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Information and Communications Technologies in Canada

A statistical profile of the ICT sector

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Information and
Communications
Technologies
in
Canada

A statistical profile of the ICT sector

Catalogue No. 56-506-XIE

Produced in the Science, Innovation and Electronic Information Division

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SYMBOLS

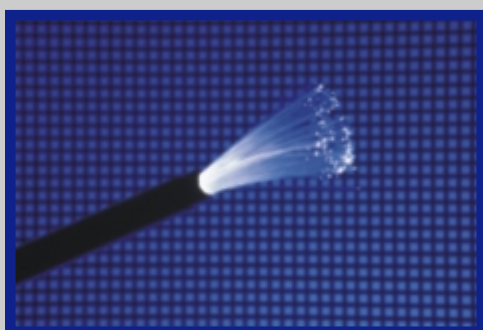
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- nil or zero.
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- r** revised figures.
- x** confidential to meet secrecy requirements of the Statistics Act.
- ()** negative value.

ABBREVIATIONS

CAGR	Compound Annual Growth Rate
CANSIM	Canadian Socio-Economic Information Management System
GDP	Gross Domestic Product
ICT	Information and communications technologies
ISIC	International Standard Industrial Classification
NAICS	North American Industry Classification System
OECD	Organization for Economic Co-operation and Development
R&D	Research and development
SEPH	Survey of Employment, Payrolls and Hours
SIC	Standard Industrial Classification
WPIIS	Working Party on Indicators for the Information Society

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In addition, we thank our colleagues at Industry Canada for their continuing support and assistance.

1. ICT Sector Overview

1.1 Defining the ICT sector

For years, the term 'information and communications technologies' (ICTs) has been widely used to describe both the fast-paced, new-growth industrial segment of the economy, as well as the continuous introduction of new technologies that foster the information society. Policy makers and analysts in Canada and around the world have been striving to understand and measure the importance of the ICT sector. In 1998, major progress was achieved when countries within the Organization for Economic Co-operation and Development (OECD) reached an important consensus on an industry-based definition of the ICT sector, under work carried out by the Working Party on Indicators for the Information Society (WPIIS). The development of a widely accepted and consistently applied definition provides a statistical framework for international comparisons and intertemporal measurements of this rapidly evolving sector (Measuring the ICT Sector, OECD, 2000).

Statistics Canada's first quantification of the ICT sector appeared in the compendium publication entitled *Networked Canada: Beyond the Information Highway*, Catalogue Number 56-504-XIE, April 2001. This publication updates these estimates with the most recent data, while providing improved industrial coverage and in-depth analysis of Canada's ICT sector.

The ICT sector is defined as the combination of manufacturing and services industries, which electronically capture, transmit and display data and information. This list of industries was drawn from the International Standard Industrial Classification (ISIC, Rev.3). Concordances were developed between these industries and the industry classification standards used in Canada (*Innovation Analysis Bulletin*, Statistics Canada, 2000). Until recently, the industry standard used in Canada was the 1980 Canadian Standard Industrial Classification (SIC), which is now being replaced by the 1997 North American Industry Classification System (NAICS). This new classification system has the advantage of recognizing new industries, especially in the two fast-growth areas of computer services and telecommunications. To the extent possible, the statistical analysis presented here is NAICS-based.

Figure 1
NAICS-based ICT sector industries

Manufacturing:

Commercial and service industry machinery	(33331)
Computer and peripheral equipment	(33411)
Telephone apparatus	(33421)
Radio and television broadcasting and wireless communications equipment	(33422)
Audio and video equipment	(33431)
Semiconductor and other electronic components	(33441)
Navigational, measuring, medical, and control instrumentation	(33451)
Communication and energy wire and cable	(33592)

Services:

Software publishers	(51121)
Cable and other program distribution	(51322)
Telecommunications services	(5133)
Other information services	(51419)
Data processing services	(51421)
Computer systems design and related services	(54151)
Electronic and precision equipment repair and maintenance	(81121)
Computer, computer peripheral and pre-packaged software, wholesaler-distributors	(41731)
Electronic components, navigational and communications equipment and supplies, wholesaler-distributors	(41732)
Office and store machinery and equipment, wholesaler-distributors	(41791)
Office machinery and equipment rental and leasing	(53242)

Manufacturing industries in the ICT sector include establishments that manufacture products intended to fulfill information processing and communications functions including transmission and display, or use electronic processing to detect, measure and/or record physical phenomena, or to control a physical process.

The products of the ICT services industries must be intended to enable the function of information processing and communication by electronic means.

Figure 2
1980 SIC-based ICT sector industries

Manufacturing:

Record player, radio and t.v. receiver	(3341)
Telecommunications equipment	(3351)
Electronic parts and components	(3352)
Other communication and electronic equipment	(3359)
Electronic computing and peripheral equipment	(3361)
Electronic office, store and business machine	(3362)
Other office, store and business machine	(3369)
Communications and energy wire and cable	(3381)
Indicating and recording instruments	(3911)
Other instruments and related products	(3912)

Services:

Cable television	(4814)
Telecommunication carriers	(4821)
Other telecommunication	(4839)
Computer services	(7721)
Computer equipment maintenance and repair	(7722)
Electronic machinery, equipment and supplies, wholesale	(5743)
Computer and related machinery, equipment and software, wholesale	(5744)
Office and store machinery, equipment and supplies, wholesale	(5791)
Office furniture and machinery rental and leasing	(9913)

The definition of the ICT sector requires some detailed industry information not currently available. Thus, the electronic precision equipment repair and maintenance industry (NAICS 81121) is not included in the sector's totals, while an estimate of the office machinery and equipment rental and leasing industry (NAICS 53242) is only included in the GDP sector total.

1.2 The ICT sector at a glance



The ICT sector contributed \$57.5 billion to Canada's gross domestic product (GDP) in 2000, accounting for 7.3% of business sector GDP, and 6.2% of total economy GDP.

ICT sector growth between 1997 and 2000 was a remarkable 68.7%, substantially higher than business sector growth, and nearly five times the rate of growth of the total economy.



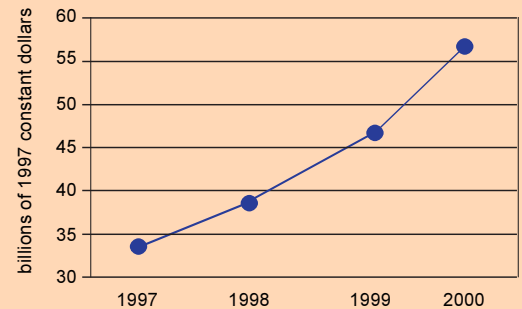
In 1999, the ICT sector employed 469 thousand people, accounting for 3.9% of economy-wide employment.

Between 1994 and 1999, employment in the ICT sector increased by 32.5%, more than three times the rate of growth of economy-wide employment (9.9%).

