

Job creation and the emerging home computer market

The rapid spread of personal computers for use at home has generated more than 150,000 jobs in sales and software since 1988—58,000 in 1995 alone; the PC software industry and the information retrieval services industry, in particular, have benefited from rising employment

Laura Freeman

The American family, not the American business, has become the new focus in the personal computer (PC) market. American consumers were expected to purchase 9.5 million home computers by the end of 1995, reaching 39 percent of U.S. households. This is a popularity never achieved by the electric typewriter or the video game. Forecasts have even called for 60 percent to 65 percent of U.S. homes to have a PC by the year 2000.¹ It is no wonder that computer companies are taking the home buyer seriously. More than 40 percent of all newly sold PC's have been going into U.S. homes, and industry experts say that the home market has been growing at least twice as fast as the business market.

Increased sales of PC's to the home market have stimulated employment growth in supporting industries, including wholesaling and retailing of the PC, prepackaged software, and information retrieval services (which include on-line services).² Employment in home PC-related industries grew by an average of 2.7 percent between 1988 and 1994 and then grew by almost 10 percent in 1995 alone.³ (See table 1.) A total of 58,000 jobs were added in 1995, which compares favorably with many other high-profile service sector industries. (See chart 1.) The growth in the 1988–95 period amounted to 31 percent, compared with 11 percent for all nonfarm industries. Employment trends for the four home PC-related industries, however, differ considerably. This article explores the job growth in each of these indus-

tries and the impetus behind it.

The employment growth can be linked directly to the home PC market instead of the business market, for various reasons. Strong distinctions exist between the two markets. The first distinction is in regard to price. Due to sophisticated networking and other features required by businesses, office PC's typically cost \$3,000 to \$5,000, and sales are expected to grow at only 8.9 percent per year by 1998. In comparison, home PC's typically sell for under \$2,000, with low-end models going for about \$1,100 and high-end models costing as much as \$3,000, and sales are expected to grow at a level well above that of business PC's.⁴

The other distinction between the two markets has to do with the use of PC's. When purchasing computers, families tend to look for user-friendly machines, whereas businesses look for computers that fit into their current office system, can easily be upgraded, and have a good warranty. This makes the business computer purchase a less frequent occurrence, whereas the home PC market has become the area more likely to improve in sales volume.

The business-use segment of the PC market is currently about 90-percent penetrated, so sales have concentrated on the home market. Once ignored by the Nation's PC makers, this market is now getting attention. More and more companies are entering into the home PC market, even though the boom in the market is now 4 years old. Still, although the market is enjoying increasing sales, its rate of growth has been slowing.

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Table 1. Employment in home PC-related industries, 1988, 1994, and 1995

[Numbers in thousands]

SIC	Industry	Employment			Change from 1988 to 1994		Change from 1994 to 1995		Change from 1988 to 1995	
		1988	1994	1995	Number	Average annual percent	Number	Percent	Number	Average annual percent
.....	Total home PC-related	487.4	579.6	637.5	92.2	2.70	57.9	9.99	150.1	30.80
5045	Computers, peripherals, and software distribution ..	300.7	285.5	302.1	-15.2	-.72	16.6	5.81	1.4	.47
5734	Computer and software stores	61.0	88.7	97.7	27.7	6.49	9.0	10.15	36.7	60.16
7372	Prepackaged software	86.4	157.4	181.9	71	11.74	24.5	15.57	95.5	110.53
7375	Information retrieval services	39.3	48.0	55.8	8.7	3.16	7.8	16.25	16.5	41.98

(See chart 2.) The growth rate in sales of PC's to homes, which reached a peak of 30 percent from 1992 to 1993, was projected to drop to 25 percent by the end of 1995 and 16 percent by the end of 1996. Nonetheless, the home market has the greater potential for development, compared with the business market, not only in terms of sales, but also as regards employment.

The computer home market

Why is the computer market expanding? Reasons for the growth in the home-based computer market can be divided into two categories: technological and social. The computer industry has undergone drastic technological advances in recent years. The most important of these is the speed at which computers process data. This change, along with reduced production costs for computer components, has lowered the prices of home PC's. Competition among manufacturers also has kept prices down and has helped to encourage purchases of computers for home use.⁵ Computer prices have dropped by 65 percent from 1988 to 1994, subject to the application of a price deflator.⁶ In other words, a computer bought in 1994 would cost only 35 percent of what it cost in 1988. Considering the changes in both quality and prices of the most recent home PC models, technology has brought this industry into a different era.

Among the social reasons for the market change in home-based computer systems is the desire of parents to expose children to computers at younger ages. Also, parents are buying computers for their college-bound students, who, in turn, are teaching the parents about home computing. In addition, parents who are either self-employed or working for someone else at home after hours or as telecommuters are shopping for home systems.⁷ Although 44 percent of first-time PC buyers cite doing job-related work at home as the major reason for buying their new machine, 38.3 percent of first-time buyers want a computer at home for their children's schoolwork, accord-

ing to Link Resources, a leading high-technology market research company.⁸

Who are the people in this new market? The individuals driving growth in the home computer market come from a variety of educational backgrounds, employment and occupational categories, income levels, age groups, and family size and composition. Home use of PC's is growing across all demographic groups, but there does seem to be a specific type of individual that is more likely than others to make this purchase.

