

Information technology workers

Roman Habtu

EMAIL, THE INTERNET and surfing the Web have become as integral to our daily work lives as the telephone. Yet these technologies barely existed a decade ago. The rapid growth of the information, communication and technology industry in the 1990s created a surge in demand for people skilled in computer specialties. As demand grew, so did supply. Information technology (IT) occupations became an attractive profession for people planning or changing their career. The 2001 Census collected the first information about these new occupations using the National Occupational Classification for Statistics, 2001 (see *Data source and definitions*). While some of these occupations may have existed prior to the 1996 Census, the number of jobs within each occupation was not large enough to warrant a separate occupational code.

Except for anecdotal evidence, little is known about the people who design, produce, and service the technology we use every day. Who works in these occupations? What is their education? How many women are there? Or immigrants? Do workers in these occupations

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Table 1: Labour force activity, experienced labour force*

	Labour force		Employed		Unemployment rate
	'000	%	'000	%	%
All occupations	15,576.6	100.0	14,695.1	100.0	5.7
All occupations other than					
natural and applied sciences	14,572.8	93.6	13,738.0	93.5	5.7
Natural and applied sciences	1,003.8	6.4	957.1	6.5	4.7
IT occupations	406.7	2.6	387.5	2.6	4.7
Computer engineers (except software engineers)	27.9	6.9	26.8	6.9	4.1
Information systems analysts and consultants	106.7	26.2	103.1	26.6	3.3
Database analysts and data administrators	14.1	3.5	13.6	3.5	4.0
Software engineers	27.0	6.6	25.9	6.7	3.9
Computer programmers and interactive media developers	102.1	25.1	96.6	24.9	5.4
Web designers and developers	24.2	5.9	22.2	5.7	8.4
Computer and network operators and web technicians	48.1	11.8	45.8	11.8	4.9
User support technicians	49.6	12.2	47.0	12.1	5.2
Systems testing technicians	7.1	1.7	6.6	1.7	6.4

Source: Census of Canada, 2001

* Those employed in the week prior to census enumeration day, or unemployed and last worked in 2000 or 2001.

prefer self-employment? Do they work longer hours, and how much do they earn? In which industries, provinces and urban centres are they concentrated?

IT almost 3% of total employment

Over 387,000 people worked in occupations related to information technology in 2001 (Table 1). This number represented almost 3% of all employed Canadians in 2001,

and 40% of those employed in natural and applied sciences and related occupations.

Three-quarters of these workers were employed in four of the nine occupations examined: information systems analysts and consultants, computer programmers, user support technicians, and computer and network operators and web technicians. Computer and software engineers constituted half of those remaining.

Almost 90% of IT workers were employees in 2001, as were workers in all occupations (88%). However, this percentage masks differences within some IT occupations. For example, more than one in four web designers were self-employed.

Finding work seemed to present few problems. At 4.7%, the unemployment rate for IT workers was significantly lower than the overall rate (7.4%); it was also lower than the rate for occupations other than natural and applied sciences (5.7%).¹ This reflects the favourable labour market for most high-technology workers during this period.

IT attractive to the young and educated

Younger entrants into the labour market were attracted to new occupations in information technology. In 2001, the average age of workers in these occupations was 36 compared with 39 for all occupations and 38 for natural and applied sciences and related occupations (Table 2). Specific occupations had even younger age profiles. For example, nearly 7 in 10 web designers were under 34 with an average age of 32.

A higher proportion of IT specialists (44%) had at least a bachelor's degree compared with those in natural and applied sciences and related occupations (41%). This is more than double the proportion in the employed population (20%). Most specialized in fields of study related to applied sciences, engineering and mathematics (72%)—similar to the overall natural and applied sciences occupation group where three-quarters of all workers specialized in these fields.

Earnings and hours

Only one in seven employed workers in 2001 earned \$60,000 or more. By contrast, more than one in four IT specialists enjoyed such earnings, as did those in natural and applied science occupations. Furthermore, while more than one in three of the total employed earned less than \$20,000, the proportion was only one in six among IT specialists. Median earnings were also above the national average, indicating high returns to this highly educated group.

