

# High-tech boom and bust

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OVER THE LAST FEW years, the information and communication technology (ICT) sector has become increasingly important. In early 1997, the sector contributed \$33.8 billion to the domestic economy, but by December 2000 this amount had increased a whopping 84% to a peak of \$62.3 billion. The rate of growth during these four years was much greater than that of the economy as a whole (Chart A). As a result, by the end of 2000, the ICT sector made up 7% of all economic

activity in the country, up sharply from 4% four years earlier.

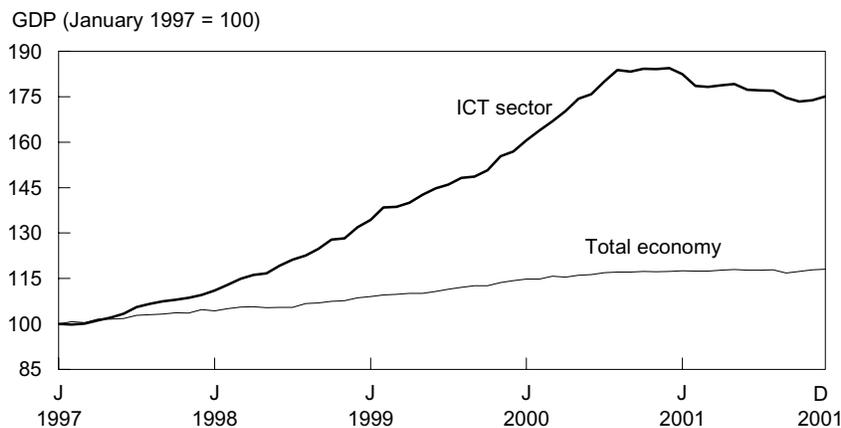
However, the value of the ICT sector plummeted over most of 2001, entirely on the manufacturing side. (ICT services continued to rise in 2001, albeit at a reduced pace from the previous year.) By October, ICT gross domestic product was at \$58.0 billion, a drop of 7%. In the last two months of the year, this figure edged up, ending the year at \$58.8 billion, still down 6% for the year (Chart B).

With less demand for their products, a number of large corporations in the ICT sector announced massive layoffs in 2001 and halted the hiring of new staff. As a result, employment in this sector declined dramatically.

The full extent of the decline cannot be measured using the two main Statistics Canada employment surveys: the Labour Force Survey (LFS) and the Survey of Employment, Payroll and Hours (SEPH). Each survey has a key weakness: the LFS cannot produce sufficiently detailed industry data, and SEPH excludes the self-employed—who make up about 1 in 10 ICT workers. However, it is possible to measure employment in the closely related computer and telecommunications (CT) sector. The CT sector is probably the core of what many Canadians consider the ‘high-tech’ sector. It includes the manufacture of computers, communication equipment, and semiconductors. It also includes companies that design and maintain computer systems, as well as telecommunications firms (see *The CT sector*).

The goal of this article is two-fold: first, to document the size of the decline in CT employment and hours worked in Canada and selected large urban centres according to the Labour Force Survey. This gives an idea of the CT sector’s influence on overall employment in 2001. Second, on

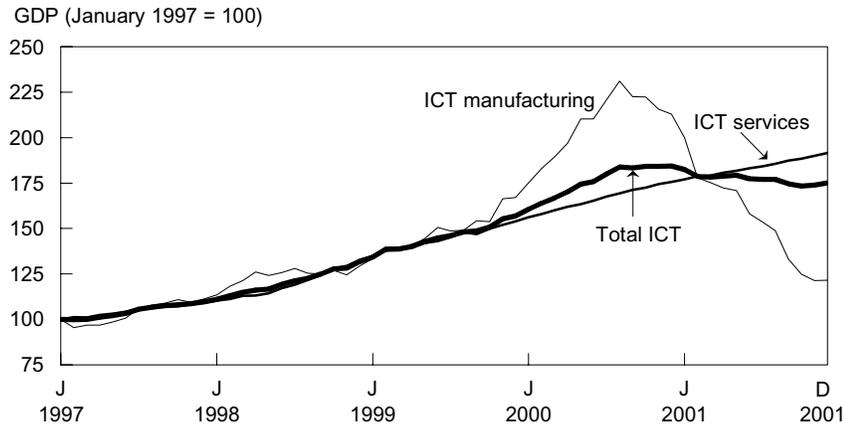
**Chart A: The ICT sector has become increasingly important to the economy.**