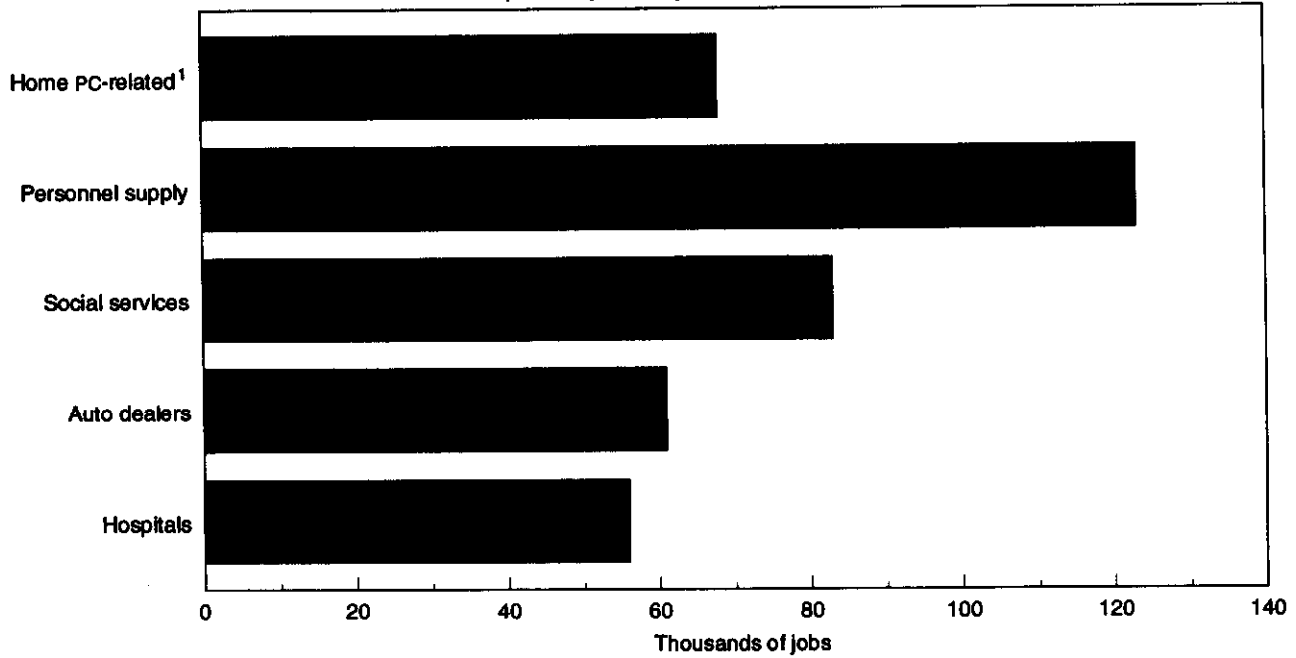
The Bureau of the Census has reported on the use of computers at home, school, and work by persons 18 years and older. Its 1993 study indicates that individuals with at least a bachelor's degree are the most likely to use a PC in the home environment.⁹ (See chart 3.) The age range of most home PC users is 35 to 54 years. Add to this information the fact that 44 percent of individuals purchase PC's for home use in order to perform job-related work, and a picture emerges of the person most likely to purchase a home PC.

In addition to reporting individual profiles, the Census Bureau study suggests that the typical family that owns a home PC is a married couple, with full-time employment among family members, that leans towards the higher end of the family income bracket, from \$35,000 and up. The employed family members are classified mostly within occupations in management and professional areas and technical, sales, and administrative support areas.

Persons fitting the foregoing profiles are key to the new market in home PC's and have become the target of a variety of industries, from retailers of PC's and software to computer services. But, according to the research firm of Odyssey Ventures, Inc.,¹⁰ "the easiest piece of the home market, affluent families with children, is getting saturated. Two-thirds of the 10 million homes with children and incomes above \$50,000 already have a PC."¹¹ This means that computer manufacturers will increasingly have to entice moderate- and low-in-

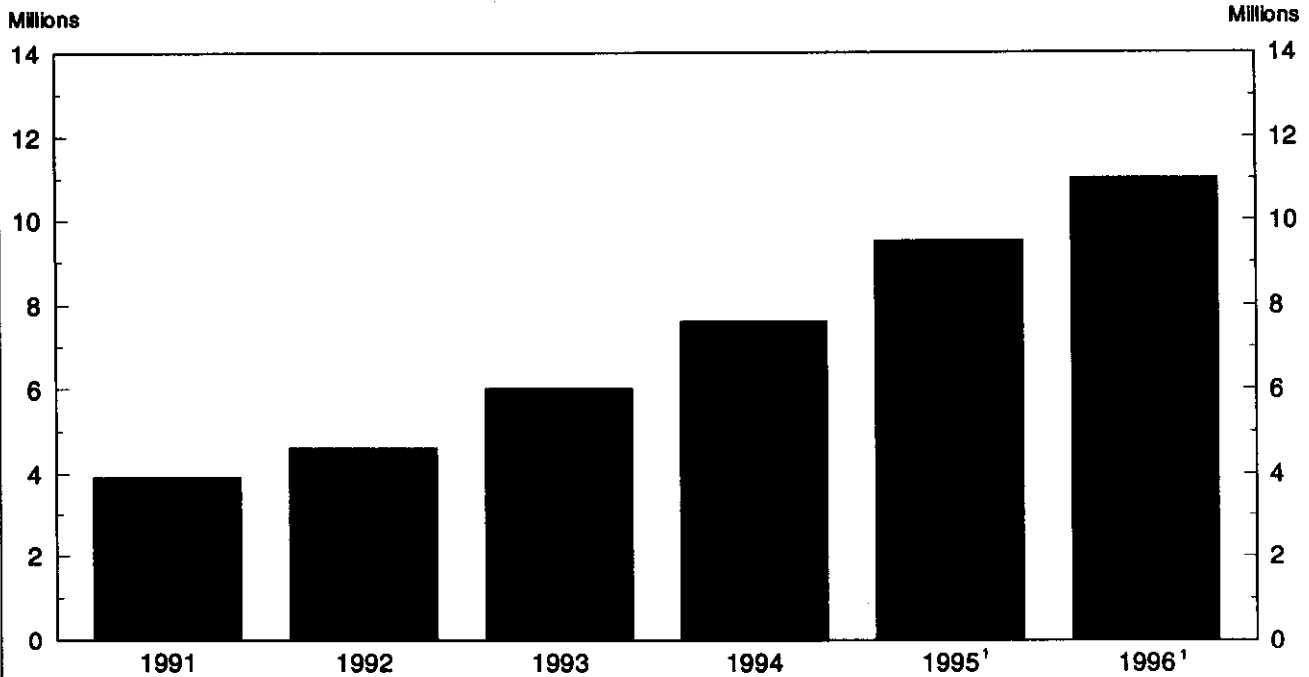
Chart 1. Employment growth in home PC-related industries, compared with selected other high-profile service sector industries, 1995

(Over-the-year changes, seasonally adjusted)