Part-time work was less prevalent among IT specialists—6% versus 18% overall. This was also the case among workers in the natural and applied sciences and related occupations.

Table 2: Characteristics of employed workers

	All occupations	Sciences	IT occupations
			'000
Total	14,695.1	957.1	387.5
Average age (years)	39	38	36
			%
Both sexes	100.0	100.0	100.0
Men	53.1	78.6	73.0
Women	46.9	21.4	27.0
Immigrant status			
Canadian-born	79.7	72.1	67.6
Immigrant	19.9	27.2	31.5
Non-permanent resident	0.5	0.7	0.8
Education			
High school or less	35.0	8.5	6.7
Postsecondary	45.4	50.5	49.3
Bachelor's degree	19.6	41.0	44.1
Province			
Newfoundland and Labrador	1.3	1.1	0.7
Prince Edward Island	0.4	0.3	0.3
Nova Scotia	2.7	2.2	1.6
New Brunswick	2.2	1.7	1.5
Quebec	23.4	23.4	21.7
Ontario	38.9	42.2	50.0
Manitoba	3.7	2.7	2.3
Saskatchewan	3.3	2.0	1.5
Alberta	10.9	11.9	9.2
British Columbia	12.8	12.2	11.0
Yukon, Northwest Territories and Nunavut	0.3	0.3	0.1
Region			
Urban	80.5	87.9	92.7
Rural	19.5	12.1	7.3
Work status			
Part-time*	18.1	5.9	6.1
Full-time	81.9	94.1	93.9
50 hours or more	21.7	18.0	14.5
Employees	87.6	89.8	89.3
Self-employed**	12.4	10.2	10.7
Average hours worked	39	41	40
Income			
Under \$20,000	35.4	16.4	16.9
\$20,000 - \$39,999	32.1	24.7	24.1
\$40,000 - \$59,999	18.8	29.6	29.6
\$60,000 and over	13.8	29.2	29.4
Median earnings (\$)	28,000	44,900	45,500
Industry			
Manufacturing	13.8	17.8	9.8
Information and culture	2.7	5.8	11.5
Professional, scientific and technical services	6.4	31.7	40.9
Public administration	5.9	10.6	8.8
All other industries	71.2	34.1	29.0

Source: Census of Canada, 2001

* Less than 30 hours.

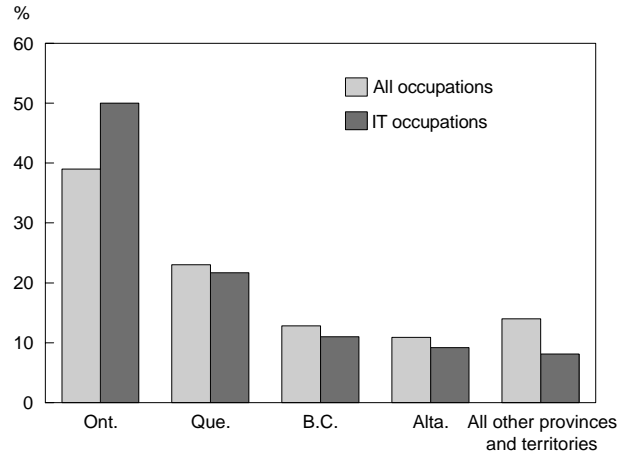
** Incorporated and unincorporated.

Working longer hours is linked with higher earnings, and is largely associated with those with more education (Morissette, Myles and Picot 1993). In 2001, more than one in five employed workers in Canada put in 50 hours or more per week. Given their level of education, one might expect an even higher proportion of IT specialists to put in such long hours. However, only one in seven worked 50 hours or more, a proportion also lower than in natural and applied science occupations. These proportions partly reflect the downturn in demand for IT workers during this period.² The exception was web designers, 20% of whom worked long hours. Average hours worked differed little between all the employed, those in natural and applied sciences, and those in information technology.

IT specialists concentrated in Ontario and in four industries

Seven in 10 IT specialists worked in just four industries—one in four in professional, scientific and technical services alone. Information and culture, another high-tech industry, accounted for 12%;³ manufacturing, 10%; and public administration, 9%. The latter two likely produced and used high-technology services. By contrast, only one in three of all workers worked in these four industries.