Source: National Accounts, gross domestic product, seasonally adjusted

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**Chart B: Declines in manufacturing caused a drop in GDP within the ICT sector in 2001.**



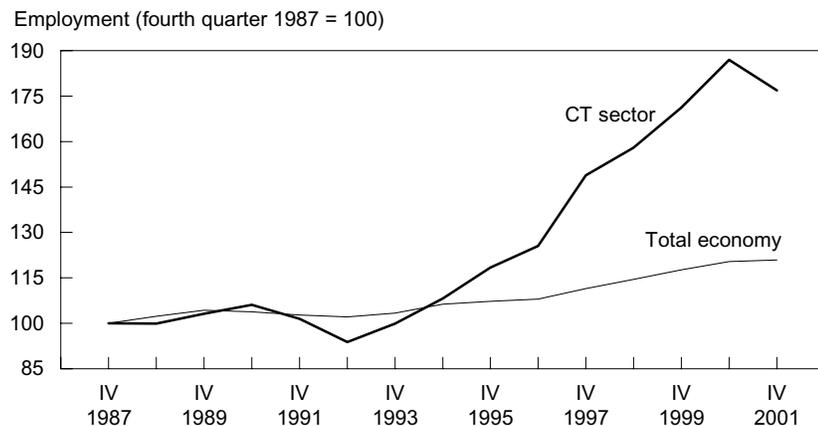
Source: National Accounts, gross domestic product, seasonally adjusted

a more technical note, the article introduces this new sector—a grouping of industries for which Statistics Canada has more data than it does for the standard ICT sector.

**A heady period for Canada’s CT sector**

The CT sector employs a lot of people—632,000 on average in 2001. These people worked some 23 million hours, accounting for 4.2% of employment and 4.6% of total hours worked. The majority of employment and hours was found in computer systems design and related services (about 40%) and telecommunications (around 25%).

**Chart C: CT employment grew faster than overall employment.**



Source: Labour Force Survey

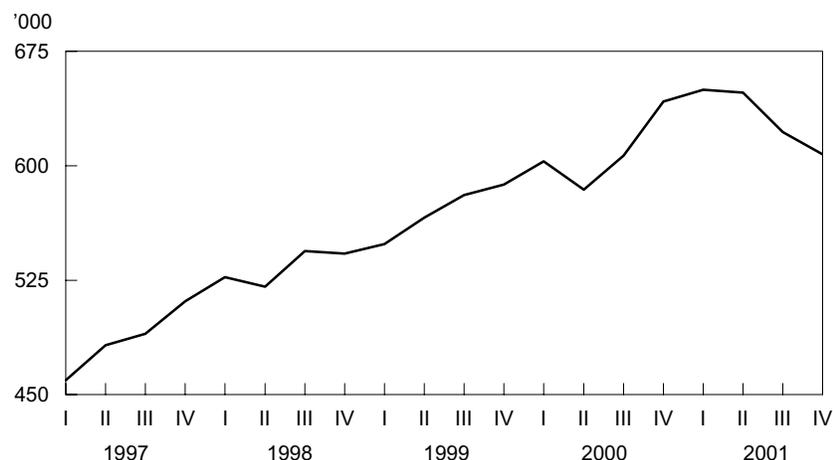
Job growth was very strong, to say the least (Chart C). From the fourth quarter of 1996 to the fourth quarter of 2000, CT employment increased 211,000 (49%), and the number of hours worked in this sector grew by 8 million (51%). These rates of growth were three to four times greater than for the economy as a whole—11% for employment and 15% for the number of hours worked.