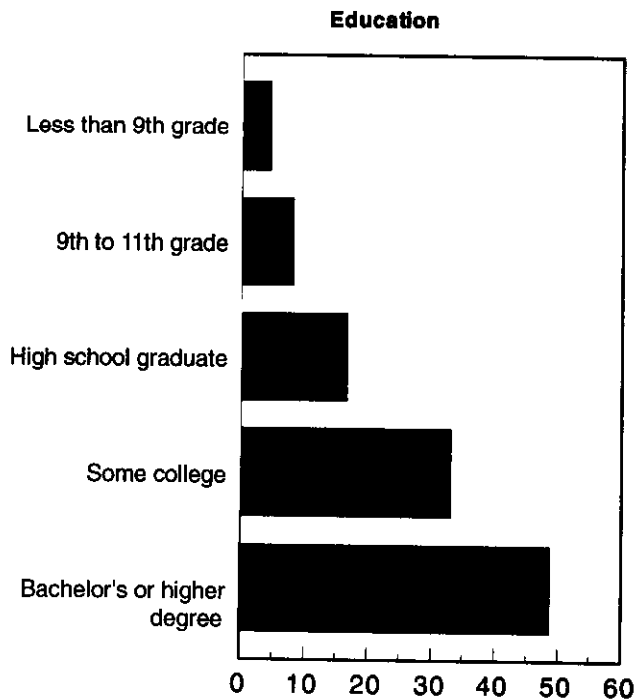
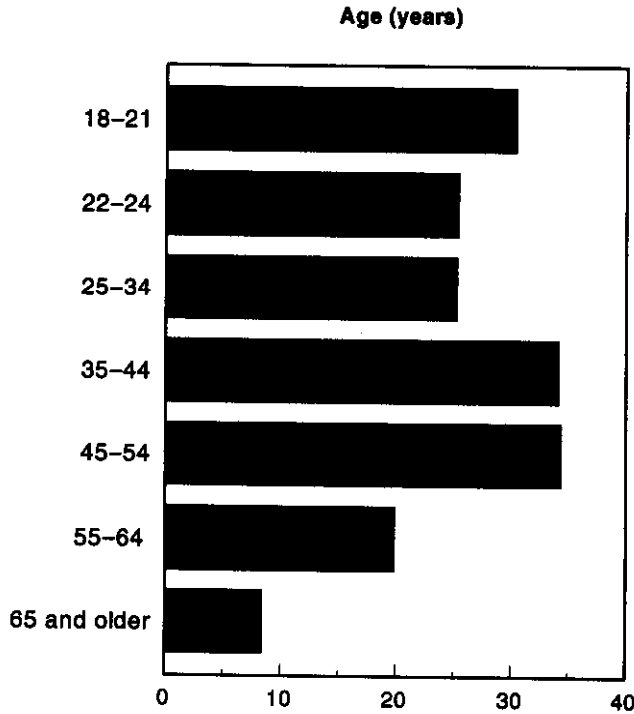
¹ Home PC-related industries include SIC's 5045, 5734, 7372, and 7375.

Chart 2. Personal computers sold to U.S. homes, 1991-96



¹ Data for 1995 and 1996 are projected.
SOURCE: "Computers/Surging Sales," *Newsday*, Oct. 8, 1995.

Chart 3. Use of computers at home: percent by age and educational attainment, 1993



SOURCE: U.S. Bureau of the Census.

come families to purchase a computer, an enormous expectation for a product that is the most expensive consumer purchase after a home and a car.

Increased sales of home computers is important to computer manufacturers because high technology and a competitive market have diminished their profit margins significantly. Indeed, net profit margins have been reduced to as low as 1 percent.¹² Yet it is unclear whether manufacturers can reduce prices of PC's enough to entice low- and moderate-income families into the market. Some manufacturers are betting that they can ignore the price problem, while others have branched out into other businesses to help subsidize their PC business.¹³

Considering that the home PC "boom" is now in its fourth year, forecasters predict that it cannot last much longer. A recent survey disclosed that only 5 percent of households lacking a PC were "extremely likely" to buy one in the next 6 months; some 78 percent said that they had no plans to purchase a computer this year.¹⁴ Still, firms that sell PC's and complementary products have changed their marketing techniques to specialize in what the home-use purchaser needs. They have also been expanding their businesses—for example, by adding employment—in order to take advantage of the current demand for home PC's and other PC products.

Jobs selling computers

The wholesale and retail PC industries. The wholesaling of PC's is classified as a category within the overall distribution of computers, peripherals, and software. Although specific employment data for home PC wholesaling are unavailable, trends can be inferred from the larger wholesale PC distribution industry.

Employment in computers, peripherals, and software distribution within the wholesale trade sector followed a

steady downward trend between its peak in 1991 and the end of 1993. This trend reflected recessionary cutbacks during the beginning of the period and loss of employment due to advances in technology (including technology to monitor inventories) throughout the period. The industry lost a total of 38,000 jobs over that time span and then began to experience a bounce back: since January 1995, computers, peripherals, and software distribution has regained 32 percent of the jobs lost, representing a growth rate of 4 percent. (See chart 4.) Possible reasons for this include the improved home PC sales and the introduction of Windows®95.

Another home PC-related industry falls within the retail trade sector. The retailing of home PC's is categorized within computer and software stores. This industry has had continuous employment growth, but the rate of growth has gone through dramatic changes. The rate fell from 9 percent in 1989 to almost no growth in 1992, but has gained strength rapidly since then, reaching a high of 11 percent in 1994. (See chart 5.) Because the business PC market is at a 90-percent saturation rate, this new employment growth likely reflects not only the strength of the economy during the current economic expansion, but also increased business due to the use of the home PC and the corresponding surge in retail sales.

Purchases of home PC's, classified as either new sales or replacement sales, meet special needs of the user that the computer industry has recognized and acted upon in order to boost penetration into the market. Most computers purchased as *new* sales for home use are multipurpose computers that work easily and effortlessly, as tools for work at home or for children's use. New home computer buyers are investing in PC products that will give them maximum productivity as they work and peak enjoyment as they learn and play. As a result, analysts and computer manufacturers believe that consumers are now "calling the shots" when it comes to new computers designed for the family room, home office, or study.¹⁵ Formerly accustomed to catering to businesses, these manufacturers, as well as retailers and others in related industries, are listening carefully, and the capabilities of the newer home PC's have extended far beyond word processing and spreadsheet analysis. Whether the consumer needs the PC to pay bills, run a business from the home, answer the phone, or all three, the key, according to manufacturers, is making the machine simple to use and with multipurpose applications. The newest systems come complete with a new multimedia theme and include oversized computer monitors with super VGA color, sound cards, modems, fax capabilities, printers, single or even dual CD-ROM drives, answering machines, stereo speakers, and preloaded software. The purpose is to give users a complete multimedia system that is ready to go in one-stop shopping.

"Computer makers are also counting on *replacement* sales to home-PC owners looking for the latest technology, but this

part of the market could easily slow. For some consumers, who are currently purchasing high-end Pentium models that can easily be upgraded with the latest chip, that may be enough to let them forgo buying a new PC for some time."¹⁶ Although the marketing method of tailoring products to consumers' needs may eventually hurt replacement sales, it has worked to the extent that 25 percent more consumers in the United States purchased computers for their homes in 1995 than in 1994. Not only have the wholesale and retail PC industries registered employment growth, but also, the software industry is expanding within the home PC market.