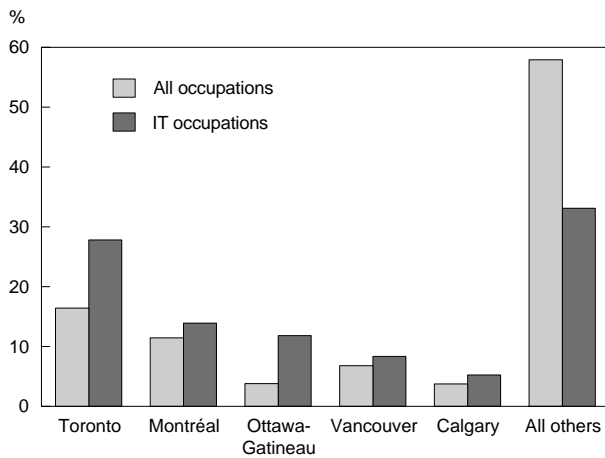
Chart A: Half of IT specialists worked in Ontario.



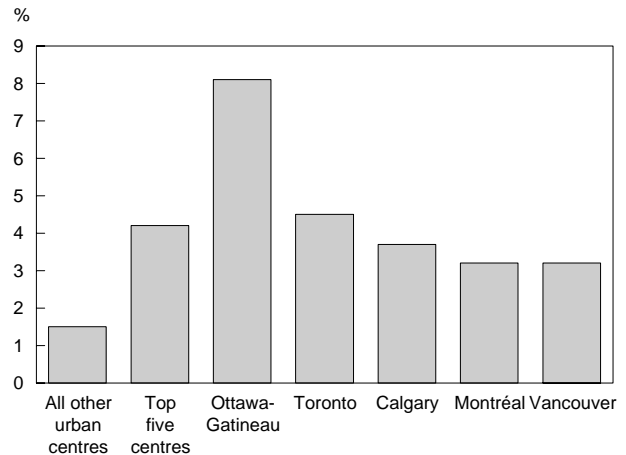
Source: Census of Canada, 2001

Ontario employed one in every two IT specialists in Canada in 2001, substantially higher than its share of all employed (Chart A). Quebec had the second highest proportion (22%), followed by British Columbia (11%) and Alberta (9%). The remaining provinces and territories employed less than 1 in 10.

Chart B: Two-thirds of IT specialists were located in five metropolitan areas...



...with the highest concentration in Ottawa-Gatineau.



Source: Census of Canada, 2001

IT specialists were more concentrated in urban areas (93%) than workers overall (81%). Two-thirds were employed in five metropolitan areas: Toronto, Montréal, Ottawa-Gatineau, Vancouver and Calgary (Chart B). The proportion of IT specialists in this group of top five urban centres was almost three times greater than in all other urban centres combined. The highest concentration, over 8%, was in Ottawa-Gatineau. The lower incidence in Toronto and Montréal reflects their much larger workforces.

Women making inroads

Occupations in information technology were dominated by men (73%). Although this proportion was more than in all occupations (53%), it was still significantly less than for the natural and applied sciences as a whole (79%) (Table 3). Over a quarter of IT workers in 2001 were women. The three with the greatest representation of women were database analysts and data administrators (42%), systems testing technicians (41%), and web designers and developers (33%) (Chart C).

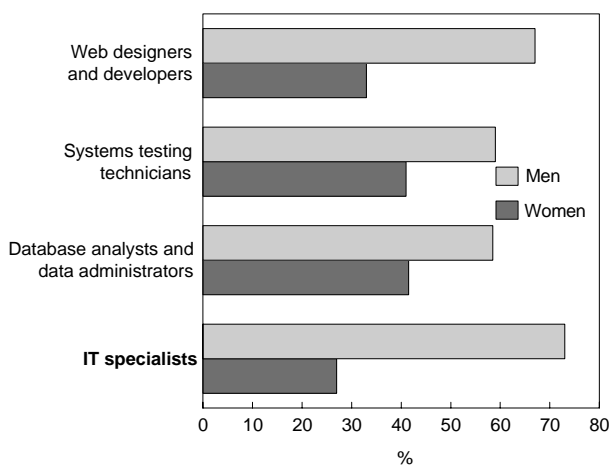
Women in IT occupations had higher than average levels of education. Two in every five held a bachelor's degree or higher, compared with one in five of all employed women. More than half had specialized in

applied sciences, engineering and mathematics, compared with less than 1 in 10 of all employed women, suggesting that women have made headway into non-traditional fields of study.

