

ACCESS TO AND USE OF INFORMATION TECHNOLOGIES AT HOME

1. INTRODUCTION

Since the launching of information infrastructure initiatives in the early 1990s, policy makers intent on ensuring accessibility to the information highway, and to the services it will provide to all, have found it important to assess the availability and use of computers and modems, which, together with communications networks, constitute the major components of these infrastructures. "Universal access at a reasonable cost" is an objective of many countries' action plans for the information infrastructure/information society. As a first step to analysing this issue, several OECD countries undertook surveys of computer use during the 1980s.

The availability and use of information technologies within and by governments and for education and training are covered in Part II. This section focuses on the availability and use of IT in households.

2. HOUSEHOLD ACCESS

IT penetration rates in households reflect how much access household members have to information technology goods and services.¹ They show that the share of households equipped with computers and related goods grew significantly between the early and mid-1990s (Table 5.1). Supported by substantial price reductions and greater numbers of applications, computer penetration reached a quarter or more of households in Australia, Canada, Denmark, Germany, the Netherlands, Sweden, and the United States by the mid-1990s. The share of households equipped with a PC and a modem, *i.e.* households with access to on-line services and the Internet, is much lower.

While not all households necessarily wish to purchase a computer, *income* is clearly the most important differentiating factor with respect to household penetration rates. Given the strong relationship between income and other socio-economic variables

(employment status, occupation, educational level of householder), this variable explains most of the variation in household penetration rates (the correlation coefficient, or R^2 , is 0.77) (Figure 5.1). For every \$10 000 increase in income, the likelihood of a household owning a computer increases by 7 percentage points.

In Canada in 1995, household penetration rates varied from 12.3 per cent for the lowest quartile (income under US\$17 256) to 50.2 per cent for the highest (income above US\$50 834), compared to an overall average of 28.8 per cent. Recent data from Australia (February 1996) also indicate wide variability: from 9.5 per cent (income below US\$9 630), to 52 per cent (income above US\$42 222), with an average for all households of 29.5 per cent. In Japan in 1993, household penetration rates ranged from 3 per cent for those with income under US\$16 277, to 20.7 per cent for those with income over US\$40 693 (the average being 11.9 per cent). In the United States, where more disaggregated data are available, the 1993 figures range from 5.8 per cent (income under US\$10 000), to 60.3 per cent (income over US\$75 000), with an average rate of 22.9 per cent.

Other demographic characteristics provide additional evidence of widespread disparities among households:

- Access to computers varies greatly with *age* and *family type*. Households where the head of household is between 35-44 and 45-54 years of age have the highest penetration rates (Figure 5.2). This is partly due to the presence of children and teenagers, the most avid computer users, in these households (Figure 5.3). It is also linked to higher overall income levels, particularly of those in the 45-54 age bracket.
- Differences in levels of education are also significant explanatory variables. In Sweden in 1995, persons aged 16 to 64 who had completed two or more years of university studies

Table 5.1. ICT equipment diffusion in selected OECD countries, 1990 and 1995¹

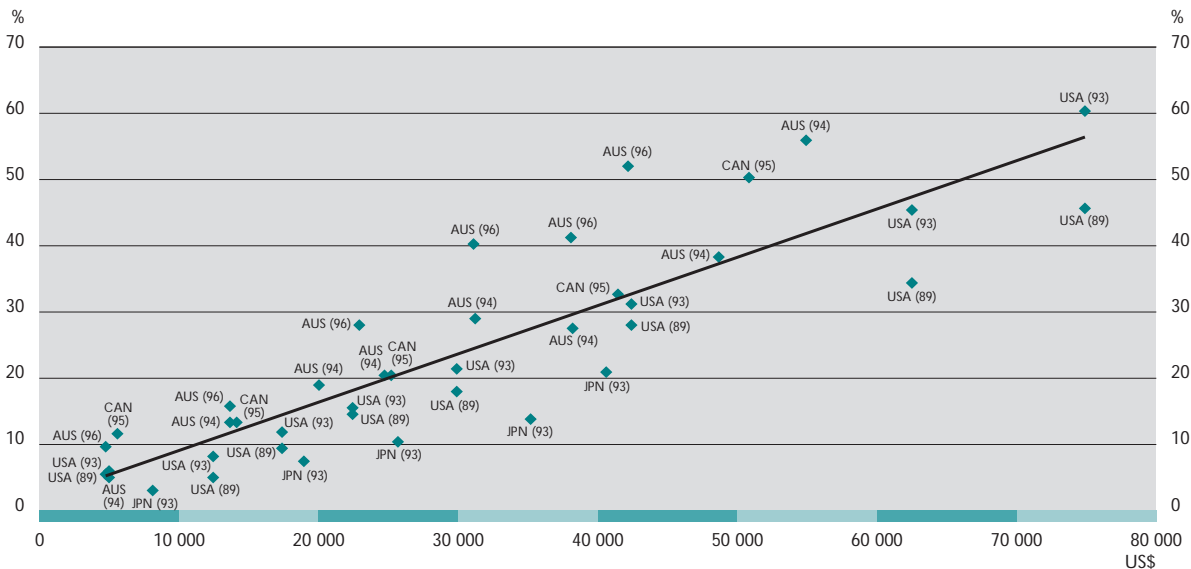
	United States		Canada		Japan		United Kingdom		Ireland		Spain	
	1990	1995	1990	1995	1991	1995	1990	1995	1990	1995	1990	1995
Population (millions)	249.9	263.1	27.8	29.6	123.9	125.2	57.4	58.5	3.5	3.6	39.0	39.2
Households (millions)	93.3	98.5	9.6	11.0	41.0	43.1	21.9	23.4	1.0	1.1	11.3	12.2 ⁵
Installed base of:												
Personal computers (millions)	54.2	86.3	2.7	5.1 ⁵	8.6	19.1	4.7	10.9	0.4	0.5 ⁵	1.1	3.2
Fax machines (thousands)	5 084	14 052 ⁵	300	525 ⁴	5 000	6 000 ⁹	750	1 800	53	80 ⁴	144	215 ⁴
Videotext terminals (thousands) ¹⁰				105 ⁴		128 ⁴		104 ⁴				480 ⁴
Number of mainlines/ 100 inhabitants	54.6	62.7	55.0	59.0 ⁵	45.4	48.7	44.2	50.2	28.1	36.5	32.3	38.5
Percentage of households equipped with:												
Videotext												
Fax machines		6 ^{5, 7}			5.5 ²	10 ⁹						
Personal computers	15	25.5 ³	16.2 ⁷	28.8 ⁷	11.5 ⁹	15.6 ⁹		20 ⁸		18		12 ⁸
Modem-equipped PCs		15 ⁴		9.8 ⁷				4 ⁴				
CD-ROM players	3.1 ^{2, 11}	14 ^{5, 11}						7 ¹⁷				7 ¹⁷
Cable TV		51 ¹⁴	71.4 ⁷	73.4 ⁷		19 ¹⁴		4 ¹⁴		40 ^{5, 13}		6.6 ^{5, 13}
Satellite TV (direct)								12.4 ^{4, 13}		3.3 ^{4, 13}		7.2 ^{4, 13}
	Netherlands		France		Germany		Italy		Belgium		Denmark	
	1990	1995	1990	1995	1990	1995	1990	1995	1990	1995	1990	1995
Population (millions)	15.0	15.5	56.7	58.1	79.4	81.9	57.6	57.0	10.0	10.1	5.1	5.2
Households (millions)	6.0	6.5 ⁵	21.9	22.5 ⁴	34.0	36.9	20.0	21.1 ⁵	3.9	4.0 ⁴	2.2	2.4
Installed base of:												
Personal computers (millions)	1.4	3.1	4.0	7.8	6.6	13.5	2.1	4.8	0.9	1.4	0.6	1.4
Fax machines (thousands)	180	500	580	1 200 ⁵	696	1 447 ⁵	170	202 ⁴	67	165 ⁴	100	185 ⁴
Videotext terminals (thousands) ¹⁰				6 540 ⁴		378 ⁴		200 ⁴				
Number of mainlines/ 100 inhabitants	46.4	52.5	49.5	55.8	40.2	49.3	38.8	43.6	39.3	45.7	56.6	61.3
Percentage of households equipped with:												
Videotext			16.9 ¹²	20 ^{4, 12}								
Fax machines				2 ⁸								
Personal computers		27 ⁸	11 ^{2, 12}	14.3 ¹²		25 ⁸		14 ¹⁹		21 ⁸		32 ^{6, 16}
Modem-equipped PCs				1 ⁸		3 ⁴						12 ^{6, 16}
CD-ROM players		10 ¹⁷		4.5 ⁸		11 ¹⁷		6 ¹⁷		7 ¹⁷		19 ^{6, 15}
Cable TV		92 ^{5, 13}		7 ¹⁴		42 ¹⁴		0.01 ^{5, 13}		90 ¹⁴		
Satellite TV (direct)		3.1 ^{4, 13}				17.5 ^{4, 13}		0.2 ^{4, 13}		0.4 ^{4, 13}		