Jobs in the software industry

The software industry has good opportunities for increased sales worldwide. The United States is extremely competitive in computer software. U.S. firms have been the unquestioned leader in the industry since its inception in the 1970s, and the growth in the number of firms has been exponential. Vast fortunes have been created along with thousands of jobs—changing society forever by an industry that did not exist 20 years ago.¹⁷

Employment trends. Although the overall computer services industry has shown serious deceleration in the midst of continued growth,¹⁸ it has recently displayed renewed strength in two areas: information retrieval services (discussed in the next section) and the software industry. The prepackaged software industry employs slightly less than 200,000 individuals. Although a small industry with only 17 percent of the employment of the entire computer and data processing services industry (SIC 737), prepackaged software added 71,000 jobs between 1988 and 1994, plus an additional 25,000 jobs during 1995 alone. The result is more than a doubling of employment since 1988. It is important to note that the prepackaged software industry averaged an annual growth rate of 9 percent from 1990 to 1994, but grew more than 15 percent during 1995. (See chart 6.) This accelerated growth is most likely due to increased sales from home PC users.

PC applications software. The higher employment growth in the software industry in 1995 can be credited to the home PC, because of the saturated business market and the trends in software sales, which have recently changed in composition. North American software sales, tracked by the Software Publishers Association, point toward a market dominated by home PC's.¹⁹ The association tracks quarterly data on software sales according to the type of application. (See table 2.) In 1994, sales of personal computer application software reached \$7.38 billion.²⁰ Word processor and spreadsheet software remained the largest application categories with solid unit sales growth. Price declines, however, limited revenue growth.

Chart 4. Employment in computers, peripherals, and software distribution, 1988-95

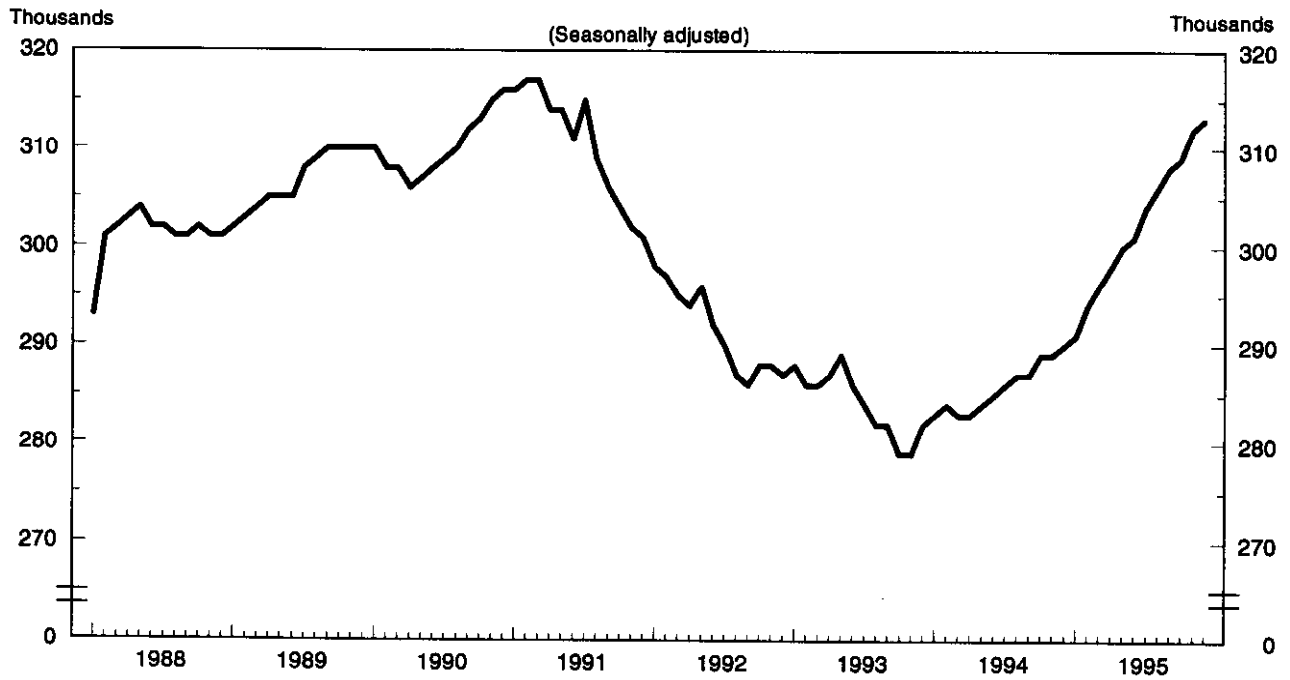


Chart 5. Annual rate of employment growth in computer and software stores, 1989-95