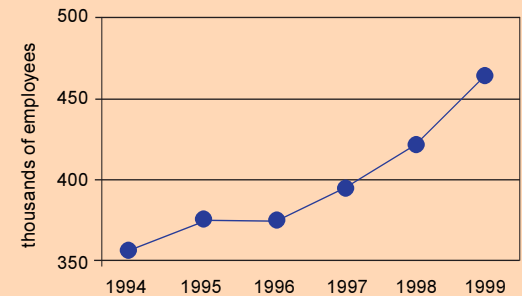


Exports of ICT merchandise and services totalled \$42.4 billion and imports \$63.8 billion in 2000, representing 9.6% and 16.5% of total exports and imports, respectively.

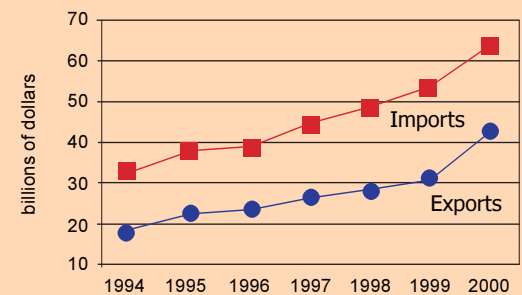
GDP



Employment



Exports and Imports





Despite strong growth in ICT merchandise exports and a trade surplus in ICT services, the deficit in overall ICT trade has grown from \$13.9 billion in 1994 to \$21.2 billion in 2000. Over the last year, however, the trade deficit was reduced by \$2.5 billion.



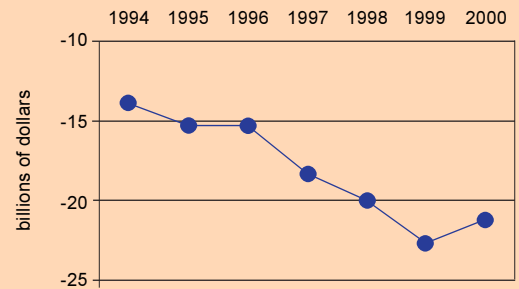
ICT sector revenues reached \$89.6* billion in 1999, or 4.5% of total industry revenues, mainly due to the above average revenue growth in ICT services industries.



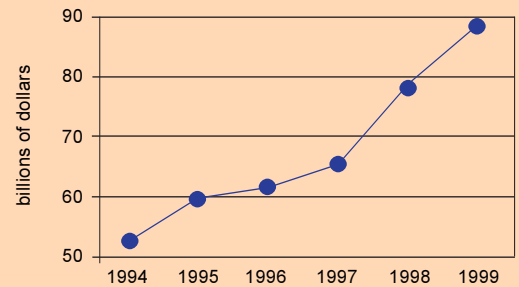
ICT sector expenditures on research and development (R&D), reached \$5.0^p billion in 2000, accounting for a whopping 45.7% of total private sector R&D. This is indicative of the sector's dynamism and forward-looking attitude.

* ICT wholesaling is not included.

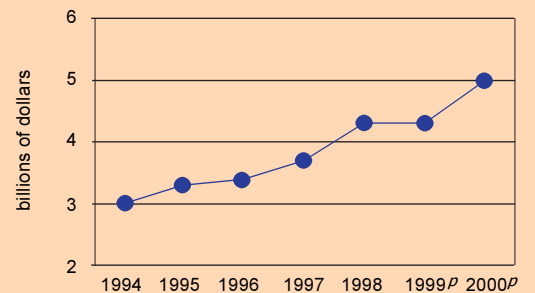
Trade balance



Revenues*



R&D



2. Profile of the ICT Sector

2.1 Production

Gross Domestic Product (GDP) is a measure of the economic production which takes place within the geographical boundaries of Canada. GDP by industry is designed to show the industrial distribution of total output. GDP for a single industry is also referred to as net output, or value added. Conceptually, it is equal to the total value of production by the industry (gross output) less the value of inputs purchased from other industries or inputs which have been imported (intermediate inputs). Revisions to the data have been made as a result of major classification and conceptual changes. GDP estimates for ICT wholesaling (NAICS 4173 and 41791) and office machinery and equipment rental and leasing (NAICS 53242) industries have been produced. Please see the Notes, Methodologies and Data sources section for further information (Gross Domestic Product by Industry, Industry Measures and Analysis Division, Statistics Canada).

The Canadian ICT sector is making a substantial contribution to economic growth in Canada. ICT industries contributed \$57.5 billion to Canada's GDP in 2000, representing 7.3% of business sector GDP, and 6.2% of total economy GDP. Fast growth in the ICT sector, particularly over the last two years, has led to an increasing share of business sector GDP – up by more than two percentage points from its 5.0% share in 1997.

Average annual compounded GDP growth for the ICT sector was 19.0% over the 1997-2000 period, compared with business sector growth of 5.1% , and economy-wide growth of 4.4%. Over the same period, total growth for the ICT sector was a remarkable 68.7%, substantially higher than business sector growth (16.1%), and nearly five times the growth rate of the total economy (13.8%).

The GDP shares for the manufacturing and services industries of the ICT sector have generally remained stable over the reference period, with services generating the largest share. Between 1999 and 2000, however, the ICT manufacturing share grew from 25.1% to 28.7%, while the share of ICT services dropped from 74.9% to 71.3%. Part of this growth in manufacturing can be attributed to the computer equipment industry, where GDP has increased by 53.4% over the last year. Other significant increases in production were seen in the communications equipment and the semiconductor and electronic components industries – between 1999 and 2000, GDP in each of these manufacturing industries increased by 47.5% and 40.2%, respectively.

Within the services sector, the telecommunications industry boasted the largest contribution to Canadian GDP, at \$22.0 billion. The computer and information services industries showed the strongest growth over the 1997-2000 period (81.2%). Overall, GDP for ICT sector manufacturing industries continues to grow somewhat faster than the services industries, as total growth over the reference period reached 100.5%, compared with 58.6% for ICT sector services.