Although women made inroads into IT occupations, they had lower median earnings, even though more than 9 in 10 worked full time in 2001 compared with only three-quarters of employed women overall (Table 4). For example, women employed as database analysts had median earnings of \$38,900 in 2000 compared with \$50,100 for men.⁴ Earnings differences may be associated with the slightly lower proportion of women working full time and lower returns to postsecondary education below a bachelor's degree. As in other IT specialties, a high proportion of women employed as database analysts worked full time (90%); however, this was lower than the proportion of men (96%). Furthermore, fewer women in this occupation (43%) had a bachelor's degree or higher compared with men (52%).

In contrast, median earnings for women employed as systems testing technicians (\$40,000) and web designers (\$29,100) were above those of men. This may in part be due to women's higher educational attainment in both these occupations, as well as to the high proportion working full time (particularly for systems testing technicians). However, women's earnings in both occupations were lower than the median for women in all IT specialties (\$41,100). Web designers also had the lowest median earnings among all IT specialists and experienced the highest unemployment rate.

Chart C: Two in five database analysts in 2001 were women.



Source: Census of Canada, 2001

Contribution of immigrants

In 2001, proportionately more immigrants worked in IT occupations (32%) than in all occupations (20%) (Chart D), and even more than in the natural and applied sciences and related occupations (27%). Immigrants made up nearly half of software engineers, 40% of computer engineers, and more than one-third of computer programmers (Chart E). Furthermore, their representation in every IT occupation was above their overall average (20%).

Nearly half the immigrants working in IT occupations came in the 1990s (49%)—31% in the second half of the decade, a period coinciding with the high-technology boom (Chart F). For example, more than 6 in 10 immigrants employed as software engineers arrived in

Table 3: Personal characteristics of IT specialists

	Total '000	Women %	Immigrant		Average age years	BA or above %
			Both sexes %	Women %		
All occupations	14,695.1	46.9	19.9	45.9	39	19.6
Natural and applied sciences and related occupations	957.1	21.4	27.2	21.4	38	41.0
Professional	525.4	22.2	32.1	22.2	38	60.1
Technical	431.7	20.3	21.2	19.9	38	17.8
IT occupations	387.5	27.0	31.5	26.5	36	44.1
Professional						
Computer engineers (except software)	26.8	14.4	39.5	14.4	37	59.4
Information systems analysts and consultants	103.1	31.2	29.0	29.1	39	47.5
Database analysts and data administrators	13.6	41.5	30.6	40.1	38	48.3
Software engineers	25.9	17.7	47.1	20.1	35	76.0
Computer programmers and interactive media developers	96.6	23.2	36.6	27.8	34	50.1
Web designers and developers	22.2	33.1	24.6	34.4	32	38.1
Technical						
Computer and network operators and web technicians	45.8	25.2	25.0	22.1	36	22.5
User support technicians	47.0	31.0	22.7	25.3	35	21.8
Systems testing technicians	6.6	40.7	35.6	47.5	35	33.2

Source: Census of Canada, 2001

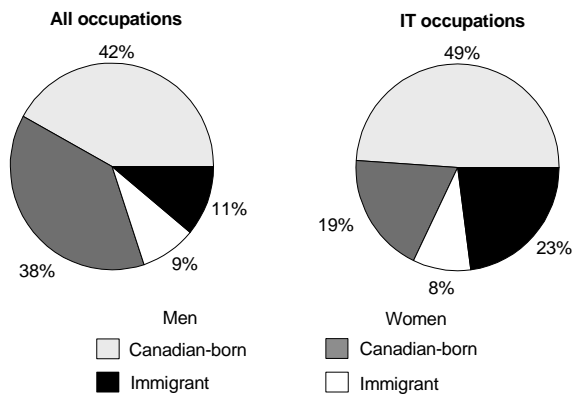
Canada between 1996 and 2001. These figures suggest that the 1997 policy to facilitate the entry of immigrants into Canada to work in this field did indeed have the desired effect.⁵

Software engineers had the highest median earnings (\$59,900) of all IT workers, and close to one-third earned at least \$75,000 in 2000.