1. Or closest year. When possible, official sources have been used.
2. 1992.
3. November 1994.
4. 1993.
5. 1994.
6. March 1996.

- Source: OECD Secretariat, based on data compiled from ITU and:
7. Statistics Canada.
 8. GFK Estimates.
 9. Japanese Economic Planning Agency.
 10. OMSYC.
 11. IDATE.
 12. INSEE.

13. Cable & Satellite Europe, January 1994. Quoted in "Les chiffres clés de la télévision et du cinéma", Paris 1995.
14. Ovum, quoted in *Les Echos* of June 12 1996.
15. Gallup Institute, for the newspaper *Berlingske Tidende*, quoted in "IT in Figures 1996", Ministry of Research and Information Technology, Denmark.
16. IDC.
17. Inteco.

◆ Figure 5.1. **Computer penetration rates, by household income¹ in Australia, Canada, Japan and the United States**



1. Household incomes were converted to US\$ using PPPs. Income values were obtained by taking the midpoint of each income bracket, except for the upper open-ended ranges where the lower bounds were used.

Source: Australia: Australian Bureau of Statistics (1994, 1996b), *Household Use of Information Technology*.
 Canada: Statistics Canada (1996b), *Access to the Information Highway: Canadian Households*.
 Japan: Economic Planning Agency in JEIDA (1995), *PC White Paper*.
 United States: US Bureau of the Census (1993b), *Computer Use in the US*.

were almost twice as likely to have access to a computer at home than those who had only completed upper secondary school (Figure 5.4). In Canada and the United States, there is strong evidence that the householder's educational level has a significant impact on computer availability at home (Figure 5.5). Completion of high school by the householder increases penetration rates by a factor of 1.7 in Canada (1995) and 2.1 in the United States (1993). In Canada, if the householder had completed a university degree, family members were more than twice as likely to have access to a PC than if he or she had only completed high school; in the United States, they were almost three times as likely.

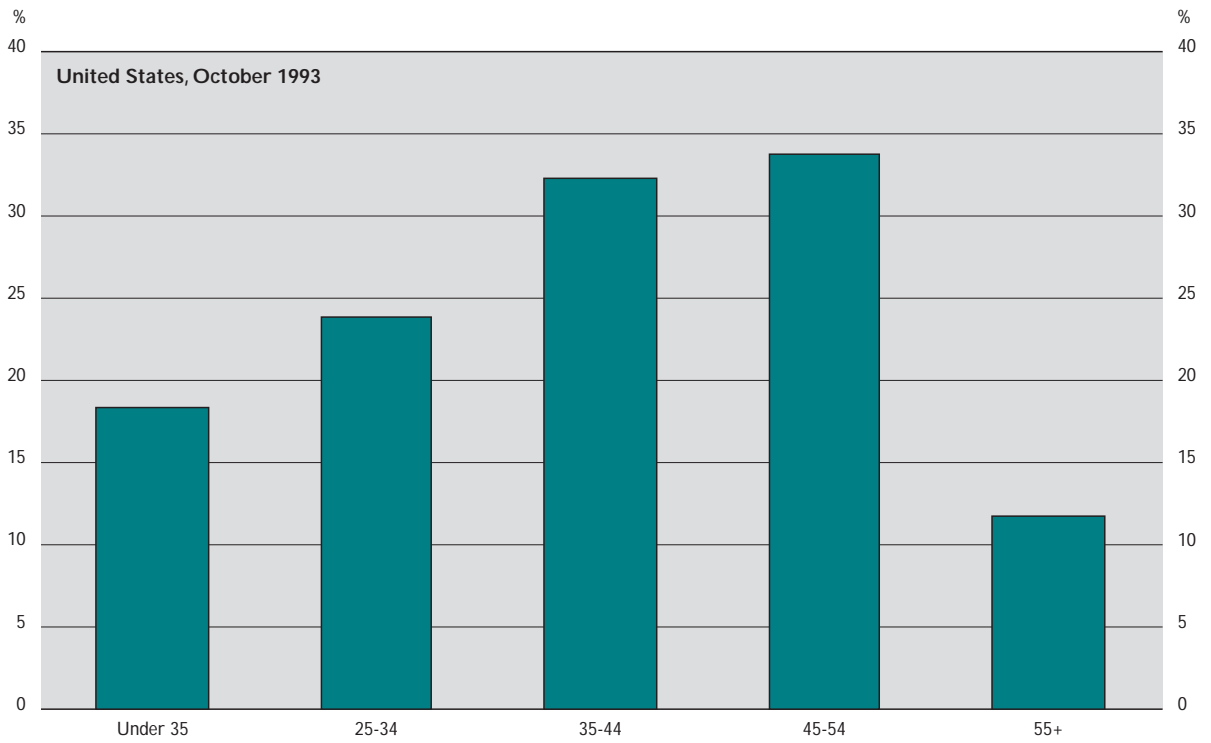
Labour force characteristics such as *employment status* and *occupation* of householders, through their impact on income, strongly influence the presence of information and communication technologies (ICTs) in households. In Canada and Japan, households where the householder is self-employed have the highest penetration rates, partly owing to work at home (Figure 5.6), while those where the householder

(or user) is unemployed are, as expected, below average (Figures 5.6 and 5.7). Data for the United States, France and Sweden also indicate that workers in white-collar occupations (whether highly skilled, such as managerial and professional, or less skilled, such as technical, sales and administrative) are much more likely to have access to computers at home than those employed in blue-collar jobs.