Figure 3
ICT sector GDP, 1997-2000

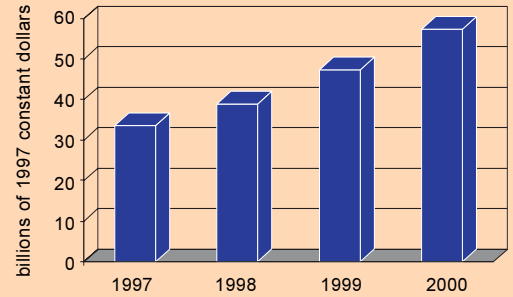


Figure 4
Indexed GDP, 1997-2000

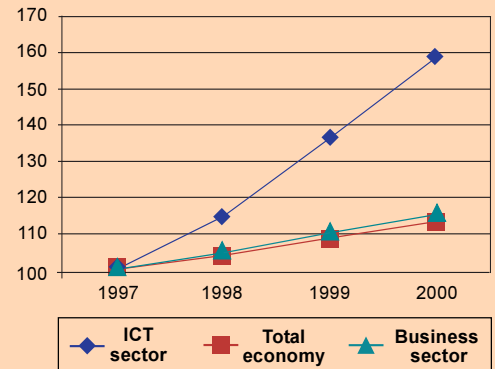


Figure 5
Indexed ICT sector GDP, 1997-2000

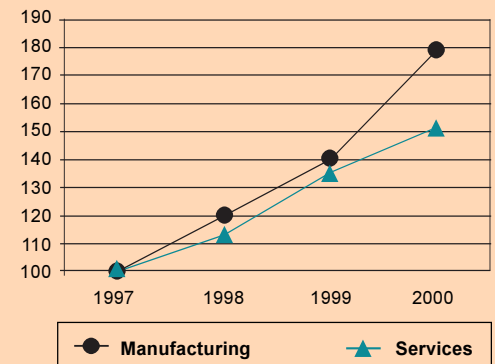


Table 1.
ICT sector GDP, 1997-2000

	1997	1998	1999	2000	00/97	CAGR (00/97)
	<i>billions of 1997 constant dollars</i>				<i>%</i>	
Manufacturing	8.2	9.9	11.9	16.5	100.5	26.1
<i>% of ICT</i>	<i>24.1</i>	<i>25.3</i>	<i>25.1</i>	<i>28.7</i>	...	...
Services*	25.9	29.1	35.4	41.0	58.6	16.6
<i>% of ICT</i>	<i>75.9</i>	<i>74.7</i>	<i>74.9</i>	<i>71.3</i>	...	...
Total ICT sector	34.1	39.0	47.2	57.5	68.7	19.0
Business sector	679.7	710.0	749.8	788.8	16.1	5.1
<i>ICT as a %</i>	<i>5.0</i>	<i>5.5</i>	<i>6.3</i>	<i>7.3</i>	...	...
Total economy	816.9	848.4	889.4	929.6	13.8	4.4
<i>ICT as a %</i>	<i>4.2</i>	<i>4.6</i>	<i>5.3</i>	<i>6.2</i>	...	...

Source: Industry Measures and Analysis Division, Statistics Canada.

* Information services include news syndicates and library and archive services, which are not included in the ICT sector.

All figures have been revised due to methodological and conceptual changes. See Notes, Methodologies and Data sources for more information.

Table 2.
ICT sector GDP by industry, 1999-2000

NAICS Industries	<i>billions of 1997 constant dollars</i>	1999	2000
Manufacturing			
3333	Commercial and Service Industry Machinery	0.7	0.8
3341	Computer and Electronic Products	1.8	2.7
33421, 33422	Communications Equipment	4.5	6.6
3344	Semiconductor and Other Electronic Components	2.3	3.2
3343, 3345	Navigational, Measuring, and Control Devices, Audio and Video Equipment	1.6	1.8
33592	Communication and Energy Wire and Cable	1.0	1.4
Services*			
	ICT Wholesaling, Office Machinery Equipment Rental and Leasing, Computer and Information Services, Telecommunications, Cable	35.4	41.0

Source: Industry Measures and Analysis Division, Statistics Canada.

* Information services include news syndicates and library and archive services, which are not included in the ICT sector.

2.2 Employment

In most cases, employment estimates were drawn from the various industry surveys and do not include self-employment. However, employment data for the computer and information services industries (NAICS 51121, 51419, 51421, 54151), 1997, 1998 and 1999 include estimates for those who filed Canada Customs and Revenue Agency non-employer income tax forms for those years. Employment data for ICT wholesale (NAICS 4173, 41791) and telecommunications (NAICS 5133) industries were taken from the Survey of Employment, Payrolls and Hours (SEPH). See the Notes, Methodologies and Data sources section for more information.

The ICT sector is a major source of new jobs, as its share of employment continues to grow steadily. In 1999, 469 thousand employees were working in the sector, accounting for 3.9% of economy-wide employment. This represents a steady increase from previous years when ICT sector employment was 3.2% (1994) and 3.3% (1995) of total economy employment. Between 1994 and 1999, employment in the sector increased by 32.5%, well surpassing economy-wide employment growth of 9.9%. In the last three years, ICT sector employment growth has been especially strong.

Average annual employment growth over the period was 5.8% for the ICT sector, three times the annual economy-wide employment growth of 1.9%.

Employment in the services industries expanded by 35.3% over the reference period. Most of these employment gains occurred in the computer and information services industries, where the number of employees has grown by 95.9% since 1994. This fast-paced growth has led to an increasing share of employment for ICT sector services industries, which accounted for more than three-quarters of total ICT sector employment in 1999.