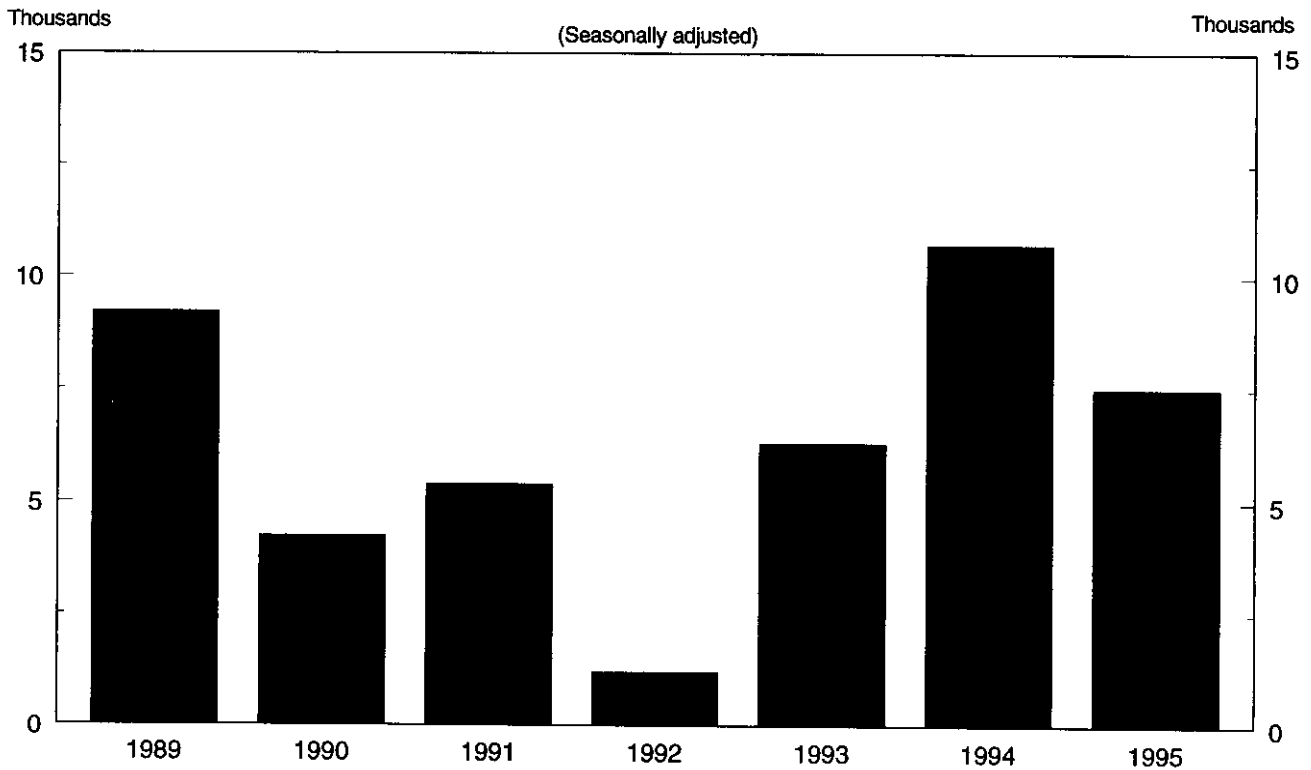
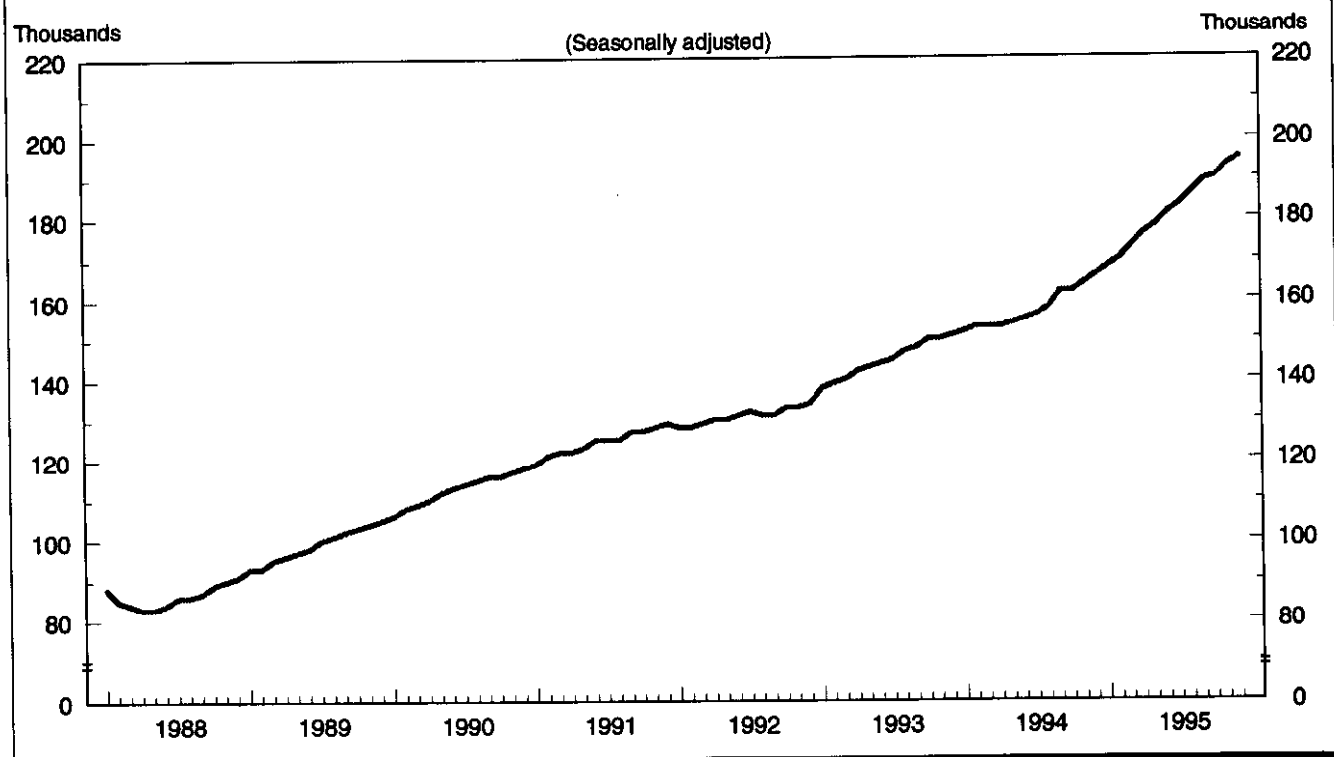


Chart 6. Employment in prepackaged software, 1988-95



With sales of \$522 million (up 88 percent), home education had the largest percent increase during 1994, accounting for 23.5 percent of the total change in software sales. Entertainment was the second fastest growing category, with sales of \$716 million, an increase of 56 percent over 1993. Together, these imply more purchases from the home PC user.

Through the third quarter of 1995, the rate of growth of sales for consumer software products was still strong, but was slowing from the feverish pace of late 1994. Entertainment products showed the highest consumer growth over the first three quarters, up 73 percent, while home education software

grew the fastest in the third quarter of 1995, rising 30 percent over its rate a year earlier.²¹ Of particular note is that application segments which traditionally have led the industry (word processor and spreadsheet applications) had little or no revenue growth, while other segments (entertainment and home education) emerged as growth leaders due to new users and technologies. Once mainly business oriented, the software industry has now begun to focus on the booming market in the home PC arena.

CD-ROM. PC application software used to be the only gauge of growth in the software market, until the CD-ROM (compact disc read-only memory) became popular. A CD-ROM is similar in appearance to a music CD and is used mainly in the home market. The circular discs store vast amounts of data and are capable of multimedia uses that combine numerous elements such as text, still photographs, audio, and video. CD-ROM's established themselves several years ago in the business and school markets, but the devices were slow to catch on in the potentially larger consumer market until late 1994.