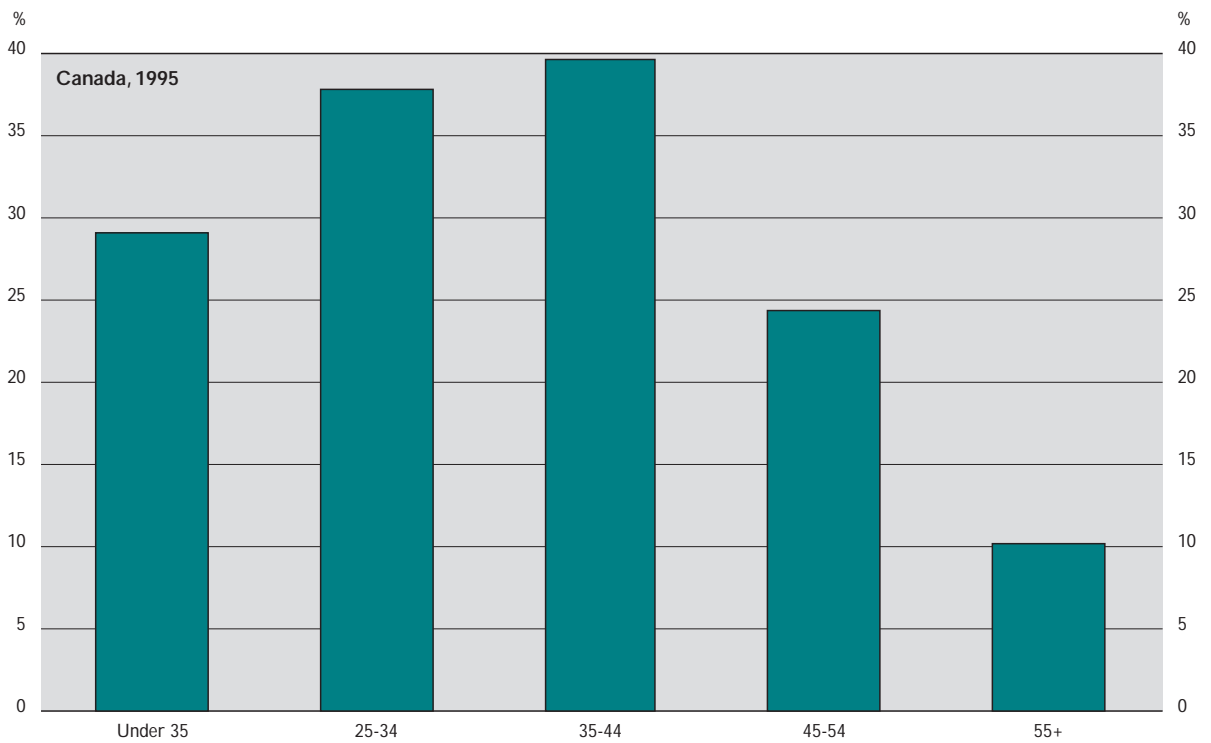
The *location* of households, both residential and regional, is also an important determinant of ICT penetration in households.

- Urban households typically have higher computer penetration rates than rural ones in all income brackets. Penetration rates in urban areas vary between 33 per cent and 17 per cent of households/individuals, in contrast to rural areas where the range is between 24 and 11 per cent on average (Figure 5.8). In every state of Australia, for example, computers had penetrated a far greater proportion of households in capital cities than in rural areas. City households accounted for 72 per cent of all home computers in 1994.
- The difference by residential location is even more pronounced for households that also

◆ Figure 5.2. *Percentage of households using a computer, by age of householder*

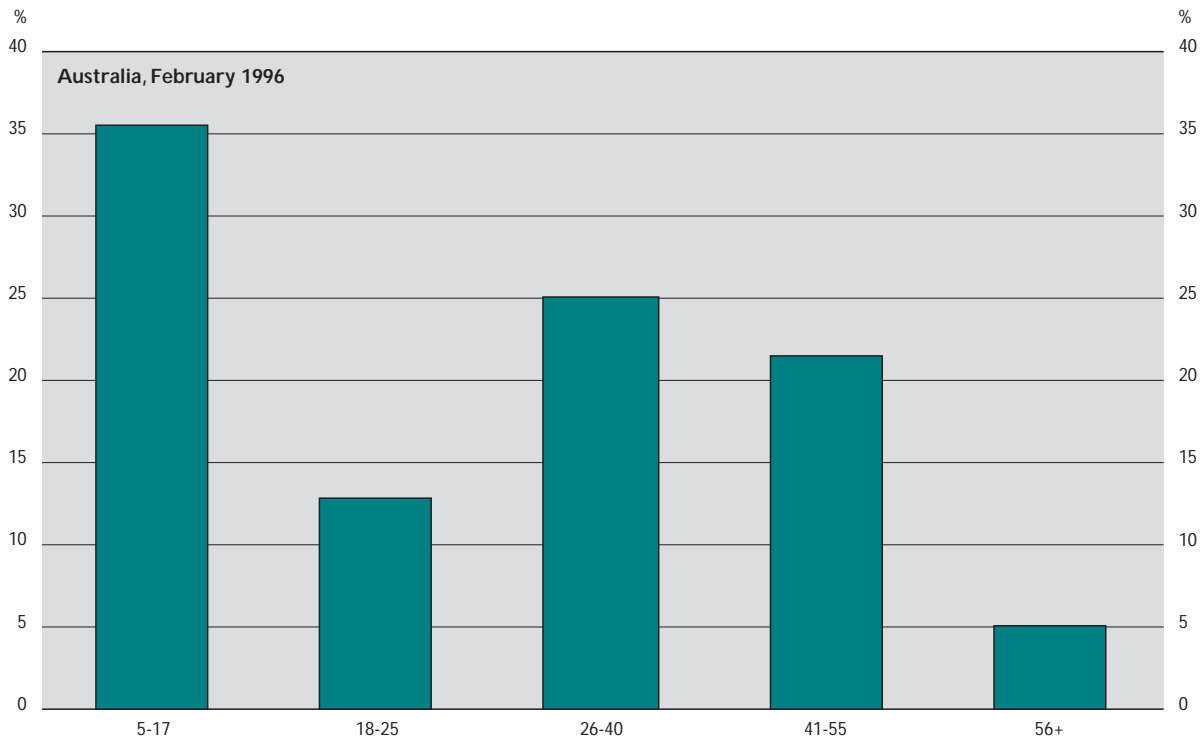


Source: US Bureau of the Census (1993b), *Computer Use in the US*.

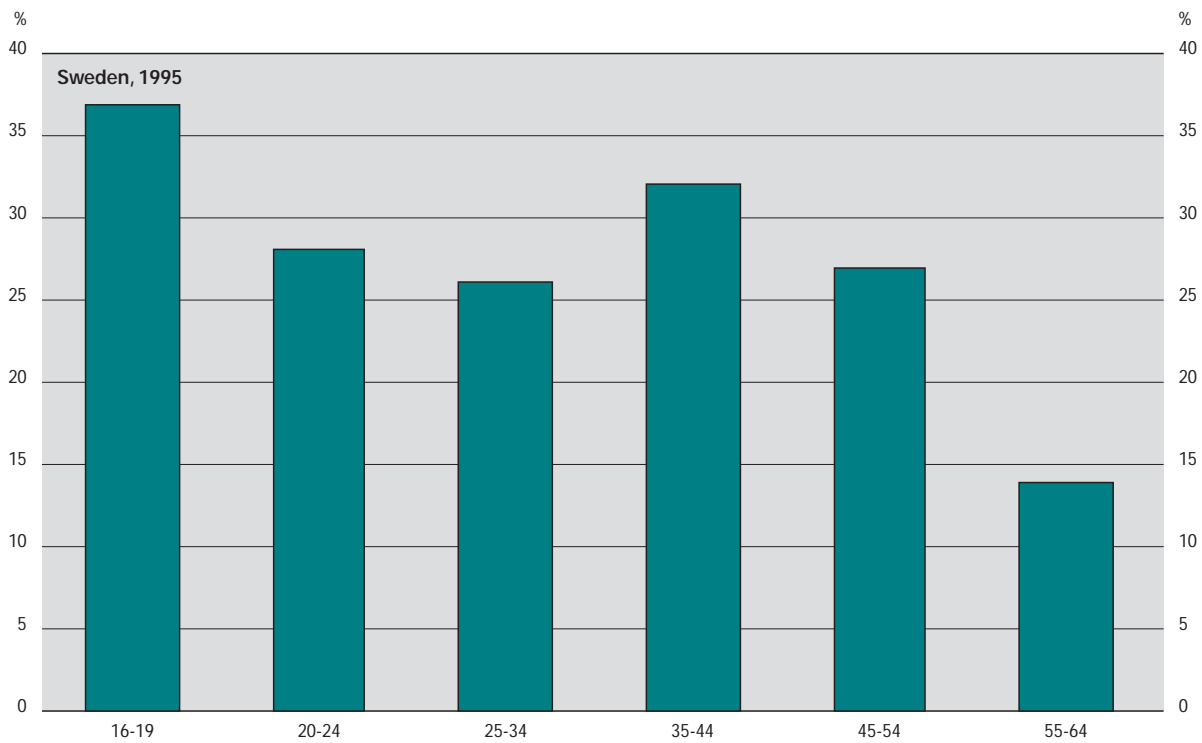


Source: Statistics Canada (1996b), *Access to the Information Highway: Canadian Households*.