Figure 6
ICT sector employment, 1994-1999

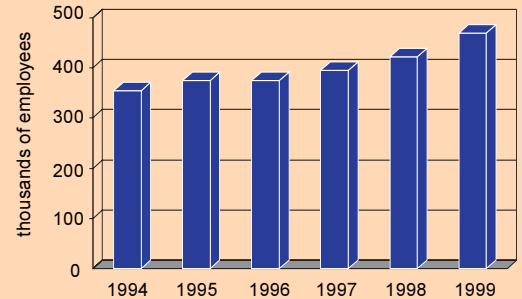


Figure 7
Indexed employment, 1994-1999

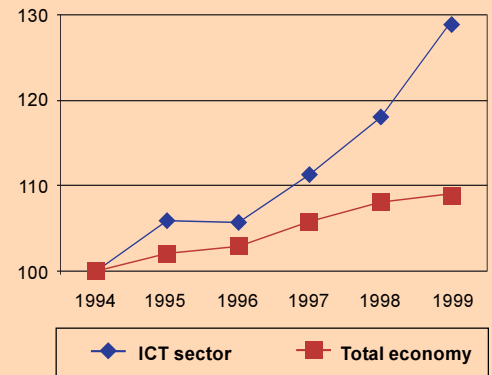


Figure 8
Indexed ICT sector employment, 1994-1999

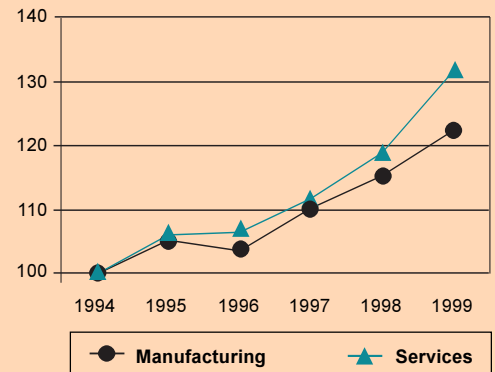


Table 3.
ICT sector employment, 1994-1999

	1994	1995	1996	1997	1998	1999	99/94	CAGR (99/94)
	<i>thousands of employees</i>						<i>%</i>	
Manufacturing	90.3	95.0	93.5	99.6	104.7	112.2	24.2	4.4
<i>% of ICT</i>	<i>25.5</i>	<i>25.4</i>	<i>25.0</i>	<i>25.2</i>	<i>24.8</i>	<i>23.9</i>	...	...
Services	263.7	279.8	280.8	295.5	316.9	356.9	35.3	6.2
<i>% of ICT</i>	<i>74.5</i>	<i>74.6</i>	<i>75.0</i>	<i>74.8</i>	<i>75.2</i>	<i>76.1</i>	...	...
Total ICT sector	354.0	374.8	374.3	395.1	421.6	469.1	32.5	5.8
Total economy	10,994.4	11,228.3	11,311.1	11,643.2	11,912.1	12,079.3	9.9	1.9
<i>ICT as a %</i>	<i>3.2</i>	<i>3.3</i>	<i>3.3</i>	<i>3.4</i>	<i>3.5</i>	<i>3.9</i>	...	...

Source: Various industry surveys. See Notes, Methodologies and Data sources section for more information.

Table 4.
ICT sector employment by industry, 1998-1999

NAICS Industries	<i>thousands of employees</i>	1998	1999
Manufacturing			
3333	Commercial and Service Industry Machinery	10.6	11.8
3341	Computer and Electronic Products	14.9	13.2
33421, 33422, 3343	Communications, Audio and Video Equipment	27.4	27.4
3344	Semiconductor and Other Electronic Components	20.5	24.3
3345	Navigational, Measuring, and Control Devices	24.2	23.5
33592	Communication and Energy Wire and Cable	7.1	12.0
Services			
4173,41791	ICT Wholesaling	71.7	74.7
51121, 51419, 51421, 54151	Computer and Information Services	122.1	156.9
5133	Telecommunications	113.6	113.1
51322	Cable	9.5	12.2

Source: Various industry surveys. See Notes, Methodologies and Data sources section for more information.

2.3 International trade

Merchandise trade data are captured as commodities. In an effort to produce industry trade data, Statistics Canada assigns exported commodities to industries. Trade data for services are reported by product category. See Notes, Methodologies and Data sources for more information.

Canadian ICT trade is growing at a remarkable pace. Exports were valued at \$42.4 billion in 2000, more than twice as much as their value in 1994. This represents 9.6% of total exports. Imports reached \$63.8 billion, nearly double their 1994 value, representing 16.5% of total Canadian imports. Between 1994 and 2000, total Canadian exports experienced unprecedented growth, at an average annual rate of 10.5%, and ICT exports grew even more at an average rate of 14.7% annually. Over the same period, ICT imports grew at an average annual rate of 11.8%, while average annual growth for total imports was 9.6%.

Most of our ICT trade comes from merchandise. ICT merchandise exports expanded to \$39.4 billion in 2000, accounting for 92.9% of ICT exports, 9.5% of total merchandise exports, and 9.0% of total exports. Imports of ICT merchandise represented 17.2% (\$61.5 billion) of total merchandise imports, up from its share of 15.2% in 1994. Receipts for ICT services totalled \$3.0 billion in 2000, while payments for ICT services stood at \$2.3 billion, maintaining an ICT services trade surplus.

Between 1994 and 2000, ICT merchandise exports experienced strong growth, particularly in the last year when their exports increased by \$12 billion. Over the same reference period, receipts for ICT services have also grown, albeit their growth has been bumpy. Merchandise and services imports have both increased over the reference period, with merchandise out-pacing services.

Figure 9
ICT exports, 1994-2000

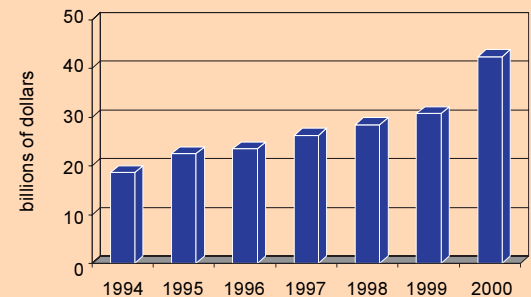
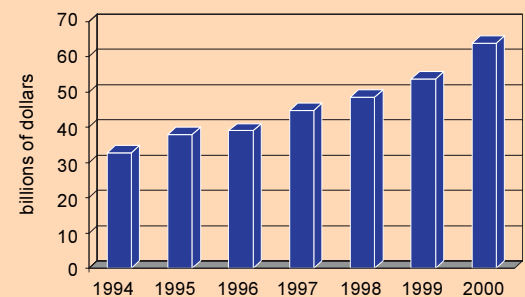


Figure 10
ICT imports, 1994-2000



At 32.1%, exports of telecommunications equipment experienced a huge jump in the last year, representing the largest share of ICT merchandise exports. The value of exports for telecommunications equipment doubled from last year due to an increased demand for optical network equipment and wireless communication equipment (\$12.7 billion). Exports of electronic parts and components, other communication, and computing and peripheral equipment were valued at \$20.7 billion. Together, these ICT merchandise industries represented 8.1% of total Canadian merchandise exports.

Electronic parts and components represented the largest share of ICT merchandise imports (36.5%), accounting for 6.3% of total Canadian merchandise imports. Computing and peripheral equipment imports were valued at \$11.8 billion, or 19.2% of ICT merchandise imports.

Exports of computer services were valued at \$1.7 billion in 2000, followed by telecommunications carriers at \$1.0 billion, and information services at \$0.3 billion. Imports of telecommunications carriers were the highest (\$1.1 billion) of the ICT services, accounting for nearly half (49.4%) of total ICT services payments.

Despite the strong growth in ICT merchandise exports and the ICT services trade surplus, the ICT trade deficit nearly doubled between 1994 and 1999, from \$13.9 billion to \$22.7 billion. However, this trend was reversed in 2000, when the deficit was reduced to \$21.2 billion. This may be due to the doubling in exports of telecommunications equipment.

