secondary capability, and they are designed primarily for one-handed operation.[65]

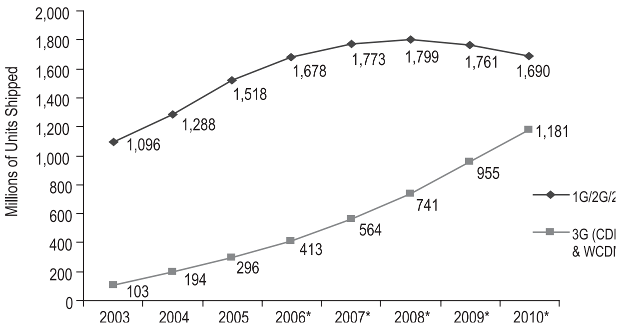
- At the end of 2006, a large number of quality smartphones costing $200 or less were introduced. These phones, which include the BlackBerry Pearl, Samsung BlackJack, Nokia E62, and the Treo 680, cost much less than similar phones had previously.[66]
- The NPD Group found that U.S. sales of smartphones grew from 216,000 units in January 2006 to 715,000 units in October 2006, a 230-percent increase. A large number of high-profile new devices, greater memory capabilities, and an average 10-percent reduction in price over that period were the main reasons for the growth.[67]
- Apple's much-anticipated iPhone was expected to revitalize the traditional handset market,[68] but some believe its high price markup (it had a $499 or $599 retail price even though its component parts cost about $230) will limit its appeal. There are expected to be about 835 other music phones introduced by various competitors in 2007.[69]
- iSuppli estimates that 74 percent of cell phones sold in the U.S. in 2007 will have a camera, and 13 percent will have a 3.2-megapixel camera.[70] About 48 percent of cell phone sales worldwide were camera phones in 2006, and this share is expected to grow to 81 percent by 2010.[71]
- U.S. smartphone operating systems are approximately evenly split between Windows Mobile, BlackBerry OS, and Palm OS.[72]
- In the first half of 2006, Japan overtook EMEA (Europe, the Middle East, and Africa) to become the largest market for smartphones. During this period, Japan accounted for 33 percent of the worldwide smartphone market, and North America was the only region in the world where PDAs outsold smartphones.[73]
- There were 17.7 million PDAs shipped worldwide in 2006, an increase of 18.4 percent over 2005's 15 million units.[74]
- About 60 percent of all PDAs shipped worldwide in 2006 could be used to connect to a cellular network, up from 47 percent in 2005.[75]
- The number of BlackBerry subscribers passed 5 million in 2006.[76]

Worldwide Camera Phone Sales by Region

	Units Sold (millions)			CAGR,
	2005	2006	2010*	2006-2010* (%)
Africa	7.5	16.0	45.1	29.6
Asia/Pacific	67.6	106.7	395.5	38.7
Eastern Europe	15.8	26.1	70.7	28.3
Japan	42.0	45.2	44.3	-0.5
Latin America	8.6	22.5	78.4	36.6
Middle East	7.3	14.1	34.4	24.9
North America	75.7	106.8	187.2	15.0
Western Europe	95.9	122.4	166.6	8.0
Total	**320.5**	**459.9**	**1022.1**	**22.1**

* Projections
Source: Gartner[77]

1G/2G/2.5G and 3G Cell Phone Worldwide Shipments



* Projections
Source: CDMA Development Group[78]

Worldwide PDA* Shipments by Company (thousands)

Company	2005	2006	Q1 2007
Research in Motion	3,193	3,511	928
Palm	2,774	1,970	n/a
Hewlett-Packard	2,260	1,722	n/a
Mio Technology	n/a	1,515	568
Nokia	n/a	n/a	319
Samsung	n/a	n/a	451
Sharp	n/a	1,428	436
Others	6,675	7,597	2,423
Total	**14,902**	**17,743**	**5,126**

* Excludes smartphones but includes cellular PDAs
Source: Gartner[79]

Data Storage

The growth in digital multimedia content is increasing the need for consumers and businesses to have storage facilities capable of holding several gigabytes of media. The home network storage market more than doubled in size from 2005 to 2007.[80] The storage software market brought in revenues totaling $9.8 billion in 2006, 8.3 percent higher than 2005,[81] and storage requirements for IT organizations are likely to increase by about 30 to 50 percent per year for the next few years according to The Advisory Council.[82]

- Studies have shown that people tend to read about 10 megabytes of material per day, listen to about 400 megabytes of sound per day, and see about one megabyte of information every second.[83]
- The first commercial hard drive with one terabyte of storage (1,000 gigabytes) was released by Hitachi in early 2007 with an average retail price of $399.[84]
- The average installed capacity in Fortune 1000 organizations grew from 198 terabytes in early 2005 to 680 terabytes in October 2006.[85]
- NOR and NAND are the two main types of Flash memory technologies, primarily used in memory cards and other portable devices such as PDAs and laptop computers. Flash memory has faster read access times, better shock resistance, and is less vulnerable to adverse environmental conditions than hard disk memory.[86] In 2006, NOR Flash suppliers saw their revenues increase by 6 percent, while NAND Flash suppliers' revenues increased by 15 percent. However, lower-than-expected prices and profitability hampered growth in both segments of the Flash market.[87]
- Intel and Spansion compete aggressively with each other in the NOR Flash market, but both firms were unprofitable for all of 2005 and 2006.[88] Samsung is the largest producer of NAND Flash memory.[89] Intel recently began competing in the NAND Flash market as well.[90]
- After a long period of falling, the prices of Flash memory began to rise quickly around March 2007, and some believed there may be a shortage late in the year.[91]
- Sales of Flash-based portable music players are expected to increase from 47 million in 2007 (21.7 percent of the market) to 135 million (50.2 percent of the market) in 2011.[92]
- The current Blu-ray specification allows for a maximum of 50 gigabytes to fit on a disc, but TDK has a prototype Blu-ray disc that holds up to 200 gigabytes on six layers. NEC and Harvard Medical School have a prototype of a light-sensitive protein coating that may be able to hold up to 50 terabytes of data on a DVD-sized disc.[93]

Percent of U.S. Internet Users with Digital Content Stored on Home Computers or Other Hard Drives, 2007

Content Type	Internet Users (%)
Movies and Television Shows	17
Personal Videos	26
Video Clips	36
Music	59
Digital Pictures	84

Source: Parks Associates[94]

Worldwide Server Vendor Revenue Estimates

Company	2005 Revenue ($billions)	2005 Market Share (%)	2006 Revenue ($billions)	2006 Market Share (%)
IBM	16.6	32.2	16.9	32.1
Hewlett-Packard	14.6	28.2	14.2	27.0
Sun Microsystems	4.9	9.6	5.7	10.8
Dell Inc.	5.4	10.5	5.4	10.3
Fujitsu/Fujitsu Siemens	2.7	5.2	2.5	4.8
Other Vendors	7.4	14.3	7.9	15.0
Total	**51.6**	**100.0**	**52.7**	**100.0**

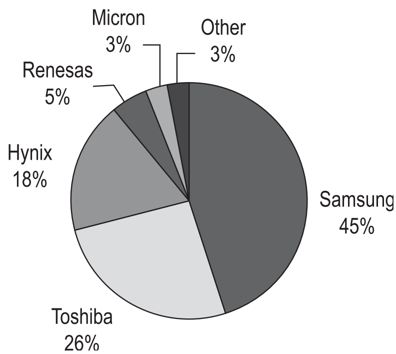
Source: Gartner[95]

How U.S. Internet Users are Backing up Documents and Content, 2006

Storage Type	Users (%)
CDs/DVDs	51
Don't Back Up	37
Zip Drives	11
External Hard Drives	11
Online Internet Storage	9
Copy on Second PC	5
Other	1

Source: Parks Associates[96]

NAND Flash Memory Market Shares, 2006



Source: Investor's Business Daily[97]

Gaming Hardware

As of March 2007, there were over 100 million gaming consoles and 700 million copies of video games in active use worldwide.[98] The introductions of Sony's PlayStation 3, Nintendo's Wii, and Apple's iTV are expected to create growth of 20.6 percent in the gaming console industry in 2007, with 35.4 million units sold for the year.[99]

- The Yankee Group predicted that by 2011, the PlayStation 3 will have sold about 30 million units and account for about 44 percent of the total number of third-generation gaming consoles sold in North America. Microsoft's Xbox 360 will have sold almost 27 million units (accounting for 40 percent of the market), and Nintendo will have sold over 11 million units (accounting for 16 percent of the market) over the same period.[100]
- An early 2007 study found that 36.5 percent of online U.S. adults owned a gaming console and 15.9 percent owned a portable gaming console.[101]
- In spite of the efforts of gaming console manufacturers to attract non-gamers, the vast majority of interest in next-generation gaming consoles is from current console gamers.[102]
- Sony seems to enjoy the most brand loyalty in the gaming console industry. A late 2006 survey found that 60 percent of Sony PlayStation 2 owners considering buying a new console were likely to buy a PlayStation 3, while only 46 percent of Nintendo GameCube owners looking to buy a new console felt the same about the Wii, and 45 percent of Microsoft Xbox owners looking to buy a new console said the same thing about Microsoft's Xbox 360.[103]
- The combined cost of the manufacturing and materials in Sony's PlayStation 3 was estimated to be $806 for the 20-gigabyte version, which retails for $499. The Xbox 360's manufacturing and materials cost $323, and it has a suggested retail price of $399.[104]
- The worldwide portable video game market is estimated to exceed $10 billion in revenue in 2007.[105]
- Since the Nokia N-Gage, Tapwave Zodiac, and Gizmondo have been taken off the market, the Nintendo DS and Sony PSP are the only handheld gaming devices still in production.[106]

U.S. Gaming Console Sales (thousands)

	Dec. 2006	Jan. 2007	Feb. 2007	Mar. 2007	Apr. 2007
Microsoft Xbox 360	1,132	294	228	199	174
Nintendo Wii	604	436	335	259	360
Nintendo GameCube	n/a	34	24	22	13
Sony PlayStation 2	1,400	299	295	280	194
Sony PlayStation 3	491	244	127	130	82
Total	**3,627**	**1,307**	**1,009**	**890**	**823**

Source: X-bit Labs[107]

Gaming Spending by Region ($billions)

	2005	2010*	CAGR* (%)
Asia/Pacific	9.8	17.4	12.3
Europe, Middle East, and Africa	7.6	13.9	13.0
U.S.	8.5	13.0	8.9
Canada	0.7	1.3	12.5
Latin America	0.5	0.8	9.5
Total	**27.2**	**46.4**	**11.3**

* Projections
Source: PriceWaterhouseCoopers[108]

Gaming Console Manufacturers' Web Traffic

Website	Feb. 2006 Unique Audience (thousands)	Feb. 2007 Unique Audience (thousands)	Year-over-Year Growth (%)
Nintendo	856	1,631	91
Xbox	827	1,218	47
PlayStation	1,105	1,016	-8

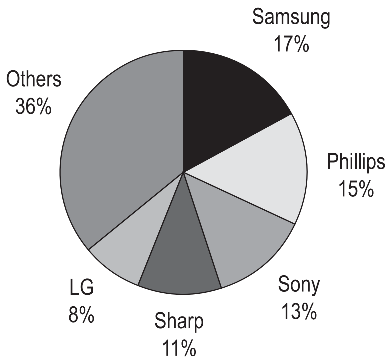
Source: Nielsen//NetRatings[109]

Televisions

In 2006, sales of TVs in U.S. retail stores reached $18.2 billion, an increase of 15.7 percent over 2005, with only 8.7 percent of revenue coming from online sales.[110] In 2007, there are expected to be about 1.7 billion televisions in use worldwide, with sales of about 160 million units for the year.[111] As of early 2007, only one-third of U.S adults had heard of the digital TV transition, which is scheduled for February 17, 2009.[112]

- As of January 2007, about 17 percent of U.S. households had a TV capable of supporting high-definition television (HDTV), an increase from about 7 percent two years earlier.[113]
- About 13.6 million HDTVs were sold in 2006. About half of the 24 million households with HDTVs don't actually watch programs in high-definition because they haven't obtained the necessary hardware. About half of those 12 million don't realize they're not watching high-definition television broadcasts on their HDTV.[114]
- On Thanksgiving weekend 2006, Wal-Mart lowered its price for a 42-inch flat-panel HDTV to $998, the first time the price of an HDTV, which had usually retailed for about $2,000, dropped below $1,000.[115]
- Sharp, which developed much of the technology behind LCD (liquid crystal display) TVs and was a big promoter of the technology early on,[116] had been the dominant LCD TV seller for most of 2006 until the fourth quarter, when it fell to fourth place, behind Samsung, Phillips, and Sony.[117] There were about 80 LCD TV brands sold in the U.S. as of February 2007.[118]
- In 2006, 52.7 million LCD TV panels were sold worldwide, a whopping 95.8-percent growth rate over 2005. iSuppli predicts that sales will increase at the lower but still high rate of 42.7 percent to reach 75.2 million units sold in 2007. In 2011, iSuppli predicts that sales will be 172 million units, by which time LCD TVs account for 65 percent of all television shipments worldwide.[119]
- The average price of a 42-inch LCD TV was $1,877 in March 2007, but this could drop to $1,175 by the end of the year.[120] It has been predicted that a typical 46- or 47-inch LCD TV will cost $1499 in 2010.[121]
- The average price of a plasma TV in the U.S. was $5,000 in 2002, but it declined to $1,500 by early 2007.[122] 13.4 million plasma TVs are expected to be sold in the U.S. in 2007 and 22.7 million in 2011.[123]
- Due mostly to a Chinese government program to speed up the conversion of urban households from analog TV to digital cable TV, worldwide digital cable set-top box shipments increased from 15.6 million in 2005 to 27.5 million in 2006, with revenues increasing from $3.1 billion to $4.2 billion. In China, shipments increased from 2.2 million to over 9 million.[124]

Worldwide LCD TV Market Shares, Q4 2006



Source: Circuits Assembly[125]

U.S. HDTV Ownership by Household Income, October 2006

Annual Household Income ($)	HDTV Ownership (%)
Less than 30,000	6
30,000-50,000	8
50,000-75,000	17
75,000-100,000	25
More than 100,000	38

Source: Leichtman Research Group[126]

Other Hardware

A wide range of consumer hardware products are available today. Some products, such as the iPod, have surprised everyone with their success, often affecting related industries in very significant ways. But many more products have surprised the experts by their lack of success. For example, in 2002, Bill Gates predicted that within five years, most PCs shipped would be tablet PCs, but they only made up about 2 percent of laptop computers shipped in early 2007, due to higher-than-expected costs and problems with touch and handwriting recognition technologies.[127] Another innovation whose widespread adoption has always seemed to be "right around the corner" is the robot. PC World predicts that 4.5 million domestic robots will be sold by 2009, and that service and professional robotics sales will exceed $17 billion by 2010.[128] Only time will tell if it turns out to be true.

- Some 27 percent of all U.S. Internet users own at least one digital music player. Owners of digital music players are 66 percent more likely than the typical Internet user to have an annual household income above $150,000.[129] Sales of MP3 players were $6 billion in 2006, an increase of 23 percent over 2005. Of those sales, 78 percent were from retail sales.[130] The portable media player (PMP) market is predicted to see sales of 217 million units in 2007, a 22-percent increase over 2006's 178 million,[131] and increase at a 5.5-percent annualized growth rate until 2011, when 269 million units are sold.[132] Apple sold the 100-millionth iPod in early 2007. Microsoft's Zune, intended as a competitor to the iPod, had not attracted a significant market share as of early 2007.[133]
- Shipments of stand-alone digital cameras grew at an average annual rate of 38 percent from 2000 to 2005, but they are only expected to grow 6 percent per year in the second half of the decade. Digital still camera sales were estimated to be 76.6 million units and $18.1 billion in 2006, up from 67.8 million units and $17.2 billion in 2005.[134] Lyra Research estimates there were 850 million camera phones worldwide in 2006 and that there will be 1.5 billion of them in 2010.[135] As people are becoming more accustomed to taking, storing, and sharing photographs digitally, the digital camera and the camera phone might wind up complementing rather than competing with each other.[136]
- USB has been and is expected to continue to be the dominant local interface until the end of 2010, when Bluetooth is predicted to become about as popular.[137] About 600 million Bluetooth-enabled devices were sold worldwide in 2006.[138]
- The market for organic light emitting diodes (LEDs), used in lighting applications and displays, is expected to be $10.9 billion by 2012 and $15.5 billion by 2014.[139] The overall market for organic electronics is expected to grow from $1.4 billion in 2007 to $19.7 billion in 2012 and $34.4 billion in 2014.[140]

Worldwide PMP/MP3 Player Shipments and Revenues

	2005	2006	2007*	2008*	2009*	2010*	2011*	CAGR, 2006-2011* (%)
OEM Factory Revenue ($millions)	14,028	18,026	20,620	21,722	21,770	21,819	21,519	7.4
Units (millions)	128.7	178.1	216.9	240.7	254.6	264.2	268.6	13.0

* Projections
Source: iSuppli[141]

U.S. Portable MP3 Player Ownership by Age Group (Percent)

Age Group	2005*	2006*	2007*
12-17	27	42	54
18-24	18	31	39
25-34	20	30	38
35-44	16	30	38
45-54	10	16	24
55-64	6	7	14
65+	2	2	6

* January of each year
Source: Edison Research[142]

Percent of U.S. Households with a Home Network with Devices Connected to their Home Network, 2006

Device	Connected to Home Network (Wireless) (percent)	Connected to Home Network (Wired) (percent)
Desktop PC	20	72
Printer	11	66
Scanner	6	48
Laptop PC	41	13
Other	5	17
PDA	6	8
Gaming Console	less than 5	8
TV	less than 5	9
Stereo	less than 5	7
DVR	less than 5	less than 5

Source: infoComm[143]

Software

The NPD Group estimated that U.S. retail sales of non-gaming software were $2.9 billion in 2006, a 2-percent decline from $3 billion in 2005.[144] A study on IT spending found that packaged software was the fastest-growing segment of the industry, with a 5.9-percent annual growth rate predicted for the period from 2005 to 2010.[145]

- Four of the top ten software titles in the U.S. in 2006 were security-related, while three were related to taxes or accounting. The others were Microsoft Office Suites and a Microsoft Windows upgrade.[146]
- Software as a Service (SaaS) is hosted software consumed by contracted customers on a pay-for-use basis or as a subscription based on usage. SaaS was responsible for about 5 percent of business software revenue in 2005 but is expected by Gartner to have a 25-percent share by 2011.[147]
- Released in January 2007, Vista was Microsoft's first update to its operating system since 2001. In December 2006, IDC projected that 90 million units of Windows Vista would be shipped in 2007,[148] and as of May 2007, official sales were at 40 million units.[149]
- iSuppli estimated that PC hardware component costs would increase by $100 to support Vista rather than Windows XP.[150] In-Stat predicts that the digital rights management features in Vista will prompt many users to keep old copies of Windows XP and Windows 2000.[151]
- A mid-2007 survey of CIOs found that Microsoft had an 80 percent share of the business server market and Linux had a 13 percent share.[152] Microsoft's Windows had a share of more than 90 percent of the desktop market in mid-2007, while Linux's desktop market share was only about 1 percent.[153]
- In 2007, IDC estimated that the antivirus market (which is mostly software) is worth $5.2 billion, with 60 percent of that revenue from businesses and 40 percent from individual consumers. It's expected to grow to $7.5 billion by 2010, with similar shares coming from consumers and businesses. Some analysts believe the traditional methods for virus, trojan, and spyware detection are becoming ineffectual. This is due to the growing variety of malware, which requires the programs to be updated frequently in order to be effective.[154]
- Worldwide revenue from standalone open source software was $1.8 billion in 2006 and is predicted to grow 26 percent per year to reach $5.8 billion in 2011.[155]
- According to SourceForge, as of July 2007, the six most popular open-source software downloads were all P2P filesharing programs. The most downloaded program was eMule, downloaded about 329 million times.[156]

Top Ten PC Software Titles Ranked by Units Sold in the U.S., 2006

Rank	Title	Publisher	Release Date	ASP ($)
1	MS Office 2003 Student/Teacher Edition	Microsoft	Oct. 2003	136.91
2	TurboTax 2005 Deluxe with State	Intuit	Nov. 2005	38.41
3	Norton Internet Security 2006	Symantec	Sep. 2005	65.39
4	Quickbooks 2006 Pro	Intuit	Nov. 2005	171.22
5	MS Office 2004 Student/Teacher Edition	Microsoft	Mar. 2004	147.73
6	Norton Antivirus 2006	Symantec	Sep. 2005	34.89
7	Spy Sweeper	Webroot	Apr. 2003	16.90
8	TurboTax 2005 Premier with State	Intuit	Nov. 2005	67.59
9	MS Windows XP Home Edition Upgrade	Microsoft	Oct. 2001	93.34
10	Norton Internet Security 2006/System Works 2006 Upgrade Bundle	Symantec	Nov. 2005	59.21

Source: The NPD Group[157]

Top All-Time Open-Source Downloads as of July 2007

Rank	Name	Type	Downloads (millions)
1	eMule	P2P Filesharing	329.7
2	Azureus	P2P Filesharing	146.9
3	Ares Galaxy	P2P Filesharing	110.2
4	BitTorrent	P2P Filesharing	51.9
5	DC++	P2P Filesharing	45.9
6	Shareaza	P2P Filesharing	38.9
7	VirtualDub	Video Processing	33.5
8	CDex	CD Extraction/Conversion	32.4
9	GTK+ and the GIMP installers for Windows	Graphical User Interface Creation	29.4
10	7-Zip	File Archiving	26.0

Source: SourceForge.net[158]

Chapter 3
The Communications Sector

The communications industry has undergone dramatic changes as a result of new technologies. One of the most important indicators of progress in the communications industry is the widespread proliferation of broadband Internet access. At the beginning of 2007, there were about 300 million consumer broadband connections in a world of around 6.5 billion people. Of those 300 million broadband connections, 20 million offered speeds of 2 mbps or more.[1] Several groups have estimated that there were about 50 to 60 million households with broadband subscriptions in the U.S. at the end of 2006.[2]

The wireless revolution has also spurred a worldwide expansion of the telecommunications sector. In 2006, the revenues of the U.S. telecommunications industry grew 9.3 percent to reach $923 billion, its fastest annual growth rate since 2000. The worldwide market grew even faster, at 11.2 percent, totaling $3 trillion for 2006, expected to increase to $4.3 trillion by 2010.[3]

As of early 2007, mobile networks covered about 99 percent of the population of developed countries and 80 percent of the world's total population, though that is expected to rise to 90 percent by 2010.[4] In 2006, growth in industrialized countries' wireless telecom services markets was 5.3 percent (down from 7.1 percent in 2005), compared with 25 percent in developing countries (up from 23 percent in 2005).[5] At the end of 2006, two-thirds of the world's mobile customers were in developing countries, up from 50 percent at the end of 2003.[6]

The upcoming U.S. wireless spectrum auction has drawn interest not only from each of the large wireless carriers, but also from Internet and consumer electronics companies pushing for a portion of unlicensed spectrum that can be accessed by any wireless device, not only those that operate with a single carrier. At the same time, the need to transmit large music, image, and video files is pushing the U.S. and Europe closer to the widespread adoption of third-generation (3G) technology, which is already well-established in Japan and Korea. Less clear at this point is which of the many technical standards for 3G service will emerge as the most commonly used in each region.

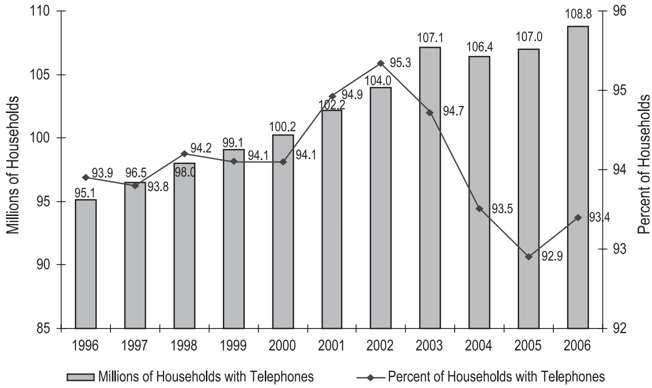
Another emerging feature of the wireless landscape is the expanding use of communication technologies in the business sector. This is reflected in the growing number of wireless computer networks and the beginning stages of manufacturer, distributor, and retailer use of radio frequency identification devices (RFID), particularly to track shipments of high-value or commercially sensitive goods. The precise timetable for commercial adoption of RFID on a widespread basis is still uncertain, however, with even the world's largest retailer, Wal-Mart, encountering substantial difficulties in expanding the use of RFID by its suppliers and in its own distribution centers.

Telephone Subscribership

The telephone has long been the most widely used communications device. Despite the proliferation of wireless Internet-based technologies, the percentage of U.S. households with landline telephone service actually grew during 2006 to reach 93.4 percent in November, following three consecutive years of decline.[7] By the end of 2005, there were 11.3 million U.S. households with wireless-only phone service.[8] The wireless industry's share of the worldwide telecommunications market is increasing due to the lack of modern preexisting landline telephone infrastructure in many areas of the developing world.

- Fixed telephony's share of the world telecom services market fell from 48 percent in 2001 to 35 percent in 2005 and 32 percent in 2006.[9]
- In 2005, end-user telecommunications revenues in the U.S. for 2005 totaled $236 billion. About $101 billion came from wireless service (43 percent of the total), $82.4 billion came from local service (35 percent of the total), and $52.4 billion came from toll service (22 percent of the total).[10]
- Verizon and AT&T each had 31.4 percent of all local loops at the end of 2005, while BellSouth accounted for 13.2 percent of the total.[11]
- In late 2005, the share of end-user switched access lines from competitive local exchange carriers (CLECs) declined in the U.S., after several years of growth. The FCC estimates that 17.3 percent of end-user switched access lines were from CLECs in June 2006, down from 19.1 percent in June 2005.[12] At least one CLEC was offering service to customers in 82 percent of the zip codes in the U.S., where about 98 percent of U.S. households resided.[13]
- In June 2006, CLECs provided 36 percent of their end-user switched access lines over local loop facilities that they owned, 42 percent came from unbundled network elements, and 22 percent came through resale arrangements with other carriers. About 20 percent of the CLECs' lines were coaxial cable.[14]
- Gartner predicts that the total number of fixed-line and mobile connections in developed markets will grow from 1.36 billion in 2005 to 1.53 billion in 2010, and from 2.05 billion to 3.47 billion in emerging markets. Among the fastest-growing emerging markets will be India, growing from 125 million to 443 million connections, and Indonesia, growing from 61 million to 133 million connections.[15]

U.S. Household Landline Telephone Subscribership



Data are for November of each year
Source: FCC[16]

Telecom Customer Bases (millions)

	2001	2002	2003	2004	2005	2006
Fixed Lines						
Industrialized Countries	537	533	525	516	502	488
Developing Countries	471	518	583	654	711	756
Mobile Customers						
Industrialized Countries	576	625	682	748	821	886
Developing Countries	369	521	705	955	1,320	1,716
Broadband Subscribers						
Industrialized Countries	34	58	86	120	155	186
Developing Countries	2	5	16	36	60	91

Source: IDATE[17]

End-User Switched Access Lines Reported in the U.S.

Date	ILEC Lines (millions)	CLEC Lines (millions)	Total (millions)	CLEC Share (%)
June 2000	179.6	11.6	191.2	6.0
June 2001	174.8	17.3	192.0	9.0
June 2002	167.3	21.6	189.0	11.5
June 2003	158.3	27.0	185.3	14.6
June 2004	148.0	32.0	180.0	17.8
June 2005	143.8	34.0	177.7	19.1
June 2006	142.2	29.8	172.0	17.3

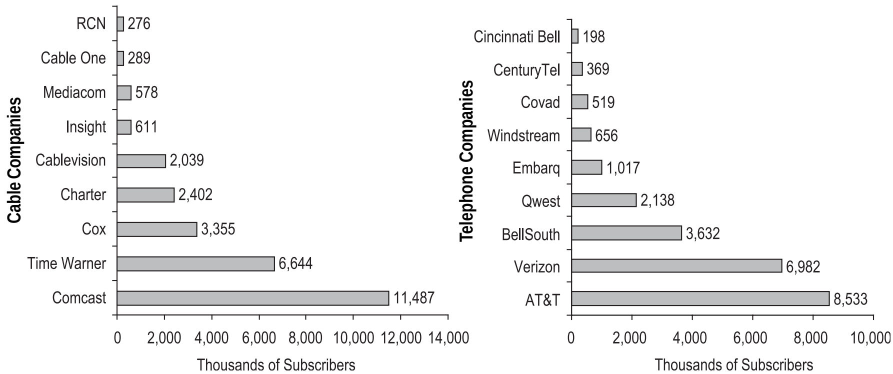
Source: FCC[18]

U.S. Broadband Adoption

Measuring the rate of U.S. broadband adoption is difficult, because there is no widely agreed-upon definition of the term "broadband." The International Telecommunication Union defined it as a transmission capacity greater than 1.5 to 2 megabits per second (mbps), but the OECD has a minimum download speed of 256 kilobits per second (kbps) in its definition of the term, while the FCC uses 200 kbps in its definition.[19] Most estimates of the number of U.S. households with broadband in 2006 range from 50 million to 56 million.

