PAPER 4.1

EMPLOYMENT CHARACTERISTICS AND TRENDS IN INFORMATION TECHNOLOGY SERVICES

George Sciadas & Deborah Sussman

Statistics Canada

Introduction

World economies have been undergoing transformation for some time, with significant repercussions on their labour markets. While certain tendencies, such as corporate restructuring and down sizing, appear to be subsiding, the introduction of information technologies is intensifying. Although information technologies comprise also a manufacturing sector, this trend is particularly true of information technology services. These services directly affect the employment picture of the industries involved and, indirectly, the labour market at large, since these technologies permeate the entire industrial fabric of the economy. Several issues, ranging from the employment-creation or the labour-saving nature of these two issues of up-skilling of the work force and productivity, are currently debated. Efforts are underway to examine the overall economic implications associated with these, particular emphasis is placed on their impact on employment.[1] These developments are happening at the same time at which there is forceful technological advancements which lead to convergence in the delivery of up to now distinct services and suppliers and with worldwide proliferation and demonopolization of the markets for telecommunications services.[2]

Information technology services are also at the centre of current research on the "knowledge economy". As a recent OECD report puts it "[The] emergence of a cluster of new information and communication technologies (ICTs) has significantly affected the scope and nature of knowledge accumulation. ICTs allow for increased codification of knowledge, transforming it into information that can easily be transmitted and acquired at low cost. The ability to codify knowledge and information over distance and time means that knowledge becomes to some extent globally available. The new ICTs are a fundamental driving force for the globalization of industry and services and the associated restructuring of OECD economies" (OECD 1996, p.8).

The impact of information technology services depends, among other factors, on whether or not the units of analysis are whole economies, regions, industries or individual firms. Even at the firm level it depends on size. For instance, SMEs may not be affected the same way as large firms. Different employment analyses of the direct and indirect effects of IT services will be necessary to examine all the interrelationships involved. This paper traces the evolution of employment in the information technology services sector in Canada over the last twenty years. It provides a detailed industrial profile and illustrates the sector's composition, major characteristics and trends.

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[1] OECD(1995a) "Work on Technology, Productivity and Job Creation: Progress and Future Development of Activities", Directorate for Science, Technology and Industry, Paris, March.

[2] OECD(1995b) "Telecommunication Infrastructure: The Benefits of Competition", Information Computer Communications Policy, No.30, Paris, March.

1. Sector Identification

To distinguish the provision of IT services from the hardware infrastructure that supports their delivery, industrial sectors are defined. At time such aggregates have been referred to as Information and Communication Technologies (ICT) or Information Technologies and Telecommunications (ITT) services (Industry Canada 1994). For the purposes of this report, broadcasting, telecommunications and computer services are grouped into one sector. The same sector has been recognised in recent efforts as part of the Canadian contribution to the OECD's Global Information Infrastructure/Global Information Society initiative (GII/GIS 1996). From now on this sector will be referred to as IT services. IT services span major groups 48 (Communications) and 77 (Business Services) of the 1980 Canadian Standard Industrial Classification (SIC). Specifically the industrial aggregate analysed consists of the following 3-digit industries:

481. Broadcasting
482. Telecommunication Carriers
483. Other Telecommunications Industries
772. Computer and Related Services [3]

Broadcasting comprises "establishments primarily engaged in broadcasting audio or video signals by radio and television including cable systems". Telecommunications carriers and other telecommunications industries refer to "establishments primarily engaged in operating telephone and other telecommunication transmission services by electro-magnetic means" and establishments "engaged in telecommunications operations not elsewhere classified", respectively (Establishments engaged in the construction of transmission facilities are classified under construction). Computer and related services includes "establishments primarily engaged in the provision of computer services including maintenance and repair of computer equipment" (SIC 1980).

The data for this report come from the *Labour Force Survey*. Total employment includes paid employment, self-employment and unpaid family work. The last has no relevance for IT services. Self-employment includes workers in both incorporated and unincorporated businesses. Part-time employment refers to working less than 30 hours a week. It does not distinguish between voluntary and involuntary part-timers. Average hours worked refers to 'usual' rather than 'actual' hours.