Figure 11
Indexed ICT exports, 1994-2000

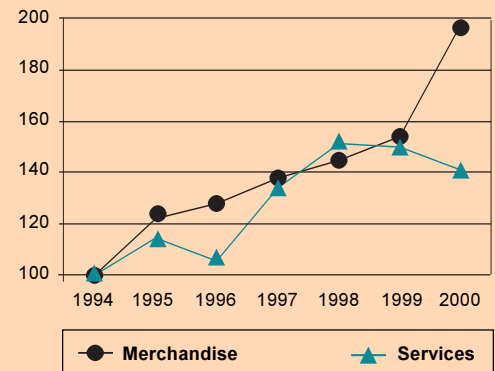
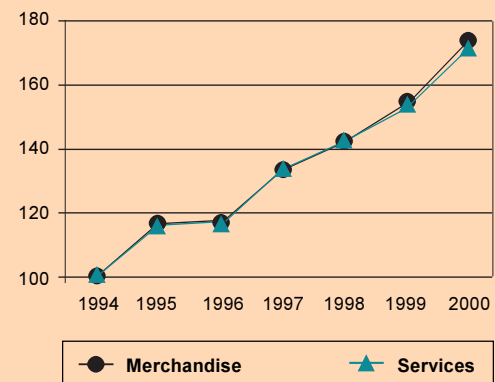


Figure 12
Indexed ICT imports, 1994-2000



Consistent with the overall pattern of Canadian exports, the U.S. is our largest trading partner with respect to ICT exports. Slightly more than 84% of ICT merchandise exports were destined for that country. ICT imports are more diversified with just over half of the merchandise imports coming from the United States. Canadian ICT merchandise exports also go to the U.K. (4.7%), Hong Kong (1.2%), and Germany (1.0%), while a significant portion of Canadian ICT merchandise imports also comes from Japan (8.6%), Mexico (5.3%) and Taiwan (3.9%). In 2000, Japan displaced France from the fifth top destination of Canadian ICT merchandise exports.

Figure 13
ICT trade balance, 1994-2000

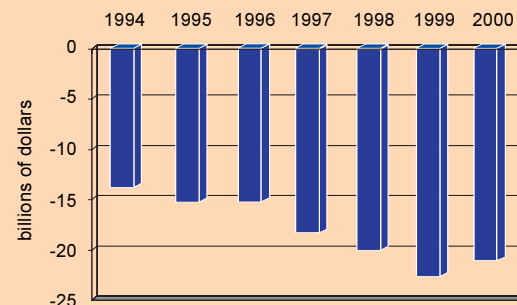


Table 5.
ICT merchandise exports, top 5 countries of destination, 1994-2000

	1994	1995	1996	1997	1998	1999	2000	00/94
	<i>billions of dollars</i>							<i>%</i>
United States	13.1	16.1	17.0	18.7	20.6	22.9	33.2	152.6
United Kingdom	0.4	0.6	0.6	0.7	0.7	0.9	1.9	322.6
Hong Kong	0.2	0.2	0.2	0.3	0.3	0.3	0.5	211.5
Germany	0.2	0.4	0.4	0.2	0.2	0.2	0.4	124.1
Japan	0.2	0.2	0.2	0.3	0.2	0.2	0.3	33.1
Others	2.4	2.6	2.9	3.2	3.1	2.9	3.1	35.6
Total ICT merchandise exports - all countries	16.5	20.1	21.3	23.4	25.1	27.4	39.4	139.1

Source: International Trade Division, Statistics Canada.

**Table 6.
ICT exports, 1994-2000**

	1994	1995	1996	1997	1998	1999	2000	00/94	CAGR (00/94)
	<i>billions of dollars</i>							%	
Merchandise	16.5	20.1	21.3	23.4	25.1	27.4	39.4	139.1	15.6
<i>% of ICT</i>	<i>88.6</i>	<i>89.2</i>	<i>90.6</i>	<i>89.1</i>	<i>88.2</i>	<i>89.3</i>	<i>92.9</i>	...	...
Services*	2.1	2.4	2.2	2.9 ^r	3.3 ^r	3.3 ^r	3.0	41.0	5.9
<i>% of ICT</i>	<i>11.4</i>	<i>10.8</i>	<i>9.4</i>	<i>10.9</i>	<i>11.8</i>	<i>10.7</i>	<i>7.1</i>	...	...
Total ICT sector	18.6	22.5	23.5	26.3^r	28.4^r	30.7^r	42.4	127.9	14.7
Total									
Merchandise Exports	225.7	262.3	275.8	298.1 ^r	318.4 ^r	355.0 ^r	412.9	82.9	10.6
<i>ICT as a %</i>	<i>7.3</i>	<i>7.7</i>	<i>7.7</i>	<i>7.9</i>	<i>7.9</i>	<i>7.7</i>	<i>9.5</i>	...	...
Total									
Commercial Services									
Exports	15.5	16.8	19.4	21.9	25.4 ^r	25.9 ^r	27.1	75.2	9.8
<i>ICT as a %</i>	<i>13.7</i>	<i>14.5</i>	<i>11.5</i>	<i>13.0</i>	<i>13.2</i>	<i>12.7</i>	<i>11.1</i>	...	...
Total Exports	241.2	279.1	295.2	320.0 ^r	343.8 ^r	380.9 ^r	440.0	82.4	10.5
<i>ICT as a %</i>	<i>7.7</i>	<i>8.1</i>	<i>8.0</i>	<i>8.2</i>	<i>8.3</i>	<i>8.1</i>	<i>9.6</i>	...	...

Source: International Trade Division, Balance of Payments Division, Statistics Canada.

* Includes telecommunications, computer and information services. Information services includes news agency services, which do not belong to ICTs. Data before 1996 include prepackaged software royalties.

**Table 7.
ICT exports by type, 1999-2000**

SIC Industries	<i>billions of dollars</i>		1999	2000
Merchandise				
Record Player, Radio and Television Receiver			0.3	0.3
Telecommunications Equipment			6.3	12.7
Electronic Parts and Components			5.8	8.4
Other Communication and Electronic Equipment			3.5	4.5
Electronic Computing and Peripheral Equipment			6.7	7.8
Office, Store and Business Machine			0.5	0.5
Communications and Energy Wire and Cable			1.1	1.6
Indicating, Recording and Controlling Instruments			1.3	1.5
Other Instruments and Related Products			1.9	2.1
Services				
Telecommunications			1.3 ^r	1.0
Computer			1.7 ^r	1.7
Information			0.3 ^r	0.3

Source: International Trade Division, Balance of Payments Division, Statistics Canada.

Table 8.
ICT imports, 1994-2000

	1994	1995	1996	1997	1998	1999	2000	00/94	CAGR (00/94)
<i>billions of dollars</i>								%	
Merchandise	30.9	36.0	37.0	42.2	45.9	51.1	61.5	98.9	12.1
% of ICT	94.4	94.9	95.0	94.3	94.3	95.3	96.4	...	...
Services*	1.8	1.9	2.0	2.5 ^r	2.7 ^r	2.5 ^r	2.3	27.5	4.1
% of ICT	5.6	5.1	5.0	5.7	5.7	4.7	3.6	...	...
Total ICT sector	32.7	38.0	39.0	44.7^r	48.6^r	53.7^r	63.8	95.0	11.8
Total Merchandise Imports	202.7	225.6	232.6	272.9	298.4 ^r	320.3 ^r	356.7	76.0	9.9
ICT as a %	15.2	16.0	15.9	15.5	15.4	16.0	17.2	...	...
Total Commercial Services Imports	19.6	20.3	22.4	24.7 ^r	27.6 ^r	28.3 ^r	29.6	51.0	7.1
ICT as a %	9.3	9.5	8.8	10.4	10.0	9.0	7.8	...	...
Total Imports	222.3	245.8	254.9	297.6	326.0	348.5 ^r	386.3	73.7	9.6
ICT as a %	14.7	15.4	15.3	15.0	14.9	15.4	16.5	...	...