- Parks Associates estimates that U.S. residential subscriptions to broadband Internet services grew 20 percent in 2006 to surpass 50 million, 47 percent of all U.S. households. The figure is expected to pass 60 million, 55 percent of all households, by the end of 2007.[20]
- According to Magna Global, at the end of 2006, 55.6 million U.S. households (74 percent of all Internet households) had broadband connections, a significant increase over 43.9 million in 2005 and 26 million in 2003.[21]
- According to Cable Digital News, there were 53 million U.S. high-speed data customers at the end of 2006, with 29 million of them broadband cable subscribers, and 24 million of them DSL subscribers through telephone companies. As of early 2007, in 9 of the past 11 three-month periods, telephone companies added more subscribers than cable companies.[22]
- According to the National Cable and Telecommunications Association, at the end of 2006, there were 119 million homes passed by cable high speed data service. There were 32.6 million digital cable customers, 28.9 million residential cable high speed data customers, and 9.5 million residential cable telephony customers.[23]
- According to the Leichtman Research Group, as of mid-2007, the 19 largest cable and telephone providers in the U.S. had about 94 percent of the broadband market. Cable companies had 31.5 million broadband subscribers, and telephone companies had 26.4 million broadband subscribers halfway through 2007.[24]
- The "digital divide" in U.S. broadband access rates by household income declined slightly in 2006 and 2007. An estimated 68 percent of U.S. households with incomes over $50,000 had broadband connections in 2007, up from 59 percent a year earlier. By comparison, 39 percent of households with incomes under $50,000 had broadband connections in 2007, up from 27 percent in 2006. Only 7 percent of Internet subscribers said that broadband service was not available for their home.[25]

U.S. Broadband Subscribership by Type, End of 2006



Source: Leichtman Research Group[26]

U.S. Residential High-Speed Lines

	2004		2005		2006
Technology	**Jun.**	**Dec.**	**Jun.**	**Dec.**	**Jun.**
ADSL	10,759,495	13,119,326	14,442,823	17,370,536	20,143,255
SDSL and Traditional Wireline	393,049	419,215	159,489	129,439	112,043
SDSL	n/a	n/a	153,978	122,215	102,631
Traditional Wireline	n/a	n/a	5,511	7,224	9,412
Cable Modem	18,525,265	21,270,158	23,497,069	25,625,191	27,720,407
Fiber	22,719	34,959	83,293	213,484	442,027
Satellite and Wireless	387,563	422,623	428,367	533,480	1,839,368
Satellite	n/a	n/a	265,017	320,149	382,047
Fixed Wireless	n/a	n/a	160,775	203,188	301,153
Mobile Wireless	n/a	n/a	2,574	10,143	1,156,168
Power Line and Other	n/a	n/a	4,447	4,550	5,093
Total Lines	**30,088,091**	**35,266,281**	**38,615,489**	**43,876,680**	**50,262,193**

Source: FCC[27]

Number of U.S. Providers of High-Speed Lines, by Technology

	ADSL	Cable Modem	All Other	Total
June 2000	47	36	75	**116**
June 2001	86	47	98	**160**
June 2002	142	68	138	**237**
June 2003	235	98	217	**378**
June 2004	298	129	281	**485**
June 2005	758	227	779	**1270**
June 2006	832	253	814	**1323**

Source: FCC[28]

Worldwide Broadband Adoption

Meaningful comparisons of broadband data between different countries are very difficult because of the differences in infrastructure, population densities, policies, and business practices.

- According to PriceWaterhouseCoopers, the number of households with broadband worldwide grew from 30 million in 2001 to 187 million in 2005 and is expected to grow to 433 million in 2010.[29]
- ABI Research estimates that the total number of broadband subscribers worldwide would grow 9 percent a year and reach 480 million by 2012.[30]
- Gartner estimates that the percent of households worldwide with a broadband connection will grow from 12 percent in 2005 to 21 percent in 2010, when there will be a total of 364 million consumer broadband connections.[31]
- The price of broadband access varies widely in Europe. As of late 2006, 4 mbps service was available in Italy for the equivalent of about $25 per month, and 2 mbps service was available in the U.K. for about $30 per month, but in Denmark, 4 mbps service cost $73 per month, and in Norway 1.5 mbps service cost $43 per month.[32] There are also wide disparities in broadband density rates in Europe, with 29 percent of the people of the Netherlands and Denmark broadband subscribers as of July 2006, compared with only 2 percent of Greeks.[33]
- In early 2007, the price of broadband (defined as the Internet usage fee averaged at 100 kbps per month) was 7.59 percent of GDP per capita in China, 2.49 percent in Turkey, 1.03 percent in Mexico, 0.21 percent in Spain, and 0.12 percent in Australia. In Canada, it was 0.03 percent, in the U.K., it was 0.02 percent, in the U.S., it was 0.01 percent, and in France, it was 0.01 percent. In South Korea it was only 0.006 percent, and in Japan it was only 0.002 percent.[34]
- The most recent OECD data showed that Denmark and the Netherlands had the highest broadband subscriber rates, at 31.9 and 31.8 subscribers per 100 inhabitants, respectively. In most OECD countries, there were far more DSL subscribers than cable broadband subscribers, with the exception of South Korea, Canada, and the United States.[35]
- Small providers operating local area network access to small areas or apartment buildings are more common in Eastern Europe than Western Europe, and they make up almost 40 percent of the market for Internet access in Bulgaria.[36]

Broadband Data for Select Countries

	Broadband Households (millions)*	Percent of Total Households*	Subscribers per Household**	Average Speed (mbps)**	Price per Month for 1mbps, Fastest Technology ($PPP)**	Average Speed (mbps)***
U.S.	54.6	45.9	0.51	4.80	3.33	4.69
China	46.6	12.6	n/a	n/a	n/a	1.64
Japan	23.7	52.3	0.52	61.00	0.27	9.82
South Korea	12.7	78.8	0.90	45.60	0.45	3.41
U.K.	12.0	47.1	0.50	2.60	11.02	n/a
Germany	11.8	30.8	0.38	6.00	5.20	4.63
France	11.2	42.3	0.49	17.60	1.64	4.72
Italy	7.9	35.4	0.38	4.20	3.36	n/a
Canada	7.4	58.0	0.62	7.60	6.50	3.60
Brazil	4.9	10.6	n/a	n/a	n/a	0.76
Australia	3.5	45.4	0.50	1.70	2.39	3.71

* Source: eMarketer, 2006[37] (Defines Broadband as more than 200 kbps in at least one direction)
** Source: Information Technology and Innovation Foundation, 2006[38]
*** Source:Speedtest.net, 2007[39] (Average speeds of Internet users participating in a frequently updated survey as of July 2007)

Broadband Subscribership per 100 Inhabitants, December 2006

	DSL	Cable	Fiber/LAN	Other	Total	Total Subscribers (thousands)
Denmark	19.6	9.4	2.6	0.4	31.9	**1,728.4**
Netherlands	19.5	12.0	0.4	0	31.8	**5,192.2**
Iceland	28.8	0	0.2	0.6	29.7	**87.7**
South Korea	11.4	10.7	7.0	0	29.1	**14,042.7**
Switzerland	18.8	8.8	0	0.9	28.5	**2,140.3**
Norway	21.7	3.8	1.5	0.6	27.7	**1,278.3**
Finland	23.5	3.5	0	0.3	27.2	**1,428.0**
Sweden	16.0	5.2	0	4.8	26.0	**2,346.3**
Canada	11.4	12.3	0	0.1	23.8	**7,675.5**
Belgium	14.0	8.4	0	0.1	22.5	**2,354.0**
U.K.	16.5	5.1	0	0	21.6	**12,993.4**
Luxembourg	18.2	2.2	0	0	20.4	**93.2**
France	19.1	1.1	0	0	20.3	**12,699.0**
Japan	11.1	2.8	6.2	0	20.2	**25,755.1**
U.S.	8.5	10.3	0.3	0.6	19.6	**58,136.6**
Australia	15.0	3.3	0	1.0	19.2	**3,939.3**
Austria	10.6	6.4	0	0.3	17.3	**1,428.0**
Germany	16.4	0.5	0	0.1	17.1	**14,085.2**
Spain	12.1	3.1	0	0.1	15.3	**6,654.9**
Italy	13.8	0	0.4	0.6	14.8	**8,638.9**
New Zealand	12.7	0.6	0	0.7	14.0	**576.1**
Portugal	8.7	5.1	0	0	13.8	**1,460.3**
Ireland	9.1	1.3	0	2.0	12.5	**517.3**
Hungary	6.1	3.8	0	2.0	11.9	**1,198.7**
Czech Republic	4.8	2.1	0	3.7	10.6	**1,086.6**
Poland	5.2	1.6	0	0.1	6.9	**2,640.0**
Slovak Republic	3.4	0.7	0.9	0.2	5.1	**274.1**
Greece	4.4	0	0	0.2	4.6	**512.0**
Turkey	3.8	0	0	0	3.8	**2,773.7**
Mexico	2.7	0.8	0	0	3.5	**3,728.2**
OECD	**10.5**	**4.9**	**1.1**	**0.3**	**16.9**	**197,463.9**

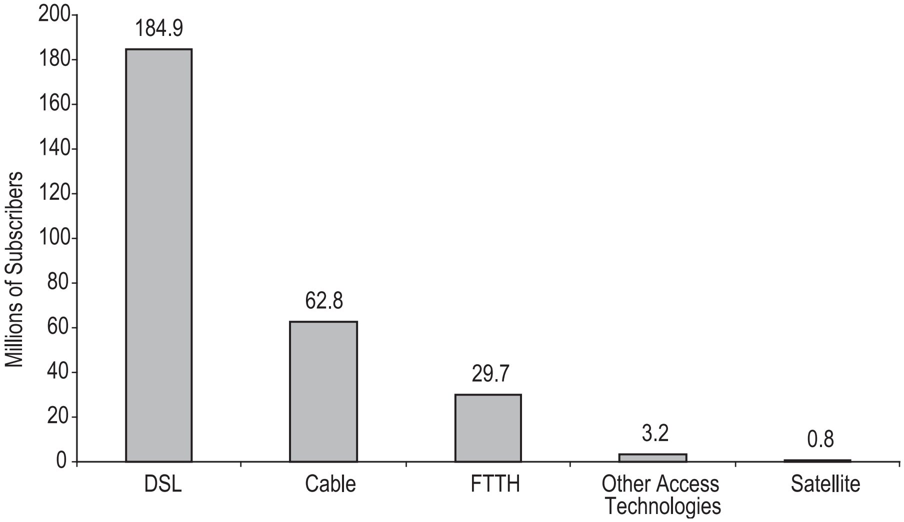
Source: OECD[40]

Emerging Broadband Service Platforms

Several new Internet access technologies have emerged in recent years to compete with DSL and cable broadband providers. Broadband Internet access will likely be provided over a number of different platforms well into the future.

- More than 12 million miles of fiber were deployed in the U.S. in 2006, a 9.1-percent increase from 2005.[41] Verizon has a multibillion dollar program to expand the reach of fiber capable of delivering 50 mbps connection speeds.[42]
- As of March 2007, 1.34 million U.S. homes had fiber to the home (FTTH) connections, and 7.9 million homes were passed by fiber, with Verizon by far the largest provider. These numbers are approximately double those from a year earlier, when 671,000 were connected by fiber and 4.1 million homes were passed.[43] Parks Associates predicts that the number of U.S. FTTH residential subscribers will increase from 3 million households in 2007 to 18 million in 2011.[44]
- Worldwide FTTH subscribers grew 86 percent in 2006 to reach 7.5 million by year's end and are expected to approach 47 million by 2010.[45] In mid-2006, 2.74 million homes and buildings were passed with FTTH in the EU-28, (the EU-25 plus Norway, Iceland, and Switzerland) with about 820,000 subscribers. About 96 percent of FTTH subscribers in Europe at that time were in Sweden, Italy, Denmark, the Netherlands, and Norway.[46]
- As of early 2007, over 300 U.S. cities were in some stage of planning or deploying a municipal Wi-Fi network.[47] One study found that the costs of municipal Wi-Fi plans are likely to be so high that more than half of them will not break even.[48]
- There were about 57 million Wi-Fi hotspots in Europe as of late 2006.[49] In-Stat predicts that the number of worldwide Wi-Fi deployments will double over the next five years.[50] Amsterdam, Paris, and Vienna are building municipal fiber networks.[51]
- Xohm, Sprint's WiMax service, is expected to have a multi-market commercial launch in early 2008. This will require preparation of over 10,000 sites, delivery of 1,750 base stations, and installation of 20,000 antennas.[52]
- From 270,000 subscribers in 2006, the total number of WiMax subscribers in 16 Asia/Pacific countries is expected to reach 31.4 million by 2012, with $8 billion in revenues by then.[53]
- Although there were only about 150,000 broadband over powerlines (BPL) subscribers in the U.S. as of early 2007, the broadband service, which gives users speeds of up to 3 mbps from plugging an adapter into a normal power outlet, has been predicted to grow to 2.5 million subscribers by 2011, with many of these in rural and underserved areas. BPL technology might also reduce power outages and result in a more efficient energy transmission system.[54]

Worldwide Broadband Subscribership by Type, 2006



Source: GigaOM[55]

Technology Comparison: EVDO, WiMax, and Wi-Fi, December 2006

	EVDO	WiMax	Wi-Fi
Technology Type	3G Cellular	Wireless Metro Area Network	Wireless Local Area Network
Typical Throughput	400-700 kbps	1+ mbps	1-5 mbps
Availability	Worldwide	Trials in Selected Locations	Worldwide
Introduced in Cellular Handsets	2002	Expected 2007 or 2008	2005
Spectrum	Licensed	Licensed & Licensed-Exempt	Licensed-Exempt
Deployment Cost	High	Medium	Low
Service Subscription	Yes	Yes, at least initially	Sometimes
Introduced in Laptops	2005	Expected 2007 or 2008	2001

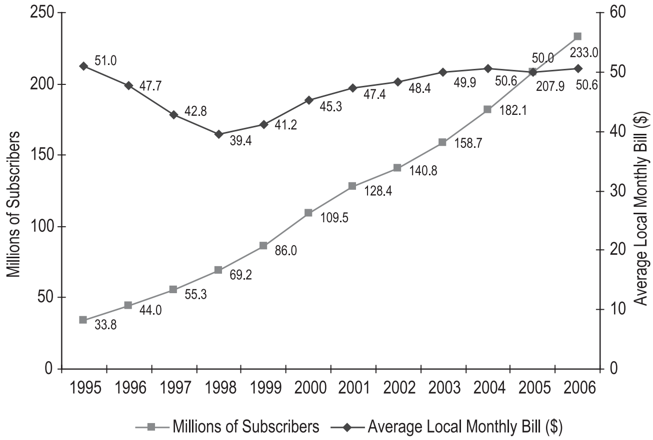
Source: In-Stat[56]

The Wireless Industry in the U.S.

The rapid adoption of wireless telephony is one of the most remarkable trends in communications over the past several decades. The major wireless carriers are focusing marketing and infrastructure resources on the rapidly expanding market for data and media services. The U.S. wireless penetration rate was about 80 percent at the end of the first quarter of 2007.[57] U.S. wireless consumers used about 1.8 trillion minutes in 2006, a 20-percent increase from 2005.[58] Total wireless revenues were $126 billion in the U.S. in 2006.[59]

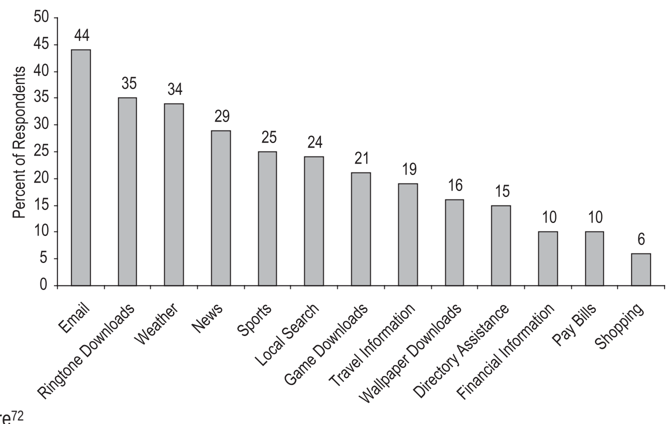
- The average data average revenue per user (ARPU) for wireless companies in the U.S. was $8.34 in the first quarter of 2007. Sprint's data ARPU was the highest at $9.25, followed by Verizon at $8.70, AT&T at $7.88, and T-Mobile at $7.50.[60]
- As of 2006, 98 percent of the U.S. population lived in counties with access to at least three different mobile telephone operators, up from 88 percent in 2000.[61] Verizon and AT&T were tied as the leading U.S. wireless carriers at the end of the first quarter of 2007, each with a 26-percent market share. Sprint was in third place at 23 percent, followed by T-Mobile at 11 percent and Alltel at 5 percent.[62]
- Wireless providers usually spend between $350 and $450 for each wireless subscriber they acquire.[63] A 2006 survey of most of the major companies in the North American wireless industry found that the overall average length of a customer relationship was 53 months, up from 46 months in the previous year's survey. The average number of minutes used per customer per month was 770, versus 708 a year earlier.[64]
- Wireless data and multimedia services accounted for 10 percent of U.S. wireless revenue in 2006 but are expected to make up 24 percent of all wireless revenue by 2010.[65] As of late 2006, Americans spent an average of $3.70 per month for wireless data services.[66] U.S. spending on mobile services such as video, text messaging, and music is expected to grow from $5.4 billion in 2006 to $37.5 billion in 2010.[67]
- A December 2006 Pew survey found that 34 percent of U.S. Internet users had used a wireless connection such as Wi-Fi to access the Internet.[68] This was an increase from 22 percent two years earlier.[69] The same survey found that 80 percent of U.S. wireless users also had broadband connections at home,[70] suggesting that wireless connectivity complements rather than substitutes for broadband.

U.S. Wireless Subscribership and Costs



Based on surveys from December of each year
Source: Cellular Telecommunications & Internet Association[71]

Reasons Americans Access the Internet from Cell Phones, November 2006



Source: comScore[72]

U.S. Mobile Data Revenues Forecast by Type ($billions)

	2006	2007*	2008*	2009*	2010*
Messaging	3.3	5.9	10.1	12.5	15.0
Entertainment	1.1	2.6	5.9	9.5	15.0
Information	1.0	2.0	3.8	5.1	7.5
Total	**5.4**	**10.5**	**19.8**	**27.1**	**37.5**

* Projections
Source: eMarketer[73]

The Worldwide Wireless Industry

The wireless market in the developed world may be nearly saturated, but low wireless penetration rates in the rest of the world show that there is still growth potential for the wireless industry. Wireless phones can provide a cost-effective alternative in areas where wireline and Internet access networks are either much less extensively deployed or have been ravaged by wars and internal conflicts. The number of wireless subscribers worldwide is expected to grow from 1.8 billion in 2005 to 2.8 billion in 2010.[74] After growing at an average rate of 25 percent in 2004, 2005, and 2006, worldwide wireless subscriber growth is expected to decline to 12.8 percent in 2007 and slow further to 5.7 percent in 2010.[75]

- In 2006, Latin America's wireless penetration rate was 48.3 percent; China's was 24.4 percent; Africa, the Middle East, and Australia's was 23.6 percent; and India's was 13.5 percent. By 2010, these numbers are expected to grow to 65.5 percent for Latin America; 36.6 percent for China; 34.8 percent for Africa, the Middle East, and Australia; and 31.5 percent for India.[76]
- China had the largest number of wireless subscribers in 2005, with 375 million, while the U.S. had 208 million, Russia had 126 million, Japan had 90 million, and Brazil had 86 million. By 2010, China is expected to have 770 million wireless subscribers, followed by India with 376 million, the U.S. with 270 million, Russia with 215 million, Brazil with 143 million, and Japan with 123 million.[77] China Mobile is the largest mobile operator in the world, with 300 million subscribers as of December 2006.[78]
- In 2006, North America, Western Europe, and industrialized Asia were collectively responsible for 67 percent of worldwide wireless service revenues, but only 35 percent of the worldwide volume. The developing countries of Asia made up for 12 percent of the worldwide wireless service revenues but 31 percent of the worldwide volume.[79]
- An early 2007 survey found that U.S. cell phone owners express less desire to have Internet access through their cell phones than residents of other regions. Only 23 percent of U.S. mobile users said this feature was important to them, compared with 30 percent of Western Europeans, 54 percent of Eastern Europeans, 56 percent of Asians, and 64 percent of Latin Americans.[80]
- In 2007, the European Commission found that, for the first time, mobile phone subscriptions in the EU actually outnumbered citizens. Penetration was highest in Luxembourg (171 percent), Italy (134 percent), and Lithuania (133 percent), and lowest in France (82 percent), Malta (83 percent), and Slovakia (86 percent).[81]
- The mobile subscriber base in Africa is expected to almost triple between 2006 and 2011.[82]

Mobile Customers and Penetration Rates

	2002	2003	2004	2005	2006	2007*	2008*	2009*	2010*
China									
Mobile Customers (millions)	207.5	268.6	317.6	374.4	450.0	535.0	630.0	695.0	770.0
Penetration Rate (percent)	16.2	20.9	24.7	29.2	35.0	41.7	49.1	54.1	60.0
France									
Mobile Customers (millions)	37.3	40.4	43.1	46.5	50.0	53.8	56.7	58.4	60.4
Penetration Rate (percent)	62.3	67.1	71.4	76.6	82.1	88.0	92.0	95.0	98.0
Germany									
Mobile Customers (millions)	59.2	64.8	71.3	79.2	85.0	88.2	89.8	90.6	91.3
Penetration Rate (percent)	71.9	78.6	86.5	96.1	103.2	107.0	109.0	110.0	111.0
Japan									
Mobile Customers (millions)	73.5	79.8	85.5	90.2	95.6	101.3	107.4	111.7	116.2
Penetration Rate (percent)	57.8	62.7	67.1	70.8	75.0	79.5	84.3	87.7	91.4
South Korea									
Mobile Customers (millions)	32.3	33.6	36.6	38.3	40.1	41.8	43.5	45.2	46.9
Penetration Rate (percent)	67.4	69.7	75.6	78.8	82.0	85.2	88.4	91.6	94.6
U.K.									
Mobile Customers (millions)	50.9	54.5	62.1	67.8	69.2	70.6	71.9	73.2	74.5
Penetration Rate (percent)	84.9	90.7	103.1	112.1	114.2	116.1	118.0	119.8	121.5
U.S.									
Mobile Customers (millions)	140.8	158.7	182.1	207.9	232.8	253.0	270.4	285.0	296.8
Penetration Rate (percent)	48.9	54.7	62.2	70.3	78.0	84.0	89.0	93.0	96.0

* Projections

Source: IDATE[83]

Mobile Voice and Data Average Revenue per User ($ per month)

	2002	2003	2004	2005	2006
U.S.					
Voice ARPU	45.5	46.3	47.2	44.6	41.9
Data ARPU	1.9	2.4	2.7	3.9	5.2
Total Mobile ARPU	47.4	48.8	49.9	48.5	47.1
Japan					
Voice ARPU	63.8	58.6	55.4	52.7	49.0
Data ARPU	16.1	18.4	18.5	18.5	18.6
Total Mobile ARPU	79.9	76.9	73.9	71.2	67.6
Western Europe					
Voice ARPU	32.4	32.4	32.1	30.5	29.0
Data ARPU	3.7	4.5	4.9	5.3	5.4
Total Mobile ARPU	36.0	36.9	37.0	35.8	34.4

Source: IDATE[84]

ARPU of Mobile Service ($ per month)

	2002	2003	2004	2005	2006
Industrialized Asia	54.0	51.6	50.8	50.1	48.7
North America	47.0	48.4	49.7	48.5	47.2
Western Europe	36.0	36.9	37.0	35.8	34.4
Developing Economies	14.2	13.7	12.7	11.4	10.7

Source: IDATE[85]

Third-Generation Technology

The demand for mobile video, photo messaging, and music on cell phones is highly dependent on the development of adequate mobile infrastructure to support it. Although only widely used in Japan at present, it is expected that third-generation (3G) technology will eventually make it much easier for large files to be transmitted wirelessly everywhere. 3G technology uses spectrum more efficiently than the more widely used (as of mid-2007) technologies, allowing for more advanced services and greater network capacity. There are several different standards (including CDMA2000, WCDMA, EVDO, and HSDPA) under the 3G umbrella. Different countries have begun incorporating 3G networks into their communications infrastructure to varying degrees. Estimates of the number of 3G subscriptions vary widely because of differing definitions of "3G."

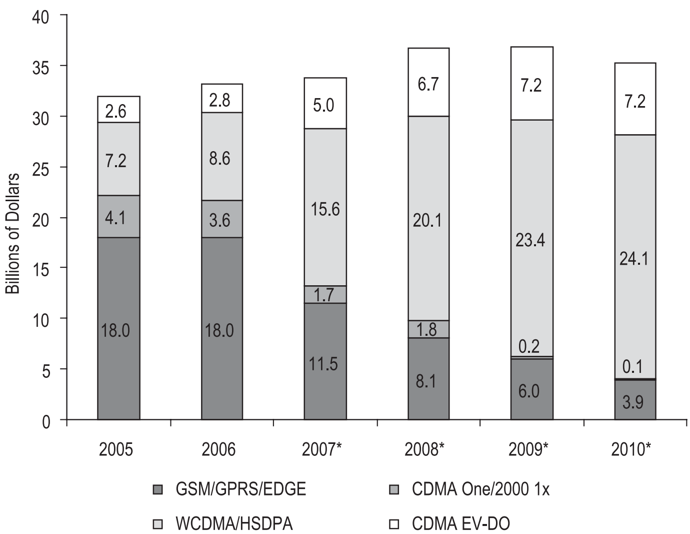
- According to IDATE, from June 2005 to June 2006, the number of 3G customers worldwide doubled, passing 100 million, which is about 5 percent of the total number of worldwide mobile customers.[86] Strategy Analytics estimated that there were 167 million 3G users worldwide at the end of 2006 and predicted this number would pass 1 billion by 2010.[87] According to ABI Research, there were 285 million 3G subscriptions worldwide at the end of 2006.[88] According to the CDMA Development Group, there were about 350 million 3G subscribers worldwide as of late 2006, with about 10 million being added every month.[89]
- The CDMA Development Group estimated that by 2010, CDMA2000 and WCDMA would account for 1.2 billion subscribers, 41 percent of the worldwide subscriber base. CDMA2000 was the more common of the two as of late 2006, with 80 percent of the global market for all 3G subscribers.[90] The WCDMA technology is expected to grow 15.6 percent per year from 2007 to 2010.[91]
- In mid-2006, the Asia/Pacific region accounted for 56 percent of the world's 3G customers.[92] Japan is the worldwide leader in adopting 3G technologies, followed by South Korea. More than 50 percent of Japan's wireless subscribers were using 3G technologies at the end of 2006.[93]
- Four firms own almost 60 percent of the patents in 3G technology, which makes licensing rates as high as 29 percent of the cost of the equipment. WiMax's patents are more evenly dispersed, making licensing rates around 5 percent.[94]

3G Customer Bases

	3G Customers (thousands)			Percent of All Mobile Customers
	Dec. 2004	Dec. 2005	Jun. 2006	Jun. 2006
Japan	10,898	29,197	39,392	43.0
South Korea	9,539	12,518	13,961	35.4
Italy	2,615	10,303	13,942	18.5
U.K.	2,832	7,352	7,607	10.9
Hong Kong	210	577	820	10.6
Sweden	279	522	1,010	10.1
Austria	225	535	845	9.5
Australia	413	736	1,732	8.9
Singapore	2	107	287	6.8
France	26	1,590	2,700	6.5
U.S.	125	1,000	10,900	5.0
Netherlands	12	230	820	5.0
Germany	195	2,072	3,955	4.8
Israel	12	230	385	4.8
Spain	68	854	1,868	4.1
Taiwan	0	147	408	2.0
South Africa	1	216	349	1.1
Total	**27,452**	**68,186**	**100,981**	**n/a**

Source: IDATE[95]

Worldwide Mobile Access Infrastructure Market by Technology



* Projections
Source: IDATE[96]

Spectrum

Since the 1897 patent on Marconi's wireless telegraph, the amount of information that can be sent over a given portion of the radio spectrum has increased to about a trillion times its original quantity.[97] The radio spectrum operates between 3 kilohertz (kHz) and 300 gigahertz (GHz) on the electromagnetic spectrum, over which companies can send signals for such purposes as cell phone communications, navigation, and radio and television broadcasting.[98] The Federal Communications Commission began competitive auctions of some spectrum licenses in July 1994. Prior to implementation of the auction system, portions of the spectrum were allocated either by comparative hearings or lottery.[99] From 1994 to July 2007, the FCC held 69 spectrum auctions, raising over $59 billion for the U.S. Treasury.[100]