◆ Figure 5.3. *Percentage of persons using a computer at home, by age*

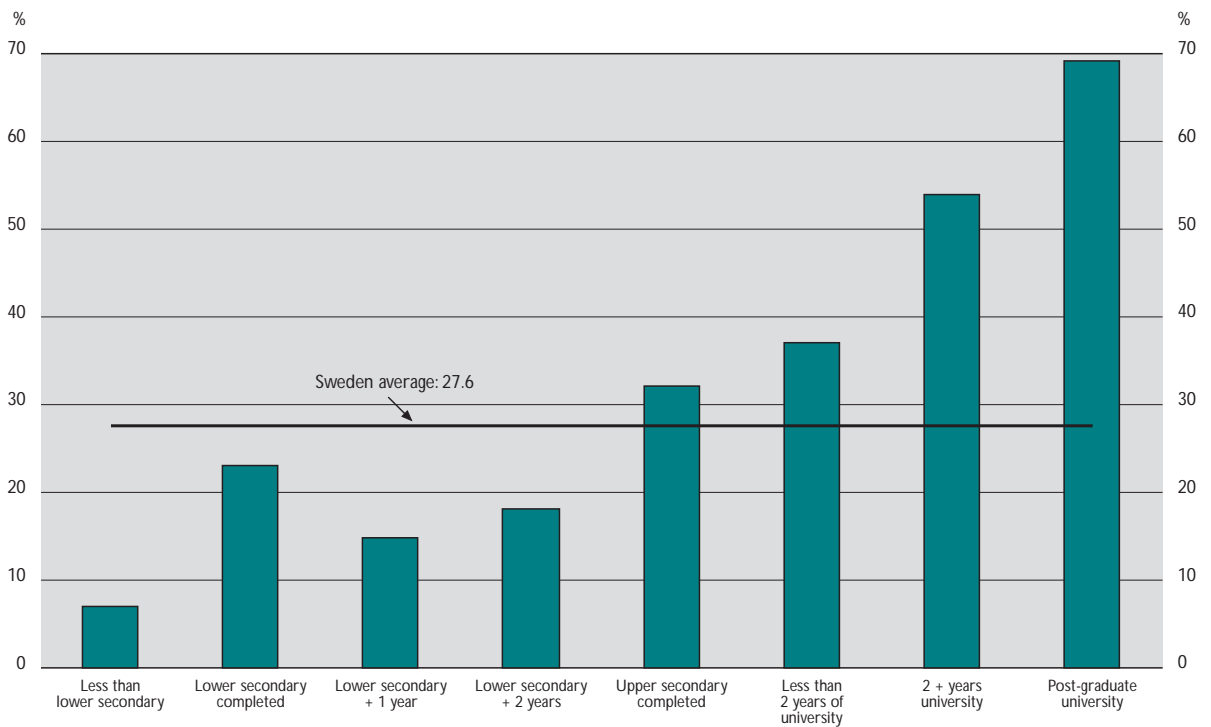


Source: Australian Bureau of Statistics (1996b), *Household Use of IT*.



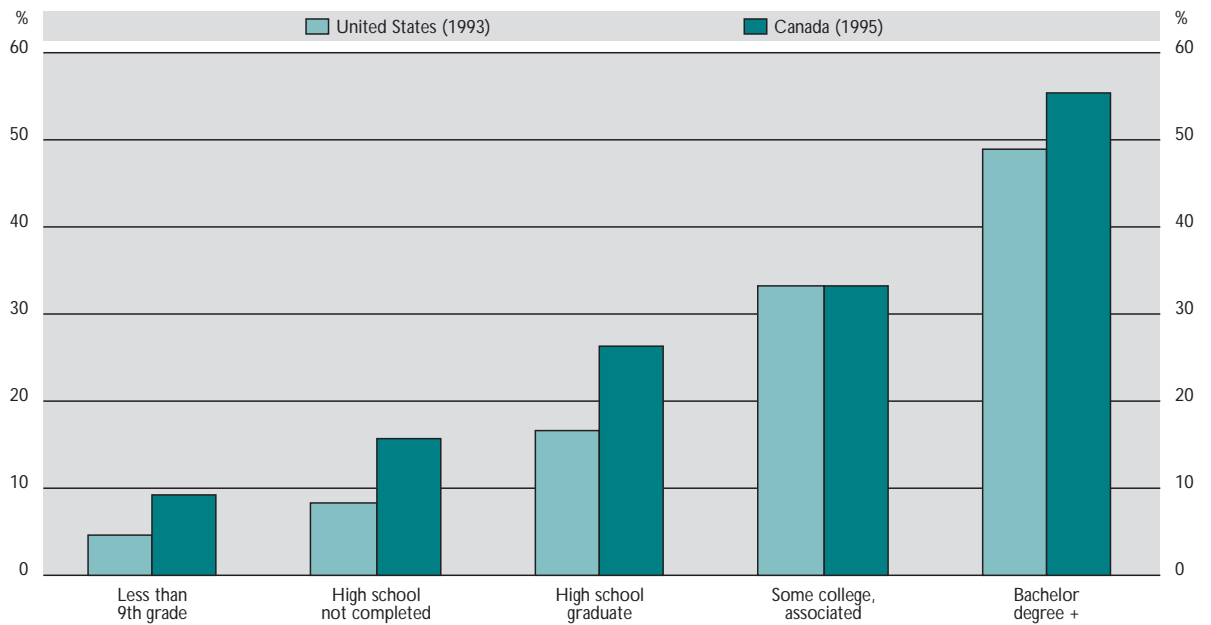
Source: Statistics Sweden (1995), *Computer Habits Survey*.

◆ Figure 5.4. *Use of PCs at home, by education level of user (age 16-64), Sweden 1995*



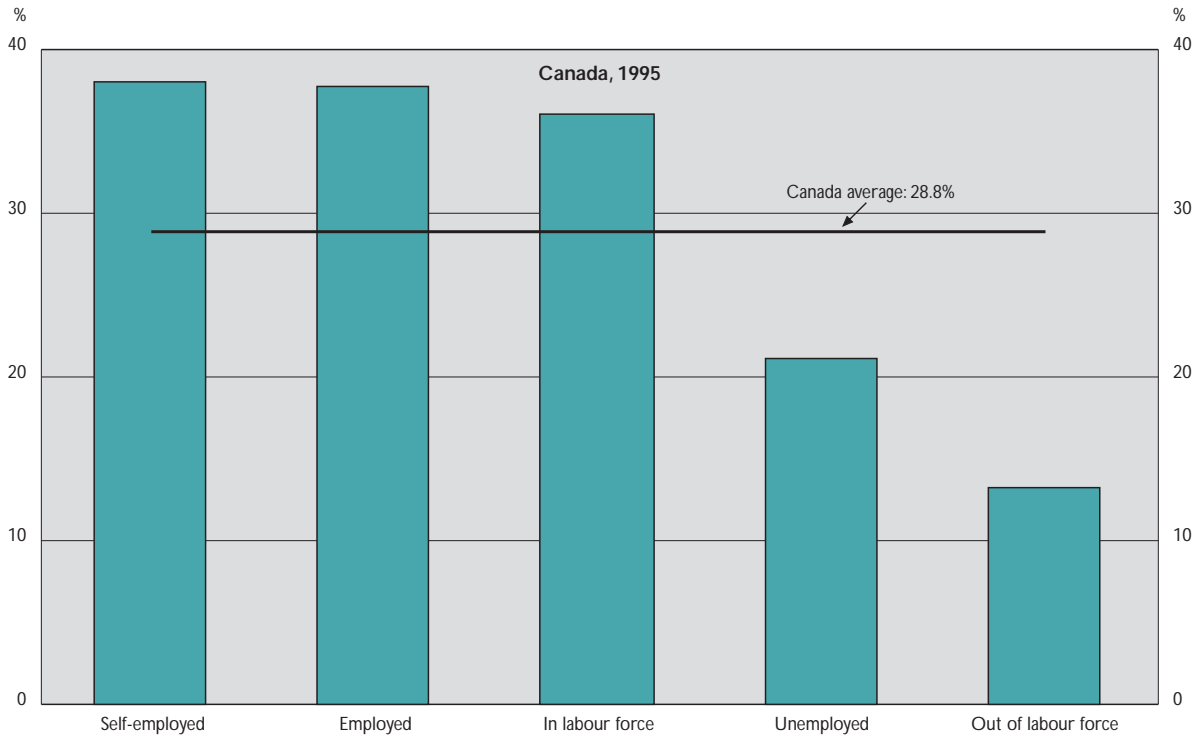
Source: Statistics Sweden (1995), *Computer Habits Survey*.