Along with software sales, sales of CD-ROM's are surging among home PC consumers due to the decreasing prices of computers with CD-ROM capability and a widening array of uses for the discs. The following tabulation, based on data from the Software Publishers Association, lists the fourth-quarter 1994 sales, in thousands of units, of CD-ROM's, by category of use:

Table 2. Selected software sales, 1993 and 1994

[Numbers in millions]

Product or service	1993	1994	Percent change
Word processors	1,027.4	1,030.5	0.30
Spreadsheets	815.9	830.1	1.74
Entertainment	459.3	716.2	55.93
Home education	277.5	522.2	88.18
Finance	354.8	410.7	15.76
Data bases	388.7	351.2	-9.65
Other graphics	235.2	342.4	45.58
Drawing and painting	259.6	346.2	33.36

NOTE: Excludes sales of operating systems and video-game cartridges. Figures are annual averages of quarterly data.

SOURCE: Software Publishers Association.

Category	Quantity sold
Total	10,229
Games and other home uses	3,474
Home education	3,181
Content software ¹	2,248
Other products	1,154
Language and tools	173

¹ For example, encyclopedias, guidebooks, and reference works.

In dollar terms, according to the Software Publishers Association, the largest selling category in the fourth quarter of 1994 was games and other home products, with sales of \$88.3 million, followed by home education, with sales of \$58.1 million. The growth in the CD software industry, according to the same source, is well above the growth recorded for the software industry overall (although such a growth rate was easier to achieve than that of the overall industry due to the small base involved). The CD segment of the software industry is dynamic and fast growing, and the appeal of distributing and buying CD software is broadening. This is another indicator of the software industry's switching focus to the home market instead of the business-use segment.

The consumer CD-ROM market was slow to develop in past years, in part because software companies were hesitant to design products when so few computer owners had CD-ROM drives. But prices for upgrade kits, which allow owners to fit CD-ROM drives onto existing machines, have fallen to about \$400 from more than \$1,000 a few years ago. With the consumers buying the necessary hardware, companies such as Microsoft are joining smaller players in designing CD-ROM software products. There are now more than 8,000 CD-ROM titles, up from fewer than 100 in 1986, according to InfoTech, Inc.²² And, as with the hardware, the prices of CD's also are dropping. The result is that computer manufacturers increasingly are including CD-ROM drives as standard equipment on personal computers, and software designers are churning out a new generation of games and other titles to maintain consumer interest.²³

Jobs providing on-line services

The information retrieval services industry is experiencing changes similar to those experienced by the software industry, also reflecting the increasing use of home PC's. More demand for home PC-related information retrieval services has translated into more jobs providing those services. The industry grew by more than 15 percent in 1995 alone. Demand stems not only from the growth in the home PC market, but also from advancing technology and an expanding new medium.

What began as an experimental network of three computers linking the Department of Defense, military research contractors, and universities involved in military-funded research,

called the ARPAnet (Advanced Research Projects Administration network), has now grown into what is widely known as the Internet. Since 1993, the Internet has become a new public forum, through the multimedia side of the net, called the World Wide Web. This combination of special software and a unique way of connecting documents has allowed users to "travel" the Internet with pictures, sound, and video simply by pointing and clicking a mouse. The World Wide Web has broadened the Internet so that it is more than just a way to send e-mail and download an occasional file. Through the Web, the Internet has become a place to visit: cyberspace. This new medium is not just based on broadcasting and publishing, but has an interactive dimension as well. The World Wide Web has allowed a broader audience to make use of the advantages of the "information superhighway."

The Internet as a whole doubled in size in 1995, as it has done every year since 1988. It now reaches nearly 5 million "host" computers, each of which may connect to several individual users. During the same period, the Web grew almost twenty-fold; in just 18 months, users created more than 3 million multimedia pages of information, entertainment, and advertising. There has never been a communications medium or consumer electronics technology that has grown as quickly—not the fax machine, nor even the personal computer.²⁴

The range of customers who use the Internet is vast and includes U.S. grade-school students who exchange letters and stories with children in other countries; college students researching term papers; homemakers exchanging recipes, paying bills, doing their banking,²⁵ and using home shopping networks; office workers transmitting data across States or oceans; and corporate marketing departments promoting their products. Internet users encompass all types of individuals with access to computers, whether for home PC use, telecommuting, or other work-related purposes. Most of these persons access the Internet through on-line information services.

Tracking the growth of the Internet in terms of employment is a difficult task. There is no "Internet, Inc." that collects fees from all Internet networks or users. Moreover, because the Internet is not owned by one or more specific companies (and does not have a standard industrial classification), an analysis of changes in employment related to it is not possible. To track its influence upon employment, one is limited to analyzing the information retrieval services industry, which provides individuals with access to the Internet.

Employment in information retrieval services. The information retrieval services industry consists of establishments engaged in providing on-line information retrieval services on a contract or fee basis. Information service providers collect, manipulate, and disseminate information about specific topics. The information is stored in large data bases and is distributed through communications links, by magnetic media

(disks or tapes), or in paper form. A rapidly emerging method is to use CD-ROM's to distribute large volumes of information. The type of information varies from abstracts of technical articles to monthly sales data for consumers on business products. The industry has a bright future, because competition requires accurate and timely information and because technological changes lead to new and better products and methods of distributing them. Included in the industry are popular on-line service companies such as Prodigy and CompuServe.

As more businesses and, more importantly, more home PC users become aware of the advantages the Internet offers, on-line services will become a larger proportion of the information retrieval services industry. Although the Internet has become the fastest growing medium of communication, the information retrieval industry itself has yet to keep up. A small industry, it employs about 60,000 individuals, but it has grown more than 16 percent since 1994. This growth rate is markedly different from that of previous years: industry growth had remained basically flat from mid-1989 until 1994. (See chart 7.) Considering the development of the product offered, the growth trend can be expected to continue, fueled not only by home PC users entering into the on-line services market, but also by broad participation from businesses aiming to profit from the home PC user. These businesses range from those advertising and selling a product to those simply keeping up with the fast pace of high technology and advancing their capa-

bilities in the information transaction arena.

Most on-line information services provide users with, among other things, a link to the hundreds of schools, businesses, and other institutions that have rushed to set up home pages on the Internet, with graphics and hypertext. (Home pages are a table of contents that lets users point and click with a computer's mouse in order to retrieve information; hypertext is the format in which the information is written.) Home pages can be created by anyone and placed on the Internet, allowing users to obtain information on a variety of topics, meet others with similar interests, or even place electronic orders for goods ranging from pepperoni pizza to airline tickets.