Source: International Trade Division, Balance of Payments Division, Statistics Canada.

* Includes telecommunications, computer and information services. Information services includes news agency services, which do not belong to ICTs.

Table 9.
ICT imports, by type, 1999-2000

SIC Industries	<i>billions of dollars</i>	
	1999	2000
Merchandise		
Record Player, Radio and Television Receiver	3.3	4.0
Telecommunications Equipment	2.7	4.5
Electronic Parts and Components	17.6	22.4
Other Communication and Electronic Equipment	3.7	4.4
Electronic Computing and Peripheral Equipment	11.0	11.8
Office, Store and Business Machine	1.4	1.5
Communications and Energy Wire and Cable	1.2	1.8
Indicating, Recording and Controlling Instruments	4.6	5.1
Other Instruments and Related Products	5.6	6.0
Services		
Telecommunications	1.4	1.1
Computer	0.6 ^r	0.6
Information	0.5 ^r	0.5

Source: International Trade Division, Balance of Payments Division, Statistics Canada.

2.4 Revenues

Revenues in the ICT sector are also increasing. The ICT sector share of total industry revenue has grown considerably over the last decade – ICT sector revenue reached \$89.6* billion in 1999, representing 4.5% of total industry revenue. ICT sector revenue shares have increased substantially from 1994, when the ICT sector accounted for 3.3% (\$52.4 billion) of total industry revenue.

Between 1994 and 1999, annual average revenue growth for the ICT sector was 11.3%, compared with total industry growth of 4.7% per year. Total ICT sector revenue growth over this period was a remarkable 70.9%, easily out-pacing total industry revenue growth (25.9%).

Within the ICT sector services industries, telecommunications generated the highest revenues (\$29 billion). Between 1998 and 1999, computer and information services industries also experienced strong growth (32.6%). ICT sector services revenue has been increasing steadily since 1994 – its share of total industry revenue stood at 62.4% in 1999. Manufacturing industries are also experiencing stable growth in revenues, after a slight drop in 1996. Revenues for communications equipment industries in particular, increased by 28.8% between 1998 and 1999.

Figure 14
ICT sector revenues*, 1994-1999

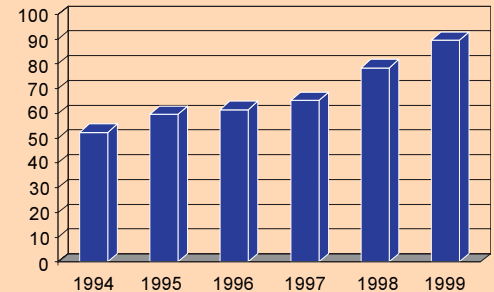


Figure 15
Indexed revenues, 1994-1999

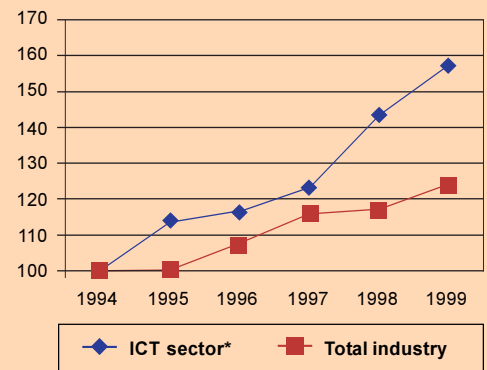
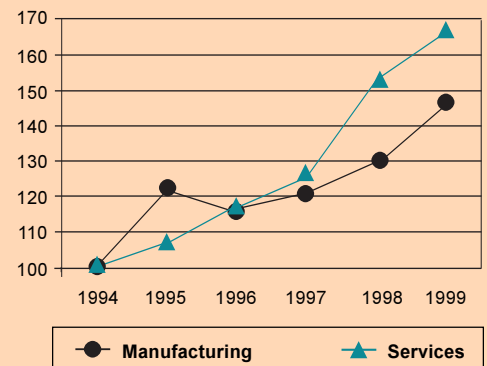


Figure 16
Indexed ICT sector revenues*, 1994-1999



* Revenue for ICT wholesaling is not included.

Table 10.
ICT sector revenues*, 1994-1999

	1994	1995	1996	1997	1998	1999	99/94	CAGR (99/94)
	<i>billions of dollars</i>						<i>%</i>	
Manufacturing	22.2	27.0	25.7	26.8	29.3 ^r	33.7	51.6	8.7
% of ICT	42.4	45.3	41.8	41.0	37.3	37.6	...	...
Services	30.2	32.6	35.8	38.5	49.2	55.9	85.0	13.1
% of ICT	57.6	54.7	58.2	59.0	62.7	62.4	...	...
Total ICT sector	52.4	59.6	61.5	65.3	78.5^r	89.6	70.9	11.3
Total industry	1,565.9	1,569.0 ^r	1,688.5 ^r	1,823.9 ^r	1,860.2 ^r	1,971.3	25.9	4.7
ICT as a %	3.3	3.8	3.6	3.6	4.2	4.5	...	...

Source: Various industry surveys. See Notes, Methodologies and Data sources section for more information.

* Revenue for ICT wholesaling is not included.

Table 11.
ICT sector revenues by industry*, 1998-1999

NAICS Industries	<i>billions of dollars</i>	1998	1999
Manufacturing			
3333	Commercial and Service Industry Machinery	1.8	2.3
3341	Computer and Electronic Products	5.4	5.2
33421, 33422	Communications Equipment	9.1	11.2
3343	Audio and Video Equipment	0.2	0.2
3344	Semiconductors and Other Electronic Components	7.0	7.9
3345	Navigational, Measuring, and Control Devices	3.8	4.4
33592	Communication and Energy Wire and Cable	2.0 ^r	2.5
Services			
51121, 51419, 51421, 54151	Computer and Information Services	17.6	23.4
5133	Telecommunications	28.5	29.0
51322	Cable	3.1	3.5

Source: Various industry surveys. See Notes, Methodologies and Data sources section for more information.

* Revenue for ICT wholesaling is not included.

2.5 Research and development

Research and development is at the heart of the innovation process. While R&D is also carried out by other sectors, including governments and universities, industrial R&D is most closely linked to technological innovation and, hence, economic growth (Industrial Research and Development, Science, Innovation and Electronic Information Division, Statistics Canada).