◆ Figure 5.5. *Household penetration rates, by educational level of householder, United States (1993) and Canada (1995)*

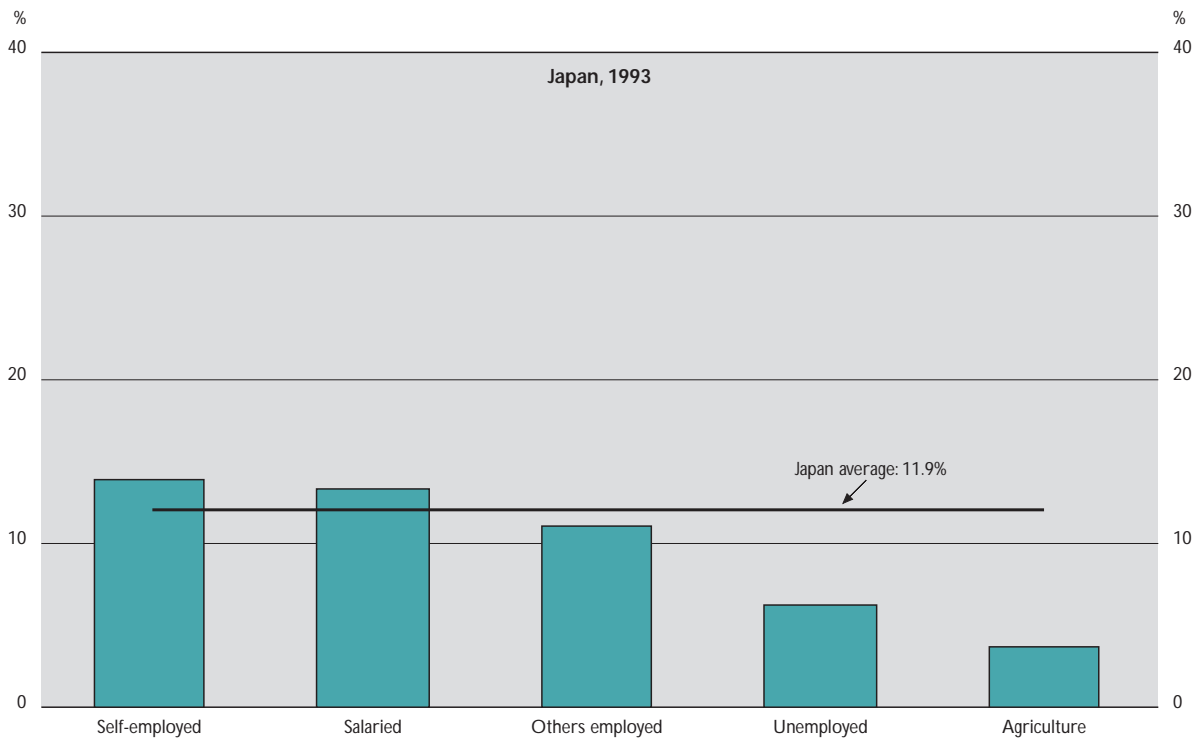


Source: Canada: Statistics Canada (1996b), *Access to the Information Highway: Canadian Households*.
 United States: US Bureau of the Census (1993b), *Computer Use in the US*.

◆ Figure 5.6. *Computer penetration rates in households, by employment status of householder*

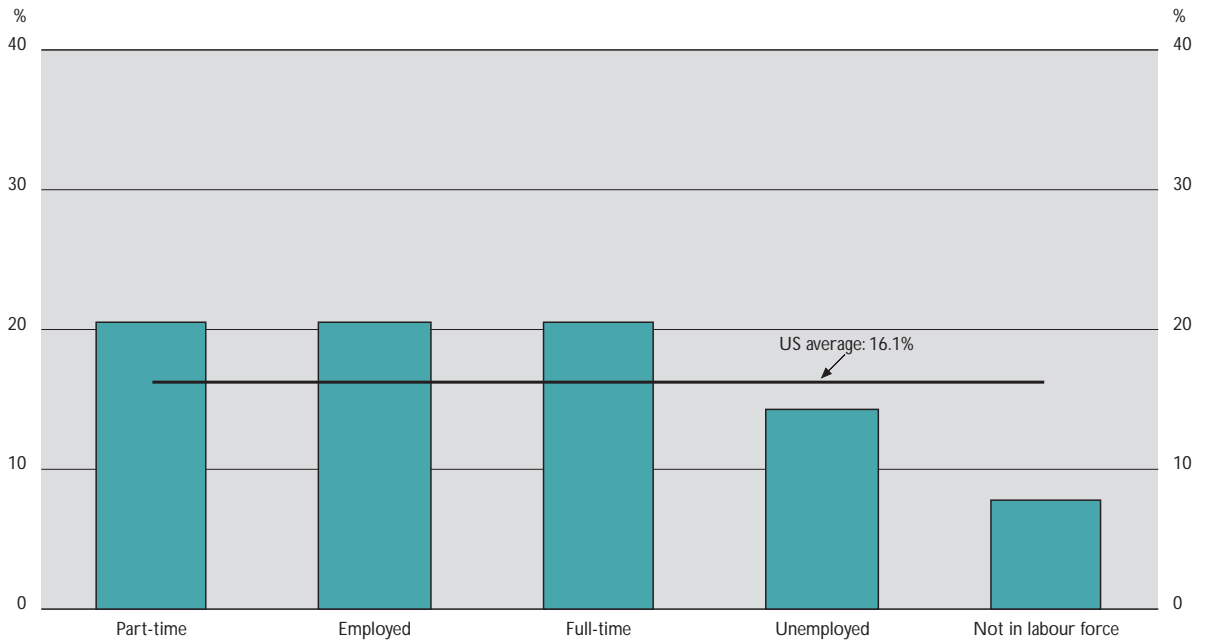


Source: Statistics Canada (1996b), *Access to the Information Highway: Canadian Households*.