2.1 Total Employment

Employment in IT service was 318,000 in 1995 and represented almost 2.5% of total

[3] Statistical agencies in Canada, the U.S. and Mexico are in the process of developing a new harmonized North American Industrial Classification System (NAICS), scheduled to come into effect with reference year 1997. IT services will be better reflected there.

employment in Canada. The level of employment almost doubled in the l976-1995 period. It grew at a rate two-and-a-half times that of the economy average, with much of the growth taking place within the last three years. (Chart 1 compares the evolution of employment in IT services and the whole economy in index form).
As the next section shows, this was principally due to growth in computer services, which evolved from an insignificant industry in 1976 to a dynamic and flourishing one by 1995.

Chart 1.1 IT employment performance

The year-over-year growth for this period, though, was not smooth. Employment grew relatively slowly in the late 70's and lost some ground during the 1980 recession. It then grew considerably in the second half of the ‘80s, to suffer a large but short-lived loss in 1992. During the last three years employment expanded at very high rates, surpassing its pre-recession level. The sector’s share of total employment increased (Table 1).

Table 1. IT Employment, 1976-1995

Year	IT services ’000	IT services Indexes	Total economy Indexes	IT services share %	Rates of growth %
1976	160	100.0	100.0	1.7	**Total Growth**
1977	168	104.9	102.2	1.7	
1978	174	108.8	105.6	1.7	IT Services
1979	186	116.2	110.1	1.7	
1980	180	112.6	113.7	1.6	**98.9**
1981	200	125.4	116.8	1.8	
1982	206	129.0	113.2	1.9	Total economy
1983	219	137.2	114.0	2.0	
1984	206	129.2	117.1	1.8	**39.5**
1985	222	139.2	120.8	1.9	
1986	234	146.4	124.5	1.9	Average annual compounded
1987	249	156.1	127.9	2.0	
1988	248	155.4	132.2	1.9	IT services
1989	268	167.5	135.1	2.1	
1990	268	167.6	135.9	2.0	**3.7**
1991	270	169.1	133.3	2.1	
1992	244	152.8	132.6	1.9	Total economy
1993	257	161.2	134.3	2.0	
1994	277	173.7	137.3	2.1	**1.8**
1995	318	198.9	139.5	2.4	

Year	IT services '000	IT services Indexes	Total economy Indexes	IT services share %	Rates of growth %

2.2 Industrial Composition

The boundaries between telecommunication carriers, broadcasting, cable in particular, and computer services is becoming quite blurred. A typical example comes could be Internet services provision. Employment is not spread evenly across all industries of the IT sector; neither is the evolution of these industries over the last two decades. Employment is characterized by the contrasting behaviour between the broadcasting and telecommunications carriers industries on one hand, and computer services on the other. The latter experienced phenomenal employment growth, more than quadrupling its share in the industrial sector at the expense of both other industries, which had small, and below average, growth (Table 2). In fact, the computer services industry accounts for all the gains in the sector's share of employment. However, employment in carriers has stabilized in the last two years, and the industry still accounts for most of the sector's employment (Chart 2). During the 80s there was some significant employment gain in computer services. This continued in the start of the 90s, but the industry experienced an equally huge plunge in 1992, to rebound and exceed their 1991 peak by 1994.

Table 2. IT services, employment by industry

	Employment 1995 '000	Employment Shares 1976 %	1995 %	Growth Total 1976-1995 %	Annual Compounded %
Broadcasting	50	22.5	15.7	38.0	1.7
Telecommunications	145			30.6	1.4
Computer Services	123			863.3	33.9
Total	318			98.9	3.7

Chart 2. IT employment by industry 1995

2.3 Self-employment and Paid Employment

The vast majority of jobs in IT services are held by full-time paid employees. Self-employment is insignificant in broadcasting and in telecommunication carriers (less than 1%), and this has changed little since 1976. It is, however, quite pervasive in computer services, where almost one in four workers in self-employed. Strong growth in self-employment was one of the major factors that contributed to the overall employment growth during the 1976-1995 period. It outpaced growth in paid employment by a huge margin (Chart 3).