- The 700 MHz band of spectrum, once used for analog television, is considered to be "the last piece of prime real estate left in wireless spectrum,"[101] and it will become available after the February 2009 digital TV transition. The auction of this band is likely to generate between $10 billion and $15 billion,[102] and the rules for the auction were announced in August 2007.[103] Google announced they were prepared to spend $4.6 billion on acquiring some of the spectrum in this auction, intending to resell access to it on a wholesale basis to wireless providers. However, it is uncertain whether this open-access proposal would be allowed by the FCC.[104]
- The FCC is considering allowing unlicensed devices to operate in the "white space," the unused portions of television bandwidth. While Internet companies such as Dell, Microsoft, and Google support the proposal, broadcasters and cable and telecommunications companies that hold spectrum licenses fear that doing so would cause signal interference.[105]
- The August 2006 AWS spectrum auction yielded the second-largest total of any U.S. spectrum auction. T-Mobile spent the most of the 104 winning bidders, paying $4.1 billion for 120 licenses covering most of the U.S.[106]

Top 20 Highest-Netting U.S. Spectrum Auctions

Auction Name	Start Date	Licenses Won	Net Winning Bids ($millions)	Rounds
C and F Block Broadband PCS	Dec. 2000	422	16,857	101
Advanced Wireless Services (AWS-1)	Aug. 2006	1087	13,700	161
Broadband PCS C Block	Dec. 1995	493	10,072	184
Broadband PCS A and B Block	Dec. 1994	99	7,019	112
Broadband PCS D, E, and F Block	Aug. 1996	1472	2,517	276
Broadband PCS	Jan. 2005	217	2,043	91
Broadband PCS C Block Reauction	Jul. 1996	18	905	25
Direct Broadcast Satellite 110 Degrees (DBS)	Jan. 1996	1	683	19
Nationwide Narrowband (PCS)	Jul. 1994	10	617	47
Local Multipoint Distribution System (LMDS)	Feb. 1998	864	579	128
Upper 700 MHz Guard Bands	Sep. 2000	96	520	66
C, D, E, and F Block Broadband PCS	Mar. 1999	302	413	78
39 GHz	Apr. 2000	2173	411	73
Regional Narrowband (PCS)	Oct. 1994	30	393	105
800 MHz SMR General Category Service	Aug. 2000	1030	320	76
Multipoint/Multichannel Distribution Services	Nov. 1995	493	216	181
Interactive Video and Data Services (IVDS)	Jul. 1994	594	214	Oral Outcry
900MHz Specialized Mobile Radio Service	Dec. 1995	1020	204	168
Digital Audio Radio Service (DARS)	Apr. 1997	2	173	25
FM Broadcast	Nov. 2004	258	148	62

Source: FCC[107]

Main Two-Way Wireless Technologies, 2007

	Data Transfer Rate per Second	Range	Approximate Cost per Chip for High Volume Purchases ($)
Mobile WiMax	15 mbps	3 mi	8
3G Cellular (HSDPA/LTE)	14 mbps	6 mi	6
2G Cellular (GSM/CDMA)	400 kbps	20 mi	5
Wi-Fi	54 mbps	150-300 ft	4
Bluetooth	700 kbps	30 ft	1
Zigbee	250 kbps	100 ft	4
UWB	400 mbps	15-30 ft	5
RFID	1-200 kbps	up to 30 ft	0.04

Source: *The Economist*[108]

Radio Frequency Identification

Radio frequency Identification (RFID) technology dates back to World War II, though not until the 1970s and 1980s did private companies and the government adapt the technology for practical uses such as unlocking car doors, tracking nuclear material, and tagging livestock.[109] RFID tags usually consist of an integrated circuit primarily for storing information and an antenna for sending and receiving signals.[110] Because information on RFID tags can be accessed remotely, they were once expected to replace bar codes. Incompatible standards, however, have prevented widespread adoption of the technology.[111] Today, RFID is widely used in supply chain management, electronic payments (especially toll roads), security, and other fields.[112] However, the increasing functions and use of RFID have created concerns over privacy rights.[113]

- Between July 2005 and January 2007, $1.1 billion was invested in firms serving the RFID technology market.[114]
- According to ID TechEx, 1.02 billion RFID tags were sold worldwide in 2006. It was predicted that 1.91 billion tags would be sold worldwide in 2007 for a market value of $4.96 billion, which would increase to a staggering $26.88 billion by 2017.[115]
- Worldwide RFID spending is expected to increase from $2.8 billion in 2006 to just over $8 billion in 2010.[116]
- In August 2006, the U.S. government began issuing "e-passports" containing an RFID tag with personal identification information. It was predicted that 15 million such documents would be distributed during the first year of the item's existence.[117]
- Wal-Mart has tried to integrate RFID into its distribution network, but as of January 2006, only 5 of its 120 distribution centers and 1,000 of its 6,000 stores used the technology.[118]
- The cheapest RFID tags cost only about 10-15 cents each in mid-2007, down from $2 in 1999.[119] More sophisticated RFID tags can cost upwards of $30.[120]
- A 2007 survey of 200 senior IT managers across all industry sectors showed that only 10 percent already had RFID systems in place, and only 5 percent were in the process of piloting or implementing systems. Although 26 percent were researching how they may use RFID in their business, 60 percent of companies showed no interest in RFID technology.[121]

Worldwide RFID Market Overview, 2005

	Percent Share
Shipments of RFID Systems	
Hardware	67.2
Services	24.5
Software	8.3
Total	**100.0**
Shipments of RFID Contactless Smartcards/Tickets	
High Frequency ISO 14443 A	40.2
Low Frequency	39.4
High Frequency ISO 14443 B	5.5
High Frequency ISO 15693	2.4
Other	12.5
Total	**100.0**
Shipments of RFID Tags and Readers	
Americas	42.5
Europe, the Middle East, and Africa	37.8
Asia/Pacific	19.7
Total	**100.0**

Source: Venture Development Corporation[122]

RFID Uses and Statistics, 2006

Application	Parameter	Value ($millions)
Car Clicker Immobilizers Active Tag Systems	Value of Sales in Last Ten Years	1,500
Military Active Tag Systems	World's Largest RFID Order (2006)	425
RFID Smart Cards	2006/2016 Sales	627/1,005
Animal Tags	2006/2016 Sales	200/1,400
Healthcare (Active and Passive)	2006/2016 Sales	190/2,100
Air Industry (Active and Passive)	2006/2016 Sales	200/1,000

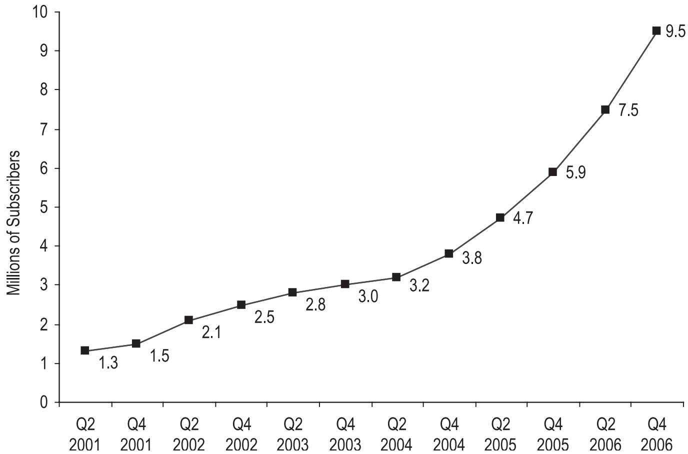
Source: Kiosk Marketplace[123]

Voice Over Internet Protocol

Voice over Internet Protocol (VoIP) transmits voice data using packet-switched networks rather than traditional circuit-switched networks, meaning that VoIP calls can be transmitted over the Internet rather than telephone lines. VoIP allows cable companies who provide Internet access to compete with telephone companies in telephone service as well as voice service. As of early 2007, VoIP was used by 20 percent of U.S. businesses,[124] and 10.6 million U.S. households had at least one active VoIP user, up from 9 million six months earlier. More than 61 percent of active residential VoIP users said they discontinued or replaced their old phone service when they obtained their VoIP connection.[125]

- According to TIA, in 2006, there were 9.5 million VoIP subscribers in the U.S., 10 percent the amount of total U.S. residential landlines. This is expected to grow to 25.5 million, 34 percent of U.S. residential landlines, by 2010.[126]
- In early 2007, cable companies served a combined 71 percent of the U.S. VoIP market, while Vonage served 24 percent. Cable companies passed 80 million U.S. homes with VoIP service, up from 33 million two years earlier. Time Warner Cable had a 21.1-percent share of the U.S. VoIP market, and Comcast had a 19.9-percent share.[127]
- NTT DoCoMo, the leading cell phone provider in Japan, is marketing a cell phone that uses standard cell phone circuitry but can detect the presence of Wi-Fi and switch over to VoIP to make Internet-based calls through a Wi-Fi connection. T-Mobile, Motorola, and BT have similar devices.[128]
- In-Stat expects the market for local (non-international) services to grow from 12 percent of VoIP revenues in 2006 to 27 percent in 2010.[129]
- According to In-Stat, total IP phone shipments will grow from 10 million units in 2006 to 164 million units in 2010. As of late 2006, Cisco led this industry with a 43 percent market share, followed by Avaya at 12 percent.[130] Gartner estimates that 150 million IP phones will be bought worldwide from 2007 to 2011.[131]
- iSuppli expects worldwide VoIP equipment revenue to grow from $3.95 billion in 2005 to $11.9 billion in 2010.[132]

U.S. Residential Cable Telephony Subscribers



Source: National Cable and Telecommunications Association[133]

Broadband VoIP Subscribers and Revenues

	2005	2006*	2007*	2008*	2009*	2010*
Users (millions)	3.2	5.2	7.6	11.0	14.7	19.3
Growth Rate (%)	n/a	65.0	46.0	44.0	34.0	31.0
Revenues ($millions)	776.3	1,407.3	1,831.1	2,250.5	2,796.0	3,516.6
Growth Rate (%)	n/a	81.0	30.0	23.0	24.0	26.0

* Projections
Source: In-Stat[134]

VoIP Ranking by Subscriber, Q4 2006

Rank	ISP	Subscribers (thousands)
1	Vonage	2,200
2	Comcast Digital Phone* (circuit switched customers not counted)	1,900
3	Time Warner Digital Phone*	1,860
4	Skype** (paid VOIP only, worldwide customers)	1,800
5	CableVision* (cable VOIP under the Optimum Voice brand name)	1,209
6	Charter* (cable VOIP)	446
7	SunRocket	150
8	Insight Communications* (cable VOIP)	123
9	Mediacom* (cable VOIP)	105
10	XO Communications* (business VOIP only)	100

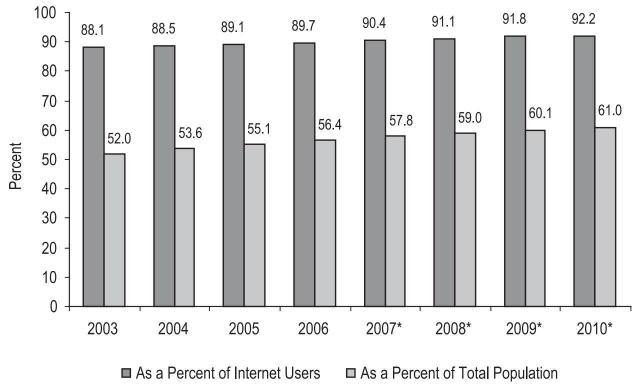
* Digital phone service, not “true” VoIP
** Date of this number unknown
Source: ISP Planet[135]

Email and Instant Messaging

The two main forms of Internet-based text communication are email and instant messaging (IM). Email is the most common activity of Internet users, and IM is most commonly used by teenagers and young adults.

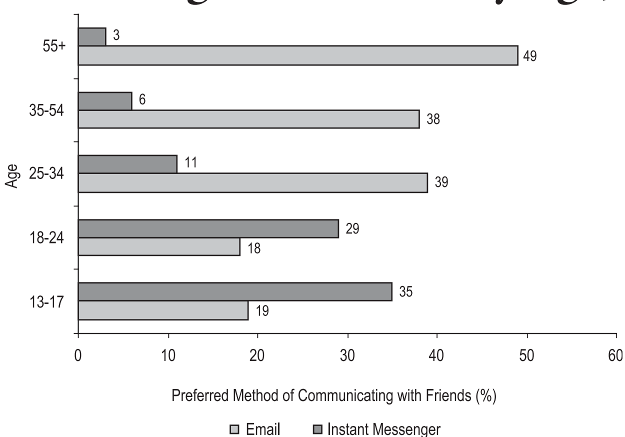
- The number of U.S. email users is expected to grow from 162 million in 2006 to 181 million in 2010. Morgan Stanley forecasts that U.S. email and email-related revenue will grow at an average annual rate of 19 percent from $251 million in 2005 to $339 million in 2006 to $601 million in 2010.[136] These numbers imply that in 2006, email generated about $2 per user in revenue for providers of email services, while in 2010 the number will be closer to $3 per user.
- The use of email on mobile phones increased from 3 percent of mobile phone users in March 2006 to 6 percent in September 2006.[137]
- Text messages typically require only 140 bytes and cost an average of $0.20 per message, generating $1400 per megabyte of data. Mobile voice transmissions, by comparison, typically cost between $0.60 and $1.90 per megabyte.[138]
- Of U.S. households that own a mobile phone, 35 percent engage in text messaging and 11 percent access the mobile Internet.[139]
- More U.S. teenagers and people in their early 20s communicate with their friends by IM rather than email, while email remains much more popular than IM for people 25 and older.[140]
- As of early 2007, SMS (short message service), a form of text messaging over cell phones, accounted for about 75 to 80 percent of non-voice service revenues worldwide. Portio Research estimated that SMS will pass IM as the main messaging service in 2011, and that in 2012, worldwide SMS revenues will reach $67 billion, with 3.7 trillion messages sent.[141]
- Europeans use text messaging more than Americans, while Americans tend to use mobile email and instant messaging more than most Europeans.[142]
- The European messaging software market is expected to grow from €740 million in 2006 to over €1 billion by 2010.[143]
- At the end of 2006, around 80 million people used free IM platforms on the Internet. These 80 million users received a total of 1.2 billion “spim” (IM-based spam) messages in 2006. The average IM user received 5 junk messages in a day in 2006, and this is expected to grow to 27 per day by 2008.[144]

U.S. Email Users



"Email user" defined as person who sends at least one email per month
* Projections
Source: eMarketer[145]

Communicating with Friends by Age, Q3 2006



Source: Parks Associates[146]

Short Text Message Revenues ($billions)

	2006*	2007*	2008*	2009*	2010*
Western Europe	20.4	19.8	18.3	16.3	14.6
Asia/Pacific	9.2	10.0	10.3	10.6	10.5
China/India	8.2	10.8	12.5	14.2	14.4
North America	7.1	7.9	8.2	8.3	8.3
Latin America	4.1	6.1	7.6	9.1	9.5
Middle East/Africa	3.5	4.6	5.4	6.2	6.5
Eastern Europe	2.4	2.5	2.3	1.9	1.5

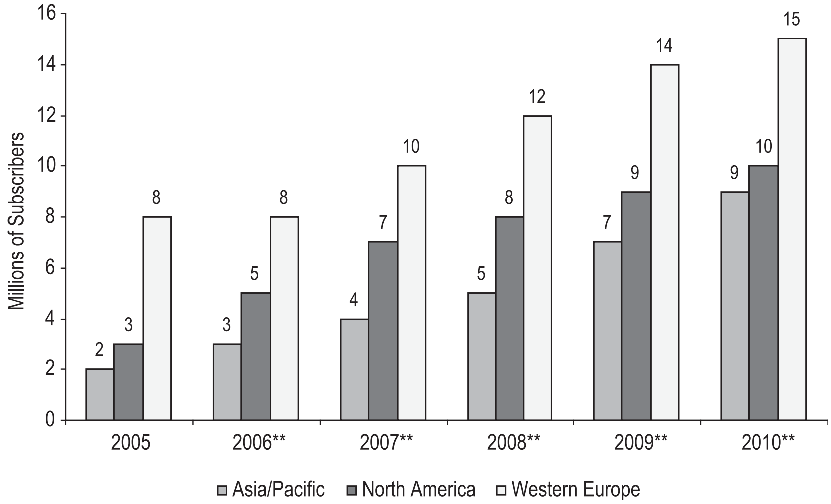
* Projections
Source: eMarketer[147]

Convergence and the Bundling of Services

Convergence is the tendency for distinctions between different types of equipment to blur over time, and for different communication platforms to offer the same services.[148] Convergence has allowed communications companies to bundle services. Cable operators offer voice, broadband, and television subscriptions on their infrastructure, while telecom operators can offer those three in addition to wireless service.[149]

- As of mid-2006, 62 percent of U.S. households subscribed to two services from the same company. About 38 percent of these subscribers did so through a telephone company, and 62 percent did so through a cable company. During the same period, 19 percent of U.S. households subscribed to three services from the same company. About 97 percent of them did so through a cable company, and only 3 percent through a telephone company.[150]
- As of late 2006, the average American household spent $176 a month on telephone, broadband, and television services.[151] In June 2007, Comcast was offering digital cable and “On Demand,” 12 mbps high-speed Internet, and digital telephone service for $33 per month each. Time Warner was offering digital cable service with more than 130 channels, 768 kbps high-speed Internet, and phone service for $114.95, with an upgrade that included more than 350 total channels and download speeds of up to 7 mbps for $129.95.[152]
- As of late 2006, 10 percent of consumers in the U.K., 8 percent in France, and 1 percent in Italy had signed up for bundles of fixed-line voice, broadband Internet, and television.[153]
- Fixed-mobile convergence refers to the ability of a single handset to make wireless calls as well as cheaper calls through a fixed line when within the range of a home or office. Worldwide revenue from fixed-mobile convergence is predicted to grow from $130 million in 2006 to almost $9 billion in 2011, which will be 1.9 percent of the total mobile demand in that year.[154]
- IPTV (Internet Protocol Television) is a technology by which digital television signals are transmitted using Internet protocols. Declining demand for old-fashioned telephone service from telephone companies may be partially offset by growth in IPTV, the number of subscribers to which iSuppli expects to grow at a 98-percent annual rate from 3.4 million in 2006 to 105.8 million in 2011.[155]

Triple-Play* Subscribership by Region



* Subscriptions to three services (such as telephone, Internet, and television) through the same provider
** Projections
Source: *The Economist*[156]

Worldwide IPTV Subscribers (thousands)

	2006	2007*	2008*	2009*	2010*	2011*
North and South America	355	1,952	4,519	7,979	11,514	15,505
China	196	1,787	3,512	7,877	13,106	19,521
Japan	178	437	2,491	5,316	9,383	11,157
Other Asia	1,187	2,108	3,392	4,985	7,929	9,935
Europe	1,982	6,728	13,391	22,638	33,887	46,890
Total	**3,898**	**13,012**	**27,304**	**48,795**	**75,819**	**103,008**

* Projections
Source: iSuppli[157]

Chapter 4
Digital Media

Consumption of television, movies, news, music, gaming, and other media represents the main source of household entertainment. On average, each American will spend the equivalent of 65 days in front of a TV, 41 days listening to the radio, and a little more than 7 days on the Internet in 2007, with the average consumer spending $937 on media over the year.[1] Traditional media sources are increasingly moving to digital formats and expanding their online distribution channels. eMarketer predicts that U.S. spending on digital music, TV, and movies will grow from $2.4 billion in 2006 to $3.6 billion in 2007 and $7.8 billion in 2010.[2]

The variety and easy accessibility of free media on the Internet has challenged entertainment companies using traditional distribution methods to adapt their business models. Early music filesharing services such as Napster ended the dominance of store-based music distribution, and online news has provided attractive alternatives for newspaper readers and television broadcast viewers. The motion picture industry will probably face similarly severe challenges from both legitimate and illegitimate online alternatives to theater-based movie viewing as broadband access rates and download speeds continue to increase in the next few years.

Although the Internet has been traditionally associated with "free information," it is increasingly a source of entertainment for which people are willing to pay. In 2006, an estimated 10 percent of U.S. adults in Internet households paid for a subscription or a la carte music service, 6 percent paid for an online gaming service, 5 percent paid for online console gaming, and 4 percent paid for online video.[3] Paid online gaming, video, and music content revenues in the U.S. were $1.6 billion in 2005 and $2.5 billion in 2006, with $1.6 billion attributed to gaming, $700 million to music, and $300 million to video in 2006. Video is by far the fastest growing segment of this market. By 2010, online media content revenues are expected to be $11.2 billion, with $4.4 billion going to gaming, $2.5 billion to music, and $4.3 billion to video.[4]

The footprint of user-created content also expanded dramatically in 2006, as news and political blogs, MySpace pages, Wikipedia entries, YouTube videos, and Craigslist ads attracted millions of viewers. Traditional media companies and e-commerce websites have responded by increasing the opportunities for users to review products and communicate in online discussion forums.

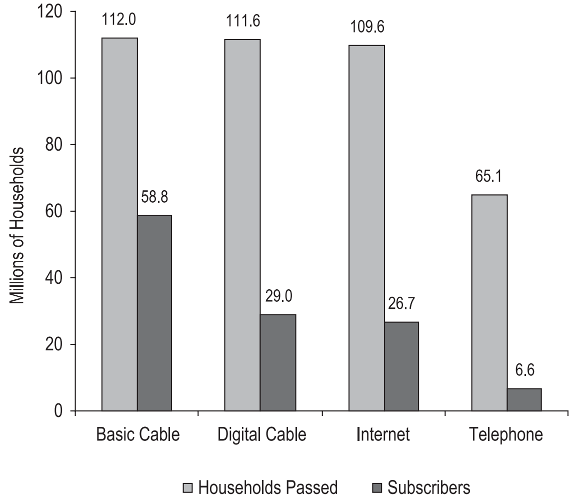
Some people find the possibilities offered by digital entertainment media disturbing. Online gambling has become a popular Internet activity for millions, and a full-time occupation for thousands. Social networking websites attract millions of children and teenagers, often for hours a day. Virtual worlds such as Second Life allow users to lead alternate, and not always exemplary, lives in the digital realm. User-produced and uploaded YouTube videos are often deemed to be disgusting or obscene. Although service providers and legislators are attempting to address these issues, they are likely to remain controversial for many years.

Television

A substantial majority of U.S. television viewers pay for either cable or satellite television programming, and they are increasingly using other free (Internet video) and paid (cell phone) channels to expand and diversify their viewing options. High-definition television (HDTV), expanded menus of digital subscription and on-demand programming, and digital video recorders are transforming the traditional offline viewing experience.

- The National Cable and Telecommunications Association (NCTA) reported that, as of December 2006, there were 111.6 million television households in the U.S., of which 65.6 million were basic cable subscribers, giving the U.S. a cable penetration rate of 58.8 percent of TV households.[5] The number of U.S. digital cable customers has grown steadily from 12.2 million in the second quarter of 2001 to 32.6 million in the fourth quarter of 2006.[6]
- As of early 2007, the average monthly price for expanded basic programming packages was $42.76, $1.59 higher than 2006's average price of $41.17.[7] From 1986, when the average price was $10.67, to 2007, the average yearly price increase in monthly rates has been $1.53.[8]
- In addition to television, cable companies are also becoming providers of Internet and telephone service to millions of U.S. households. In November 2006, 26.7 million U.S. households subscribed to Internet service through a cable company, and 6.6 million subscribed to telephone service through a cable company.[9]
- In 2007, U.S. cable revenue is predicted to be $74.7 billion, of which $26.9 billion will be advertising revenue.[10] Cable TV operators' programming expenditures were $20.6 billion in 2006, up from $15.8 billion in 2005, making for the largest increase in the industry's recent history, in percentage and absolute terms.[11]
- Satellite TV has gained ground on cable TV in the U.S. in recent years. Satellite TV grew from having 9.5 percent of the U.S. pay TV market in February 2000 to 29.2 percent in February 2007, while cable's market share declined from 89 percent to 71 percent.[12]
- About 20 million U.S. homes and 90 million television sets will be affected by the digital television transition, scheduled to take place on February 17, 2009. At that time, these homes will have to buy new TV sets or converter boxes to keep receiving over-the-air digital broadcasts.[13] A 2007 survey found that less than 30 percent of the public was aware of this transition.[14]
- According to In-Stat, of the 1.2 billion television households worldwide, 355 million were cable TV households as of late 2006, up from 349 million at the end of 2005. China had the most cable TV households, with 106 million, followed by the U.S. with 69 million.[15]

Cable Services in the U.S., November 2006



Source: MediaPost Publications[16]

FCC and NCTA Estimates of Average Monthly U.S. Cable Prices

	FCC Estimate ($)*	NCTA Estimate ($)**	Consumer Price Index***, 1982-1984=100
1995	22.35	23.07	152.4
1996	24.28	24.41	156.9
1997	26.31	26.48	160.5
1998	27.88	27.81	163.0
1999	28.94	28.92	166.6
2000	31.22	30.08	172.2
2001	33.75	31.58	177.1
2002	36.47	34.52	179.9
2003	38.95	36.59	184.0
2004	41.04	38.23	188.9
2005	43.04	39.96	195.3
2006	n/a	41.17	201.6

* Source: FCC[17] (Price of "Basic Tier" plus price of "Expanded Tier")

** Source: NCTA[18] ("Average Monthly Price for Expanded Basic Programming Packages")

*** Source: Bureau of Labor Statistics[19]

U.S. Cable Industry Revenues ($billions)

	Basic Revenue	Premium Revenue	Advertising Revenue	Total Revenue
1990	10.2	4.9	2.6	17.6
1995	16.9	4.6	5.6	25.4
2000	24.4	4.9	13.8	40.9
2001	27.0	5.3	13.7	43.5
2002	28.5	5.5	14.7	49.4
2003	29.0	5.2	16.4	51.3
2004	30.3	5.9	18.6	57.6
2005	31.1	6.4	21.0	62.3
2006	32.3	6.4	23.8	68.2
2007*	33.6	6.5	26.9	74.7

* Projections

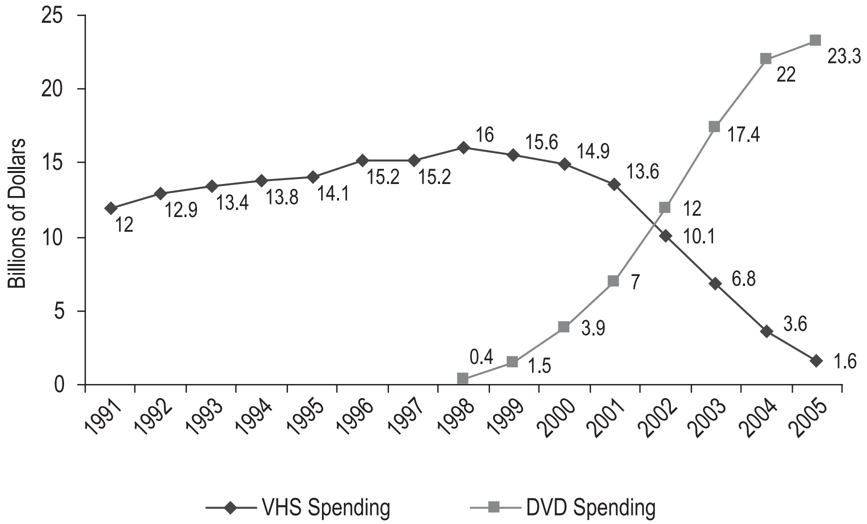
Source: NCTA[20]

Internet Video and DVDs

In the early 20th century, the only source of video entertainment was the movie theater. Network television came about midway through the century, cable television and VHS home video in the 1970s and 1980s, DVDs in the late 1990s, and Internet video soon after. Only VHS appears to be headed for obsolescence; each of the other distribution methods has advantages that consumers value in spite of the new innovations in video format.