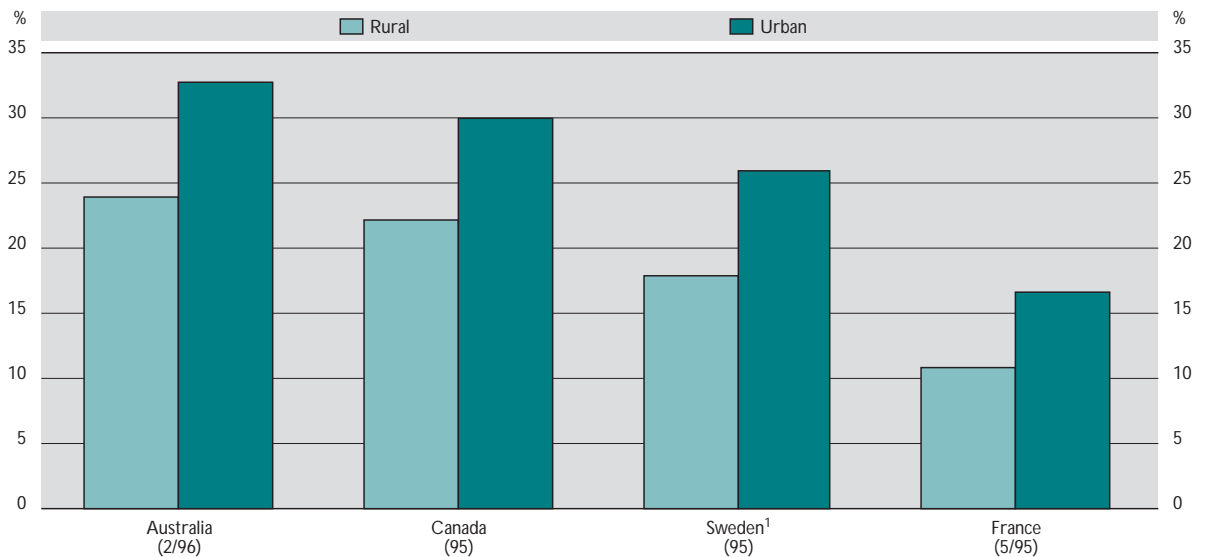
Source: Economic Planning Agency in JEIDA (1995), *PC White Paper*.

◆ Figure 5.7. **PC penetration rates in US households, by employment status, October 1993**
Persons aged 18 and over



Source: US Bureau of the Census (1993b), *Computer Use in the US*.

◆ Figure 5.8. **Computer penetration rates, by residential location**
Share of households with access to a computer



1. For Sweden, data refers to persons aged 16 to 64.

Source: Australia: Australian Bureau of Statistics (1996b), *Household Use of IT*.

Canada: Statistics Canada (1996b), *Access to the Information Highway: Canadian Households*.

France: INSEE (1996), *Conditions de vie des ménages*.

Sweden: Statistics Sweden (1995), *Computer Habits Survey*.

have a modem. In Canada, for example, twice as many urban households as rural ones have a modem (13 per cent vs. 6.5 per cent). The higher cost of accessing the Internet with a modem in rural areas may contribute to this difference.

- Computers are not evenly spread across regions. In Canada, for example, only the three "richer" provinces (out of ten) are above the national average, while in Australia, the penetration rate in the Australian Capital Territory (ACT) is more than 12 percentage points above the national average. In the United States, the penetration rate in the west is clearly above the national average, while it is below it in the south. Regions with major cities generally have a higher PC density than others. The greater Copenhagen area in Denmark is a case in point, as is the Stockholm/Sodertalje region in Sweden, where homes are twice as likely to have a computer as homes in remote rural districts (36 per cent and 18 per cent, respectively).

All these factors are interrelated in their effect on individuals' access to computers. In particular, an NTIA study shows that in the United States the rural poor and rural senior citizens have the lowest computer and modem penetration of all households (NTIA, 1995).

Households that lack computers are an indicator of potential demand. Furthermore, their characteristics provide valuable information as to where policies/support may be needed to improve the likelihood that those who need assistance in connecting to the information highway may get it. The principal reasons given by those not having a computer and/or a modem include lack of use or interest, as well as cost. Home computing still represents a significant investment for many households.

For individuals who do not have a computer at home, public libraries and other community centres possessing ICTs may constitute points of access to the information highway in many countries. In Denmark, for example, 23 per cent of the population had access to the Internet via libraries in their own municipality.

3. HOUSEHOLD USE

Accessing the information highway requires not only access to a computer and a modem but also knowing how to use them. Computer literacy is there-

fore an important determinant of use and is highest among higher income groups and younger users. Surveys that cover the use of IT at school and work as well as in homes show that the leading computer users are those who use computers on a daily basis in their jobs and find uses for them in their homes as well as households with school-age children. The work and study needs of persons in the household are among the principal reasons for buying computers.

Examining the use of home computers reveals how residential users choose to integrate them into their daily activities, including work, learning, entertainment and shopping. Home computers are actually used for a wide variety of purposes. The most frequent uses involve computer games,² educational activities, word-processing, record-keeping, and work-related activities (Figure 5.9). Uses that have gained importance in recent years include desk-top publishing, newsletter creation, working at home, and activities requiring the use of network services such as electronic mail, connecting to bulletin boards or to databases as well as connecting to a computer at work. These uses focus on access to information rather than on conducting transactions.

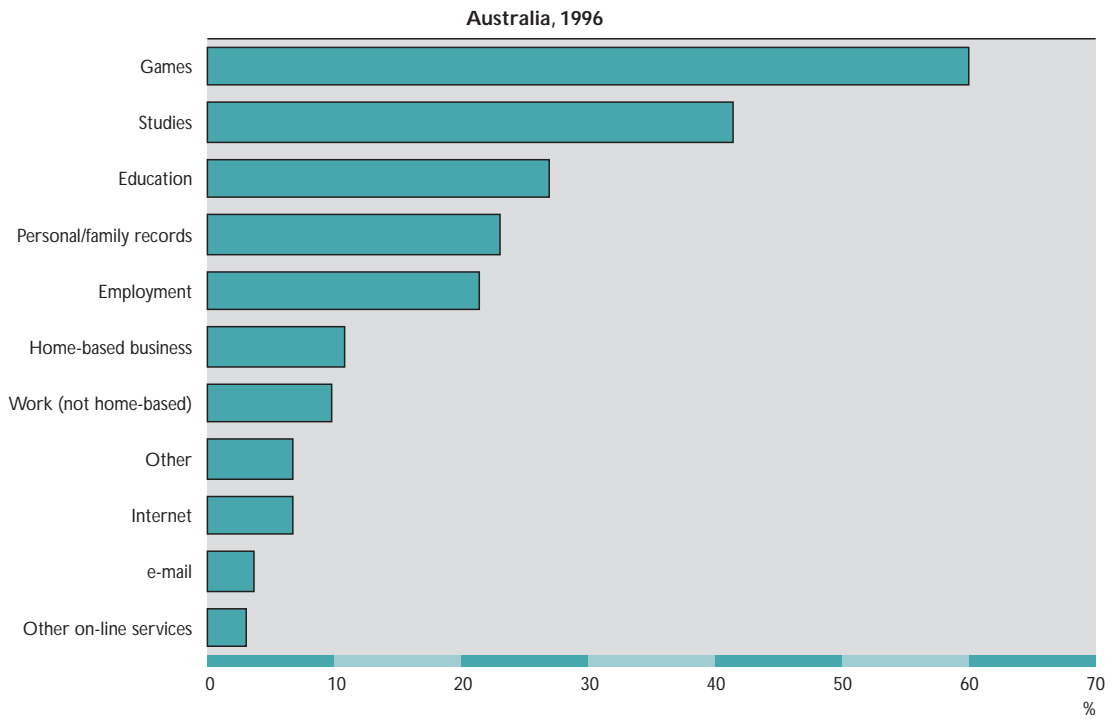
A major purpose of PC use in homes is education. This confirms that ICTs offer learning opportunities beyond educational institutions and that availability of computers at home is an important component of lifelong learning (see Part II). This means that the disparities in home ownership of computers discussed above may have considerable consequences for educational achievements.