The enhanced computer capabilities, the lower prices of PC's, and the energetic expansion of the Internet are attracting the attention of a large mix of retailers. Selling through the Internet can result in personal relationships with customers and create a competitive advantage over other retailers. It offers small companies a level playing field against larger, national retailers and can act as an important expansion vehicle for tapping into new markets in the United States and overseas. Many companies are afraid that if they do not get on-line, they will be left in the dust. In response, retailers are taking the initiative to reach the home PC user through the Internet by creating interesting home pages and updating them regularly with exciting new information. More than 100 shopping "malls" dotted the Internet in 1995, and retail sales

Chart 7. Employment in information retrieval services, 1988-95

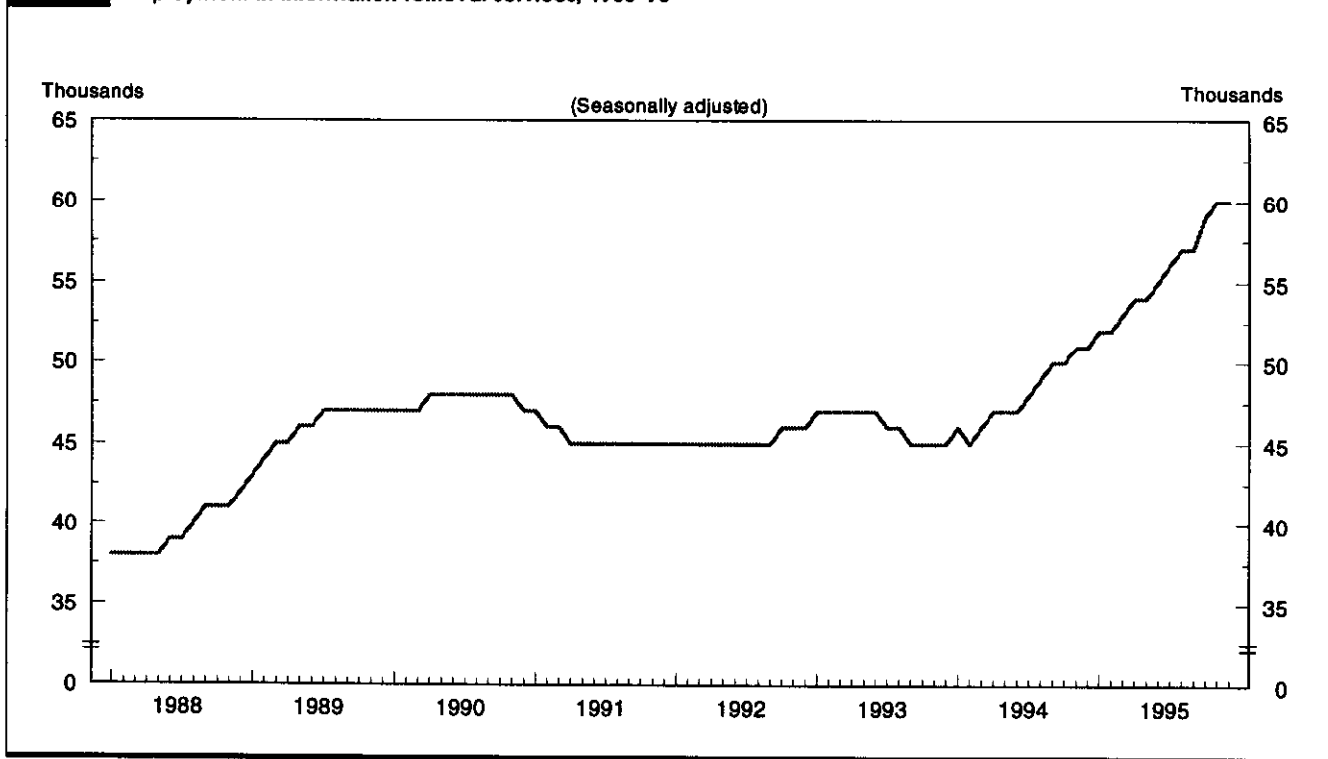
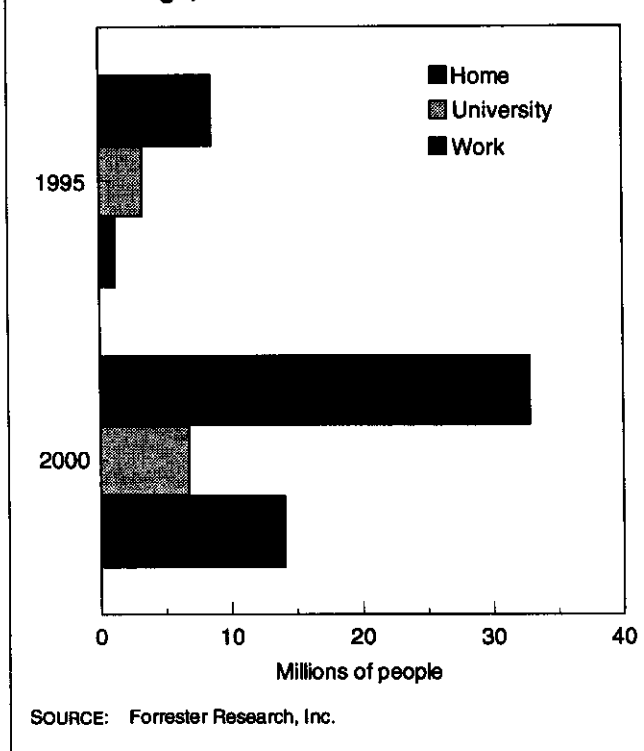


Chart 8. Sources of U.S. Internet and on-line usage, 1995 and estimated for 2000



through on-line services such as America On-line, Prodigy, CompuServe, and Microsoft Network were estimated to be several hundred million dollars that year alone.²⁶

Although on-line services receive a great deal of attention from the media, they are still in the early development phase, with only one-third of all PC users logging on, according to recent research from Computer Intelligence InfoCorp. (CII).²⁷ This leaves tremendous room for growth, and on-line services will only be as popular as is their content. According to the CII study, home and workplace PC users have similar on-line access, but the types of communications performed by the two groups are quite different. Workplace PC users are twice as likely (65 percent to 32 percent) to communicate with a larger computer or a local area network, while home PC users are more likely to go on-line or communicate using the Internet. The CII study also found that sending and receiving electronic mail and downloading software or files are the major on-line activities of both the home and the workplace users. From there, however, the usage patterns diverge: interactive chat activities

are used by more than 1 in 3 home on-line subscribers, but less than 1 in 10 workplace subscribers, and home users are nearly twice as likely to use on-line services as a gateway to the Internet as are workplace users.