**But the bubble has burst**

Beginning in January 2001, employment growth slowed in a number of sectors of the economy. The CT sector was particularly hard hit (Chart D). From its peak in March to a trough in October 2001, employment tumbled 61,000 or 9%.<sup>1</sup> In communications equipment manufacturing, employment dropped 36% during this period.

Even though CT employment picked up somewhat in November, in the fourth quarter of 2001 it was still far less than a year earlier—down 5% to 608,000 (Table 1). Had it not been for a large drop in CT manufacturing employment (-23%), CT employment would have managed to show a small increase over 2001.

The boom and bust nature of the CT sector is not unique to the current economic slowdown. During the 1990-92 recession, the labour market contracted more sharply in the CT sector than in the economy as a whole. It appears that during economic expansion, employment, and hours worked in the CT sector increase more rapidly than in the total economy; conversely, during economic slowdown, they decrease more rapidly.

**Chart D: CT employment tumbled after peaking in the first quarter of 2001.**

Source: Labour Force Survey

**CT employment swings were more pronounced**

While CT employment fell 35,000 or 5.4%, the non-CT sectors of the economy registered a net gain of 101,000 jobs (0.7%) from the last quarter of 2000 to the same quarter a year later. Thus, even though the CT sector accounted for only a small proportion of total employment, it wiped out over a third of the net employment gains registered by other sectors.

The CT sector also saw its net number of hours worked decline by about 2.1 million (-8.6%) between the last quarters of 2000 and 2001. The non-CT parts of the economy saw a net loss of 12.9 million hours (-2.6%), leaving the

**Table 1: Employment in the CT sector**

	Fourth quarter average					
	1996	1997	1998	1999	2000	2001
	'000					
<b>Employment</b>						
CT manufacturing	108.7	135.5	113.3	149.0	168.7	129.4
CT services	322.5	375.8	429.2	438.9	473.4	478.1
CT total	431.2	511.3	542.4	587.9	642.1	607.5
Total economy	13,463.3	13,903.3	14,278.1	14,667.5	15,006.8	15,073.6
CT share (%)	3.2	3.7	3.8	4.0	4.3	4.0
	%					
<b>Change from previous fourth quarter</b>						
CT manufacturing	10.9	24.6	-16.4	31.6	13.2	-23.3
CT services	4.5	16.5	14.2	2.3	7.9	1.0
CT total	6.1	18.6	6.1	8.4	9.2	-5.4
Total economy	0.7	3.3	2.7	2.7	2.3	0.4
	'000					
<b>Hours worked</b>						
CT manufacturing	4,135.3	5,174.3	4,334.7	5,726.1	6,375.4	4,693.5
CT services	11,777.8	13,826.9	15,470.4	16,182.9	17,633.6	17,239.9
CT total	15,913.1	19,001.2	19,805.1	21,909.0	24,009.0	21,933.3
Total economy	452,940.1	471,504.3	482,266.2	498,463.2	518,922.0	503,914.0
CT share (%)	3.5	4.0	4.1	4.4	4.6	4.4
	%					
<b>Change from previous fourth quarter</b>						
CT manufacturing	7.9	25.1	-16.2	32.1	11.3	-26.4
CT services	4.8	17.4	11.9	4.6	9.0	-2.2
CT total	5.6	19.4	4.2	10.6	9.6	-8.6
Total economy	0.0	4.1	2.3	3.4	4.1	-2.9

Source: Labour Force Survey

total hours lost in the economy at 15 million or 2.9%. Even though less than 5% of all hours worked in the economy are in the CT sector, it was responsible for 14% of the decline in hours worked in 2001.