The existence of a home-based business in a household is a significant motivation to acquire a home computer, as demonstrated in the case of Australia, where 46 per cent of such households had computers, compared to 30 per cent of all households, and 20 per cent of households without a home-based business. Households with a home-based business were three to four times more likely to have a modem. In the United States, a rather small share of users used computers to run a home-based business in 1993, only 5.5 per cent compared to 11.4 per cent in 1989. More than 28 per cent used home computers to work at home and 8.6 per cent to connect to their computer at work.

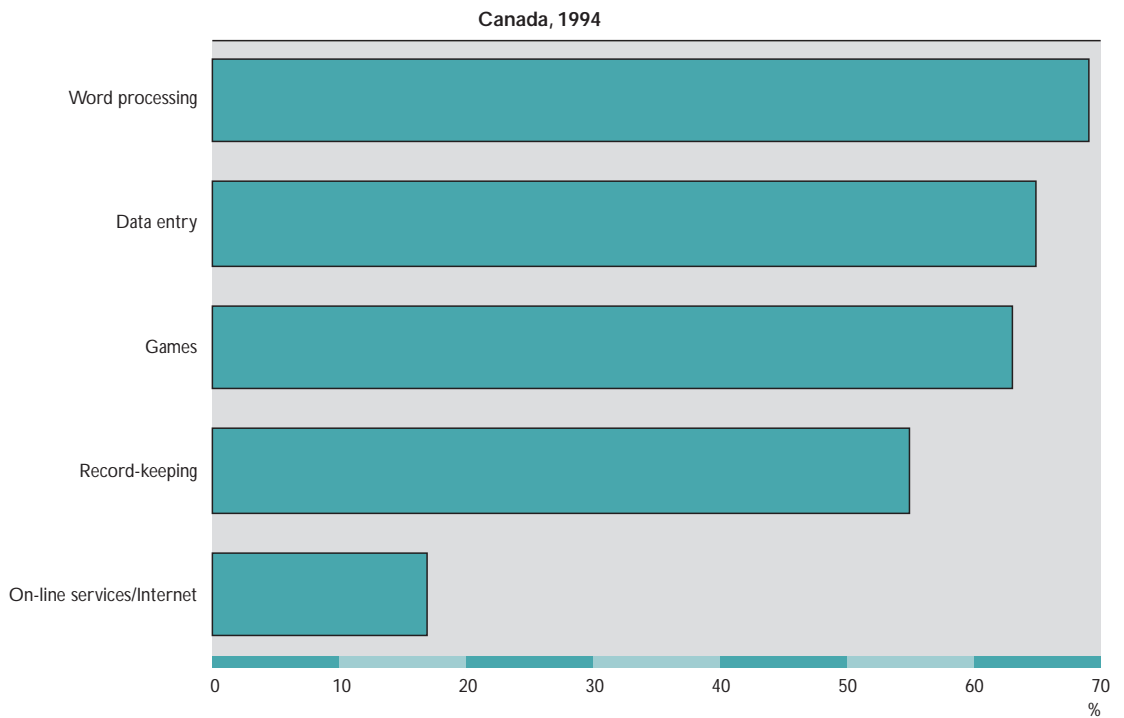
Usage habits of PC/modem users in accessing on-line services has become an important area for policy development.

- In Australia 6.7 per cent of PC users used the Internet, 3.6 per cent used e-mail, and 3 per cent used other on-line services/databases.

◆ Figure 5.9a. *Use of PCs in households*

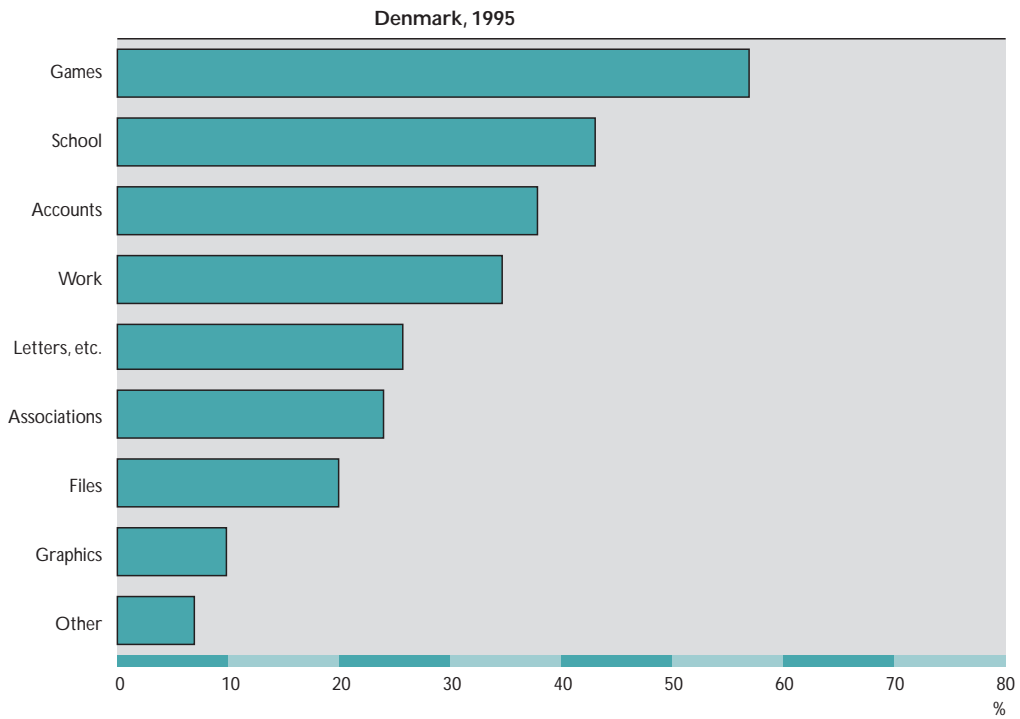


Source: Australian Bureau of Statistics (1996b), *Household Use of IT*.

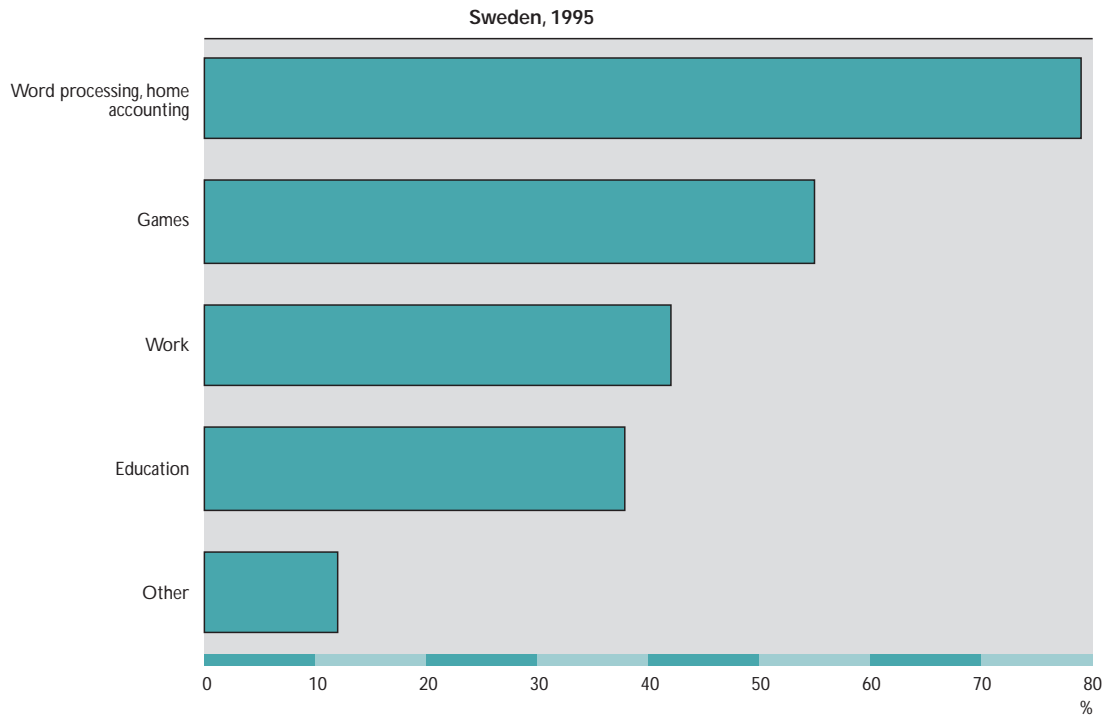


Source: Statistics Canada (1996b), *Access to the Information Highway: Canadian Households*.