Chart 3. IT self-employment performance

Although this was also true for the economy as a whole, the degree to which this occurred was more pronounced in IT services. In absolute numbers, though, more paid jobs were created although in 1990 -1995 period an almost equal amount of jobs was created in each of the two categories. Self-employment in the sector was hurt by the recession of the early '90s, when both the level of self-employment and its share of total employment fell, but it rebounded to all-time highs over the last two year (Table 3).

Table 3. IT self-employment, 1976-1995

Year	Self-employment '000	Self-employment Indexes	Paid employment Indexes	Self-employment share %	Rates of Growth %
1976	1	100.0	100.0	0.7	**Total growth**
1977	1	100.9	105.0	0.7	
1978	2	144.5	108.5	1.0	Self-employment
1979	3	284.7	114.9	1.8	
1980	2	207.5	111.9	1.4	**2,691.4**
1981	5	400.8	123.3	2.4	
1982	6	542.2	125.9	3.1	Paid employment
1983	5	397.4	135.3	2.1	
1984	7	623.9	125.6	3.6	**79.6**
1985	8	707.3	135.0	3.7	
1986	9	735.7	142.1	3.7	**Average annual compounded**
1987	15	1237.4	148.0	5.8	
1988	15	1233.9	147.4	5.9	Self-employment

1989	17	1403.1	158.3	6.2	
1990	21	1757.3	155.8	7.7	**19.2**
1991	29	2429.7	152.3	10.6	
1992	19	1628.6	141.9	7.9	Paid employment
1993	26	2239.0	145.7	10.2	
1994	25	2111.3	159.3	9.0	**3.1**
1995	33	2791.4	179.6	10.4	

2.4 Part-time and Full-time Employment.

Part-time employment is a relatively small component of IT services (6%) but, as with self-employment, it is proportionately more evident in computer services. It is less widespread than the economy as a whole, where nearly one in five employees work part-time. Part-time employment growth was higher than total employment growth. Although the absolute numbers of part-time and full-time jobs created over the period were almost the same, they translated into a much higher rate of growth for part-time employment - given its small size (Chart 4).

Chart 4. IT part-time employment performance

Both part-time and full-time employment have more than regained their pre-recession levels of employment (Table 4).

Table 4. IT part-time employment, 1976-1995

Year	Part-time employment '000	Part-time employment Indexes	Full-time employment Indexes	Part-time share %	Rates of growth %
1976	7	100.0	100.0	4.1	**Total growth**
1977	8	114.3	104.5	4.5	
1978	7	102.4	109.1	3.9	Part-time employment
1979	7	100.5	116.9	3.6	
1980	8	127.2	112.0	4.7	**192.2**
1981	12	184.1	122.9	6.1	
1982	10	146.5	128.3	4.7	Full-time employment
1983	11	164.4	136.1	4.9	
1984	10	157.5	128.0	5.0	**94.9**
1985	11	160.2	138.3	4.7	
1986	11	168.5	145.5	4.7	Average annual compounded
1987	15	222.4	153.2	5.9	
1988	13	200.4	153.5	5.3	Part-time employment

1989	14	212.1	165.6	5.2	
1990	14	212.8	165.7	5.2	**5.8**
1991	15	233.1	166.4	5.7	
1992	15	222.4	149.9	6.0	Full-time employment
1993	14	219.8	158.6	5.6	
1994	18	266.9	169.6	6.3	**3.6**
1995	19	292.2	194.9	6.1	

2.5 Female and Male Employment

Female employment represents a substantial part of total employment in IT services. The rate of growth in employment for men and women in the sector differed somewhat, with that of female employment trailing male employment, especially in the last couple of years. Female employment grew faster than male, though, in the last half of the '80s. Both men and women lost jo '90s. The year over year rates of growth for both men and women were not smooth. Chart 5 compare in index form.

More than half of the employees in the sector were full-time paid men in 1995. However, the proportion of this employment category has been declining over the years. As a result, other employment categories are growing in relative importance, particularly full-time paid women, which account for about 35% of total employment, and self-employment which accounts for 10%. Gains in self-employment were basically concentrated among males. All categories in computer services experienced increased employment.

Most of the jobs created in the industry were full-time paid. Full-time paid female employment experienced the highest rate of growth, although in absolute terms, more additional jobs were filled by men.