The ICT sector is one of the largest R&D performers in Canada. ICT sector expenditures on R&D reached \$5.0^p billion in 2000, accounting for a whopping 45.7% of total private sector R&D. Over the 1994-2000 period, the ICT sector has spent \$26.9 billion on R&D, or 42.9% of total private sector R&D expenditures.

ICT sector R&D expenditures grew at an annual average rate of 8.6% between 1994 and 2000, compared with an annual average of 6.2% for the private sector. Total ICT sector spending on R&D grew by 63.6% over this period.

In 2000, ICT manufacturing industries spent \$3.9^p billion on R&D – over three-quarters of total ICT sector R&D expenditures. Telecommunications equipment accounted for half of ICT R&D investment, and 23.0% of total private sector R&D.

R&D expenditures for the manufacturing industries grew at an annual average rate of 11.0% and at an overall rate of 86.6% between 1994 and 2000. However R&D expenditures by services industries increased little over this period (annual average of 2.3%), and even dropped slightly in 1996 and 1999, thus contributing to the slower growth.

Figure 17
ICT sector R&D, 1994-2000

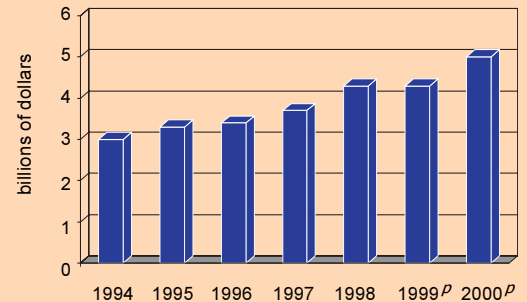


Figure 18
Indexed R&D, 1994-2000

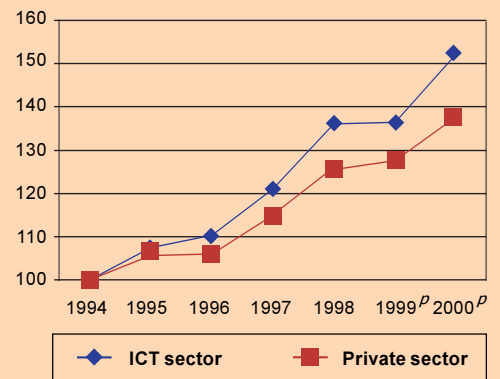


Figure 19
Indexed ICT sector R&D, 1994-2000

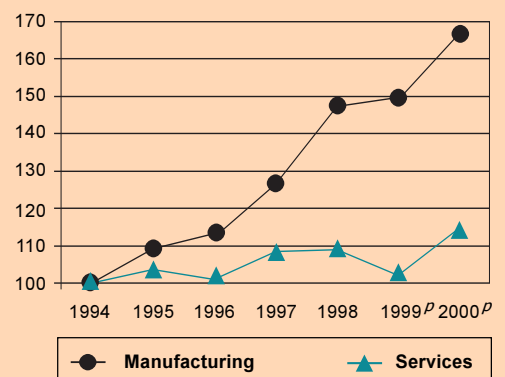


Table 12.
ICT sector R&D, 1994-2000

	1994	1995	1996	1997	1998	1999	2000	00/94	CAGR (00/94)
	<i>billions of dollars</i>							<i>%</i>	
Manufacturing	2.1	2.3	2.4	2.7	3.2	3.3 ^p	3.9 ^p	86.6	11.0
<i>% of ICT</i>	<i>68.1</i>	<i>69.2</i>	<i>70.9</i>	<i>71.8</i>	<i>75.3</i>	<i>76.9</i>	<i>77.7</i>	...	...
Services	0.9	1.0	1.0	1.0	1.1 ^r	1.0 ^p	1.1 ^p	14.5	2.3
<i>% of ICT</i>	<i>31.9</i>	<i>30.8</i>	<i>29.1</i>	<i>28.2</i>	<i>24.7</i>	<i>23.1</i>	<i>22.3</i>	...	...
Total ICT sector	3.0	3.3	3.4	3.7	4.2	4.3^p	5.0^p	63.6	8.6
Private sector	7.6	8.0	8.0	8.8 ^r	9.6 ^r	9.8 ^p	10.9 ^p	43.5	6.2
<i>ICT as a %</i>	<i>40.1</i>	<i>40.7</i>	<i>41.8</i>	<i>42.3</i>	<i>44.4</i>	<i>43.6</i>	<i>45.7</i>	...	...

Source: Science, Innovation and Electronic Information Division, Statistics Canada.

3. Notes, Methodologies and Data sources

3.1 Notes and Methodologies

The statistical compilation of the ICT sector was guided by two general principles:

- 1) The use of data sources particularly emanating from industry-specific surveys, rather than economy-wide vehicles (adherence to this principle entails a trade-off between reliability and timeliness, as typically industry surveys are subject to lengthier time lags);
- 2) The use of the new NAICS as opposed to the 1980 SIC.

Divergences from these general principles were necessary, however. Some variables of interest are not measured by industry surveys. R&D data come from the survey of industrial R&D activities, while GDP data are compiled in the System of National Accounts.

In addition, different statistical programs are at different stages of transition to NAICS. This necessitated the use of a mixture of statistics based on both the 1980 SIC and NAICS. For this reason, concordances were developed between each of these classifications and the International Standard Industrial Classification (ISIC Rev.3), which was used by the OECD (see Innovation Analysis Bulletin, Vol. 2, no. 1 and Vol. 2, no. 2, 2000, Cat. No. 88-003-XIE). Some industries, for instance telecommunications services, are not affected much on the aggregate by the change in classification, while the delineation of others, such as computer services, has changed more substantially, as these industries were transformed over time.

Moreover, some conversions to NAICS have not necessarily back-cast the series to cover the entire reference period used in the publication. Again, some mixture of classifications or choice of an alternative data source was necessary.

Instances related to specific divergences from the general principles above were carefully identified, documented and are listed below, together with additional issues.

- 1) The definition of the ICT sector requires some detailed industry information not currently available. Thus, the electronic precision equipment repair and maintenance industry (NAICS 81121) is not included in the sector's totals, while an estimate of the office machinery and equipment rental and leasing industry (NAICS 53242) is only included in the GDP sector total. In addition, revenue data for ICT wholesaling industries (NAICS 4173 and 41791) are not included. These exclusions lead to an underestimation of the sector. Efforts will be made to close these gaps.
- 2) Merchandise export and import data and intramural R&D expenditures are based on the 1980 SIC. NAICS-based data for computer and information services industries are available only for the period 1997-1999. Thus, for the 1994-1996 reference period, 1980 SIC data are used (see Note 8 for more information).
- 3) The measurement of GDP has recently undergone some important changes: replacement of SIC with NAICS; rebasing from 1992 to 1997 prices; a change in valuation from factor cost to basic prices; the capitalization of computer software. With the rebasing from 1992 to 1997, the price structure used to derive constant dollar GDP has been updated. Given price deflation for some ICT goods and services, there are considerable differences in GDP figures for a number of ICT industries between the two base years. With these changes, GDP figures are only available back to 1997. In addition, industries such as information services (NAICS 51419) include some industries that are not part of the ICT sector definition. Finally, GDP for ICT wholesaling (NAICS 4173 and 41791) and office machinery and equipment rental and leasing (NAICS 53242) are estimates only.