- iSuppli predicts that the premium video services market (including pay TV, mobile video, DVDs, broadband video, and movie theaters) will grow from $200 billion in 2006 ($120 billion of which was from pay TV) to $277 billion in 2010. IPTV (Internet Protocol Television) is expected to be the fastest-growing segment, growing from $681 million in 2005 to $23.5 billion in 2010.[21]
- eMarketer predicts that the U.S. Internet video audience will grow from 108 million in 2006 to 157 million in 2010. In 2006, 59.8 percent of all Internet users reported watching Internet video regularly, while 80.1 percent will do so by 2010.[22] However, Internet video only represented about 0.01 percent (1 percent of 1 percent) of the $350 billion in worldwide video industry revenues as of early 2007.[23]
- In early 2007, 42 percent of online U.S. adults said they had watched a video on YouTube, with 85 percent of those in the 18-24 age group having done so.[24] However, the total number of hours spent watching online video is still small compared to traditional television. The number of hours spent watching the BBC in the U.K. alone outstrips the time spent watching YouTube worldwide by a factor of ten to one.[25]
- Worldwide DVD sales are slowing and expected to decline by as much as 15 to 20 percent between 2007 and 2010.[26] In 2006, nearly all of the $16.9 billion of home video industry revenue came from standard-edition DVDs, but high-definition DVD revenue was expected to grow to $2.6 billion by 2009 and $18.3 billion by 2015, when it will be the main segment of the industry.[27]
- High-definition DVDs offer better quality images and sound than regular DVDs, but their adoption has been hindered by two competing standards: HD DVD and Blu-ray DVDs. As of mid-2007, Blu-ray seems to be gaining a slight edge due to the ability of Sony's PlayStation 3 to play Blu-ray DVDs and Blockbuster's decision to stock Blu-ray but not HD DVDs in most of its stores.[28]
- In only seven years since its introduction by Netflix, online DVD rental services have become a $1.3 billion industry. By 2006, they accounted for 15.9 percent of U.S. rental spending, up from 2.8 percent just three years before. The adoption of online DVD subscription services is projected to halt the five-year decline in the overall rental market in 2007.[29]

U.S. Consumer Spending on VHS Tapes and DVDs



Source: Adams Media Research[30]

Online Video Viewing Habits of U.S. Adults by Age Group, January 2007*

	All Adults	18-24	25-29	30-39	40-49	50-64	65+
Watched Video Online	74	85	87	76	78	62	56
Watched Video On:							
YouTube	42	73	55	44	45	23	13
TV Network	41	35	51	39	47	39	31
News Website	35	27	40	36	42	32	32
Yahoo	25	30	33	26	29	18	13
Google	24	38	30	22	24	19	14
MySpace	19	45	33	19	16	7	3
iTunes	7	16	9	8	5	3	1
Other	19	19	15	24	19	17	16
Never Watched Video Online	26	15	13	24	22	38	44

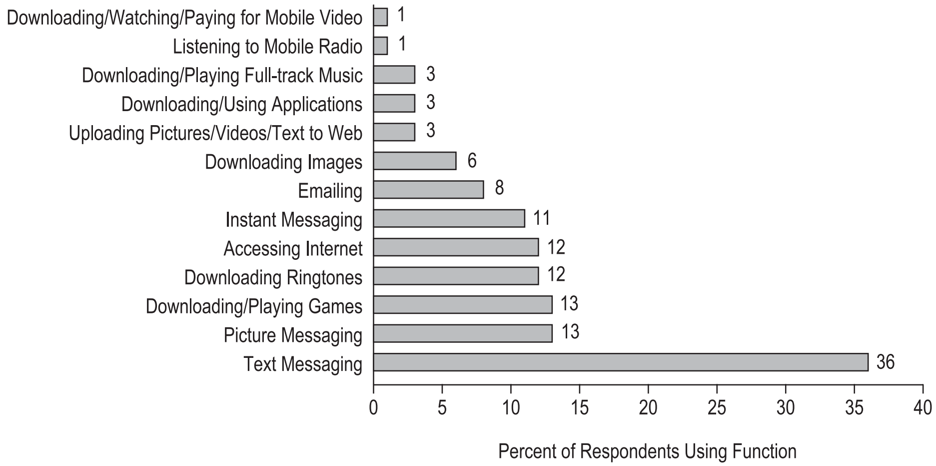
* Percent of Respondents Answering "Yes," Multiple Responses Permitted
Source: MediaPost Publications[31]

Cell Phone Content

Cell phones have evolved from communication devices to multimedia platforms. Games, images, and ringtones make up much of the cell phone content market, and the possibilities for mobile video have attracted significant attention in recent years. While mobile video is already used for short clips of video such as sports highlights, the greatest level of user interest is currently for "see-what-I-see" (user created and shared) video.[32] A 2006 survey found that 70 percent of wireless executives did not believe that cellular customers would adopt mobile video in the next three years. The same study found that mobile video would likely result in an extra $5 in average revenue per user by 2009.[33]

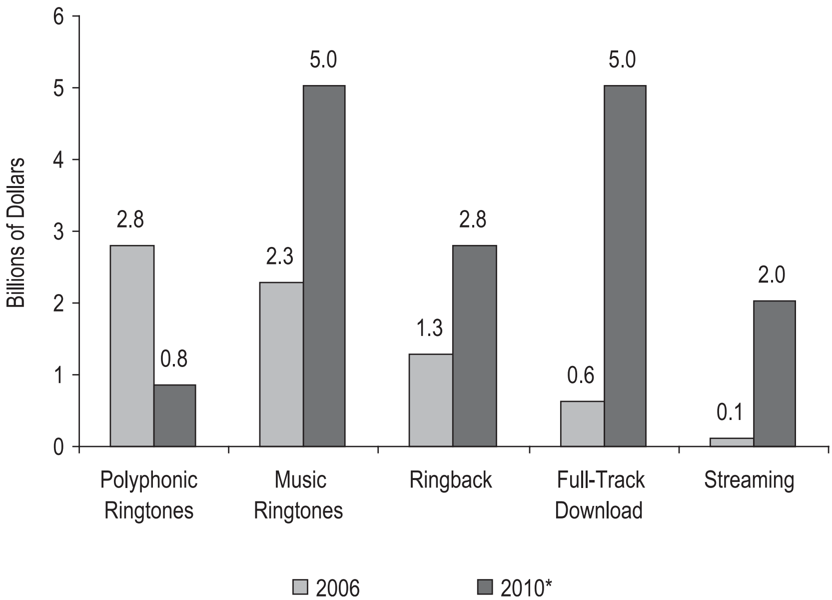
- The total worldwide mobile entertainment market (including gambling, adult content, mobile games, mobile music, mobile video, and infotainment) was estimated in late 2006 to have yearly revenues of over $17 billion, and this number is expected to increase to $47 billion in 2009 and $77 billion in 2011.[34]
- Mobile phones sold in the U.S. are increasingly incorporating music playback capabilities (32 percent of phones had such features in the fourth quarter of 2006 versus 18 percent in the second quarter), removable memory (21 percent of phones sold in the fourth quarter of 2006, up from 6 percent in the first quarter), and Bluetooth capability (49 percent in the fourth quarter of 2006, up from 31 percent in the first quarter).[35] The most-consumed mobile content product in 2006 was images.[36]
- iSuppli predicts that mobile video will have more than 100 million subscribers worldwide by 2010, with more than 300 million handsets with mobile video chips shipped for the year.[37]
- In 2006, 11 percent of phones were capable of handling video, but only 1 percent of mobile subscribers paid for a subscription.[38]
- A 2006 survey found that out of 213 million U.S. cell phone users, 12 million watched video clips, 6 million watched live TV, and 3 million signed up for some kind of video subscription service.[39] In 2006, 9.3 percent of U.S. respondents to an In-Stat survey said they were very interested in mobile video, up from 6.2 percent in 2004.[40]
- Japan and South Korea have been predicted to become the largest markets for mobile video, with $1 billion and $810 million in revenues, respectively, in 2010.[41] An early 2007 study found that Europeans were abandoning mobile video, with former users outnumbering current users by a 20-percent margin.[42]

U.S. Cell Phone Activities, 2006



Source: Arbitron[43]

Worldwide Mobile Music Revenue



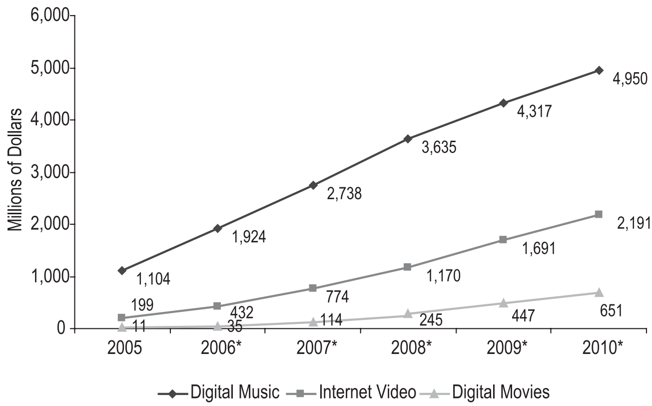
* Projections
Source: iSuppli[44]

Music

Despite the demise of early filesharing services such as Napster, the challenge to traditional channels of music retailing from new forms of music storage and transmission has continued to expand. At the end of 2006, there were 47 million U.S. "digital music households"—households where someone downloaded, ripped, burned, played, or uploaded digital music. Of these households, 32 percent actively downloaded at least one music file from a peer-to-peer (P2P) filesharing site in 2006, an 8-percent increase over 2005. This expanded interest has been at least partly met by companies offering paid music downloads. About 28 percent of the digital music households used a paid digital music downloading service, almost three times as many as in 2004.[45]

- Worldwide CD sales fell by 23 percent in value from 2000 to 2005.[46] Physical CD revenue was $25.8 billion in 2006 and is expected to drop to $24.3 billion in 2007 and $19.6 billion by 2010.[47]
- Digital music made up 6 percent of the total worldwide music market in 2006, up from 4 percent in 2005. It is expected to represent 26 percent of all music purchased worldwide by 2011.[48]
- 500 million music files were purchased on the Internet worldwide in 2006, a 56-percent increase over 2005.[49] According to the IFPI, there were about 500 legal digital music services in more than 40 countries as of early 2007.[50]
- Record companies' worldwide digital music sales almost doubled in value in 2006, reaching $2 billion and growing from 5.5 percent of industry sales in 2005 to 10 percent in 2006.[51] Legal music downloads are expected to account for 36 percent of the entire music industry in Europe by 2011.[52]
- As of late 2006, iTunes accounted for about 6 percent of all the music sold in the U.S., making Apple the fourth largest music retailer in the U.S.[53] In early 2007, iTunes had a 70-percent share of U.S. households using a legal downloading service.[54]
- Music subscription services such as Rhapsody, Napster, and eMusic reached 3.5 million consumers worldwide in 2006, growing 25 percent over the course of the year.[55]
- Worldwide, digital music sales are split roughly evenly between online and mobile channels, but in Japan, mobile music made up 90 percent of digital sales in 2006.[56] South Korea's mobile music industry has also surpassed its conventional music industry.[57]
- Mobile phone users worldwide are expected to spend $13.7 billion on music for their phones in 2007, and this number is expected to grow to $32.2 billion by 2010.[58] About 80 percent of worldwide mobile music revenue came from ringtones as of early 2007,[59] but the U.S. market for ringtones is expected to decline from $600 million in 2006 to $550 million in 2007.[60]

U.S. Digital Music, Video, and Movie Spending



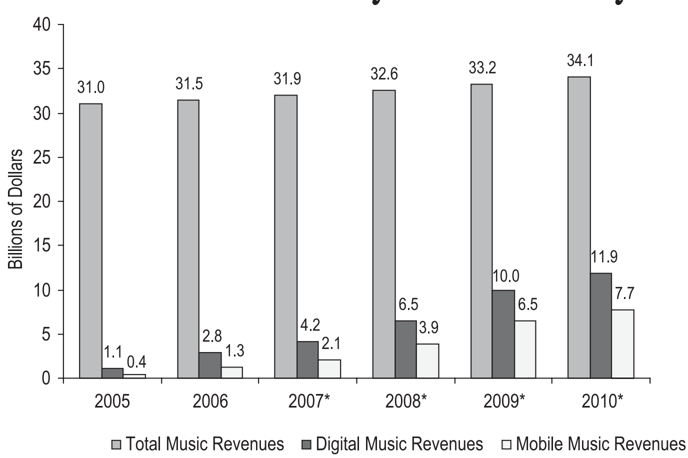
* Projections
Source: eMarketer[61]

Digital Music Markets

	Worldwide			U.S.		
	2005 (millions)	2006 (millions)	Change (%)	2005 (millions)	2006 (millions)	Change (%)
Broadband Lines	209	280	34	43	57	31
Song Catalog Online	2	4	100	n/a	n/a	n/a
Single Tracks Downloaded	420	795	89	353	582	65
Albums Downloaded	n/a	n/a	n/a	16	33	101
Subscription Service Users	2.8	3.5	25	n/a	n/a	n/a
Mobile Subscriptions	1,817	2,017	11	174	194	11
3G Mobile Subscriptions	90	137	52	3	15	448
Portable Player Sales	84	120	43	n/a	n/a	n/a

Source: IFPI[62]

Worldwide Music Industry Revenues by Segment



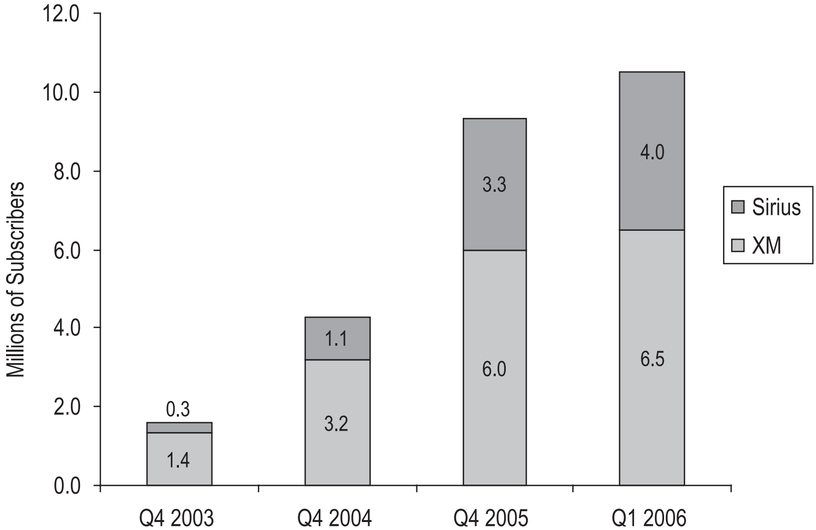
* Projections
Source: IDATE[63]

Radio

Like most traditional media channels, radio is facing competition from emerging and Internet-based technologies. For the radio industry, this competition comes in the form of satellite radio and Internet radio. Broadcast radio advertising revenues were roughly constant from 2005 to 2006 at about $8 billion. Future growth will depend on high-definition (HD) radio, which will offer better quality signals and allow for more stations, but will require listeners to purchase a digital radio receiver.[64]

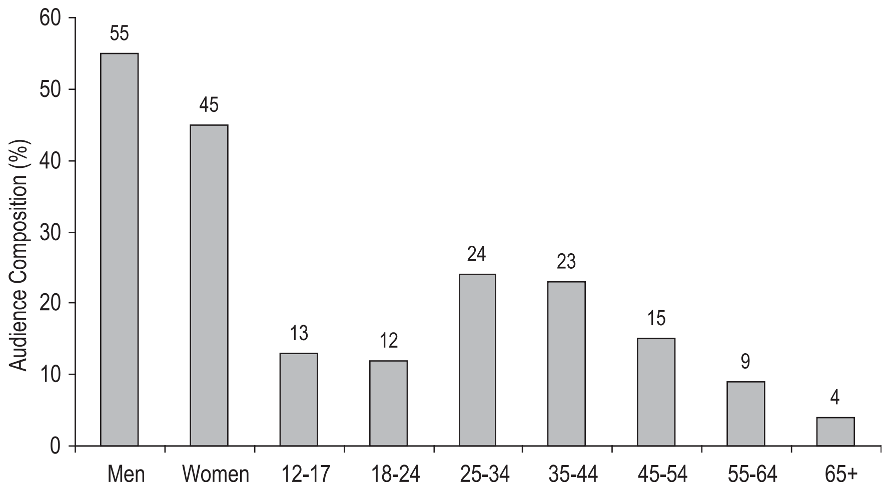
- In early 2007, there were more than 2.2 billion radio sets in use worldwide.[65] The worldwide market for digital radio receivers is expected to grow from 5 million units in 2005 to 25 million units in 2010.[66]
- In-Stat estimated that there were 8 million XM satellite radio subscribers and 6.3 million Sirius satellite radio subscribers at the end of 2006.[67] In early 2007, Sirius radio had 130 channels and XM had 170 channels.[68]
- In the U.S., satellite radio revenue is expected to grow at a compound annual growth rate (CAGR) of 39.5 percent from 2005 to reach $5.4 billion in 2010, while terrestrial radio revenue grows at a CAGR of 4.2 percent to hit $24.5 billion in 2010.[69]
- On February 19, 2007, XM and Sirius, the two main satellite radio companies in the U.S., announced their intent to merge into one satellite radio network, with the required application filed at the FCC on March 20, 2007. A decision on whether the merger will be allowed is expected to be made in early 2008.[70]
- The weekly audience for Internet radio in the U.S. remained steady in 2006 at an estimated 29 million. One survey found that 11 percent of the U.S. population aged 12 and older listened to Internet radio in the previous week as of January 2007, compared to 12 percent in January 2006.[71]
- A January 2007 JPMorgan report on the radio industry said the U.S. Internet radio segment was worth $500 million in 2006.[72]
- PriceWaterhouseCoopers predicts the worldwide market for radio advertising will grow from $44.6 billion in 2005 to $58.8 billion in 2010, a CAGR of 5.7 percent.[73]
- As of early 2007, around 1,200 radio stations were broadcasting in HD in the U.S., and there were more than 25 HD radio sets on the market, some being sold for less than $200.[74] However, although awareness of HD radio increased from 14 percent in January 2006 to 26 percent in January 2007, only 6 percent of consumers said they were very interested in HD radio in January 2007.[75]

U.S. Satellite Radio Subscribership



Source: OECD[76]

Weekly U.S. Internet Radio Audience by Gender and Age, January 2007



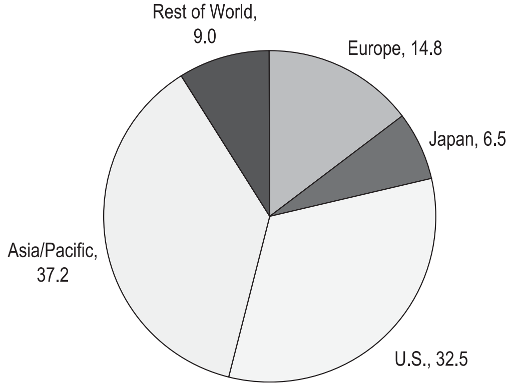
Source: Edison Research[77]

Gaming

In recent years, gaming has expanded from arcades and TV consoles to include mobile and Internet-based gaming. Massively multiplayer online games (MMOGs) such as World of Warcraft and online virtual social worlds (VSWs) such as Second Life have made gaming more interactive, giving the industry common ground with burgeoning social networking websites. The most popular role-playing MMOGs attract hardcore players willing to spend considerable time developing their characters and creating new scenarios. VSWs may have greater future growth potential because they appeal to a broader spectrum of online players.

- U.S. retail sales of portable and console gaming hardware, gaming software, and gaming accessories generated $12.5 billion in revenue in 2006, up from $10.5 billion in 2005. After a few years of declining, PC game software revenues rose 1 percent to $970 million in 2006. U.S. computer and video game software sales grew 6 percent in 2006 to reach $7.4 billion.[78]
- More than 17 million Americans downloaded a mobile game in the fourth quarter of 2006, a 45-percent increase from 12 million in the fourth quarter of 2005.[79]
- On average, there were 38 million mobile game users worldwide each month in 2005, a number predicted to grow to 134 million by 2010.[80]
- In late 2006, about 117 million people in the U.S. qualified as "active gamers," meaning they spent at least one hour per week on a gaming device. Of the active gamers, 56 percent played games online, and 64 percent of those online players were women. The active gamer universe included 48 million teenagers, 17.5 million players in the 18-24 age range, and 15 million active gamers who were 45 or older.[81]
- From 2005 to 2010, the annualized growth in the number of worldwide console subscribers is expected to be 40.8 percent, and the annualized growth in the number of worldwide handheld subscribers is expected to be 94.2 percent.[82]
- Worldwide video game advertising is expected to grow about 23 percent per year for the next five years, from $692 million in 2006 to $1.94 billion in 2011.[83]
- The massively multiplayer online gaming (MMOG) market had 13 million paid subscribers worldwide as of mid-2006. Revenues for 2006 were $2.5 billion, and they are expected to grow to $5.5 billion by 2010, when MMOG software sales would account for 10 percent of worldwide gaming revenues.[84]
- Worldwide revenue generated by massively multiplayer online role-playing games, such as World of Warcraft, and online virtual social worlds, such as Second Life, was estimated to reach $2.5 billion in 2006 and is expected to grow to $9 billion by 2010, when 40 million users are predicted to take part in them.[85] The real value of goods and services sold in Second Life is expected to be almost $700 million in 2007.[86]

Massively Multiplayer Online Gaming Worldwide Revenue Shares, 2006



Source: IDATE[87]

Top Ten Video Games Ranked by Units Sold in the U.S., 2006

Rank	Title	Platforms	Publisher
1	Madden NFL 07	360, Wii, PS3, PSP, NDS, XBX, PS2, GCN, GBA	Electronic Arts
2	Cars	360, Wii, PSP, NDS, XBX, PS2, GCN, GBA	THQ
3	Lego Star Wars II: The Original Trilogy	360, PSP, NDS, XBX, PS2, GCN, GBA	LucasArts
4	NCAA Football 07	360, PSP, XBX, PS2	Electronic Arts
5	New Super Mario Brothers	NDS	Nintendo
6	Need for Speed: Most Wanted	360, PSP, NDS, XBX, PS2, GCN, GBA	Electronic Arts
7	Gears of War	360	Microsoft
8	Call of Duty 3	360, Wii, PS3, XBX, PS2, GCN, GBA	Activision
9	Lego Star Wars	XBX, PS2, GCN, GBA	Eidos
10	Fight Night Round 3	360, PS3, PSP, XBX, PS2	Electronic Arts

Source: The NPD Group[88]

Top Ten PC Games Ranked by Units Sold in the U.S., 2006

Rank	Title	Publisher	Release Date
1	World of Warcraft	Vivendi	Nov. 2004
2	The Sims 2	Electronic Arts	Sep. 2004
3	The Sims 2: Open for Business Expansion Pack	Electronic Arts	Mar. 2006
4	Star Wars: Empire at War	LucasArts	Feb. 2006
5	The Sims 2: Pets Expansion Pack	Electronic Arts	Oct. 2006
6	Elder Scrolls IV: Oblivion	Take II Interactive	Mar. 2006
7	MS Age of Empires III	Microsoft	Oct. 2005
8	The Sims 2: Family Fun Stuff Expansion Pack	Electronic Arts	Apr. 2006
9	Civilization IV	Take II Interactive	Oct. 2005
10	The Sims 2: Nightlife Expansion Pack	Electronic Arts	Sep. 2005

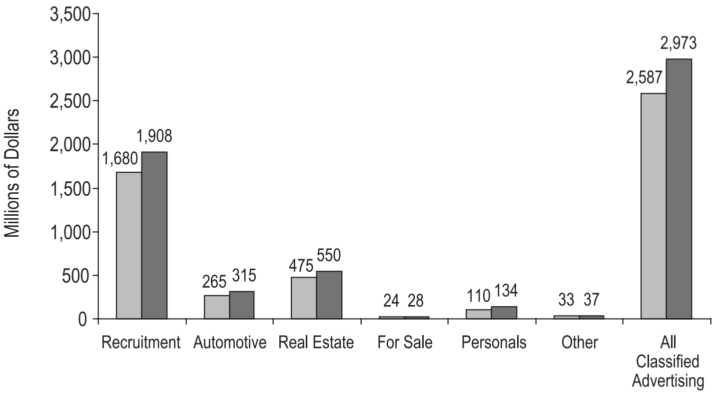
Source: The NPD Group[89]

Online News and Classifieds

The printed news industry has been dramatically affected by the widespread use of the Internet, but to the surprise of many, most newspapers have managed to stay competitive by migrating to the Internet and steadily expanding the scope and functionality of their online offerings. The total number of daily newspapers in the U.S. declined slowly from 1,480 in 2000 to 1,452 in 2005,[90] but worldwide newspaper circulation has increased 10 percent from 2000 to 2005, with more than 10,000 different daily newspaper titles and more than 450 million copies sold daily as of early 2007.[91]

- *The New York Times*' (whose online properties include nytimes.com, about.com, and boston.com, among others) Internet revenues rose from $194 million in 2005 to $274 million in 2006. Internet revenues accounted for 8.3 percent of its total revenues in 2006, up from 6 percent in 2005.[92]
- Advertising on U.S. newspaper websites rose 31.5 percent from 2005 to reach $2.7 billion for 2006, while advertising revenues for print newspapers declined 3.7 percent to $13.2 billion.[93]
- Some websites are seeking partnerships with local newspapers to make things traditionally advertised through local classifieds, such as cars, real estate, and jobs, searchable on the Internet. Cars.com had partnerships with more than 200 local newspapers and TV stations as of early 2007. CareerBuilder, Monster, and HotJobs have similar arrangements with local newspapers.[94]
- From July 2005 to July 2006, U.S. traffic to the online classifieds category grew 47 percent to 37.4 million visitors, 22 percent of the total Internet population. Craigslist attracted 13.8 million visitors in July 2006, up 99 percent from a year earlier.[95] One study found that Craigslist results in $65 million less annual revenue for local newspapers in the San Francisco Bay Area alone.[96]
- Morgan Stanley predicts that the U.S. Internet classifieds market will grow from $2.1 billion in 2006 to $3.9 billion in 2010, a 13-percent compound annual growth rate.[97]
- Worldwide local search (searching for businesses and organizations on a local basis, e.g. pizza restaurants in Akron, Ohio) is expected to grow from a $3.4 billion industry in 2005 to $13 billion in 2010. Online classifieds are expected to grow from $12.3 billion in worldwide revenue in 2005 to $18.1 billion in 2010.[98]
- The demand for location-specific search results is largely being accommodated by the largest Internet search companies. Google and Yahoo! each had a market share of U.S. local search of about 30 percent in July 2006, with Microsoft at 12 percent and Time Warner at 7 percent.[99]

U.S. Internet Classified Advertising



* Projections

Source: Morgan Stanley[100]

U.S. Daily and Sunday Newspapers

Number	2000	2001	2002	2003	2004	2005
Daily: Total	1,480	1,468	1,457	1,456	1,457	1,452
Morning	766	776	777	787	814	817
Evening	727	704	692	680	653	645
Sunday	917	913	913	917	915	914
Net Paid Circulation (millions)						
Daily: Total	55.8	55.6	55.2	55.2	54.6	53.3
Morning	46.8	46.8	46.6	46.9	46.9	46.1
Evening	9.0	8.8	8.6	8.3	7.7	7.2
Sunday	59.4	59.1	58.8	58.5	57.8	55.3

Source: U.S. Census Bureau[101]

Top Ten Websites for International News and Current Events, October 2006

Website	Unique U.S. Audience (millions)	Active Reach (%)
Yahoo! News	15.7	11.8
MSNBC	11.6	8.7
CNN	10.7	8.0
AOL News	9.0	6.7
Gannett Newspapers	5.5	4.1
NYTimes.com	5.5	4.1
Tribune Newspapers	4.7	3.5
Internet Broadcasting Websites	4.3	3.2
USATODAY.com	3.8	2.8
Fox News Digital Network	3.3	2.5

Source: MediaPost Publications[102]

Blogging, Podcasting, and Tagging

The term "Web 2.0" typically refers to websites that feature user-generated content.[103] Some of the most well-known websites in the Web 2.0 vanguard include Craigslist, MySpace, Wikipedia, and YouTube. Three of the hallmark activities of Web 2.0 are blogging, podcasting, and tagging. A blog is an online diary or journal, often accompanied by pictures, links, and other content. A podcast is a recording, usually of audio, available on the Internet for downloading. Podcasts are typically released in a serial format, almost like an audio version of a newspaper opinion column or daily news broadcast. Tagging is the labeling of blog posts, news stories, or other items on the Internet so that the content can be categorized and organized with other related items.