Table 5. IT Female employment, 1976-1995

Year	Female employment '000	Female employment Indexes	Male employment Indexes	Female share %	Rates of growth %
1976	69	100.0	100.0	30.8	**Total growth**
1977	67	97.9	110.3	25.9	
1978	71	102.8	113.3	29.9	Female
1979	69	100.0	128.4	26.0	
1980	72	104.2	119.0	29.8	**76.1**
1981	84	121.7	128.1	28.6	
1982	86	124.5	132.5	31.5	Male
1983	89	129.5	143.1	30.7	

1984	85	124.1	133.1	35.2	**116.1**
1985	86	124.2	150.5	32.5	
1986	96	138.8	152.2	38.4	**Average annual compounded**
1987	103	149.0	161.4	40.1	
1988	103	149.5	159.9	38.8	Female
1989	108	157.0	175.4	36.9	
1990	103	149.8	181.1	35.3	**3.0**
1991	108	157.3	178.1	34.3	
1992	98	142.8	160.4	35.1	Male
1993	105	152.4	167.8	40.6	
1994	108	156.3	186.8	37.6	**4.1**
1995	121	176.1	216.1	34.8	

2.6 Occupational Mix.

It is useful to look at employment levels and growth from an occupational perspective, since not computer services industry, for example, is a computer specialist. The occupational breakdown analys and administrative, other professional, clerical and other [4]. In IT services, the largest proportion of j managerial, administrative and other professional categories (60%). By comparison, only one th economy as a whole fall into these categories. For computer services the proportion of employees i more pronounced (84%). Telecommunication carriers had the largest proportion of clerical staff, average. Moreover, the mix of occupations has been shifting over the years in favour of manageri professional positions. This is evident both in the IT sector and the economy as a whole, though the t rapid in IT. In 1976, fewer than one-third of the positions were managerial, administrative and profes than half fell into these categories. These categories together accounted for almost 90% of the growt The proportion of clerical jobs, by contrast declined from almost 40% in 1976 to less than 20% in 199

Table 6. IT services, employment by occupation.

	Employment 1995 '000	Employment shares		Growth	
		Employment 1976 %	1995 %	Total 1976-1995	Annual compounded %
Managerial and administrative	62	8.6	19.6	354.3	8.3
Other professional	123	19.9	38.7	286.4	7.4
Clerical	63	39.6	19.8	-0.5	0.0
Other	70	31.9	22.0	36.8	1.7
Total	318	100.0	100.0	89.9	3.7

The occupational distribution of female employment reveals that women made significant gains in th and professional categories between 1976 and 1995. They still account, however, for most clerical po

Table 7. IT services, female employment by occupation

	Employment	Employment shares	Growth

[4] A more detailed occupational classification correlated with levels of education can be supported only by census data. For an analysis of 1991 see Hansen (1996).

	1995 '000	1976 %	1995 %	Total 1976-1995	Annual compounded %
Managerial and administrative	25	5.1	20.9	627.0	11.0
Other professional	32	8.4	26.5	452 .9	9.4
Clerical	50	80.5	41.5	-9.0	-0.5
Other	13	5.9	11.1	228.3	6.5
Total	121	100.0	100.0	76.4	3.0

The majority of professional positions other than managerial are held by men. Less than 30% of the a area between 1976 and 1995 were filled by women. Women did manage to secure most of the new jo and administrative area though (Table 8).

Table 8. IT Services, employment shares by sex and occupation.

	1976			1995	
	Male	Female	Total %	Male	Female
Managerial and administrative	74.4	25.6	100.0	59.1	40.9
Other professional	81.8	18.2	100.0	73.9	26.1
Clerical	12.3	87.7	100.0	19.7	80.3
Other	92.0	8.0	100.0	80.8	19.2
Total	56.9	43.1	100.0	61.8	38.2

2.7 Education.

Employment in IT services is characterized by a higher than economy-average level of education. M least a high school education and nearly 30% hold at least one university degree. This is well above t total work force, where approximately one worker in five has not even finished high school. The co industry, in particular, has the highest proportion of employees with at least one university degree. M employees in the industry have at least some post-secondary education. Telecommunication carriers h employees with only a high school diploma (26%). The proportion of men and women with some p increased greatly over the period. This is indicative of up skilling. In 1976, less than half of those e secondary education, whereas by 1995 this share had reached nearly 80%. The high level of educati more pronounced when looking at self-employment. While in general, the self-employed in the r educated, every person who is self-employed in this sector has at least a high school diploma, and nea a university degree. Most of the women in the sector have at least some post-secondary education, wh 1976. Nevertheless, a higher proportion of males in this sector possess a university degree and the g closed. This may help explain the occupational distribution seen in the previous section (Table 9).