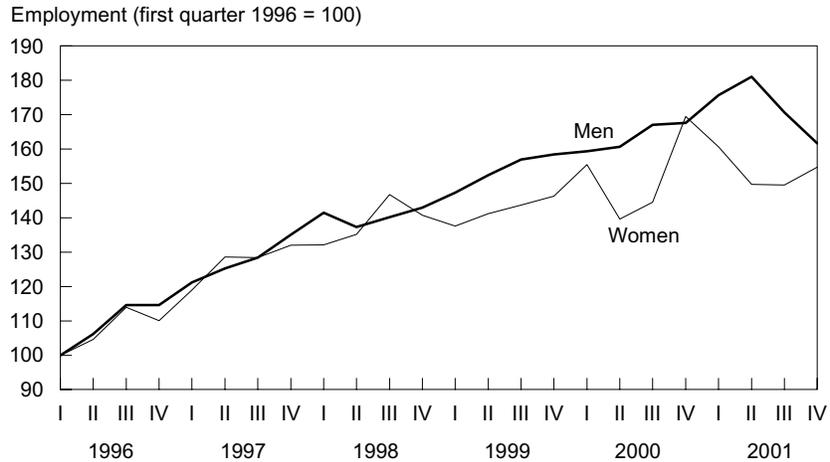
**Workers affected by the drop in CT employment**

**Class of worker**

During the CT boom of 1997 to 2000, employee growth (52%) was stronger than that of self-employment (28%). However, in 2001, the entire drop occurred among employees (down 42,000 or 7%). In fact, the number of self-employed CT workers rose (up 7,000 or 10%), driving their share from 12% in the last quarter of 2000 to 14% a year later. Almost all self-employment was in services—a rate of 17% in the last quarter of 2001, compared with only 2% in manufacturing (Table 2).

Despite the increase in 2001, the number of self-employed in the last quarter of 2001, at 82,000, was still 9% below the peak in the second quarter of 1999. In the first half of 1999, self-employment rose

**Chart E: Over the last five years, CT employment growth has been stronger for men.**



Source: Labour Force Survey

considerably, probably the result of firms engaging contract workers to correct Y2K problems.

**Men versus women**

In the last quarter of 2001, almost two-thirds of all CT workers were men, much higher than the proportion outside the CT sector (53%). Even so, in 2001 the

CT employment decline affected women (-20,000) more than men (-14,000) (Chart E).

**Level of education**

As one might expect, CT workers have more formal education than people working outside the sector. For example, at the end of 2001, about 36% of CT workers had a university degree, well above the 19% rate for other workers. During the 1997-2000 period, employers raced to hire highly qualified CT professionals, doubling the number of university-educated workers. However, in 2001, half the job losses in the CT sector were among workers with a university degree (Table 3).

**Communities affected**

The Labour Force Survey can also provide data on regional labour markets (although usually, the smaller the area studied, the smaller

**Table 2: CT manufacturing and services employment**

	Manufacturing			Services		
	Fourth quarter 2001	Change from fourth quarter 1996	Change from fourth quarter 2000	Fourth quarter 2001	Change from fourth quarter 1996	Change from fourth quarter 2000
<b>Total</b>	<b>129.4</b>	<b>20.7</b>	<b>-39.3</b>	<b>478.1</b>	<b>155.5</b>	<b>4.6</b>
Employees	126.4	20.1	-40.3	399.1	132.5	-1.7
Self-employed	3.0	0.6	1.0	79.0	23.1	6.3

Source: Labour Force Survey

## The CT sector

Before determining trends in employment in the computer and telecommunications (CT) sector, it is important to define this industry grouping. CT is a sub-sector of the information and communication technology (ICT) sector and needs to be understood in this context.

The Science, Innovation and Electronic Information Division at Statistics Canada along with Industry Canada have developed a definition for the ICT sector for each of the industry classification systems used at Statistics Canada: the Standard Industry Classification (SIC) for 1980 (four-digit level) and the North American Industry Classification System (NAICS) for 1997 (five-digit level) (April, 1999). This work was based on a similar exercise conducted by the Organisation for Economic Co-operation and Development (OECD) in developing their own classification system (International Standard Industry Classification) (OECD, 2000). In general, the ICT sector is defined as the combination of manufacturing and service industries that electronically capture, transmit and display data and information (Statistics Canada, 2001).