- As of mid-2007, there were about 70 million blogs worldwide, with 1.5 million postings per day and 120,000 new blogs added every day.[104] As of early 2007, Japanese was the most common language in the blogosphere, with 37 percent of blog posts in Japanese, followed closely by English at 36 percent and Chinese at 8 percent.[105] However, the growth rate of the blogosphere is slowing down, and Gartner predicts that the number of active worldwide bloggers will begin to decrease in 2007.[106]
- Newspaper websites are also finding that blogs generate loyal readers and attract those who are interested in specialized topics that cannot be addressed within the space limitations of print media. Traffic to the blog pages of the top ten U.S. online newspaper websites grew 210 percent from December 2005 to December 2006.[107]
- Although it has been around since 2004, podcasting has never really taken off, but it did become more common over the course of 2006. As of late 2006, 12 percent of Internet users said they had downloaded a podcast, up from 7 percent in early 2006.[108] However, in both surveys, only 1 percent of Internet users said they downloaded a podcast on a typical day.[109]
- A December 2006 Pew study found that 28 percent of U.S. Internet users had tagged or categorized content online, and 7 percent of Internet users said they did so on a typical day.[110] Some popular websites that use tagging include del.icio.us, a social bookmarking website; Flickr, an image sharing website; Last.fm, a music website; Gmail, Google's email system; Technorati, a blog search engine;[111] and Digg, a general news tagging and blogging website.
- Tagging websites use different techniques to rank content. Digg ranks stories by votes, Slashdot ranks them by editorial opinion, and Techmeme uses a complex content-analyzing algorithm.[112]
- Digg had over 500,000 registered users and was valued at more than $200 million in late 2006, even though it only took in $3 million in annual revenues and did not make a profit.[113]

Website Links from Blogs, Q4 2006

Rank	Website	Inbound Blog Sources	Rank	Website	Inbound Blog Sources
1	nytimes.com	83,740	26	pbs.org	17,463
2	cnn.com	70,100	27	cbc.ca	16,641
3	news.yahoo.com	68,213	28	tmedia.co.jp	15,471
4	msnbc.msn.com	65,634	29	news.com.au	14,845
5	bbc.co.uk	41,898	30	canada.com	14,309
6	guardian.co.uk	28,435	31	chron.com	14,275
7	latimes.com	27,442	32	mercurynews.com	14,258
8	abcnews.go.com	26,433	33	online.wsj.com	14,236
9	time.com	24,904	**34**	**Gizmodo**	**13,913**
10	asahi.com	24,736	**35**	**TechCrunch**	**13,830**
11	boston.com	23,739	*36*	Bloomberg.com	13,439
12	atnewz.jp	23,372	37	news.independent.co.uk	12,877
13	foxnews.com	23,211	38	chicagotribune.com	12,828
14	forbes.com	22,916	**39**	**The Huffington Post**	**12,703**
15	npr.org	22,317	**40**	**Productivity & Software Guide**	**11,959**
16	news.com	21,921	41	abc.net.au	11,838
17	cbsnews.com	20,636	42	nypost.com	11,827
18	nhk.or.jp	20,622	**43**	**Daily Kos**	**11,093**
19	**engadget**	**20,291**	44	economist.com	10,983
20	slashdot.org	20,282	45	mtv.com	10,719
21	money.cnn.com	20,069	46	nydailynews.com	10,698
22	Boing Boing	19,438	47	TodayLink.ir	10,510
23	iht.com	18,892	**48**	**PostSecret**	**10,331**
24	businessweek.com	18,404	49	miami.com	10,290
25	biz.yahoo.com	17,928	50	philly.com	10,029

* Blogs in Bold

Source: Technorati[114]

2006 Top Ten Blog Searches According to Yahoo!

Rank	Search
1	Perez Hilton
2	The Superficial
3	Pink is the New Blog
4	Huffington Post
5	TMZ.com
6	Daily Kos
7	Jossip
8	Socialite's Life
9	Little Green Footballs
10	Gawker

Source: Clickz Stats[115]

Preferred Podcast Programming, 2007

Programming	Percent of U.S. Podcast Users "Very Interested"
Technology News & Commentary	28
National News	27
Local News & Public Affairs	26
Music News	24
National Sports	22
Political News & Commentary	20
Local Sports	18
Entertainment News	18
Local Band Information	15
Celebrity Interviews	11

Source: Edison Research[116]

Social Networking

The exploding popularity of social networking websites has surprised many Internet experts. The overall social networking market grew 87 percent from February 2006 to February 2007, when it accounted for 6.5 percent of all Internet visits. MySpace is currently the most popular site: five of the top ten search terms used in 2006 were MySpace-related.[117] With popularity comes scrutiny, however, and concerns have been raised that social networking websites can help online predators find underage victims. Although MySpace and other websites have taken steps to address these concerns, it is likely that social networking websites will need to respond to these and other hot-button issues in the future.

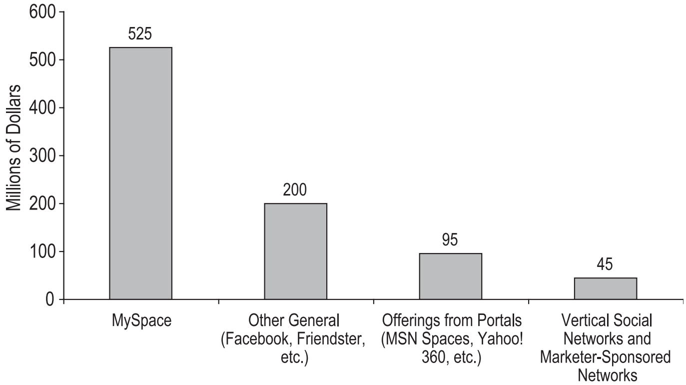
- An April 2007 Pew survey found that 55 percent of online American teenagers had profiles of themselves on one or more social networking websites.[118] According to the survey, 85 percent of teenagers who used social networking websites had a MySpace account, 7 percent had a Facebook account, and 1 percent had a Xanga account.[119]
- Social networking websites are a part of daily life for 48 percent of U.S. teens,[120] but they are also attracting older Internet users. More than half of visitors to MySpace were 35 or older as of late 2006, up from 40 percent a year before.[121]
- In June 2007, MySpace attracted more than 114 million unique visitors worldwide, while Facebook's 52 million unique visitors represented a 270-percent annual growth over the website's June 2006 total. Several of the other largest websites drew primarily non-U.S. visitors. The U.K. Bebo website attracted 62.5 percent of its 18 million visitors during June 2007 from Europe, while 89 percent of Friendster's nearly 25 million visitors were from Asia.[122] Ninety percent of South Korea's teenagers and 20-30 year olds had a Cyworld account as of early 2007.[123]
- Mobile social networks or communities are groups of people with similar interests who use social networking websites and communicate with each other primarily over mobile phones. As of late 2006, there were an estimated 50 million worldwide members, with this number expected to grow to 174 million by 2011.[124] One report estimated that the market for mobile communities and user-generated content would be worth $13.1 billion in 2011.[125]
- Predictably, each new digital innovation that attracts an audience of users quickly attracts interest from advertisers as well. eMarketer estimated that social network advertising spending would reach $865 million in 2007 and $2.2 billion by 2010.[126]
- The social networking trend is affecting the way companies design their websites, with more of them allowing customers to review and rate products. At the end of 2006, 43 percent of e-commerce websites offered customer reviews and ratings, up from 23 percent at the end of 2005.[127]

Unique Worldwide Visitors to Social Networking Websites (millions)

	June 2006	June 2007	Change (%)
MySpace	66.4	114.1	72
Facebook	14.1	52.2	270
Hi5	18.1	28.2	56
Friendster	14.9	24.7	65
Orkut	13.6	24.1	78
Bebo	6.7	18.2	172
Tagged	1.5	13.2	774

Source: comScore[128]

U.S. Online Social Network Advertising Spending, 2007*



* Projections
Source: eMarketer[129]

Visitors to Social Networking Websites by Age, August 2006

Age Group	Total Internet	MySpace	Facebook	Xanga
12-17 (percent)	9.6	11.9	14.0	20.3
18-24 (percent)	11.3	18.1	34.0	15.5
25-34 (percent)	14.5	16.7	8.6	11.0
35-54 (percent)	38.5	40.6	33.5	35.6
55+ (percent)	18.0	11.0	7.6	7.3
Total (percent)	100.0	100.0	100.0	100.0
Unique Visitors (millions)	**173.4**	**55.8**	**14.8**	**8.1**

Source: comScore[130]

Chapter 5
Electronic Commerce

While some sectors have been more affected by the Internet than others, virtually all consumer-oriented businesses have been forced to respond to a purchasing public that is better informed about product attributes, availability, and pricing. A 2007 survey found that 92.5 percent of U.S. adults regularly or occasionally go online before making a purchase.[1] Moreover, as Internet users have come to rely on online product information and reviews, more of them are becoming regular Internet shoppers for an expanding variety of goods. The maturing of online commerce is highlighted by apparel replacing computer hardware and software as the largest single category of online retail purchases in 2006.[2]

Of course, wherever people are directing their eyes, there will be an advertising market, and recent trends in the digital economy have affected the advertising industry as well. A larger percentage of advertising budgets are going to online advertising, although the share is still small in relation to television and print media advertising. Internet advertising is certain to grow rapidly in the next few years, as the Internet is still relatively unsaturated with advertising relative to most other media.

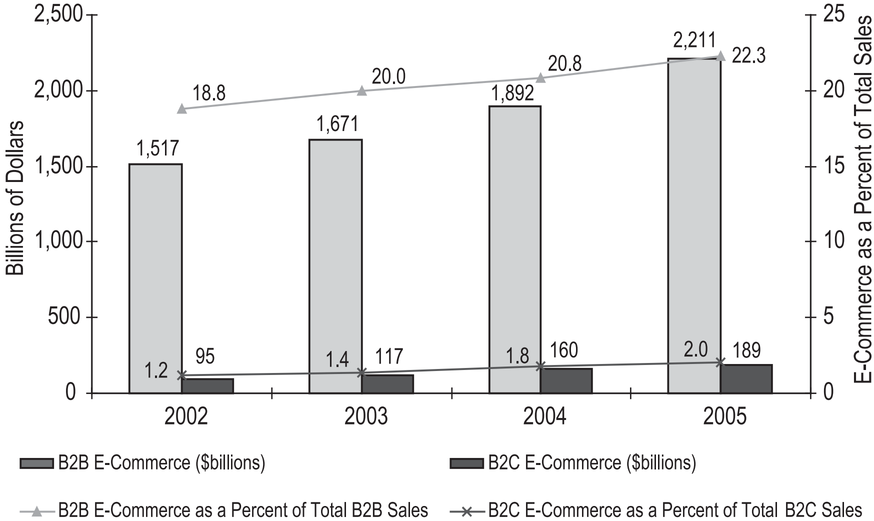
The informational advantage of online shopping is especially pronounced for products such as travel, financial services, and health care. Online travel agencies such as Expedia and Travelocity were part of the first wave of successful e-commerce firms, and they have managed to maintain that position even in the face of competition from airline, hotel, and rental car websites. Slower to move online, but now as well-established, were the e-commerce arms of banks and brokerage firms, which have generally been effective, even with Internet-based competition. Slowest of these three to move online have been providers of health products and services. The Internet has given consumers a wealth of resources that makes them more sophisticated shoppers in both the online and offline health care markets. The rise in direct-to-consumer pharmaceutical advertising and the growth of information hubs and support groups for even the rarest of diseases are two other significant aspects of this wider dispersion of medical knowledge.

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

E-commerce accounted for only 3.3 percent ($33.6 billion) of the just over $1 trillion in total U.S. retail (business-to-consumer, or B2C) sales in the second quarter of 2007.[3] A larger but less visible share of business-to-business (B2B) transactions was conducted through Electronic Data Interchange (EDI) networks, which were widely used before the mass adoption of the Internet. According to U.S. Census Bureau figures, e-commerce accounted for 22.3 percent of all business-to-business (B2B) shipments, sales, and revenues in 2005.[4]

- According to comScore, 2006 revenues at U.S. retail websites increased by 24 percent over 2005, crossing the $100 billion mark for the first time. This included $24.6 billion in holiday (November and December) shopping, a rise of 26 percent over 2005.[5] eMarketer projects that online retail sales will more than double in the next four years, reaching $211.8 billion in 2010.[6]
- With online sales of $18.3 billion in 2006, apparel has overtaken computer hardware and software as the largest single category of B2C e-commerce, according Shop.org. The apparel, accessories, and footwear category is expected to hit $22.1 billion in 2007, when 10 percent of all clothing sales are expected to occur online.[7]
- According to the American Customer Satisfaction Index, American consumers were more satisfied with online retail than offline retail in 2006. The abundance of detailed product descriptions, images, and user reviews on retail websites was the main reason for the difference.[8] Internet retail scored an average of 5.1 points higher than general retail in 2000, but is now scoring around 8.6 points higher, reaching 80 on a scale of 100 for 2006.[9]
- Although products tend to cost less bought over the Internet than in a store, the average price a consumer pays for a given *type* of product actually tends to be higher on the Internet than in a store.[10] This can be interpreted as meaning that people are more likely to buy expensive versions of products on the Internet, or that people with more expensive tastes (or more money) tend to shop more on the Internet.
- The U.K., Germany, and France accounted for 72 percent of European Internet sales, with Internet consumers in the U.K. spending an average of $2,241 per person, Internet consumers in Germany spending $996, and Internet consumers in France spending $860 online in 2006. eMarketer predicts the European B2C e-commerce market will grow from $133 billion in 2006 to $407 billion in 2011, an average annual growth rate of 25 percent.[11]
- Total B2C e-commerce sales in Japan, South Korea, China, and India were $51 billion in 2006 and are expected to reach $115 billion in 2010. B2C e-commerce in China is expected to grow from $2.5 billion in 2006 to $18 billion in 2010, a 64-percent compound annual growth rate, compared with 17 percent over the same period in Japan.[12]

U.S. B2B and B2C Sales and E-Commerce



Source: U.S. Census Bureau[13]

B2B e-commerce equals manufacturing shipments plus merchant wholesale trade including MSBOs (manufacturers' sales branches and offices); B2C e-commerce equals retail trade sales plus selected service revenues

Fastest Growing E-Commerce Categories

Category	Q2 2007 vs. Q2 2006 Growth (percent)
Video Games, Consoles, and Accessories	159
Sport and Fitness	58
Consumer Electronics (excluding PC Peripherals)	51
Event Tickets	44
Jewelry and Watches	32
Furniture, Appliances, and Equipment	25
Music, Movies, and Videos	24
Computer Software (excluding PC Games)	23
Books and Magazines	22
Apparel and Accessories	20

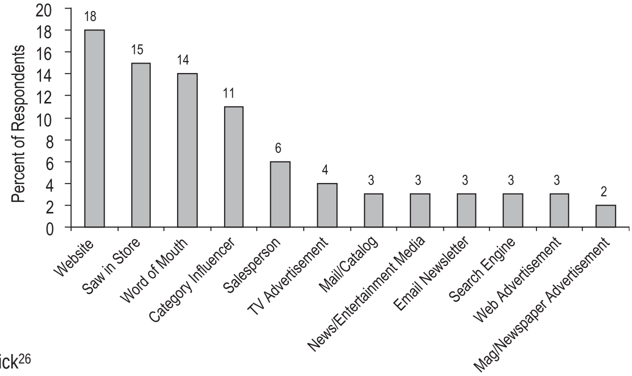
Source: comScore[14]

Internet Advertising

Online advertising now accounts for a share of corporate spending comparable to more traditional advertising methods. Moreover, this channel is far from saturated: Morgan Stanley found that the ratio of media usage to advertising spending was much higher for the Internet than for radio, TV, newspapers, and magazines, indicating there may be greater potential for Internet advertising to grow in the future.[15]

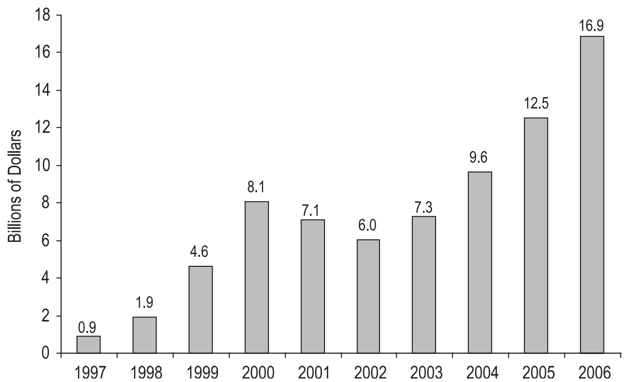
- According to eMarketer, U.S. Internet advertising spending was $16.4 billion in 2006, or 5.8 percent of total advertising spending. This is expected to increase to $36.5 billion by 2011, when it will account for 11.3 percent of total advertising spending. Much of this increase will be due to a tripling in advertising spending on video and other "rich" media (from $2.1 billion in 2007 to $6.2 billion in 2011) and a doubling in advertising spending on paid search (from $8.2 billion in 2007 to $16.1 billion in 2011).[16]
- The U.S. Presidential elections and the Summer Olympics are expected to be major drivers of increased online ad spending growth in 2008. The projected rise of 22 percent would bring the total to nearly $24 billion.[17]
- Consumer-related advertising accounted for 52 percent of Internet advertising revenue in 2006, followed by advertising for financial services at 16 percent and computing advertising at 10 percent. Within the consumer category, the biggest subcategories were retail (47 percent of consumer advertising revenue in 2006), automotive (22 percent), leisure (13 percent), entertainment (8 percent), and packaged goods (8 percent).[18]
- Expenditures on Internet advertising do not always translate into direct consumer response. A November 2006 study by DoubleClick found that email newsletters, search engine placements, and Internet advertisements each influenced only 3 percent of online shopping decisions, while offline exposure in retail outlets influenced 15 percent of online purchasing decisions.[19]
- Zenith Optimedia predicted that in 2007, $31.3 billion would be spent on Internet advertising worldwide, while $168 billion would be spent on television advertising, which topped the list of the media in which the most advertising dollars are spent. As of mid-2007, more than 10 percent of all advertising money in Norway, Sweden, and the U.K. went to Internet advertising, with Australia, Canada, Denmark, Israel, Japan, South Korea, Taiwan, and the U.S. all expected to reach that point by 2009. Internet advertising is projected to grow 28.2 percent in 2007, while the rest of the advertising market will grow 3.7 percent.[20]
- Predictions of the growth rate of worldwide Internet advertising for 2007 include Borell Associates' 10.2-percent estimate, eMarketer's 19-percent estimate,[21] Morgan Stanley's 23-percent estimate,[22] JMP Securities' 25.8-percent estimate,[23] and Zenith Optimedia's 28.2-percent estimate.[24]
- A 2007 survey of advertisers found that they were most surprised in 2006 by the rush to advertise in Second Life, followed by the interest in YouTube.[25]

Factors Influencing U.S. Online Shopping Decisions, November 2006



Source: DoubleClick[26]

Worldwide Internet Advertising Revenue



Source: Interactive Advertising Bureau[27]

Top Ten Internet Advertisers, May 2007

Rank	Advertiser	Media Value ($millions)
1	LendingTree	23.2
2	University of Phoenix Online	17.1
3	Classmates Online	12.4
4	Verizon Wireless	12.0
5	E-Trade Financial	11.3
6	LowerMyBills.com	10.0
7	Fidelity Brokerage Services	9.4
8	Monster	8.4
9	Scottrade	8.4
10	eBay	8.2

Source: Clickz[28]

Types of Internet Advertising

The number of ways that advertisers reach Internet users continues to expand from the early days of static banner ads. Display ads have given way to keyword search ads as the dominant form of advertising. The highest future growth rates will come from video ads and from placements in emerging advertising channels such as cell phones, social networking sites, blogs, and podcasts.

- Worldwide search advertising accounted for 40 percent of worldwide Internet advertising revenues in 2006, followed by display advertising at 22 percent, classifieds at 18 percent, referrals/lead generation at 8 percent, rich media at 7 percent, sponsorship at 3 percent, and email at 2 percent.[29]
- Internet display advertising revenues, which grew 17.3 percent to $9.76 billion in 2006, accounted for 6.5 percent of total media advertising in 2006.[30]
- A DoubleClick study found that people are much more likely to play a video ad, or replay one that started automatically, than they are to click through standard JPG or GIF image ads. Click-through rates for video ads ranged from 0.4 percent to 0.74 percent, versus 0.1 percent to 0.2 percent for static JPG or GIF image ads.[31]
- Since there are about 2 billion cell phone users worldwide, compared with roughly 1.4 billion TV sets and 1 billion personal computers, mobile advertising has attracted a large amount of interest. However, the lack of a common framework (such as specifications for the appropriate size of banner ads and length of video ads) and the lack of a reporting mechanism to measure the success of ad campaigns have limited the use of mobile advertising.[32]
- According to a Jack Myers Media Business Report forecast, mobile phone advertising spending is expected to double from $360 million in 2006 to $720 million in 2007.[33] Informa Telecoms and Media expects worldwide mobile phone advertising spending to reach $1.5 billion in 2007, more than double its 2006 amount, and grow to $11 billion by 2011.[34]
- Advertising spending on social networking websites is expected to increase from an estimated $350 million in 2006 to $865 million in 2007 and $1.8 billion by 2010, growing from 2.2 percent of total online ad spending in 2006 to 8.5 percent of total online ad spending in 2010.[35]
- In 2006, only 13 percent of U.S. marketers were involved with blog advertising, and only 10 percent were experimenting with RSS feeds, but as of early 2007, 34 percent were using or piloting blogs, and 40 percent were using or piloting RSS feeds.[36]

U.S. Internet Advertising Spending ($millions, except where noted)

	2004	2005	2006*	2007*	2010*	CAGR 2005-2010* (%)
Search Advertising	3,850	5,142	6,681	8,622	15,786	25
Display and Sponsorship	2,599	3,136	4,108	4,765	6,225	15
Rich Media	963	1,003	1,123	1,472	3,150	26
Classified Advertising	1,733	2,132	2,587	2,973	3,892	13
Email and Other	481	1,129	1,498	1,867	2,743	19
Total Internet Spending	**9,626**	**12,542**	**15,998**	**19,699**	**31,796**	**20**
Internet Users (millions)	183	195	205	212	229	3
Internet Households (millions)	68	71	73	77	88	4
Total Internet Spending per User ($)	**53**	**64**	**78**	**93**	**139**	**17**
Total Internet Spending per Internet Household ($)	**141**	**177**	**218**	**255**	**362**	**15**

* Projections
Source: Morgan Stanley[37]

Advertising Breakdown by Ad Unit Types, January 2007

	Ad Unit Type (millions)				
Industry	**Flash, Generic**	**Rich Media**	**Sponsored Link**	**Standard Image**	**Standard Image/Text Link**
Automotive	2,301	439	483	1,292	999
Business-to-Business	738	128	2,584	1,884	2,463
Consumer Goods	2,241	298	3,231	1,520	586
Entertainment	4,992	420	792	2,319	831
Financial Services	12,343	342	3,241	15,844	39,983
Hardware and Electronics	2,849	143	387	927	767
Health	2,928	202	1,469	2,416	178
Public Services	3,701	88	1,365	3,885	18,206
Retail Goods and Services	8,711	372	14,235	11,113	16,402
Software	4,123	93	1,703	3,011	802
Telecommunications	12,808	808	1,078	3,336	5,183
Travel	2,899	85	2,109	1,939	857
Web Media	9,623	80	18,079	14,642	24,378

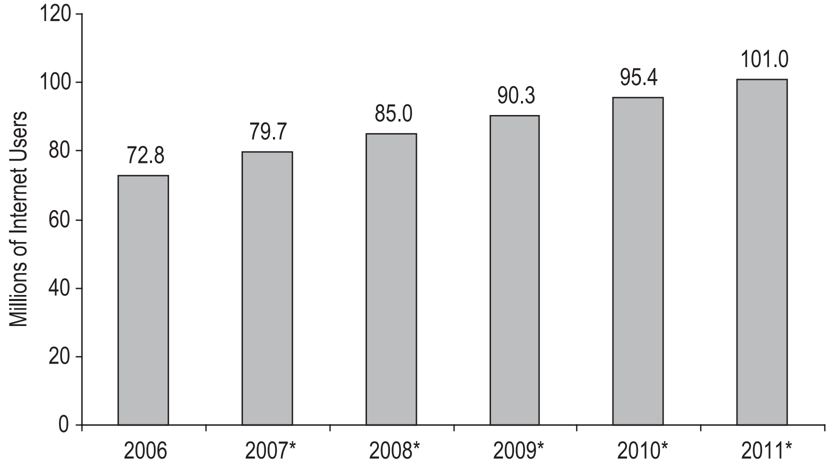
Source: Clickz[38]

Online Finance

Online brokers such as e-Trade and Ameritrade were among the first financial service firms to set up shop on the Internet, fueled by the late 1990's boom in tech stocks and the accompanying army of day traders. Other types of online financial services were slower to develop, not only because of consumer concerns about Internet security, but also because online-only banks and other financial companies were not widely regarded as safe alternatives to established firms. However, in the past three years, an expanding number of consumers have banked and paid bills online.

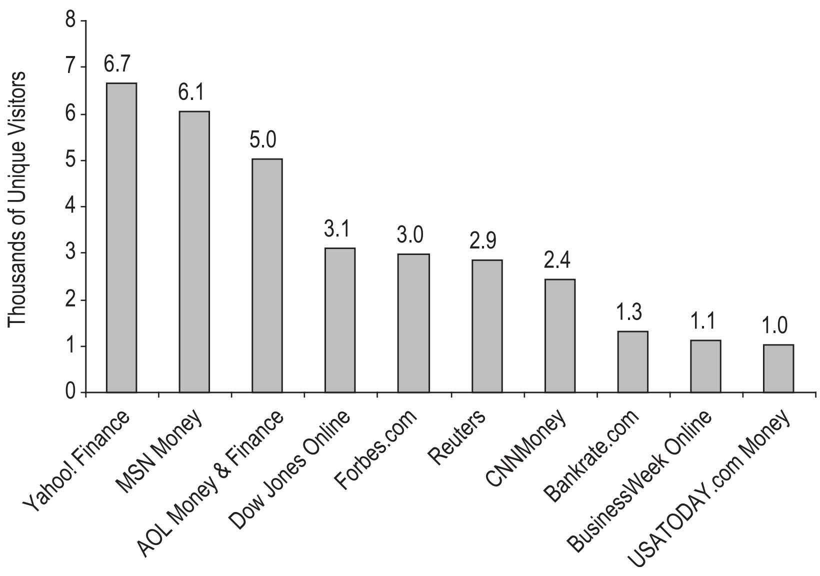
- eMarketer estimates that in 2006, 72.8 million U.S. adult Internet users conducted some banking activity online. Nearly 51 million people paid their bills online in 2006, spurred by increases in postal rates and the efforts of retail banks. Growth rates in online banking are predicted to level off after 2007, with the number of Internet users banking online growing only 6 to 7 percent annually from 2008 to 2011.[39]
- Gartner estimates that security concerns have kept approximately 33 million U.S. adults from banking online. Nearly 9 million U.S. adults have stopped banking online altogether, while an additional 23.7 million won't start because of security concerns.[40]
- Bank of America customers use online bill payment much more than customers of other major U.S. banks. The percentage of online direct deposit holders using online bill payment in the fourth quarter of 2006 at Bank of America was 65 percent, versus 18 percent for Wells Fargo, 13 percent for Chase, and 13 percent for Wachovia.[41]
- While less than 1 percent of U.S. online banking households used mobile banking (using mobile networks for financial transactions) as of early 2007, Celent projects that this share will rise to 35 percent of those banking online in 2010. Interest is already high among "Generation Y": 40 percent of 18-25 year olds report that mobile services will be a factor in their choice of a bank.[42]
- Alternative electronic payment vehicles, the largest of which is eBay's PayPal, have become enormously popular with Internet users. As of early 2007, there were more than 133 million PayPal accounts in 103 countries, with money being exchanged in 17 currencies. During 2006, $37.8 billion traded hands on the site, with an average of $1,384 being transacted during each second of the fourth quarter of 2006.[43]
- The market for business information is expected to grow from $78 billion worldwide in 2005 to $101 billion in 2010. The U.S. accounted for about half of the $33 billion financial information and $23 billion industry-specific information markets and two-thirds of the $22 billion marketing information market in 2005.[44]

U.S. Internet Users Who Bank Online



* Projections
Source: eMarketer[45]

Top Ten Online Financial News/Information Destinations, September 2006



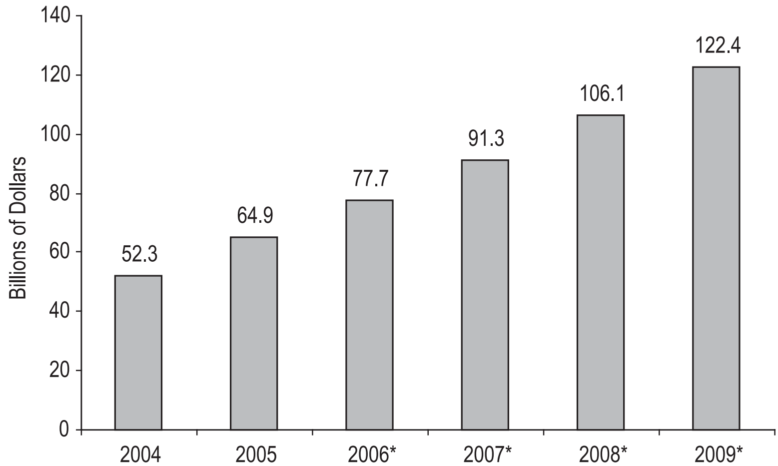
Source: MediaPost[46]

Online Travel

Traditional travel agencies were challenged by the expansion of e-commerce, but travel consumers have benefited through better information and lower prices. Travel websites have provided a previously unavailable abundance of information to travelers. An early 2007 survey found that 79 percent of Internet users used the Internet to plan their upcoming personal travel, with 47 percent of them using the Internet as their primary travel resource.[47]

- In 2006, U.S. customers spent $79 billion on online travel, a number which is predicted to grow 19 percent in 2007 to reach $94 billion and then grow 17 percent per year to reach $146 billion by 2010. The number of online travel bookings will surpass offline travel bookings in 2007, according to PhocusWright.[48]
- About 41.3 million U.S. households (52.5 percent of U.S. online households) will book travel online in 2007, up from 37.1 million households (49.8 percent of U.S. online households) in 2006. eMarketer predicts 51.1 million U.S. households (55.3 percent of U.S. online households) will do so in 2010.[49]
- While a 2007 PhocusWright study found that the shorter and less expensive a trip is, the more likely U.S. travelers are to purchase their travel for it online,[50] eMarketer found that the average annual travel spending for a household that books travel online is expected to grow from $2,122 in 2006 to $2,854 in 2010.[51]
- In 2006, Expedia spent $144 million and Travelocity spent $92 million on major media advertising, the most of the major online travel sites. Hotwire spent $17.4 million, Orbitz spent $4 million, and Priceline didn't spend anything on major media advertising. Overall advertising spending in the online travel industry totaled $352 million in 2006.[52]
- One report found that the European online travel industry is about three years behind the U.S. in adopting new techniques and technologies.[53] European online leisure/unmanaged (non-corporate) business travel is expected to make up 25 percent of the total travel market in 2007, which the U.S. achieved in 2004.[54]
- Online leisure/unmanaged (non-corporate) business travel sales in 2005 reached $35.5 billion in Europe (up 49.0 percent from a year earlier), and $15.9 billion in the Asia/Pacific region (up 31.4 percent), compared with $64.9 billion in the U.S (up 24.1 percent).[55]