◆ Figure 5.9b. *Use of PCs in households*

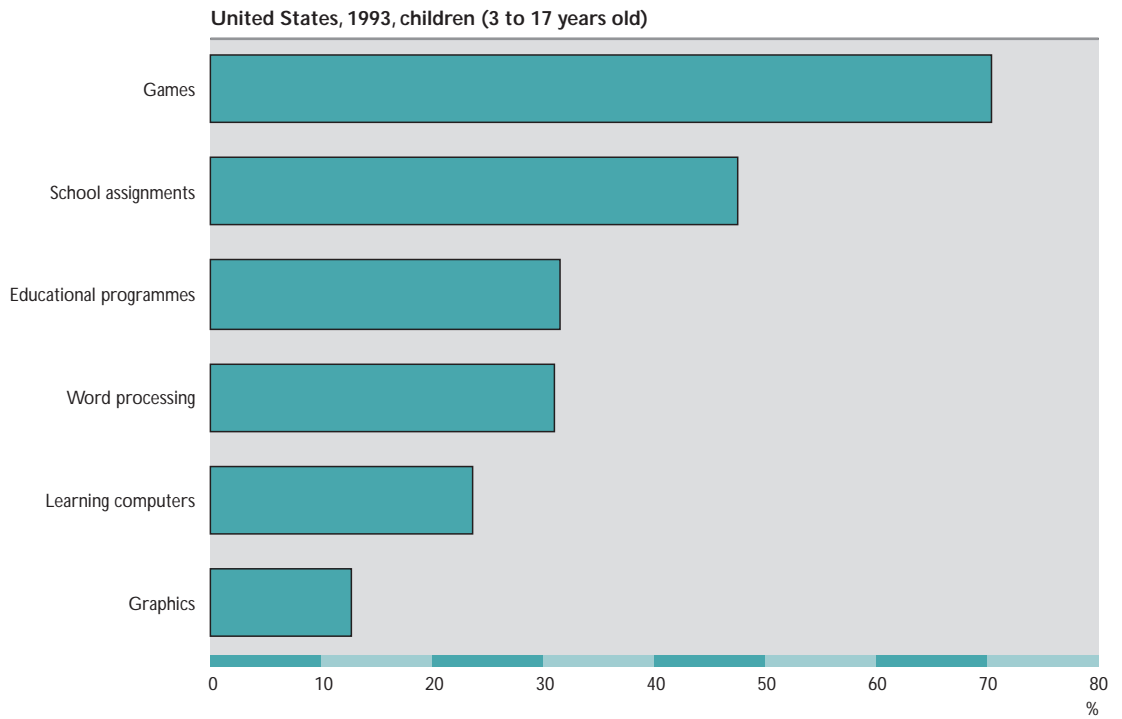


Source: Danish Ministry of Research and Information Technology (1996a), *IT in Figures 1996: 23 Pictures of the Info-Society*.

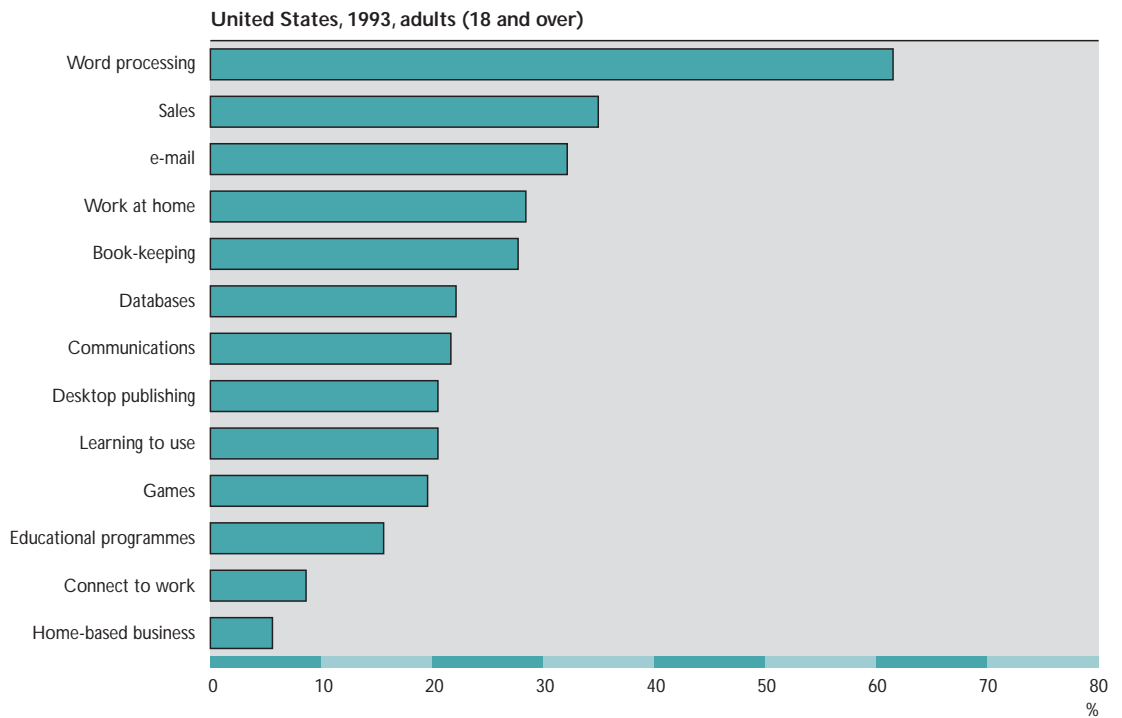


Source: Statistics Sweden (1995), *Computer Habits Survey*.

◆ Figure 5.9c. *Use of PCs in households*



Source: US Bureau of the Census (1993b), *Computer Use in the US*.



Source: US Bureau of the Census (1993b), *Computer Use in the US*.

The age distribution of Internet users was as follows: 11 per cent aged between 5 and 17; 18 per cent between 19 and 25; 38 per cent between 26 and 40; 28 per cent between 44 and 55; and 6 per cent over 55 years.

- While 17 per cent of persons aged 16 and over in Canada and the United States had access to the Internet in August 1995, only 11 per cent had actually used it in the previous three months. Only 44 per cent of these had accessed it from home. The time spent on the Internet averaged 5 hours and 28 minutes per user per week, or 35 minutes per week per person (Statistics Canada, 1996b).
- In Canada, only 17 per cent of people who used a computer in 1994 used it to access on-line services or the Internet. This figure seems low when compared to the 34 per cent of home

computers that have a modem and highlights the importance of looking at actual use in addition to penetration rates.

- In Sweden, almost 9 per cent of those aged 16 to 64 who used computers at home used them for accessing external databases, bulletin boards, or the Internet.
- In the United States, the groups that are the most disadvantaged in terms of computer and modem penetration are the most enthusiastic users of on-line services that facilitate economic betterment and empowerment. Low-income, minority, young, and less educated computer households in rural areas and central cities appear to be likely to engage actively in searching classified ads for employment, taking educational classes, and accessing government reports on-line (NTIA, 1995).

NOTES

1. The penetration rate is an indicator of technology uptake. It must be interpreted with care however, as it is affected not only by the various characteristics of households and individuals to which it relates but also to the evolution of the total number of households.
2. More than 50 per cent of users play games in Australia, Canada, Denmark, Sweden and the United States (children only).