However, many Statistics Canada surveys do not use the detail needed to define the ICT sector. In the case of the Labour Force Survey, industries are classified at the four-digit NAICS level.

One approach to measuring employment in the ICT sector using the LFS is to sum employment in all four-digit NAICS industries that include at least one five-digit NAICS ICT industry. Doing so includes many non-ICT industries. This would not be a problem if the industries were very small, but detailed industry data from the Survey of Employment, Payroll and Hours (SEPH) show that this approach leads to an unacceptable over-estimation of ICT employment. The same finding would likely be true of any Statistics Canada survey limited by the detail of its industry coding.

The conclusion, therefore, is that surveys that produce industry data only at the four-digit level cannot produce estimates for the ICT sector. They can, however, produce estimates for a core group of ICT industries termed

*computer and telecommunications* (CT). The CT sector can be seen as a sub-sector or 'core' component of ICT. In fact, according to SEPH, an estimated 88% of ICT employees work in the CT sub-sector—a percentage that has remained relatively unchanged since 1995.

The CT sector comprises 12 NAICS industries:

### Manufacturing

- Commercial and service industry machinery (NAICS 3333)
- Computer and peripheral equipment (3341)
- Communications equipment (3342)
- Audio and video equipment (3343)
- Semiconductor and other electronic components (3344)
- Navigational, measuring, medical and control instruments (3345)

### Services

- Computer and communications equipment and supplies wholesaler-distributors (4173)
- Software publishers (5112)
- Telecommunications (5133)
- Data processing (5142)
- Computer systems design and related services (5415)
- Electronic and precision equipment repair and maintenance (8112).

Not included in CT, but included in ICT, are the following:

- Communication and energy wire and cable manufacturing (33592)
- Office and store machinery and equipment wholesaler-distributors (41791)
- Cable and other program distribution (51322)
- Office machinery and equipment rental and leasing (53242)
- Other information services (51419)

The only NAICS industry included in CT that is not included in ICT is *Other communications equipment manufacturing* (33429).

**Table 3: CT employment, by education**

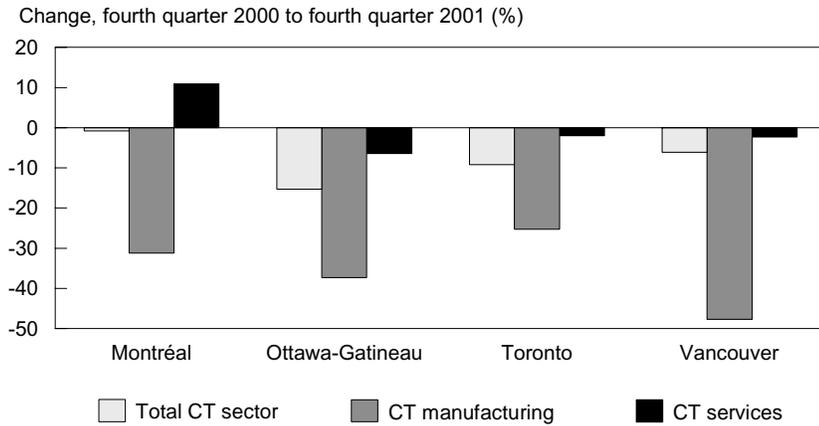
	Fourth quarter 2000	Change from fourth quarter 1996		Fourth quarter 2001	Change from fourth quarter 2000	
	'000	'000	%	'000	'000	%
<b>Total</b>	<b>642.1</b>	<b>210.9</b>	<b>48.9</b>	<b>607.5</b>	<b>-34.6</b>	<b>-5.4</b>
High school or less	125.4	23.6	23.2	123.2	-2.2	-1.8
Some postsecondary	61.5	11.8	23.8	55.1	-6.4	-10.4
Postsecondary, non-university	216.6	57.4	36.1	207.9	-8.7	-4.0
University degree	238.7	118.0	97.8	221.3	-17.3	-7.3

Source: Labour Force Survey

the sample size). Computer and telecommunications employment tends to be concentrated in large urban centres. In fact, about two-thirds of all CT workers are employed in Toronto, Montréal, Vancouver, and Ottawa-Gatineau—much higher than the share of total employment in these centres (39%).