U.S. Internet Leisure/Unmanaged (Non-Corporate) Business Travel Sales



* Projections
Source: eMarketer[56]

U.S. Travel Website Rankings, January 2007

Rank	Website	Domain	Market Share (%)
1	MapQuest	www.mapquest.com	11.9
2	Expedia	www.expedia.com	4.6
3	Yahoo! Maps	maps.yahoo.com	4.0
4	Travelocity	www.travelocity.com	2.9
5	Southwest Airlines	www.southwest.com	2.9
6	Orbitz	www.orbitz.com	2.8
7	Cheap Tickets	www.cheaptickets.com	2.6
8	Google Maps	maps.google.com	2.0
9	Yahoo! Travel	travel.yahoo.com	1.3
10	American Airlines	www.aa.com	1.3
11	Priceline.com	www.priceline.com	1.1
12	Delta Airlines	www.delta.com	1.1
13	TripAdvisor	www.tripadvisor.com	1.0
14	Hotwire	www.hotwire.com	1.0
15	Hotels.com	www.hotels.com	0.9
16	United Airlines	www.united.com	0.8
17	JetBlue Airways	www.jetblue.com	0.8
18	AirTran Airways	www.airtran.com	0.8
19	Northwest Airlines	www.nwa.com	0.8
20	US Airways	www.usairways.com	0.8

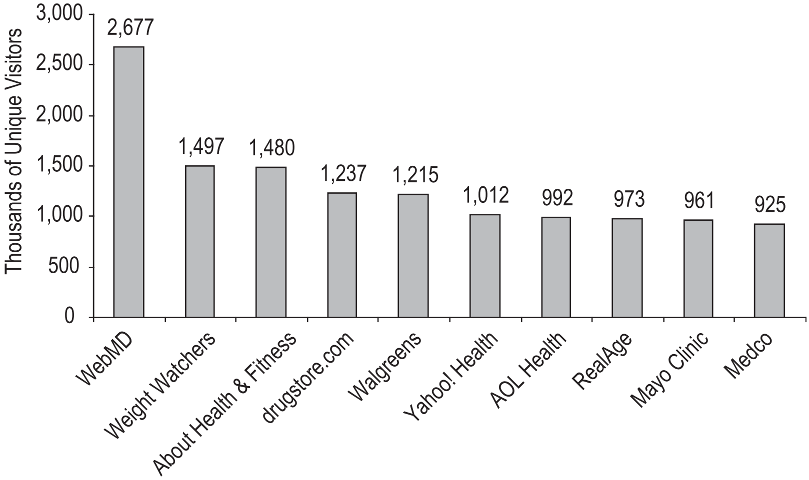
Source: Hitwise[57]

Online Health Care

The markets for health care services and products are still overwhelmingly offline, but the Internet has offered people improved access to information about products, services, and medical conditions. Online health spending in 2006 was $7 billion and is projected to grow to $24 billion in 2008, but it will still represent only 1 percent of total U.S. health care expenditures. Health spending that was influenced by the Internet was $44 billion in 2006 and is expected to grow to $86 billion in 2008.[58]

- In the U.S., the health care services likely to be most affected by remote digital technologies include geriatric care monitoring, wellness monitoring, acute care telemonitoring, web messaging, and e-visits. Parks Associates predicts that revenue from these services will grow from $461 million in 2005 to $2.11 billion in 2010.[59]
- A late 2006 Pew report found that 80 percent of U.S. Internet users, 113 million adults, have searched for health information online, and that 8 million American adults look for health information online on a typical day.[60]
- Depression was the most researched condition on websites devoted to prescription medications in 2006, with 2.9 million unique visitors, followed by bipolar disorder with 1.8 million, and insomnia with 1.7 million.[61]
- While the amount of information on medical conditions and health care products and services has exploded in recent years, the documentation required to assess its accuracy has not kept pace. A late 2006 study by the U.S. Department of Health and Human Services found that less than two percent of popular health websites displayed the date and source of information contained on their pages.[62]
- Pharmaceutical companies' Internet spending was expected to increase by about 25 percent to $780 million in 2006, as more direct-to-consumer advertising shifted from mass marketing to more targeted opportunities on the Internet. eMarketer projects that online pharmaceutical spending will rise to $1.3 billion in 2008.[63]
- As of early 2007, health care information technology (HCIT) was a $31 billion industry.[64] As of 2006, only about 10 percent of American hospitals had adopted HCIT, and the health care industry as a whole spent only 2 percent of its gross revenues on HCIT.[65]
- A 2006 survey found that about 11 percent of U.S. physicians and 9 percent of health centers had adopted a full electronic medical record system, 13 percent of physicians and 16 percent of health centers had adopted a partial system, and 76 percent of physicians and health centers had adopted neither.[66]

Top Ten Online Health, Fitness, and Nutrition Destinations, September 2006



Source: MediaPost Publications[67]

Health Topics Researched Online in the U.S., 2006

Topic	All Internet Users (%)	Gender (%) Women	Men	Age (%) 18-29	30-49	50-64	65+
Specific Disease or Medical Problem	64	69	58	61	67	64	54
Certain Medical Treatment or Procedure	51	54	47	45	56	51	40
Diet, Nutrition, Vitamins, Supplements	49	53	45	45	55	49	29
Exercise or Fitness	44	46	41	55	47	35	24
Prescription or OTC Drugs	37	39	35	29	42	40	30
A Particular Doctor or Hospital	29	31	27	27	33	26	18
Health Insurance	28	27	29	23	34	27	12
Alternative Treatments or Medicines	27	29	25	25	29	29	14
Depression, Anxiety, Stress, or Mental Issues	22	26	17	25	24	20	7
Environmental Health Hazards	22	21	22	25	23	22	10
Experimental Treatments or Medicines	18	18	19	18	19	18	14
Immunizations or Vaccinations	16	15	17	18	18	12	7
Dental Health Information	15	14	15	17	16	12	6
Medicare or Medicaid	13	13	13	10	11	15	22
Sexual Health Information	11	11	12	21	10	7	2
How to Quit Smoking	9	10	8	13	8	9	3
Problems with Drugs or Alcohol	8	9	8	14	6	7	2

Source: Pew Internet & American Life Project[68]

Chapter 6
Threats to the Digital Economy

Increased use of the Internet, particularly for downloading digital media and conducting financial transactions, has been accompanied by an expanding array of threats to users' computer performance and personal information. In many cases, well-established threats such as spam and spyware have been adapted to pose new threats such as phishing emails and keystroke-logging programs. It is ironic that these threats *to* the digital economy rely on technological advances *by* the digital economy. Viruses and worms are usually spread through the Internet, spam is possible only by the development of email server technology, and piracy of copyrighted material has become increasingly problematic with the improvements in file downloading and CD replication technologies.

Concern about Internet security threats is not always accompanied by the willingness or ability to take steps that would minimize corporate or personal exposure. A late 2006 survey found that 91 percent of companies considered viruses and malware to be a medium or high threat and 86 percent considered spam to be a medium or high threat. About 72 percent considered the external interception of confidential data to be a medium or high threat, though only 25 percent had implemented messaging encryption solutions to reduce that threat.[1] Similarly, while most Internet users are familiar with cookies and their privacy-related implications, one study found that only 28 percent of those who tried to delete cookies from their computers were actually able to do so.[2]

There will be a constant evolution of the techniques and technologies used by both cyber-criminals and the law enforcement agencies that try to catch them. According to PC World, the top five computer security stories of 2006 were (1) the increase in partnerships between computer hackers and criminal gangs and the resulting increase in phishing, (2) the growth in zero-day attacks, which exploit flaws in common software to install malicious content on computers, (3) the continued growth of junk email, (4) the appearance of worms that use MySpace.com, and (5) Microsoft's plan, later reversed, to keep its security technology inaccessible to third-party security vendors.[3] On the horizon are still newer threats. One potential target is Internet feed services such as RSS (Real Simple Syndication), which represents a new way for hackers to deliver keystroke loggers, Trojan horses, and other malware.[4]

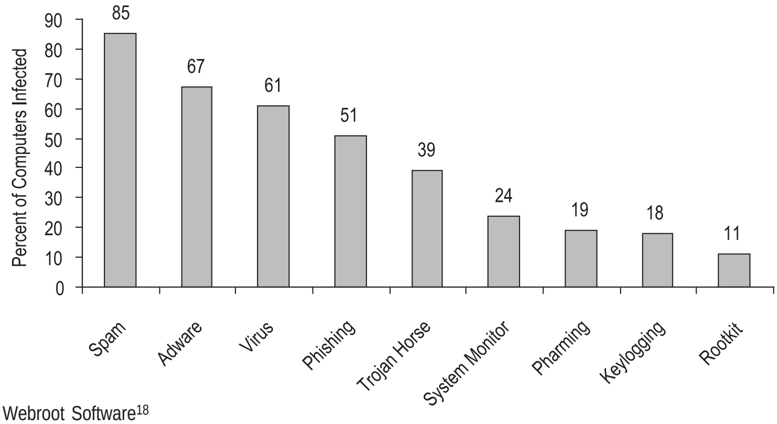
Interestingly, the tendency for malware to be propagated on peer-to-peer (P2P) networks has had the positive side effect of reducing piracy, since people are less likely to download copyrighted materials due to the risk of infecting their computers. Symantec believes that the use of P2P networks as a propagation mechanism of malicious code will continue to grow. P2P networks were used by 47 percent of the malicious code that was propagated in the last six months of 2006.[5]

Malicious Software

The growth of the Internet's size and usage has provided a rich environment for malicious programs such as viruses, worms, Trojans, spyware, and other forms of malware. A virus is a program that can self-replicate and infect other computers over the Internet as part of an infected file. Worms are like viruses but can spread to other computers without being contained in another file. Spyware is surreptitiously installed software that intercepts or takes partial control over the user's interaction with the computer without the user's informed consent. A Trojan is a program that installs malicious software while seeming to be doing something else. [6]

- Worms made up 52 percent of the total volume of malicious code threats detected in the last six months of 2006, down from 75 percent during the previous six months. The number of Trojans increased significantly in the second half of the year, rising from 23 percent to 45 percent of the volume of the top 50 malicious code samples.[7]
- In 2006, about one out of every 120 emails contained a virus.[8] A late 2006 Infonetics Research study found that blocking viruses was the number one reason research companies buy new network security products and services.[9]
- The Netsky family of worms is still the most dominant group of malware, making up about a third of all malware detected during March 2007.[10]
- The "Storm" worm, which attracted clicks with false headlines such as "230 dead as storm batters Europe," infected about 300,000 computers worldwide by early 2007, making it the worst malware outbreak since the Sober.O mass-mailing worm in May 2005.[11]
- One study found that 80 percent of all instances of malicious code were in online advertising.[12]
- According to Sophos, as of late 2006, about 36 percent of malware-infected websites were from China, 32 percent were from the U.S., and 8 percent were from Germany.[13] Finjan found that 80 percent of the websites containing malicious code in the first quarter of 2007 were hosted in the U.S.[14]
- "Botnets" are computers infected by worms or Trojans used in order to propagate junk email or malicious code. [15] Botnets have been described as the "backbone of today's cybercrime." There are usually about 50,000 computers sending spam and other malicious content at any moment, generally operating for about 45 minutes and then going silent, making it hard to identify them.[16]
- In the second half of 2006, Symantec observed 11 percent more bot-infected computers than in the first half of the year. China had the most bot-infected computers, with 26 percent of the world total, followed by the U.S. with 14 percent.[17]

Worldwide Malware Infections, Q4 2006



Source: Webroot Software[18]

Malicious Activity by Country, Second Half of 2006

Overall Rank	Country	Overall Proportion of Worldwide Malicious Activity (%)	Malicious Code Rank	Spam Host Rank	Phishing Host Rank	Bot Rank	Attack Rank
1	U.S.	31	1	1	1	2	1
2	China	10	3	2	8	1	2
3	Germany	7	7	3	2	4	3
4	France	4	9	4	4	3	4
5	U.K.	4	4	13	3	6	6
6	South Korea	4	12	9	9	11	9
7	Canada	3	5	23	7	10	5
8	Spain	3	13	5	16	5	7
9	Taiwan	3	8	11	6	7	11
10	Italy	3	2	8	14	12	10

Source: Symantec[19]

The Changing Nature of Internet Threats

	2004	2005	2006
Prevalent Type of Threat	Benign Adware, Randomized Hijacks	Malicious Adware, Trojans	Targeted/Custom Trojans, Phishing Trojans
Method of Distribution	Websites	BitTorrent, Peer-to-Peer, Bundles, Piggybacking	Email, Internet Hacking
Method of Infection	File Placement and Naming	DLL Injection, Browser Helper Object	Modifying Executables
Method of Removal	Deleting on Disk, Deleting Registry Keys	File Neutering, Correlation Removal	Driver-based Removal, Dynamic Conditional Removal

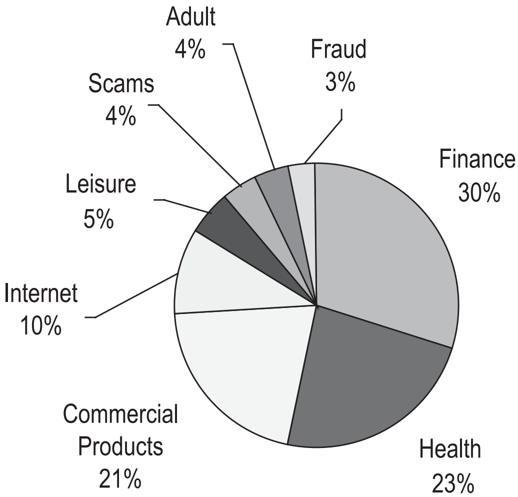
Source: Webroot Software[20]

Spam

Spam consistently defies those who predict it will soon no longer be a problem. The types of spam sent have changed, with recent years witnessing the growth of image spam, "pump and dump" stock scams, and a decline in adult-oriented solicitations. Symantec estimated that spam made up 54 percent of all monitored email traffic in the first half of 2006 and 59 percent in the second half of 2006. It also estimated that 0.68 percent of all spam contained malicious code of some type.[21] Other estimates of the percent of email that is spam go as high as 95 percent.[22]

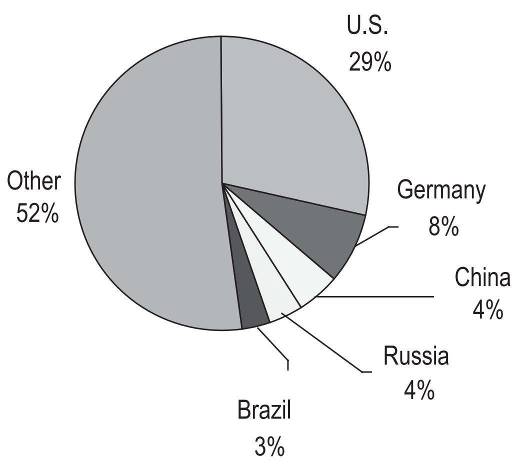
- In the second half of 2006, the most common type of spam was spam related to financial services, which was responsible for 30 percent of all spam. Spam related to health services and products was in second place with 23 percent, while spam promoting commercial products accounted for 21 percent of the total.[23]
- In 2006, spammers used more "pump and dump" emails to hype the value of a certain stock they owned so they could sell it and generate profit. A "pump and dump" scam typically yields a profit of 5 to 6 percent in a few days.[24]
- According to Symantec, the more certain and immediate payoffs from stock-related spam accounts for the sharp decline in adult-oriented spam, which made up just 4 percent of total spam in the second half of 2006, down from 22 percent in the previous six-month period.[25]
- At the end of 2006, image spam made up about 40 percent of all email, up from less than 1 percent a year earlier. Image spam puts messages within images that are just as readable to their recipients as regular text spam but impossible to be read by most spam-blocking features.[26]
- Spam used an estimated 819 terabytes of bandwidth every day in late 2006, about 85 percent of the total for worldwide email traffic.[27] This percentage can be expected to increase further as more spammers use images to avoid spam-blockers.
- A "spam zombie" is a computer infected by malicious code that allows email messages to be relayed through it. Although Symantec estimated that about 44 percent of spam originated in the U.S. in the second half of 2006, only 10 percent of spam zombies were estimated to be in the U.S. during that time.[28]
- About 43 percent of email users believe signing up for permission-based email from retailers and banks leads to more unsolicited email, and almost a third believe the unsubscribe button in email offers doesn't work. Almost one half of those who opt in to receive email marketing messages have been influenced to make purchases by them.[29]

Worldwide Spam Categories, Second Half of 2006



Source: Symantec[30]

Top Spam-Sending Countries, 2007



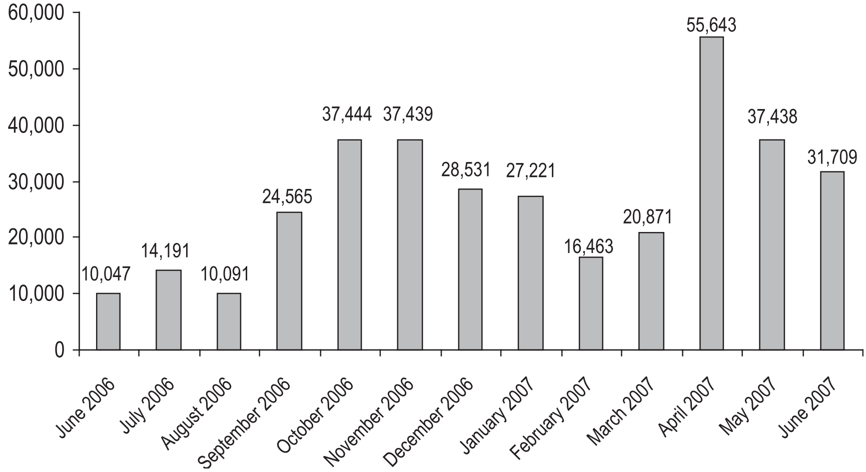
Source: CommTouch[31]

Phishing

Phishing is a criminal activity in which perpetrators design emails or websites resembling those of well-known online businesses in an attempt to fraudulently acquire sensitive personal information. The volume of phishing emails has grown tremendously in the past two years, and phishing has become so prevalent that several new names have been created for different versions of it. "Vishing" emails ask recipients to call a "customer service" phone number, where personally-identifying information is then asked for. "Spear phishing" emails are sent to all the employees or members of a business or organization in an attempt to obtain access to a company's computer system.[32] "Pharming" involves the creation of deceptive sites hosting malicious code that not only resemble well-known sites but actually manage to redirect incoming traffic from the real website to the fraudulent one.[33]

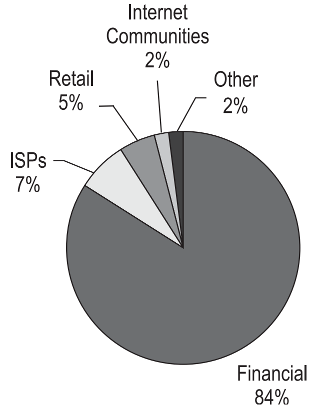
- A Gartner survey found that 109 million U.S. adults received phishing emails in 2006, up from 57 million in 2004. An estimated 24.4 million Americans clicked on a phishing e-mail in 2006 (up from 11.9 million in 2005), and about 3.5 million gave sensitive information to phishers in 2006, up 84 percent from 1.9 million in 2005.[34]
- Symantec detected 166,248 unique phishing messages in the second half of 2006, a 6-percent increase over the first half of the year.[35] The Anti-Phishing Working Group found that there were 31,709 new phishing websites in June 2007, up 216 percent from the 10,047 new websites detected in June 2006.[36]
- The two most popular targets for phishing are eBay and PayPal, which accounted for about 75 percent of phishing emails in early 2007.[37] As of early 2007, eBay had 233 million users worldwide[38] and PayPal had 133 million.[39]
- Gartner estimated that U.S. consumers lost $2.8 billion from phishing in 2006, with only slightly more than half of this amount recovered from financial institutions. The average loss per victim grew from $257 in 2004 to $1,244 in 2006.[40]
- The Anti-Phishing Working Group estimated that 95.2 percent of phishing attacks targeted websites in the financial services industry in June 2007, 0.7 percent targeted ISPs, 1.4 percent targeted retail sites, and 2.7 percent targeted other types of websites or companies.[41]
- In 2006, there was a dramatic rise in the number of phishing toolkits, which accounted for 15 percent of phishing websites designed to steal credentials.[42] "Rock Phish," an elusive criminal organization possibly responsible for half of phishing emails worldwide and $100 million annually in financial losses, is an important source of these toolkits.[43]

New Phishing Websites



Source: Anti-Phishing Working Group[44]

Brands Used in Phishing Attacks Second Half of 2006 (percent)



Source: Symantec[45]

Identity Theft

Phishing and security breaches have contributed to rising rates of identity theft—the use of another individual's personal information (such as a credit card or social security number) by a third party to acquire funds or purchase things in the individual's name. About 54 percent of all data breaches that could lead to identity theft in the second half of 2006 were caused by the theft or loss of a computer or data-storage device, while 28 percent were caused by deficient security policies or the failure to comply with existing security policies. In the second half of 2006, the U.S. government accounted for 25 percent of all potential identity theft-related data breaches, more than any other sector.[46]

- A 2007 Javelin Report found that 8.4 million Americans were victims of identity fraud in 2006, half a million fewer than the year before. The total fraud amount declined 12 percent, from $55.7 billion to $49.3 billion.[47] About 3.7 percent of the U.S. adult population was victimized in 2006, down from 4.0 percent in 2005 and 4.7 percent in 2003. The average fraud amount declined from more than $10,000 in 2005 to $7,260 in 2006. The average resolution time decreased from 25 hours in 2005 to 5 hours in 2006. Lower-income Americans were less likely to be victims, but those who were victims took an average of 70 percent longer to detect the fraud than higher-income victims.[48]
- Of the 246,035 identity theft complaints reported to the FTC in 2006, 25 percent of victims' information was used for credit card fraud, 16 percent for phone or utilities fraud, 16 percent for bank fraud (savings/checking account fraud and electronic fund transfers), 14 percent for employment-related fraud, 10 percent for government documents/benefits fraud, and 5 percent for loan fraud.[49]
- According to the FTC data, Arizona had the most victims per 100,000 people in 2006, with 147.8, followed by Nevada at 120.0, California at 113.5, and Texas at 110.6.[50]
- U.S.-based credit card numbers are sold on the Internet for about $1 to $6, including the card verification number. A full "identity," which includes a U.S. bank account, credit card, date of birth, and government-issued identification number, is usually sold for $14 to $18. Symantec also found that credit cards on U.S. banks are typically sold on "underground economy servers" for $3, while cards on U.K. banks tend to sell for about $6. Interestingly, the value of a credit card number was less than the average of $10 charged for a one-month password to World of Warcraft.[51]
- As of September 2006, the FBI had about 1,600 pending identity theft-related cases, and the U.S. Postal Inspection Service had about 1,500.[52]

Identity Theft Statistics

Javelin Reports	2003*	2005*	2006**
U.S. Adult Victims of Identity Fraud	10.1 million	9.3 million	8.4 million
Fraud Victims as a Percent of U.S. Population	4.70%	4.25%	3.70%
Total One-Year Fraud Amount	$53.2 billion	$54.4 billion	$49.3 billion
Average Fraud Amount per Victim	$5,249	$5,885	$5,869

FTC Reports	2004***	2005***	2006***
Identity Theft Complaints	410,709	437,906	428,319
Complaints Reporting Amount Paid	310,299	285,255	364,500
Amount Paid Reported	$569 million	$683 million	$1.187 billion
Average Amount Paid	$1,833	$2,396	$3,257

*Source: Javelin Strategy and Research[53]
**Source: Javelin Strategy and Research[54]
***Source: FTC[55]

Prices of Identity Theft-Related Items Traded on Underground Economy Servers, Second Half of 2006

Item	Advertised Price ($)
U.S.-based Credit Card with Card Verification Value	1-6
U.K.-based Credit Card with Card Verification Value	2-12
An Identity (including U.S. Bank Account, Credit Card, Date of Birth, etc.)	14-18
List of 29,000 Emails	5
Online Banking Account with a $9,900 Balance	300
Yahoo! Mail Cookie Exploit - Advertised to Facilitate Full Access	3
Valid Yahoo and Hotmail Email Cookies	3
Compromised Computer	6-20
Phishing Website Hosting (per site)	3-5
Verified PayPal Account with Balance (Balance Varies)	50-500
Unverified PayPal Account with Balance (Balance Varies)	10-50
Skype Account	12
World of Warcraft Account (One-Month Duration)	10

Source: Symantec[56]

Piracy

Software, music, and movies are the main types of intellectual property that are pirated. Although recent Supreme Court rulings have helped to thwart piracy of music via file-sharing programs, there are still many programs that make it easy for music consumers to download copyrighted works without paying for them. Most piracy occurs outside the U.S. While more than 13,000 legal actions outside the U.S. had been taken by the recording industry to thwart illegal music file-sharing as of late 2006,[57] piracy rates are still extremely high in most developing countries.

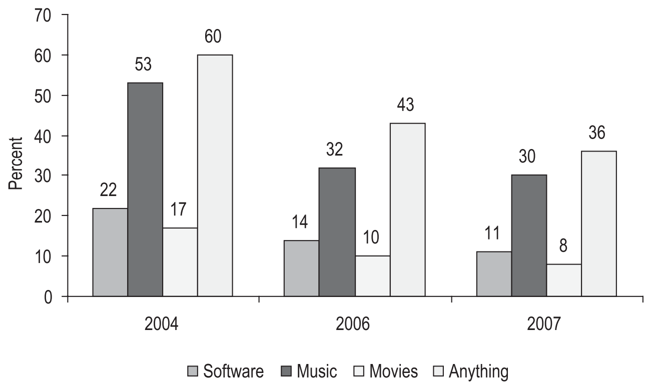
- The Business Software Alliance estimated that about 35 percent of the more than $100 billion worth of software installed on computers worldwide in 2006 was not paid for, with estimated losses due to software piracy at almost $40 billion for the year. However, efforts to control piracy appear to be having some success. China's piracy rate dropped 4 percentage points in 2006 to 82 percent, and its legitimate software market grew to almost $1.2 billion in 2006, up 88 percent over 2005 and 358 percent over 2003. Russia's piracy rate fell 7 points over the last three years but was still 80 percent in 2006.[58]
- About 74 percent of respondents to an In-Stat survey said they downloaded music in 2006, a significant increase over the 48 percent who did so in 2005.[59] A late 2006 survey found that about 48 percent of U.S. Internet users age 12 and older had downloaded music online, while 18 percent had downloaded a movie online.[60]
- In 2006, of U.S. Internet users who switched from downloading music illegally to purchasing it legally, 25 percent cited fear of legal action as the main reason, and 20 percent cited fear of viruses.[61]
- More than a third of worldwide Internet traffic in 2007 is expected to be illegal peer-to-peer (P2P) video.[62] In the third quarter of 2006, about 8 percent of Internet households downloaded at least one digital video file from a P2P service for free. Only 2 percent of Internet households paid for a video download, with about 90 percent of them purchased from Apple's iTunes.[63]
- Five billion files were downloaded from P2P sites in 2006, a 47-percent increase over 2005's 3.4 billion. LimeWire was responsible for 62 percent of these downloads. The average LimeWire user downloaded 309 music files in 2006, an increase of 49 percent from the previous year.[64]
- In 2006, legally downloaded files accounted for around 25 percent of all downloads in the U.S., 20 percent in the U.K., and 15 percent in France.[65] As of mid-2007, the six most downloaded open-source software applications worldwide were all P2P filesharing programs.[66]

Estimated Revenues Generated by Foreign Sales/Exports of Selected U.S. Core Copyright Industries, 1991-2005 ($billions)

Industry	1991	1996	1999	2000	2001	2002	2003	2004	2005
Pre-Recorded Records, Tapes, etc.	6.2	9.8	10.3	9.8	8.9	8.5	8.4	8.5	8.3
Motion Pictures, TV, Video	7.0	11.6	13.7	14.5	14.7	17.0	19.1	19.4	18.5
Computer Software	19.7	34.8	50.7	56.9	60.7	60.0	66.8	73.7	79.1
Newspapers, Books, Periodicals	3.4	4.0	4.2	4.2	3.9	3.8	4.5	4.7	5.0

* Projections
Source: International Intellectual Property Alliance[67]

U.S. Youths who Reported Downloading without Paying



Source: Business Software Alliance[68]

Internet Download Sales

	Q1 2005 (millions)	Q1 2006 (millions)	Year-over-Year Growth (%)
U.S.			
Single Tracks	76.2	144.0	89
Single Tracks, Album-Equivalent	7.6	14.4	89
Albums	3.0	7.4	144
U.K.			
Single Tracks	4.5	11.5	152
Japan			
Internet Downloads	1.1	5.9	434

* Excludes downloads via cell phones
Source: IFPI[69]

Chapter 7
The Worldwide Digital Economy

The information technology (IT) sector played a huge role in the economic expansion of the 1990's and was equally affected by the ensuing slowdown. The rapid development of the digital economy was made possible by the support of private venture capital firms and stock markets that attached generous (and in some cases, ruinous) valuations to telecommunications, infrastructure, and Internet-related companies. With the excesses wrung out of the market during a painful two-year contraction, the shares of high-tech companies eventually began to exhibit steadier growth.