According to Forrester Research, the home-use segment of the Internet and on-line services will grow by 283 percent by the year 2000, compare with a growth rate of 108 percent for the work-use segment.²⁸ (See chart 8.) From 1995 to 2000, the Internet will expand, driven by the spread of home PC's and consumers' desires to connect with one another. As this happens, the demographics, infrastructure, government, and monetary systems of the Internet will evolve to support a level of business activity theretofore not possible. According to Forrester, anywhere companies now have an employee taking information or payments, they will soon have a customer's computer on-line. Anywhere these firms distribute information—through catalogs, advertisements, or customer service lines—they will have a live connection as well. Forrester expects that new technologies will facilitate the delivery of information services to new users. First, high-speed wireless networks will attract the mobile customer by offering hassle-free access to data. Then, multimedia will make shopping at home attractive and painless, so people can see what they are purchasing and place an order without filling out a form or talking to a person. Finally, diverse platforms will ensure that not just PC users, but users of intelligent phones,²⁹ personal digital assistants,³⁰ or interactive tv's also can be on-line.³¹

MORE THAN 150,000 JOBS were created in various home PC-related industries (wholesale trade, retail trade, software, and information retrieval services) between 1988 and 1995, with 58,000, or 39 percent, coming in 1995 alone. Technological advances and price declines spurred sales of both home PC's and the software they use. This trend caused employment to increase in related industries; but the rise in employment can be expected to continue only as long as computer manufacturers pursue the advances of technology and pass them on to the consumer, helping the computer attain mass market appeal. Most important, for jobs to be created in the home PC-related industries, computer manufacturers must overcome the obstacle of a saturated business market and seek out new opportunities in the home market. Further, software programmers and on-line service providers must target their products and services toward home users with the newest technology. Finally, businesses must expand efforts to reach their customers through the latter's home PC's. □

Footnotes

¹ Karen Freifeld, "Computers/Surging Sales; Computer Companies Gear Up for a Competitive Holiday Season as More and More Consumers Look to Buy a Home PC," *Newsday*, Oct. 8, 1995, p. 1.

² Employment data are from the Current Employment Statistics survey and appear in *Employment, Hours, and Earnings, United States, 1909-94*, Bulletin 2445 (Bureau of Labor Statistics, 1994), and the supplement en

titled *Employment, Hours, and Earnings, United States, 1990-1995*, Bulletin 2465 (Bureau of Labor Statistics, September 1995). Unless otherwise stated, employment data are annual averages.

³ The specific industries covered by the "home PC-related" category are computers, peripherals, and software (sic 5045), computer and software stores (sic 5734), prepackaged software (sic 7372), and information retrieval services (sic 7375).

⁴ Della de Lafuente, "Home Computing: Family Purchases of New PCs Fueling the Market," *Chicago Sun-Times*, Nov. 6, 1994, p. 1.

⁵ For a detailed analysis, see Jacqueline Warnke, "Computer manufacturing: change and competition," this issue, pp. 18-29.

⁶ The Department of Commerce's price deflator for domestic PCs, calculated with technology as a constant.

⁷ De Lafuente, "Home Computing."

⁸ *Ibid.*

⁹ *Use of Computers at Home, School, and Work by Persons 18 years and older: October 1993* (U.S. Department of Commerce, Bureau of the Census, 1993).

¹⁰ Odyssey Ventures, Inc. is an independent market research firm dedicated exclusively to studying the complex and changing relationship among consumers, technology, and at-home information and entertainment.

¹¹ Odyssey Ventures, Inc., "Homefront" study, July 1995.

¹² Bart Ziegler, "Hard Drive—PC Makers' Big Push into the Home Market Comes at a Risky Time," *The Wall Street Journal*, Nov. 1, 1995, p. A1.

¹³ *Ibid.* "There's never been a mass-market product produced at over \$1,000," says Howard Elias, a vice president in Digital Electronic Corporation's PC division, who insists that "The PC is an anomaly."

¹⁴ Odyssey Ventures, Inc., "Homefront" study.

¹⁵ De Lafuente, "Home Computing."

¹⁶ Ziegler, "Hard Drive," p. A1.

¹⁷ "Implications of 'Lotus v. Borland' Decision," *Massachusetts Lawyers Weekly*, May 1, 1995, p. B4.

¹⁸ For a detailed analysis, see William C. Goodman, "The software and engineering industries: threatened by technological change?" this issue, pp. 37-45.

¹⁹ The Software Publishers Association is the principal trade association of the PC software industry. The association bases its figures on a

survey of members that excludes sales of operating systems for PCs and networks, as well as sales of video-game cartridges.

²⁰ Software Publishers Association, "Personal Computer Application Software Sales Reach \$7.38 Billion in North America in 1994; Record Fourth Quarter Closes a Record Sales Year," news release.

²¹ Software Publishers Association, "Third Quarter North American Software Sales Hit \$2.2 Billion," news release; the introduction of the new operating system, Windows@95, in late August caused a brief spur in sales of business application software, including word processor and spreadsheet software. After little change in the second quarter of 1995, sales of the major business application categories rebounded to levels nearly 40 percent higher than in the third quarter of 1994, led by sales of the new operating system. This growth in business applications, however, is probably a temporary spurt, and home PC-related software will likely resume the lead in sales.

²² See "CD-ROM Sales Surging among Consumers; Lower Computer Prices, More Uses Cited" (Plain Dealer Publishing Co., Sept. 20, 1994), p. 2C.

²³ *Ibid.*

²⁴ "The Internet—the Accidental Superhighway," *The Economist*, July 1, 1995, pp. 3-18.

²⁵ For a detailed analysis of the banking industry, see Teresa L. Morisi, "Commercial banking transformed by computer technology," this issue, pp. 30-36.

²⁶ Neil Buckley, "The Revolution Continues—Large Retailers Now see the Re-creation of Personal Relationships with Customers as a Source of Competitive Advantage," *Financial Times Limited*, Oct. 4, 1995, p. III.

²⁷ Computer Intelligence InfoCorp., "Consumer Technology Index," 1995. CII, a Ziff-Davis Publishing Company, is a leading source of fact-based information on and for the computer and communications industries.

²⁸ Forrester Research, "People and Technology—Analyzing the Impact of Technology on Consumers," *The Forrester Report*, September 1995. Forrester Research is a technology market research firm that studies the Internet and its commercial potential.

²⁹ Intelligent phone networks include calling services, such as automatic call forwarding, and message services.

³⁰ Personal digital assistants are portable, handheld computers that have telephone, fax, e-mail, and paging capabilities.

³¹ See Egil Juliussen and Karen Petska-Juliussen, *The 7th Annual Computer Industry Almanac, 1994-1995—the Complete Guide to People, Salaries, Companies, Technologies, and Forecasts in the Fascinating Ever-Changing Computer Industry*, p. 350.