Although similar in many regards, the CT workforces in these four key centres have some different

**Chart F: In each of the four urban centres, CT manufacturing employment fell sharply in 2001.**



Source: Labour Force Survey

characteristics. For example, Toronto has a relatively large computer and peripheral equipment manufacturing component, while Montréal and Ottawa-Gatineau are more specialized in communications equipment manufacturing. A relatively large proportion of Montréal's workforce is also employed in semiconductor manufacturing. Vancouver, meanwhile, tends to lean toward the services side with its important telecommunications and computer systems design industries.

With different CT sector composition as well as different economic conditions in the four centres, different CT employment trends in 2001 might also have been expected—but what *did* happen?

During the 1997-2000 boom, CT employment in the four centres rose 64%—remarkable growth for a four-year period. However, in 2001, conditions took a dramatic

turn for the worse (Chart F). In the fourth quarter, CT employment in Ottawa-Gatineau was down 10,000 (-15%) from a year earlier (Table 4). While not the only area of weakness, the communications equipment industry laid off numerous workers. Toronto had 17,000 fewer workers at the end of the year (-9%), while in Vancouver employment dropped 4,000 (-6%). In Montréal, the drop was less dramatic as gains in employment in CT

services largely offset declines in manufacturing. At the end of 2001, CT employment in Montréal was down 1,000 (-1%).

In Montréal and Ottawa-Gatineau, CT employment peaked sooner in the year, and also noted a recovery in the last quarter. In Montréal, the peak of 106,000 occurred in December 2000. By September, that number had dropped to 91,000 (-15%) but rose considerably in the last quarter. Ottawa-Gatineau reached its peak in March 2001 (69,000), and bottomed out in September (51,000 or -26% from the peak), recovering somewhat in the last quarter.

In both Toronto and Vancouver, CT employment peaked in the middle of 2001. In Toronto, the peak was attained in July, when there were 204,000 CT workers, a figure that dropped to 169,000 (-17% from the peak) at the end of the year. In Vancouver, CT employment hit 64,000 in August but slid to 58,000 by December (-8% from the peak). Unlike in Montréal and Ottawa-Gatineau, CT employment in Toronto and Vancouver showed no increase in the last quarter of 2001.

**Table 4: CT employment in major urban centres**

	Fourth quarter 2000	Change from fourth quarter 1996		Fourth quarter 2001	Change from fourth quarter 2000	
	'000	'000	%	'000	'000	%
Toronto	186.2	80.0	75.3	169.1	-17.1	-9.2
Montréal	106.3	32.8	44.6	105.4	-0.9	-0.8
Ottawa-Gatineau	67.5	28.4	72.6	57.2	-10.3	-15.3
Vancouver	62.1	23.9	62.6	58.3	-3.8	-6.1

Source: Labour Force Survey

## Summary

Gross domestic product in the information and communication technology (ICT) sector declined rather dramatically at the end of 2001, especially in the manufacturing component. This led to layoffs and hiring freezes in ICT companies. While the full scale of the ICT decline is not directly measurable, total employment can be estimated in a core sub-sector of ICT: computer and telecommunications. This sub-sector experienced amazing job growth during the 1997-2000 period. However, CT employment fell dramatically in 2001, especially in its manufacturing industries. Some types of workers, such as women, employees, and university graduates, were more affected by this decline. Similarly, areas such as Ottawa-Gatineau and Toronto were hit harder by high-tech woes than most other urban areas in Canada.

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### Perspectives

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## ■ Note

1 Although not seasonally adjusted, these CT data show little if any seasonal pattern. In other words, seasonally adjusting the overall CT employment series has little effect.

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