...cont'd

- 4) Wherever possible, employment data have been provided by the various industry surveys. In the case of the ICT wholesaling and telecommunications services industries, employment estimates were obtained from the Survey of Employment, Payroll and Hours (SEPH). For more information about SEPH see Statistics Canada's Guide to the Survey of Employment, Payrolls and Hours, Catalogue No. 72-620-GIE.
- 5) Employment estimates for 1997, 1998 and 1999 from the Annual Survey of Software Development and Computer Services (NAICS 51121, 51421, 54151) and the Annual Survey of Internet Service Providers and Related Services (1999 only, NAICS 51419) include a small number of self-employed workers who filed non-employer T1 income tax forms. This is not considered adequate to accurately reflect the significant level of self-employment in these industries, which may therefore be underestimated.
- 6) Merchandise trade data are captured and reported on a commodity basis, as they cross the border. In an effort to quantify industry trade, Statistics Canada's International Trade Division produces industry-based data by allocating the total trade of a commodity to its primary industry of production. For instance, all exports of computers will be assigned to computer manufacturers. In that sense, ICT merchandise exports and imports do not reflect the total exports and imports of all merchandise by ICT industries, but rather the total exports and imports of ICT commodities assigned to these industries. For more information consult Canadian International Merchandise Trade, Catalogue No. 65-001-XIB. Similarly, the Balance of Payments Division generally publishes services trade data by product category, and not by industry. For more information consult Canada's International Trade in Services, Catalogue No. 67-203-XIB (Internet) or XPB (paper).
- 7) Beginning with reference year 1996, the physical exports of prepackaged software units for general commercial or personal use are excluded from computer services. The exports are now part of merchandise, but were included in services for years prior to 1996 to ensure sufficient valuation in the merchandise and services account. There is also some break in the data for telecommunications services from 1996. A break also occurs in the exports of computer services; specifically, prepackaged software royalties were classified from the reference year 1996 to royalties and licence fees, in line with imports.
- 8) As noted above, between 1994-1996, data for the computer services industries are only available by 1980 SIC. Starting with the 1997 reference year, data are NAICS-based. Since both industry classifications are used for the employment and revenue data, it is important to understand the difference between the computer services industry (SIC 772) and the computer services industries under NAICS. The concordance between the two classifications is imperfect:

SIC 772 included:

- 1) Computer Systems and Design
- 2) Software Publishers
- 3) Data Processing
- 4) Repair and Maintenance of computer equipment

NAICS includes:

- 1) Computer Systems and Design
- 2) Software Publishers
- 3) Data Processing
- 4) Internet Service Providers (ISPs)

Revenue for ISPs in 1997 represented about 2% of total revenue, while in 1996 Repair and Maintenance of computer equipment represented about 3% of total revenue. In other words, allowing for sampling and non-sampling errors and the relatively small difference in revenues (approximately 1%), it is relatively safe to compare NAICS totals (for 1997, 1998 and 1999) to SIC totals (1994-1996). However, this may change in subsequent years if the ISP industry grows. Although the vast majority of the firms that were covered in SIC 772 are now classified in the four NAICS industries mentioned above, the number of employees for 1997, 1998 and 1999 is not strictly comparable to data for previous years.

3.2 Data sources

All data come from various statistical programs and databases in Statistics Canada. A detailed list of data sources and publication vehicles used in their dissemination follows:

GDP	Gross Domestic Product by Industry, Statistics Canada, Catalogue No. 15-001-XIE, CANSIM II Tables 379-0017, 379-0020 (<i>special tabulation</i>).
Employment	<p>Annual Survey of Manufactures, Statistics Canada, Catalogue No. 31-203-XPB, CANSIM II Table 301-0003.</p> <p>Annual Return, Cable Television, Statistics Canada, Catalogue No. 56-205-XIB.</p> <p>Annual Survey of Computer Services, Statistics Canada, Catalogue No. 63-222-XPB, CANSIM II Table 354-0002 (to 1996).</p> <p>Annual Survey of Internet Service Providers and Related Services, Statistics Canada, Catalogue No. 63-222-XPB (from 1999).</p> <p>Survey of Employment, Payrolls and Hours, Statistics Canada, Catalogue No. 72-002-XIB, 72F0023XIB, CANSIM II Table 281-0024 (<i>special tabulation</i>).</p>
International trade	<p>Canadian International Merchandise Trade, Statistics Canada, Catalogue No. 65-001-XIB (XPB) (<i>special tabulation</i>).</p> <p>Trade Data Online, http://www.strategis.ic.gc.ca</p> <p>Canada's International Trade in Services, Statistics Canada, Catalogue No. 67-203-XIB (XPB). Balance of Payments Division, Statistics Canada.</p>
Revenues	<p>Annual Survey of Manufactures, Statistics Canada, Catalogue No. 31-203-XPB, CANSIM II Table 301-0003.</p> <p>Annual Return, Cable Television, Statistics Canada, Catalogue No. 56-205-XIB.</p> <p>Annual Survey of Telecommunications Service Providers, Statistics Canada, Catalogue No. 56-203-XIE (1997 (XIB), 1998, 1999 forthcoming).</p> <p>Annual Report, Telephone Statistics, Statistics Canada, Catalogue No. 56-203-XPB (1994-1996), CANSIM II Table 356-0002.</p> <p>Annual Survey of Computer Services, Statistics Canada, Catalogue No. 63-222-XPB, CANSIM II Tables 354-0002 (to 1996) and 354-0005 (from 1997).</p> <p>Annual Survey of Internet Service Providers and Related Services, Statistics Canada, Catalogue No. 63-222-XPB (from 1999), CANSIM II Table 354-0006 (from 1997).</p> <p>Quarterly financial statistics for enterprises, Statistics Canada, Catalogue No. 61-008-XIE, CANSIM II Table 187-0001.</p>
Intramural R&D Expenditures	Industrial Research and Development, Statistics Canada, Catalogue No. 88-202-XIB, Science, Innovation and Electronic Information Division, Statistics Canada, (<i>special tabulation</i>).

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Related publications

Government of Canada (1996). *Building the Information Society: Moving Canada into the 21st Century*, <http://www.strategis.ic.gc.ca>.

Industry Canada (2001). *Information and Communications Technologies (ICT) Statistical Overview*, Spectrum, Information Technologies and Telecommunications Sector. <http://strategis.ic.gc.ca/SSG/it00957e.html>.

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