The fluctuations in the IT sector and the overall economy have been much less dramatic over the past five years than during the boom and bust periods. Forrester Research predicts slower growth for the IT industry in 2007, with worldwide purchases of IT goods and services increasing 5 percent to reach $1.55 trillion, compared with 8-percent growth in 2006. U.S. IT purchases are expected to be $527 billion in 2007, representing growth of 5 percent versus 6 percent one year before.[1]

This chapter contains information on the financing, spending, and performance of the IT sector and the economy as a whole. It also includes sections on technology and communications-related developments in three specific regions: China, India, and the European Union—in effect, three microcosmic *Digital Economy Fact Book*s for each area. Four of the world's top ten mobile carriers ranked by number of subscribers are located in emerging regions,[2] and the digital revolution's expansion across national borders makes an international scope appropriate for a full discussion of telecommunications and Internet-based industries.

Funding for New Ideas

The rapid expansion of the digital economy has been supported from its early years by venture capital financing. Venture capital has usually been used in industries requiring large upfront capital investments that cannot be financed by the more standard debt or equity methods because of high risk. The venture capital sector financed the early explosion of Internet and telecommunications companies. After a short contraction in 2001 and 2002, the venture capital industry now plays an important role in the entire range of industries in the digital economy, especially software, other intellectual property, and biotechnology.[3]

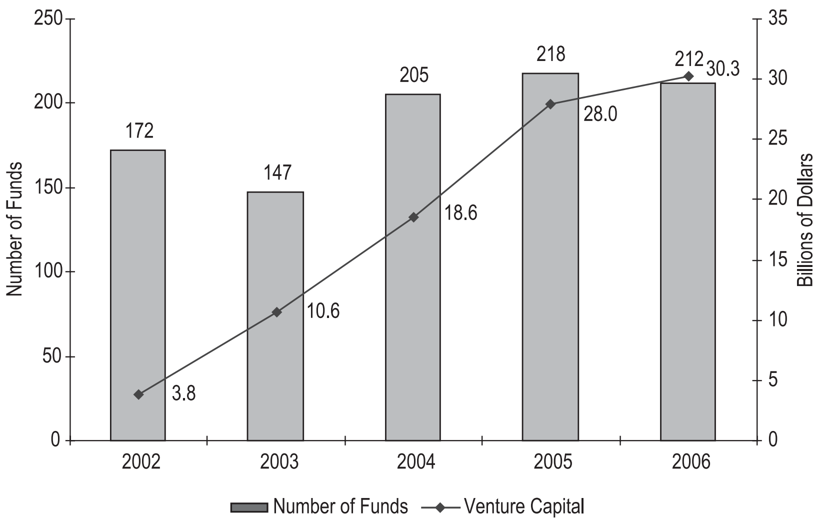
- In the first quarter of 2007, there were 17 venture-backed initial public offerings (IPOs) in the U.S., up from 10 a year before. The $2.09 billion they raised was also a significant increase over the $541 million raised in the first quarter of 2006. Nine IPOs in the technology sector made up about 67 percent of the total raised in the first quarter of 2007, including the $600 million offering from Clearwire Corporation (a wireless broadband ISP), the largest venture-backed IPO since October 2004.[4]
- Internet-specific companies, which accounted for 16 percent of all U.S. venture capital funding in 2006, received $4 billion in 645 deals in 2006, a sizable increase over the $3.2 billion generated by 494 deals in 2005. The Media and Entertainment sector also saw some growth in venture capital funding, with $1.6 billion going toward 299 deals in 2006, up from $1.1 billion for 180 deals in 2005.[5]
- According to a Global Insight study, in 2005, U.S. venture capital-backed companies were responsible for $2.1 trillion of U.S. GDP and 10 million American jobs. The study also found that the growth in output and employment was larger in venture capital-backed companies than for the economy as a whole from 2003 to 2005.[6]
- In 2006, U.S. venture capitalists invested $25.5 billion (a 12-percent increase over 2005) in 3,416 different deals (a 10-percent increase over 2005). 2006 witnessed the highest level of venture capital investment since 2001, with totals remaining more stable from quarter to quarter than previous years.[7] A late 2006 survey of venture capitalists found that the average prediction for venture capital investments in the U.S. in 2007 was $27.6 billion.[8]
- The U.K. led the rest of Europe in 2006 in venture capital investment by a wide margin, selling 515 minority stakes worth €1.78 billion. France was second with 195 deals worth a total of €875 million, and Spain was in third place, with 67 transactions totaling €491 million.[9]
- The majority of U.S. respondents to a 2007 survey of venture capitalists said they invested less than 5 percent of their capital overseas. The main countries for these international venture capital funds were China, India, Israel, and Canada.[10]
- In 2006, there were 57 venture-backed IPOs in the U.S., a modest increase over the 56 that took place in 2005. The total offer amount grew to $5.12 billion, up from $4.46 billion in 2005.[11]

Venture Capital Investments by Industry in the U.S.

Industry	2004 Investments ($millions)	2004 Number of Deals	2005 Investments ($millions)	2005 Number of Deals	2006 Investments ($millions)	2006 Number of Deals
Software	5,246	886	4,816	869	4,970	865
Biotechnology	4,147	340	3,862	376	4,511	423
Medical Devices and Equipment	1,706	249	2,147	271	2,654	308
Telecommunications	1,947	236	2,496	263	2,612	294
Semiconductors	2,078	239	1,882	220	1,986	219
Industrial/Energy	647	131	851	136	1,766	183
Media and Entertainment	900	116	1,052	180	1,622	299
Networking and Equipment	1,554	183	1,461	169	1,083	134
IT Services	613	131	909	132	1,000	152
Electronics/Instrumentation	383	65	387	85	681	89
Business Products and Services	461	80	474	89	653	116
Consumer Products and Services	297	60	365	70	511	90
Financial Services	435	70	796	62	424	74
Computers and Peripherals	593	69	501	61	405	64
Health Care Services	421	68	455	69	394	58
Retailing/Distribution	207	40	252	42	207	39
Undisclosed/Other	1	3	6	62	26	9
Total	**21,635**	**2,966**	**22,767**	**3,100**	**25,504**	**3,416**

Source: PriceWaterhouseCoopers[12]

Fundraising by Venture Capital Funds



Source: National Venture Capital Association[13]

Mergers and Acquisitions

Mergers and acquisitions and initial public offerings provide venture capitalists with opportunities to cash out initial investments in start-up firms. As a result of low interest rates, easy access to debt, and plentiful financial resources at private equity firms, corporate merger and acquisition activity was at a very high level in the U.S. and worldwide in 2006 and early 2007. There were $1.35 trillion worth of mergers and acquisitions in the U.S. in 2006, up from $1.15 trillion in 2005.[14]

- There were 207 announced mergers and acquisitions in the U.S. in the first quarter of 2007, totaling almost $13 billion. The online media industry in particular witnessed a lot of activity, with 72 transactions totaling over $1.7 billion.[15] In the first half of 2007, $31.8 billion worth of deals took place, more than the total value of all mergers and acquisitions in 2006.[16]
- In the U.S. during the first quarter of 2007, the technology sector dominated venture-backed mergers and acquisitions, with 51 deals and a total disclosed value of $1.96 billion.[17]
- $412 billion was spent in 2006 in the U.S. on acquiring IT and telecommunications firms, up 22 percent from 2005. The IT sector itself saw merger and acquisition activity grow 32 percent to reach $207 billion.[18]
- Major mergers and acquisitions involving Internet and communications-related companies in 2006 and early 2007 included AT&T and BellSouth ($86 billion, closed December 2006);[19] Siemens and Nokia ($20 billion, announced June 2006);[20] Microsoft and Aquantive ($6 billion, announced May 2007);[21] Google and DoubleClick ($3.1 billion, announced April 2007);[22] Google and YouTube ($1.65 billion, announced October 2006);[23] NBC and iVillage ($600 million, announced March 2006);[24] and CBS and Last.fm ($280 million, announced May 2007).[25]
- There were 175 mergers and acquisitions in Europe in 2006, up from 156 in 2005 and close to the peak of 186 in 2000. Their combined value was €43 billion, up from 2005's €25 billion. Most of this growth took place in continental Europe and not the U.K.[26]

U.S. Venture-Backed Liquidity Events

Quarter/ Year	Total M&A Deals	M&A Deals with Disclosed Values	Total M&A Disclosed Value ($millions)	Average M&A Deal Size ($millions)	Number of IPOs	Total Offer Amount ($millions)	Average IPO Offer Amount ($millions)
2001	353	165	16,799	102	41	3490	85
2002	318	152	7,916	52	22	2109	96
2003	291	123	7,726	63	29	2023	70
2004	339	186	15,441	83	93	11015	118
2005	347	168	16,094	96	56	4461	80
2006	340	147	16,660	113	57	5117	90
Q1 2007	77	28	4,537	162	18	2191	122
Q2 2007	67	28	2,685	100	26	4273	164

Source: National Venture Capital Association[27]

U.S. Venture-Backed Merger & Acquisition Industry Breakdown, Q2 2007

	Number of Venture-Backed M&A Deals	Number of Venture-Backed M&A Deals with a Disclosed Value	Total Disclosed Venture-Backed Deal Value ($millions)
Technology			
Communications/Media	7	5	286
Internet Specific	18	4	344
Computer Software	21	9	822
Semiconductors	3	2	198
Computer Hardware	3	0	0
Total Technology	**52**	**20**	**1,650**
Life Sciences			
Medical/Health	5	4	417
Biotechnology	3	2	390
Total Life Sciences	**8**	**6**	**807**
Total Other	**7**	**2**	**228**
Total	**67**	**28**	**2,685**

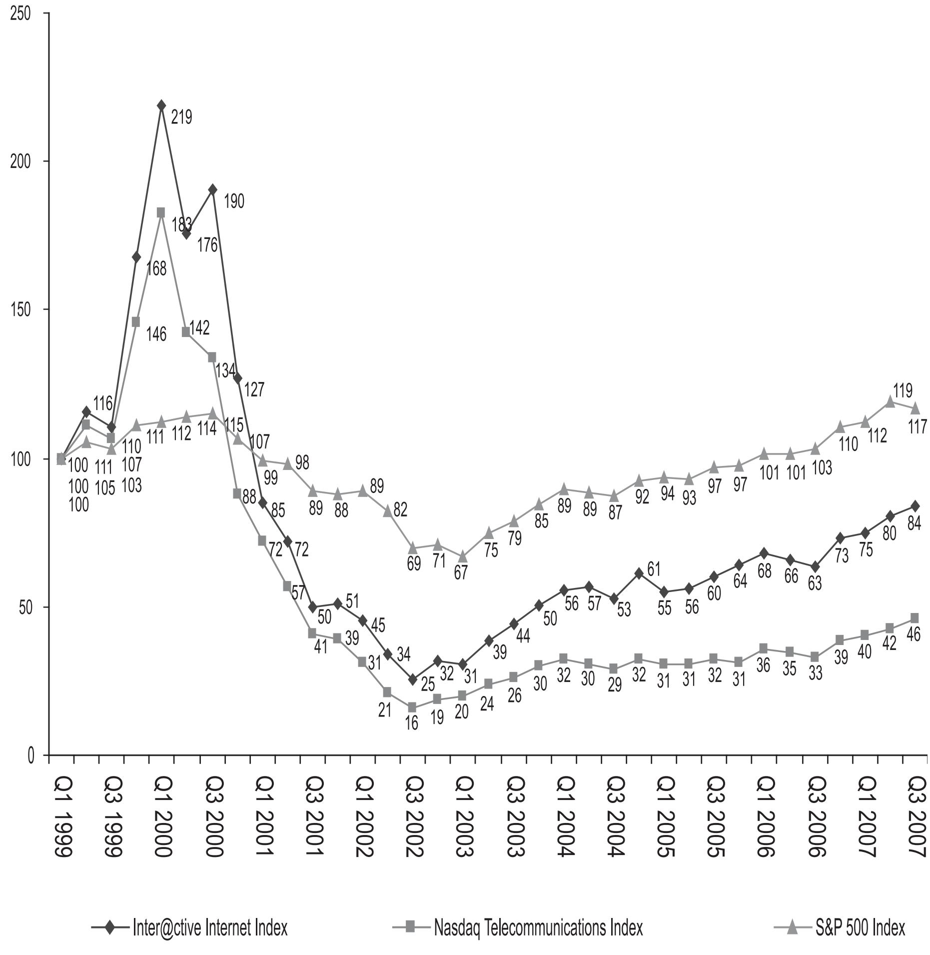
Source: National Venture Capital Association[28]

IT-Sector Revenue Trends and Stock Indices

While technology spending has grown along a fairly steady path during the past ten years, the share prices of firms in high-tech sectors have fluctuated wildly. Investors in Internet, telecommunications, and computer firms have experienced large gains, precipitous losses, or both.

- The worldwide market for information and communications technologies (ICT) in 2006 was estimated to be worth $3.15 trillion, with $1.57 trillion of that amount spent on the communications segment, $730 billion on computer services, $537 billion on hardware, and $317 billion on software. Worldwide ICT spending is expected to grow to $4 trillion in 2009.[29]
- Net income for the 22 major U.S. technology vendors tracked by the Forrester ITAA Tech Sector index reached $13.2 billion in the fourth quarter of 2006, the highest quarterly level in the index's history.[30] However, the index itself dropped 2.6 points to 125.1 in the first quarter of 2007, its first decline in a year.[31]
- IBM was the world's largest IT vendor in 2006 with sales of $48.2 billion, more than double that of second-ranked EDS. However IBM's share of the overall IT services market was a mere 7.2 percent.[32]
- The European Information Technology Observatory predicted the overall European ICT market would grow by only 2.9 percent in 2007 to $887 billion, a slightly slower rate than 2006, and much lower than 2005's 4.1-percent growth. The IT sector itself (including software, hardware, and services) is expected to grow 4.4 percent during 2007 to reach $425 billion, with software growing 6.5 percent, services growing 5.5 percent, and hardware growing 1.7 percent.[33]
- From the first quarter of 1999 to the second quarter of 2007, the Interactive Week Internet index declined 20 percent, and the Nasdaq Telecom index declined 58 percent, while the S&P 500 index rose 19 percent.[34] At the peak of the bubble in the first quarter of 2000, the Internet index was 219 (from where it would decline 89 percent over the next two and a half years), the Telecom index was 183 (from where it would decline 91 percent over the next two and a half years), and the S&P 500 index was 112 (from where it would decline 38 percent over the next two and a half years).[35]
- From the third quarter of 2002 to the third quarter of 2006, however, the Internet and Telecom indices rose much faster than the S&P 500 index, with the Internet index increasing 151 percent, the Telecom index increasing 105 percent, and the S&P 500 index rising 48 percent.[36] From the third quarter of 2006 to the third quarter of 2007, the Internet index grew 32 percent, the Telecom index grew 40 percent, and the S&P 500 index grew 14 percent.[37]

IT-Sector Stock Indices



Source: MSN Money[38]
All indices are scaled so that they equal 100 in Q1 1999.

IT Spending

After the disruptions in 2001 and 2002, IT spending has resumed its steady growth and is again a major driver of fixed investment spending in the United States. IT spending in the rest of the world has accelerated, suggesting that the productivity boom attributed to U.S. IT investment in the past 20 years may be experienced on a worldwide basis in the next decade.

- According to a consensus of industry forecasts from AnalystPerspectives, worldwide IT spending is expected to increase between 4 and 6 percent in 2007, down from an 8-percent increase during 2006. U.S. IT spending is expected to grow 6.3 percent in 2007. AMI-Partners predicts worldwide IT spending by small and medium-sized businesses will grow 10 percent in 2007, while Gartner forecasts large-enterprise IT spending will grow by 2.8 percent in 2007. 2006 saw IT spending go increasingly towards 'run the business' spending rather than strategic investment due to higher energy costs, regulatory compliance demands, and other overhead expenses.[39]
- U.S. IT spending has been growing faster than European IT spending in recent years, but Forrester Research predicts that the opposite will be true in 2007, with European IT spending growing 3.7 percent versus 2.9 percent in the U.S.[40]
- In 2007, the petroleum and health care industries are expected to exhibit the greatest increase in IT spending in North America in 2007, at 10.8 percent and 10.2 percent, respectively.[41]
- IT spending growth is expected to be especially high among small and medium-sized businesses in Asian countries (excluding Japan) such as India, Indonesia, the Philippines, and Vietnam. In these countries, IT spending is expected to grow 15 percent in 2007.[42]
- India's IT spending is expected to grow 23 percent in 2007, and IT spending is expected to grow an average of 14 percent in China, Eastern Europe, the Middle East, Africa, and Latin America during 2007.[43]
- Worldwide ICT spending growth was 6 percent in 2006, down from almost 13 percent in 2004. Information and Communications Technology (ICT) spending made up 6.8 percent of worldwide GDP between 2001 and 2005. The top ten ICT-spending countries remained the same from 2001 to 2005 (in descending order): the U.S., Japan, Germany, the U.K., France, China, Italy, Canada, Brazil, and South Korea. China is expected to surpass France in 2007 and the U.K. in 2008, while India is expected to replace South Korea in the tenth position in 2007.[44]

Worldwide IT Spending Change (percent)

Industry	2004-2005	2005-2006	2006-2007*
Media	2.8	2.9	6.9
Pharmaceuticals & Medical Products	5.6	3.3	6.4
Health Care	8.9	4.6	5.6
Chemicals	-0.2	5.1	5.4
Hospitality & Travel	0.0	0.0	5.1
Retail	-0.1	-4.9	5.0
Construction & Engineering	0.0	4.9	3.8
Information Technology	2.3	4.7	3.6
Transportation	-1.4	-0.2	3.6
Banking & Financial Services	7.1	3.1	3.2
Energy	-2.9	3.9	3.0
Telecommunications	0.2	0.0	2.8
Manufacturing	-1.3	1.2	2.8
Education	6.0	4.1	2.7
Professional Services	10.1	-1.7	2.5
Metals & Natural Resources	0.8	0.0	2.2
Electronics	8.3	7.8	2.1
Utilities	-0.6	3.1	1.5
Government	5.0	2.4	1.3
Insurance	7.7	6.5	0.6
Food & Beverage Processing	6.0	1.3	-0.4
Consumer Products	0.0	7.9	-5.6

* Projections
Source: Gartner[45]

Worldwide IT Services Vendors, 2006

Company	2006 Revenue ($billions)	2006 Market Share (%)
IBM	48.2	7.2
EDS	21.3	3.2
Fujitsu	17.9	2.7
Accenture	17.2	2.6
HP	16.4	2.4
CSC	14.7	2.2
Others	536.6	79.8
Total Market	**672.4**	**100.0**

Source: Gartner[46]

IT-Sector Employment and Productivity

While IT-sector revenues have largely recovered from the 2001-2002 contraction, employment in the IT-sector has not. U.S. IT-sector employment has dropped steadily since 2001, and future growth is projected to lag that of the U.S. economy, mostly as a result of gains in productivity and offshoring.

- According to the most recent data from the U.S. Bureau of Labor Statistics, there were 3.06 million people employed by the Information sector in the U.S. in 2006, representing 2.3 percent of all U.S. employment. 3.08 million were employed in this sector in 1997, and a high of 3.63 million were employed in it in 2000. Employment in this sector is expected to increase 11.6 percent from 2004 to 2014, lower than the projected 14.8-percent increase in total employment for all industry sectors. Average hourly earnings of information nonsupervisory workers were $23.23 in 2006, versus $16.76 for production and nonsupervisory workers in private industry.[47]
- The projected average salary increase across all IT positions is 3.8 percent for 2007, the highest it has been since 2001, but this is still lower than the projected U.S. average wage increase for all professions, which is 4.2 percent for 2007.[48]
- In the first quarter of 2007, the unemployment rate in the U.S. was 9.3 percent for computer hardware engineers, 5.0 percent for computer support specialists, 3.2 percent for network and computer systems administrators, and 3.0 percent for computer programmers. For computer software engineers and computer and information systems managers, the unemployment rate was less than 1 percent.[49]
- According to the Bureau of Economic Analysis, the Equipment and Software category contributed .44 percentage points to the 2.9 percent growth in U.S. real GDP in 2006. This represents a decline from the .69 percentage points contributed by that category to 2005's 3.1-percent GDP growth.[50]
- The Federal Reserve's price index for communications equipment manufacturing has declined an average of 12.5 percent per year from 1997 to 2005, from 210.7 in 1997 to 71.3 in 2005, the result of dramatic improvements in productivity.[51]

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

	2006 Proportion (%)	2002-2006 Average	Annual Percent Change 2002	2003	2004	2005	2006
Production							
Total Index	100.0	2.7	2.7	1.2	3.0	3.2	3.5
Manufacturing	81.9	3.0	2.7	1.3	3.4	4.4	3.4
Excluding Selected High-Tech Industries*	77.0	2.1	2.3	0.3	3.0	2.9	2.0
Selected High-Tech Industries*	4.8	17.7	8.3	17.2	10.4	28.1	24.6
Mining and Utilities	18.1	1.2	2.7	0.5	0.7	-1.6	3.9
Capacity							
Total Index	100.0	0.7	0.8	-0.9	0.1	1.1	2.4
Manufacturing	82.5	0.8	0.4	-0.9	0.0	1.7	2.7
Excluding Selected High-Tech Industries*	77.0	0.1	-0.4	-0.8	-0.2	0.6	1.4
Selected High-Tech Industries*	5.5	11.2	12.6	1.4	4.3	18.3	19.6
Mining and Utilities	17.5	1.1	2.6	1.0	1.2	-0.9	1.4

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

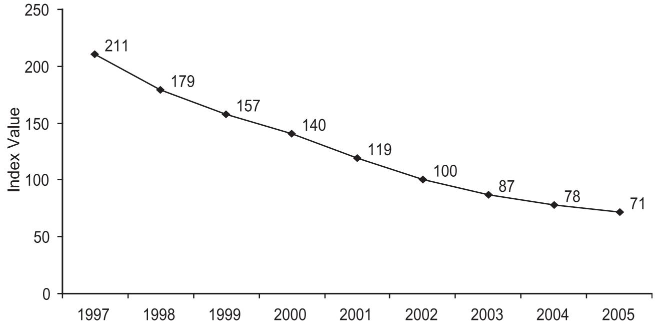
Source: Federal Reserve[52]

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

Industry	2002	2003	2004	2005	2006
Home Electronics	-10.1	20.4	14.2	16.8	13.1
Information Processing (Business Equipment)	-6.7	7.0	7.2	13.7	10.1
Computer and Electronic Products	4.3	13.6	10.2	18.3	18.3
Electrical Equipment, Appliances, and Components	-3.8	-1.0	2.0	3.8	2.4
Computers and Peripheral Equipment	-2.9	4.8	6.6	30.4	12.1
Communications Equipment	-13.6	13.9	6.2	12.9	14.8
Semiconductors and Related Electronic Components	28.0	24.4	13.7	33.8	34.8

Source: Federal Reserve[53]

Price Index for Communications Equipment Manufacturing



Source: Federal Reserve[54]

The index is scaled to equal 100 in 2002.

Outsourcing and Offshoring

Declining rates of growth in IT-sector employment and wages in the past few years have often been attributed to increasing rates of outsourcing and offshoring. Outsourcing is the movement of an internal business process to an external company. When the external company is located in a different country, the outsourcing is sometimes referred to as offshoring.[55] Offshoring covers a wide range of functions, but a significant share of them involve the manufacturing of electronics such as laptop computers and cell phones.[56] More recently, offshoring has become a viable option for companies providing information services.

- Companies spent an estimated $400 billion on outsourcing worldwide in 2006, with IT services its second-largest component, behind the logistics, sourcing, and distribution services sector.[57]
- Frost and Sullivan estimated in mid-2006 that the market for outsourcing labor to 13 major Asia/Pacific countries would grow from $7.2 billion in 2005 to $25.1 billion in 2012.[58]
- ARC Advisory Group estimated that the worldwide market for offshoring services in the manufacturing sector would grow from $5.6 billion in 2005 to $15.2 billion in 2010, an annualized growth rate of 22 percent.[59]
- The U.S. state and local government outsourcing market is expected to grow from about $12 billion in 2006 to about $20 billion in 2011.[60] The U.S. federal government IT outsourcing market is expected to grow from $13.3 billion in fiscal year 2006 (October 2005 to September 2006) to $17.7 billion in fiscal year 2011.[61]
- North America's share of software developer jobs is expected to decline from 23 percent in early 2007 to 18 percent in 2010, with essentially all of those jobs being moved outside the U.S. The worldwide software developer population is expected to grow from 14.5 million in 2007 to 19.5 million in 2010.[62]
- A Brookings study on service offshoring found that five metropolitan areas (Boulder, CO; Lowell, MA; San Francisco, CA; San Jose, CA; and Stamford, CT) would lose between 3.1 and 4.3 percent of their jobs as a result of service offshoring between 2004 and 2015. The other 181 metropolitan areas studied would lose less than 3 percent of their jobs, and 158 of them would lose less than 2 percent. In the most affected 14 metropolitan areas, 17 percent of computer programming, software engineering, and data entry jobs were likely to be offshored between 2004 and 2015.[63]
- There were 157 outsourcing agreements in Europe in 2006, up 11 percent from 2005. Although 2006's number was the highest on record, the total value of those awards was €4.3 billion, which was actually less than 2005's total value of €5.7 billion. The decline reflects a trend toward shorter contract durations and smaller contract values.[64]

Outsourcing and Offshoring Overview

Worldwide Outsourcing Revenues (2006)	$400 billion
Worldwide Outsourcing Contracts (2005)	
Total Contract Value for Deals more than $1 billion	$26.7 billion
Total Contract Value for Information Technology Outsourcing (ITO) Deals more than $1 billion	$21.6 billion
Total Contract Value for Business Process Outsourcing (BPO) Deals more than $1 billion	$5.1 billion
Total Contract Value for Deals less than $50 million	$74.9 billion
India's IT Services and Software Export Revenues (2005)	$16.5 billion
India's BPO Export Revenues (2005)	$5.1 billion
China's IT Services and BPO Offshore Business (2005)	$6.8 billion
The Philippines' IT Services and BPO Offshore Business (2005)	$3.4 billion
Malaysia's IT Services and BPO Offshore Business (2005)	$1 billion
Worldwide Spending on Offshore R&D and Engineering (2005)	$18 billion
Worldwide Offshore Application-Development Services (2006)	$23 billion

Source: Plunkett Research[65]

Rankings of Top Offshore Locations by Services, 2005

	Financial Structure (highest=4)	People and Skills Availability (highest=3)	Business Environment (highest=3)	Total Score (highest=10)
India	3.47	2.14	1.26	6.87
China	3.21	1.76	1.17	6.14
Malaysia	2.95	1.12	2.00	6.07
Philippines	3.58	1.16	1.05	5.79
Singapore	1.62	1.44	2.67	5.73
Thailand	3.27	0.94	1.51	5.72
Czech Republic	2.57	1.12	1.90	5.59
Chile	2.73	0.97	1.87	5.57
Canada	1.10	2.03	2.40	5.53
Brazil	2.91	1.36	1.23	5.50
U.S.	0.54	2.74	2.22	5.50

Source: OECD[66]

The European Digital Economy

The European digital economy has evolved differently than its American counterpart. Europeans use their cell phones for text messaging and Internet access more often, but online shopping rates still lag well behind those in the United States. There are also profound differences between the old and new members of the European Union, although rapid growth rates in the Eastern Europe Information and Communications Technology (ICT) sector indicate that the European digital economy will become more homogenous in the future.