Immigrant women constituted more than 8% of IT workers. While they were the least represented group, their proportion in IT occupations was comparable with that in all occupations (9%).

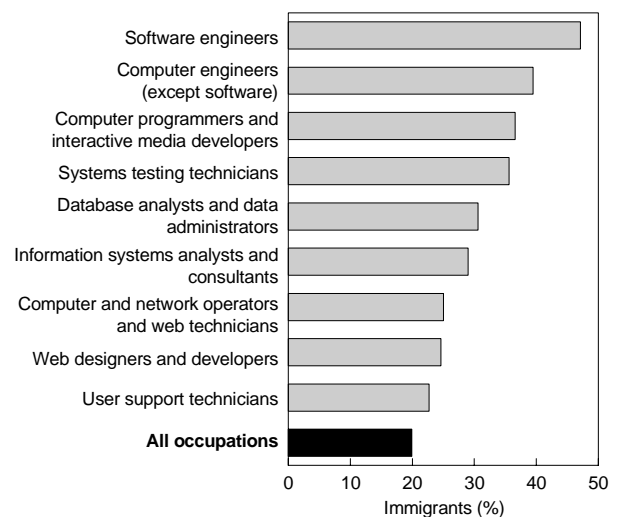
Their presence in IT occupations was also similar to that of women in the total population. Nearly one in two immigrants working as systems testing technicians in 2001 were women, as were two in five database analysts, and one in three web designers.

Chart D: IT occupations employed higher than average proportions of men and immigrants.



Source: Census of Canada, 2001

Chart E: Nearly half of software engineers in 2001 were immigrants.



Source: Census of Canada, 2001

Data source and definitions

In the **2001 Census**, occupations were classified for the first time according to the **National Occupational Classification for Statistics**.

The classification included nine new occupations related to information technology, under the major group 'Natural and applied sciences and related occupations.'

C Natural and applied sciences and related occupations

- C0 Professional occupations in natural and applied sciences
 - C04 Other engineers
 - C047 Computer engineers (except software engineers)
 - C07 Computer and information systems professionals
 - C071 Information systems analysts and consultants
 - C072 Database analysts and data administrators
 - C073 Software engineers
 - C074 Computer programmers and interactive media developers
 - C075 Web designers and developers
- C1 Technical occupations related to natural and applied sciences
 - C18 Technical occupations in computer and information systems
 - C181 Computer and network operators and web technicians
 - C182 User support technicians
 - C183 Systems testing technicians

Labour force activity in the census is defined as follows:

Labour force: the employed and unemployed

Employed: those who worked in the reference week (the week prior to census enumeration day) or were absent from work for various reasons

Unemployed: those who looked for work in the reference week, were on temporary layoff, or had a job starting in four weeks or less

Experienced labour force: employed or unemployed but last worked in 2000 or 2001

Inexperienced labour force: those who last worked prior to 2000 or never worked

2 A recent study showed that hours worked fell by more (-8.6%) than employment (-5.4%) in the computer and telecommunications (CT) sector between the last quarters of 2000 and 2001 (Bowlby and Langlois 2002). By contrast, workers in knowledge-based workplaces were working above average hours in the late 1990s (Drolet and Morissette 2002).

3 For more detailed discussion of the high-technology sector, see Bowlby and Langlois 2002.

4 Income information collected in the 2001 Census was based on the reference year 2000.

5 In response to skill shortages in the software industry, the federal government introduced a pilot project in 1997 to facilitate the entry of immigrants with skills in software development. Known as the Software Development Worker Pilot Program, the pilot was aimed at filling positions for which there were no qualified Canadian citizens or permanent residents. The seven occupations identified were senior animation effects editor, embedded systems software designer, MIS software designer, multimedia software developer, software developer services, software products developer, and telecommunications software designer. More information on the program is available on the Citizenship and Immigration Canada Web site at www.cic.gc.ca/english/press/98/9869-pre.html (accessed July 15, 2003).

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