Table 9. Education in IT services, 1995.

				Total employment		Self-employment	
	Male '000	Female '000	Total	IT services %	Total economy %	IT services %	Total employment %
No high school	6	8	14	4.3	20.4	2.2	25.1
High school +	125	86	210	66.2	61.5	54.5	55.6

University	66	28	94	29.6	18.1	43.3	19.3
Total	196	121	318	100.0	100.0	100.0	100.0

2.9 Other Characteristics.

As is the case in the economy at large, women are on average slightly younger than their male However, both are on average younger than workers in the rest of the economy. The self-employed a the need for more on-the-job experienced required to start one's own business. The average age h since 1976.

Average tenure is higher for men than women - again, as is the case for the economy at large. It is this sector as compared to the rest of the economy, particularly for women. The average tenure fo lower for both sexes. This too has increased since 1976 for both sexes.

Men in IT services work about the same number of hours as the economy-wide average, while women do women in the economy at large. Self-employed men in this sector work longer hours than self-em hours per week worked by both self-employed men and women has fallen since 1976, while it has risen

Table 10. IT services, some characteristics

	IT Services		Total Economy		Self-employment	
	Male	Female	Male	Female	Male	Female
Average age (years)	36.7	36.2	36.9	36.5	39.9	38.3
Average tenure (months)	111.2	110.3	97.0	81.7	64.0	54.3
Average hours (per week)	40.8	37.7	39.9	33.6	43.3	31.1

3. Conclusions and Future Work

Rapid changes in telecommunications, broadcasting and computer services have come with an inc employment implications of the introduction of services which rely on convergent technologies. This employment in IT services sector. Much more remains to be done, both at the industry and the macro

It has been argued that short-term job losses are inevitable due to labour-saving technological imp growth will prevail over time as the case has been with the introduction of other technologies which At the industry level, it has also been argued that although traditional telephone companies down resellers, cellular and personal communication service suppliers are creating new jobs in the telecon more macro level, a serious issue is the distinction between direct and indirect jobs. The former ref IT sector and the latter to the spill-overs outside the sector and onto the rest of the economy, as services to serve businesses and households more efficiently and effectively. Telecommunications employed in other industries as well and these jobs are not reflected in IT employment statistics. An in Canada has been the creation of a number of toll-free 1-800 call centres for order processing, ma

[5] With regards to telecommunications, an issue has also been the connection between jobs and the opening up of competition.

and telemarketing services. Thus, intra-industry as well as inter-industry job loss, creation and re-or
This needs to be done in conjunction with skill sets and wage dispersion. It is also becoming increasi
provision of the content of these services and the employment associated with it.

According to the OECD, reductions in the size of the work force in traditional telephone companies
whether or not competition was introduced (OECD 1995b). Moreover, the dynamics of emplo
conjunction with investment and output. A recent report from the U.S. (Executive Office of the Pres
proposals and eventually policies to employment growth through growth in output. It argues for
environment conducive to productivity increases, through the shifting of jobs and other resource
telecommunications and information sectors and increased private investment in an advanced telecor
This would increase aggregate demand and accelerate the rate at which the economy approaches full e

Demand for employment ultimately depends on demand for goods and services. More work needs to
for broadcasting, telecommuncations and computer services by firms as well as households. A rec
telecommunication services by Business Services firms (Mozes and Sciadas 1995) found that not all fi
of the lower prices and wider range of services in Canada. This has policy implications not only in ter
telecommunication services but also in terms of potential jobs.

All in all, a substantial amount of work lies ahead in order to discern the direction of change and
quantity of developments, so that our economies are better prepared to go through the transition.

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