- About 87 percent of the European population use fixed telephony, 78 percent use mobile telephony, and 61 percent use the Internet.[67]
- While 19 percent of online Americans used their mobile phones to access the Internet as of October 2006, 29 percent of online Europeans did, with mobile Internet use heaviest in Germany and Italy, where 34 percent of the online residents there accessed the Internet through their mobile phones.[68]
- Eastern European telephone companies' capital expenditures grew 62 percent from 2003 to 2004 and 41 percent from 2004 to 2005, much faster than those in western Europe, which only grew 1.9 percent and 1.5 percent over these periods, respectively.[69] Interestingly, telephone companies' capital expenditures in the U.S. and in the EU-25 were each equal to precisely 16.1 percent of their revenues from 2003 to 2005.[70]
- Growth in European telecom revenues declined from more than 10 percent in 2002 to 4 percent in 2005 and 3 percent in 2006, due mainly to the decline in fixed telephony and insufficient broadband growth. Mobile services accounted for more than half of the industry's revenues in 2006.[71]
- There were about 19 million European VoIP subscribers at the end of 2006, with that number expected to grow to 34 million by the end of 2007.[72]
- Of European countries in September 2006, online shopping was most common in the U.K., where 52 percent of adult Internet users shopped online, followed by Germany at 48 percent, and France at 45 percent. Only 14 percent of online Italian adults and Spanish adults shopped online in September 2006.[73]
- From 2002 to 2006, telecommunications services and equipment have been responsible for 4.3 percent of Europe's GDP growth, while IT has contributed only about 0.2 percent. In 2006, telecommunications services and equipment accounted for almost 3 percent of European GDP.[74]
- The euro area's unemployment rate was 7.0 percent in May 2007, the lowest it has ever been since records for the currency zone began in 1996.[75]

Mobile Average Monthly Revenue per User in EU-5 (Euros)

	2001	2002	2003	2004	2005	2004-2005 Growth Rate (%)
France	31.60	32.10	33.10	33.50	33.30	-0.8
Germany	30.90	29.00	28.40	27.90	26.00	-6.8
Italy	25.20	25.90	26.70	26.40	25.70	-2.4
Spain	29.10	28.80	29.00	30.70	31.40	2.5
U.K.	26.60	27.00	28.30	28.90	27.70	-4.0

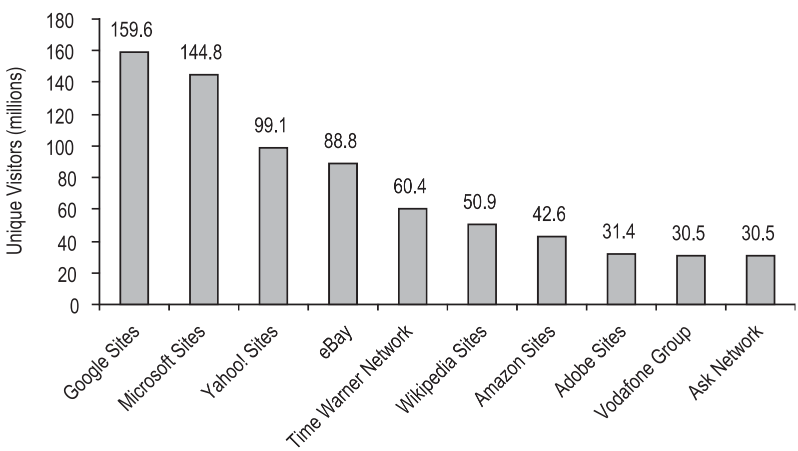
Source: IDATE[76]

Mobile Internet Market Share Measured by Phone Brand Penetration, September 2006 (percent)

Brand	U.S.	France	Germany	Italy	Spain	U.K.
Nokia	17	22	32	50	39	39
Motorola	26	13	22	18	14	14
Samsung	10	21	8	8	17	17
Sony Ericsson	6	14	12	5	11	13
Other	41	30	27	19	20	17

Source: comScore[77]

Top Ten Online Properties by Unique European Visitors, 2006



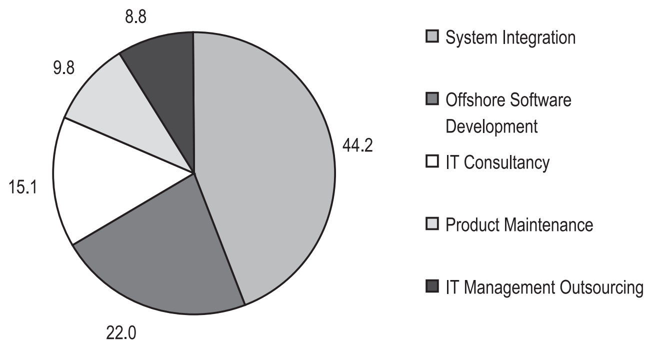
Source: comScore[78]

The Chinese Digital Economy

The dominance of China in manufacturing industries has spread to the high-tech sector; China is the world's largest exporter of information and communications technology (ICT) goods.[79] By the end of 2006, China had over $1 trillion in foreign exchange reserves, $63 billion worth of foreign direct investment, and a $177 billion trade surplus.[80] The monthly Chinese trade surplus reached $26.9 billion in June 2007, 27 percent higher than its value a year earlier. Some U.S. lawmakers and others believe that China intentionally keeps its currency undervalued to gain a trade advantage.[81]

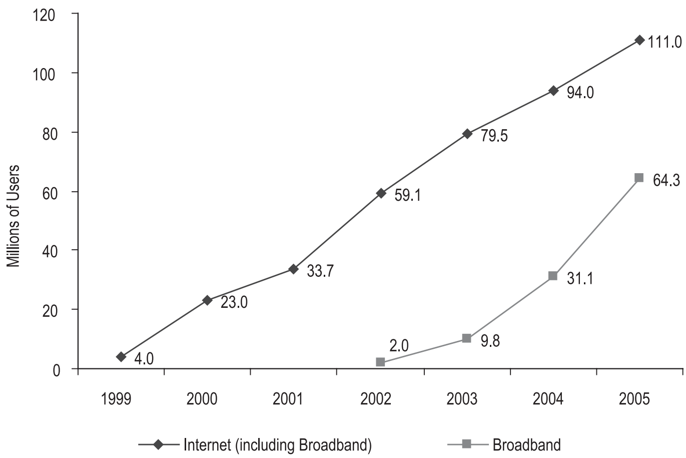
- In 2005, China had 111 million Internet users, with 64.3 million of them broadband users.[82] Leading Chinese Internet companies include the search engine Baidu, the portal Sina, and the instant messenger Tencent QQ.[83]
- The Chinese government censors the Internet under a wide variety of laws and administrative regulations, though the enforcement is somewhat uncoordinated.[84]
- The Chinese consumer electronics manufacturing industry is expected to grow from $71.5 billion in 2006 to $167 billion in 2010. Companies based in China contributed only 8 percent of China's total $425 billion electronics manufacturing industry revenue in 2005.[85]
- Telecommunications in China are controlled by state-run businesses. China Telecom and China Netcom control the fixed-line business, and China Mobile and China Unicom are the main mobile providers.[86]
- China had 437 million mobile phone subscribers at the end of 2006.[87] 301 million of them had subscriptions with China Mobile, giving that company more subscribers than the total U.S. population. Chinese mobile phone subscribers rely heavily on pre-paid phone cards and pay about $10 per month (roughly 7 percent of their monthly salary) for mobile service, about 80 percent less than what Americans pay for wireless service.[88]
- China is the fourth largest U.S. export market. Exports of U.S. goods to China grew 31.7 percent in 2006, while imports grew 18.2 percent. U.S. exports to China in 2006 were larger than U.S. exports to India, Brazil, and France combined.[89] In 2005, about 91 percent of China's $764 billion of exports were manufactured goods.[90]
- China invests more in infrastructure than India; for example, in 2002, China spent $128 billion on power and transport infrastructure versus $18 billion in India, and China's highway network totals 1.4 million kilometers (870,000 miles) versus only 200,000 kilometers (124,000 miles) in India.[91] Tariffs tend to be lower in China than India, and they have been lowered further in recent years. In 1990, the average Chinese tariff was 32 percent, versus 56 percent in India, and in 2004, the average Chinese tariff was 6 percent, versus 28 percent in India.[92] Due to the government encouragement of foreign investment, China received $60.6 billion in foreign investment in 2004, versus $5.5 billion in India.[93]

Chinese IT Services Market Structure, Q2 2006 (percent)



Source: OECD[94]

China's Internet and Broadband Users



Source: OECD[95]

Top Five U.S. Imports from China ($billions)

Category	2000	2001	2002	2003	2004	2005
Office Machines, Data Processing	11.0	10.8	15.2	23.6	35.6	42.2
Telecom and Sound Equipment	9.8	10.1	14.1	16.9	24.4	34.2
Miscellaneous Manufactured Articles	19.4	19.8	23.5	26.3	29.5	33.6
Apparel and Accessories	8.5	8.9	9.5	11.4	13.6	19.9
Electrical Machinery, Parts, and Appliances	9.0	9.1	10.2	11.9	15.3	18.1

Source: Congressional Research Service[96]

The Indian Digital Economy

Whereas China is viewed as the premier country where goods are produced cheaply, India is seen as the place to procure business and IT services cheaply.[97] IDC expects India to have the fastest-growing domestic IT market in the Asia/Pacific region, growing 19 percent in 2006, while China's grows only 12 percent.[98]

- As of September 2007, there were about 60 million Internet users in India and 2.5 million broadband connections.[99]
- As of August 2007, there were an estimated 201 million cell phones in use in India and 40 million fixed telephone lines.[100]
- In-Stat estimates that the number of wireless telephone subscribers in India will grow from 100 million in 2006 to 265 million in 2010. The leading Indian wireless operators as of early 2007 were Bharti Airtel, BSNL, Reliance, Hutchison, and Idea Cellular, which together accounted for 84 percent of the subscriber base in 2005.[101] As of December 2006, urban wireless penetration was 40 percent, while rural wireless penetration was only about 2 percent.[102]
- iSuppli predicts that ARPU for cell phones in India will decline from $7 in 2006 to $5 in 2010.[103] Total mobile service revenue in India is expected to increase at a 22.1-percent annualized growth rate from 2006 to 2010.[104]
- Due to a lack of infrastructure, more than half of India's 700 million rural inhabitants have to rely on community pay phones and have no electricity in their homes.[105]
- India's television channels are sold under an a la carte system, with a price cap of five rupees per month (about US$0.10).[106]
- Indian media and entertainment industry spending on IT is expected to grow at a 32-percent annualized growth rate from about $100 million in 2006 to $300 million in 2010.[107]
- Venture capital firms invested $129 million in 20 deals in India during the first quarter of 2007; in the first quarter of 2006, 23 deals totaling $125 million occurred.[108]
- Investment as a share of GDP averaged 22.5 percent in India from 1994 to 2004 but has been growing in recent years, reaching 26 percent in 2003 and expected to be near 30 percent for 2006.[109]

Doing Business Indicators in China and India, 2007

	China	India
Rank in World Bank Survey		
Starting a Business	123	90
Dealing with Licenses	136	124
Hiring and Firing	87	116
Registering Property	24	101
Getting Credit	113	84
Protecting Investors	100	29
Enforcing Contracts	47	138
Closing a Business	59	118
Starting a Business		
Procedures (number)	13	11
Time (days)	48	71
Cost (percent of per capita income)	14	62
Minimum Capital (percent of per capita income)	947	0
Registering Property		
Procedures (number)	3	6
Time (days)	32	67
Cost (percent of property value)	3	8
Enforcing Contracts		
Procedures (number)	25	40
Time (days)	241	425
Cost (percent of debt)	26	43
Closing a Business		
Time (years)	2	10
Cost (percent of estate)	22	9
Recovery Rate (cents on the dollar)	32	13

Source: Deloitte Touche Tohmatsu[110]

Top Wired and Wireless Service Providers in India

	Subscribers (millions)			
	Sep. 2005	Mar. 2006	Jun. 2006	Sep. 2006
Wireline				
BSNL	36.8	37.5	34.9	34.0
Wireless				
Reliance	13.0	17.3	22.5	26.0
Bharti	14.1	19.6	23.1	27.1
BSNL	12.4	17.7	21.0	23.7
Hutchison	9.7	15.4	17.5	20.4
Idea	5.9	7.4	8.5	10.4

Source: TRAI[111]

Appendix: Digital Economy Timeline, July 2006-June 2007

2006

July 12: European Union fines Microsoft. EU regulators fine Microsoft €280.5 million for defying a 2004 antitrust order. In the earlier ruling, the EU found that Microsoft must provide technical information about the Windows operating system that would allow other companies to develop software that could function within Windows.

July 24: AMD acquires ATI Technologies. Computer chip manufacturer AMD acquires ATI Technologies, one of the largest independent chipmakers for computer graphics cards. The deal, for $4.2 billion in cash and 57 million shares of AMD stock, will expand AMD's manufacturing capability and allow it to integrate microprocessors and graphics engines in individual chips.

August 2: America Online changes focus. Former Internet titan AOL, experiencing declining subscription revenues and growing advertising revenues, announces that it will no longer charge fees for its services. Although some analysts remain skeptical of AOL's long-term prospects, the company hopes advertisements on its websites and higher traffic will more than offset the lost subscription revenues.

August 7: Apple completes transition to Intel processors. After a fourteen-month transition, Apple announces that it has completed its transition to Intel chips in all its desktops and laptops.

August 7: Google and Fox team up on advertisements. After bids from Microsoft, Yahoo!, and others, Fox Interactive Media chooses Google for an exclusive three-year partnership whereby Google will provide all search functions and associated advertisements to Fox's online sites, including MySpace.

August 7: America Online admits to potential privacy breach. AOL admits that it released more than 20 million search queries made by more than 650,000 of its users between March 1 and May 31, 2006. The data, which compromised user anonymity, was posted by AOL researchers to a public website for use by other researchers.

August 11: "Macaca" costs Allen Senatorship. In an incident that quickly becomes a smash hit on YouTube, Virginia Sen. George Allen is caught referring to a volunteer for his opponent in his reelection campaign for U.S. Senator as "macaca," an ethnic slur. The fallout from how the Allen campaign deals with the incident helps lead to Allen's defeat in the general election, giving Democrats a majority in the Senate, as well as derailing Allen's potential presidential campaign.

August 15: Dell recalls burning batteries. Dell begins a recall of more than four million laptop computer batteries worldwide after receiving six reports of overheating batteries causing property damage. The batteries, manufactured by Sony, were included as part of computers sold between April 2004 and July 2006. It is the third recall of defective batteries by Dell since 2001.

September 14: Microsoft announces the Zune. Microsoft announces details about the Zune, its own portable media player. Meant to compete with Apple's iPod, the Zune, with a 30-gigabyte hard drive and three-inch color screen, would have an online marketplace to rival Apple's iTunes. The device goes on sale November 14th and retails for $250.

September 29: U.S. Department of Commerce and ICANN renew deal. The U.S. Department of Commerce and the Internet Corporation for Assigned Names and Numbers (ICANN) agree to a further extension of its charter, giving ICANN more independence in administering the domain name registry service.

October 4: Former HP Chairwoman in boardroom scandal. California Attorney General Bill Lockyer charges five people in connection with the Hewlett-Packard scandal that led to the resignation of several board members. The individuals charged are former chairwoman Patricia Dunn, a former chief ethics lawyer, and three outside investigators, all of whom allegedly used illegal means to gain access to private telephone records through a process known as "pretexting."

October 9: Google buys YouTube. Following the failure of its own video website, Google announces its $1.65 billion all-stock acquisition of online video website YouTube. The deal, which increases Google's Internet advertising distribution channels, raises liability issues for Google regarding potential copyright infringement on the website.

October 13: U.S. bans Internet gambling. President Bush signs into law the Unlawful Internet Gambling Enforcement Act as part of the SAFE Port Act. The Unlawful Internet Gambling Enforcement Act bans American banks and credit card companies from processing transactions with Internet gambling companies, but most privately-held casinos can still sponsor gambling.

November 2: Microsoft reaches agreement with Novell on Linux. Sending shockwaves through the open-source movement, Novell allows Microsoft to sell Suse Linux. The two companies also agree not to file patent infringement suits against users of either Windows or Suse Linux, relieving fears of litigation between the two companies.

November 13: Sun makes Java open-source. Sun Microsystems announces plans to make its Java software, a programming language widely used in electronic devices such as cell phones, an open-source product. Other free and open-source software applications had seemed likely to replace Java as the programming language of choice in next generation devices.

November 16: Clear Channel sells off stations. Announced along with plans for the broadcasting giant to be sold to private equity buyers for $26.7 billion, Clear

Channel Communications agrees to sell 448 of its smaller radio stations, as well as all of its television stations.

November 17: Sony releases PlayStation 3. After a long delay, Sony releases the PlayStation 3 gaming console in the U.S. Released twelve months after Microsoft's Xbox, the PlayStation 3, which is sold for less than its manufacturing cost, features Blu-ray DVD playback capability. Sony hopes this feature will help Blu-ray edge out HD DVDs in the DVD standards war and that revenue from individual game sales will yield a net profit for the company.

November 17: MySpace sued over music piracy. Universal Music Group sues MySpace for copyright infringement, disputing the idea that MySpace pages are "user-generated" and claiming that the pages use copyright holders' works without permission.

November 19: Nintendo releases Wii. The last of the three major video game consoles to be released is Nintendo's Wii, retailing for $250. The Wii, with its new motion sensitive controls and active game style, becomes a runaway bestseller.

November 27: Court rejects Illinois video game ban. The U.S. Seventh Circuit Court of Appeals strikes down an appeal of an Illinois law that would regulate the sale and rental of video games with sexually explicit content. The lower court had struck down the law as unconstitutional, noting that it was not specific enough and violated First Amendment rights.

December 27: AMD wins key ruling in Intel antitrust case. The long running AMD-Intel antitrust suit moves closer to reaching a courtroom as the Delaware federal court hearing the case rules that documents concerning Intel's business practices outside the U.S. germane to the proceedings must be released. The suit was originally filed in June 2005.

December 29: FCC approves AT&T-BellSouth merger. After more than two months of delays, the FCC approves the AT&T-BellSouth merger, clearing the way for the deal to be concluded almost a year after it was first announced. The Commission's approval, in a unanimous 4-0 vote, only moved ahead after the companies agreed to concessions that included a two-year network neutrality provision, a drop in broadband prices in some areas, and returning some spectrum to the FCC.

2007

January 17: TJX announces largest consumer data breach in history. TJX Companies, a Massachusetts-based retailer that owns TJ Maxx, Marshalls, and other stores in North America and the U.K., announces a massive data security breach in its computerized customer credit card database. Later reports and filings would put the total number of cards compromised at 45.7 million.

January 22: Sun and Intel announce server deal. Sun Microsystems and Intel announce an agreement under which Sun buys Intel chips for its server systems and Intel endorses Sun's Solaris operating system and Java software. The deal is regarded as a major blow to AMD, which had previously been the supplier for Sun's server systems.

January 30: Microsoft releases Vista. In the first update of Windows in over five years, Microsoft releases the Vista operating system to consumers worldwide. Vista includes better security features, improved file search options, a new user interface, and improved media players and support.

February 2: Viacom issues massive takedown request to YouTube. Viacom issues more than 100,000 takedown requests to YouTube for clips that the media conglomerate says were uploaded in violation of the Digital Millennium Copyright Act. YouTube agrees to comply.

February 19: XM and Sirius announce merger plans. XM and Sirius agree to a 50-50 stock merger, but the two satellite radio companies face significant hurdles in obtaining regulatory approval from both the Department of Justice and the Federal Communications Commission, since the original licenses issued to the two companies specifically forbid a merger. The two companies have yet to turn a profit in the almost ten years since those licenses were issued.

February 23: Microsoft found guilty of patent infringement. In a decision likely to have a broad impact on digital music distribution, a federal jury in San Diego finds Microsoft guilty of infringing upon MP3-related patents held by Alcatel-Lucent. The court orders the computing giant to pay $1.52 billion in settlements, one of the largest patent verdicts ever, though Microsoft plans to appeal.

March 2: Internet radio rates hiked. The Copyright Royalty Board, a part of the Library of Congress, proposes higher performance royalty rates for streaming music on the Internet. The rate hikes are seen by many in the Internet radio business, especially smaller Internet radio stations, as prohibitively high and endangering the existence of streaming radio feeds on the Internet.

March 9: Vonage loses patent case, faces uncertain future. Internet phone company Vonage loses a suit brought by Verizon for patent infringement. Vonage is ordered to pay $58 million in the settlement and is not permitted to sign up any new customers until it finds a way around the three patents on which its service is found to infringe. The news comes at a bad time for Vonage, which is losing customers for its Voice over Internet Protocol (VoIP) service to cable and phone companies.

March 12: Viacom sues Google for $1 billion. Media giant Viacom, owner of CBS, Comedy Central, DreamWorks, and Paramount Pictures, files suit against Google and YouTube for "massive intentional copyright infringement." The suit alleges that YouTube, which profits from advertisements based on keywords attached to each video, uses the videos in an unauthorized manner while not compensating the works' creators.

March 12: EU takes on Apple over DRM. The EU's Consumer Protection Commissioner Meglena Kuneva expresses discontent with the Digital Rights Management (DRM) solutions built into Apple's iTunes offerings. In an interview with German magazine *Focus,* Kuneva said she thought the idea of buying a song on iTunes and not being able to play it using other media devices was a serious problem.

March 22: Court strikes down COPA as unconstitutional. A federal judge strikes down the 1998 Child Online Protection Act, which has never taken effect because of other court rulings. The bill, meant to prevent children from accessing adult-oriented websites by instituting significant financial penalties to websites that don't offer protection methods, was struck down because the judge ruled that less restrictive measures, such as filters, were better than what he termed to be an "ineffective" and "overly broad" bill.

March 23: NBC and News Corp. announce new online video website. NBC Universal and News Corp. announce that they are teaming up with AOL, Yahoo!, and MSN to offer online video content on a new website, which will offer free ad-supported TV shows, videos, and movies of member organizations. It will also allow video capture for mash-ups and other uses. Ad revenue accompanying clips will be shared with the video providers and copyright holders.

April 2: Apple to sell music without DRM. After CEO Steve Jobs suggested in March that Digital Rights Management (DRM) might need to be removed from digital music offerings to revive declining music sales worldwide, Apple announces plans to sell EMI Music's entire catalog of songs DRM-free on its iTunes site. While the songs will sell for 30 cents more, there are no restrictions on the number of devices or computers the songs can be moved to.

April 9: U.S. lodges complaints against China with WTO. The U.S. announces that it is lodging two cases with the World Trade Organization over China's lack of intellectual property rights protection and market access for U.S. movies, DVDs, books, and music.

April 12: Department of Defense to put Internet router in space. The U.S. Department of Defense announces a plan to put an Internet router in space by 2009. Codenamed IRIS (Internet Router in Space), it would allow other satellites to communicate directly with each other via Internet Protocol, instead of sending data to ground stations and back into space.

April 13: Google to acquire DoubleClick. Search engine Google agrees to purchase DoubleClick, the online advertising agency that places ads beside search results and atop websites. The $3.1 billion deal complements its "AdSense" service and solidifies Google's importance in the growing market for Internet advertising.

April 17: BlackBerry email outage stalls communications. A computer glitch causes many BlackBerrys to stop receiving all emails. The outage, which lasts overnight, frustrates many users of the device.

April 19: Former Qwest CEO found guilty of insider trading. Continuing the crackdown on executive fraud that started after the Enron and WorldCom collapses, a Denver jury finds former Qwest CEO Joseph Nacchio guilty of 19 of 42 counts of insider trading. The punishment could run as high as $19 million in fines and 10 years in prison per count when he is sentenced in late July. Justice Department officials claimed at the time of the trial that more than 1000 convictions of corporate fraud had been obtained since the Sarbanes-Oxley Act was enacted in July 2002.

April 20: Investigation begins into Second Life rape. Belgian authorities begin an investigation into whether or not a virtual rape, which occurred in Second Life, could lead to any criminal charges in the real world. That crime, along with instances of theft and vandalism in massively multi-player online games, is leaving some to wonder how much of a presence government should play in virtual social worlds.

April 30: Supreme Court issues *KSR* decision. The Supreme Court issues its ruling in *KSR v. Teleflex*, the first opinion issued by the Court on patents in decades. The Court finds that the so-called "obviousness" test is too narrowly focused and that too many patents of dubious quality are being issued under the test.

June 4: Court overturns FCC penalties for indecency. Almost a month after the FCC released a major report on the growth of indecency on television networks, a federal appeals court throws out the Commission's policy to penalize broadcasters for accidentally aired expletives. The 2-1 decision throws a major wrench into plans made by the FCC to reduce what it has perceived to be a surge in offensive programming on television in recent years and stalls plans in Congress for legislation to further restrict TV programming.

June 18: Supreme Court won't hear tech IPO cases. The Supreme Court rules that the Securities and Exchange Commission could best hear a series of class-action lawsuits directed against Wall Street investment firms that helped bankroll the IPO boom during the Internet bubble. Investors alleged that the investment houses violated antitrust laws when they created syndicates to promote IPOs while defrauding investors.

June 18: Blockbuster chooses Blu-ray. In a move that may help decide the competing standards war between Blu-ray and HD DVD, Blockbuster announces that it will only rent Blu-ray DVDs in most stores in July. The two competing standards, backed by different companies, have been a drag on next-generation DVD player sales, as many customers wait to see which format will win out before committing to an exclusive player.

June 18: Semel resigns as Yahoo! CEO. To the surprise of many, Yahoo! CEO Terry Semel steps down after Yahoo!'s market share in the online advertisement business is eclipsed by Google. Cofounder Jerry Yang is named as the new CEO.

June 19. Video game Manhunt 2 banned in United Kingdom. The British Board of Film Classification (BBFC) rejects PlayStation game *Manhunt 2*, effectively banning its sale in the United Kingdom, only the second game to ever be rejected by the BBFC. The announcement comes one day after Ireland's ratings group declared a ban on the game. Italian Communications Minister Paolo Gentiloni is also seeking to have the game banned in Italy.

June 19: YouTube launches localized sites worldwide. YouTube rolls out localized versions of its website in Brazil, France, Ireland, Italy, Japan, the Netherlands, Poland, Spain, and the U.K. YouTube founder Chad Hurley cites this as a critical step in expanding worldwide access to the popular online video-hosting website, whose audience of 200 million is approximately evenly split between U.S. and non-U.S. users.

June 29: Apple releases the iPhone. Apple releases its eagerly anticipated iPhone, a cell phone that surfs the Internet, accesses email, and downloads pictures, music, and movies from iTunes to its 4-gigabyte or 8-gigabyte hard drive. Customers line up outside of AT&T stores overnight to get the phone, though some complain about network reliability problems and high price.

Endnotes

Chapter 1: The Growth of The Internet

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Chapter 3: The Communications Sector

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List of Abbreviations

3G:	Third Generation
ADSL:	Asymmetric Digital Subscriber Line
AOL:	America Online
ARPU:	Average Revenue per User
AWS:	Advanced Wireless Service
B2B:	Business-to-Business
B2C:	Business-to-Consumer
BPL:	Broadband over Powerlines
CAGR:	Compound Annual Growth Rate
ccTLD:	Country-Code Top Level Domain
CDMA:	Code Division Multiple Access
CEO:	Chief Executive Officer
CIO:	Chief Information Officer
CLEC:	Competitive Local Exchange Carrier
DARS:	Digital Audio Radio Service
DBS:	Direct Broadcast Satellite
DOJ:	Department of Justice
DRAM:	Dynamic Random Access Memory
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
EU:	European Union
EVDO:	Evolution Data Only or Evolution Data Optimized
FAA:	Federal Aviation Administration
FCC:	Federal Communications Commission
FiOS:	Fiber-Optic Service
FMC:	Fixed-Mobile Convergence
FTC:	Federal Trade Commission
FTTH:	Fiber to the Home
GDP:	Gross Domestic Product
GHz:	Gigahertz
GIF:	Graphic Interchange Format
GSM:	Global System for Mobile Communications
gTLD:	Generic Top Level Domain
HCIT:	Healthcare Information Technology
HD DVD:	High-Definition DVD
HDTV:	High-Definition Television
HP:	Hewlett-Packard

HSDPA: High Speed Downlink Packet Access
ICANN: Internet Corporation for Assigned Names and Numbers
ICT: Information and Communication Technology
IFPI: International Federation of the Phonographic Industries
ILEC: Incumbent Local Exchange Carrier
IM: Instant Messaging
IP: Internet Protocol
IPO: Initial Public Offering
IPTV: Internet Protocol Television
ISP: Internet Service Provider
IT: Information Technology
JPG: Joint Photographic Experts Group
Kbps: Kilobits per Second
kHz: kilohertz
LAN: Local Area Network
LCD: Liquid Crystal Display
LED: Light-Emitting Diode
M2M: Machine-to-Machine
M&A: Mergers and Acquisitions
Mbps: Megabits per Second
MMOG: Massively Multiplayer Online Gaming
MP3: Moving Picture Experts Group 1, Audio Layer 3
MS: Microsoft
MSN: Microsoft Network
n/a: not available or not applicable
OECD: Organization for Economic Cooperation and Development
OEM: Original Equipment Manufacturer
OLED: Organic Light-Emitting Diode
OS: Operating System
P2P: Peer-to-Peer
PC: Personal Computer
PCS: Personal Communications System
PDA: Personal Digital Assistant
PMP: Personal Media Player
RFID: Radio Frequency Identification
RSS: Real Simple Syndication
SaaS: Software as a Service
SDSL: Symmetric Digital Subscriber Line
SMS: Short Message Service
SMTP: Standard Mail Transfer Protocol
TCP: Transmission Control Protocol

TLD:	Top Level Domain
ULCH:	Ultra Low Cost Handset
ULL:	Unbundled Local Loop
USB:	Universal Serial Bus
UWB:	Ultra Wideband
VOD:	Video on Demand
VoIP:	Voice over Internet Protocol
VSW:	Virtual Social World
WCDMA:	Wideband Code Division Multiple Access
Wi-Fi:	Wireless Fidelity
WiMax:	Worldwide Interoperability for Microwave Access