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Our Lives in Digital Times

by G. Sciadas

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Our Lives in Digital Times

By George Sciadas

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Abstract

This paper uses statistical information to begin to shed light on the outcomes and impacts of information and communications technology (ICT). Some of the expected outcomes associated with ICT are presented, while factual evidence is used to demonstrate that these outcomes have so far not materialized. The paperless office is the office that never happened, with consumption of paper at an all-time high and the business of transporting paper thriving. Professional travel has most likely increased during a period when the Internet and videoconferencing technology were taking-off, and; e-commerce sales do not justify recent fears of negative consequences on retail employment and real estate.

The paper further demonstrates that some of the key outcomes of ICTs are manifested in changing behavioural patterns, including communication and spending patterns. People have never communicated more, something exemplified by the explosion in international calling and the massive amounts of e-mails and other electronic communications. ICT spending is also on the rise, with substitutions taking place in favour of newer ICTs, such as the Internet, and against older ones, such as the telephone. In addition, the willingness of people to pay can also be seen by the fact that many low-income households choose to spend a relatively higher proportion of their income on ICTs.

Our Lives in Digital Times

by G. Sciadas

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1. The context

Life in our time is influenced by information and communications technologies (ICTs) everywhere. Over the last two decades, or so, whether at work or in our social lives, computers, cell phones and the Internet have changed daily routines and altered behaviour. The early focus of policy on ICT *access* gave way to issues of *use,* which are more closely linked to benefits. However, the ultimate interest has been to assess the *outcomes* and comprehend the longer term *impacts* associated with ICTs.

About twenty-five years ago, the telephone was the most visible communications technology. Its usage involved, exclusively, simple two-way voice communication, which was not much different from its beginnings a century earlier. Personal computers, cell phones, and the Internet did not exist in any way that would be recognized today. These days, a visitor walking in several downtown cores will notice that people on the street appear to be talking to themselves. In fact, these are not isolated occurrences of eccentric or troubled individuals; these are people talking into microphones and listening through earpieces attached to cell phones, which are tucked away somewhere. The visitor will also notice that groups of people, presumably close friends, walking together on sidewalks and maneuvering through intersections with heavy traffic, are busy talking – but not among themselves; instead, they are chatting individually with someone else, somewhere.

Examples of such behaviour precipitate easy statements of the type that we are becoming increasingly isolated, lonely and remote from our friends and families (Kraut et al. 1998). These are followed by the elaboration of theories concerning modern alienation, the breakdown of the social and community fabric, the decay in interpersonal relationships or the strangeness of our neighbours, among others (Nie and Erbring 2000). While several forces are at work in our societies that may point in such a direction, the story of ICTs is rather different in that there are many angles and nuances to consider.

ICTs represent a very long list of goods and services, including older technologies – albeit revitalized or transformed – such as the telephone and the television, and newer technologies whose functionalities are increasingly overlapping through the process of convergence[1]. Those with the most impact are relatively few and well-known, while others are of a peripheral nature and their usage is subsumed by others, for example, the printer and the computer.

Since ICTs have permeated almost every economic and social activity, the outcomes and impacts worthy of examination would make for a very long list. Efforts to understand the impacts of ICTs on the 'macro' economy are well underway (OECD 2003) and, with new datasets available, research is taking place at the level of industry and firm performance (Clayton 2005). While researching economic outcomes is well justified, there are several other outcomes of ICTs related to the social domains of people's lives (Kraut et al. 1998, Wellman et al. 2001, Nie and Erbring 2000).

In order to gain insights into the evolving economic and social outcomes of ICTs, both direct quantification and analytical inference through diverse, time-series data are needed. It is only now, when data have recorded the history of several years, that we can start making meaningful comparisons. However, just like other revolutionary technological process, including the canal, the railway, electricity, and the airplane, it may take decades – rather than years – to fully understand the outcomes and impacts of ICTs. Although the transformation brought about by ICTs may well continue to evolve over time, this analysis takes a shorter–term view and uses a variety of data sources to arrive at reasonable inferences on selected ICT-induced behavioural changes.

1. The process of convergence is increasingly blurring the distinctions between technology and the delivery of service. For example, cable providers are now offering cellular and Internet services. Furthermore, new technologies are increasingly able to perform overlapping functions, such as connecting to the Internet through a mobile phone and using the Internet to make telephone calls through Voice over Internet Protocol (VoIP).

In particular, this paper begins to address selective issues and uses statistical information to draw some early inferences to improve understanding of ICT outcomes and impacts. Some of the anticipated or expected outcomes associated with ICT are presented, while factual evidence is used to demonstrate that these outcomes have - so far - not materialized. The paper further demonstrates that some of the key outcomes of ICTs are manifested in changing behavioural patterns, including communication and spending patterns.

Note to readers

This paper represents a new direction in Information Society research and analysis, in an attempt to begin to address the socio-economic outcomes and impacts of ICT. While Statistics Canada has collected measures of ICT readiness and intensity for some time now, indicators of ICT outcomes are still in the early stages of development. A useful framework for studying science and technology activity in Canada was adopted by Statistics Canada in 1998 (Statistics Canada 1999a), and can be used in the context of this paper to describe the evolution of statistical indicators for the Information Society.

The purpose of the framework is to systematically guide and organize the way in which statistical information is collected and interpreted with respect to various science and technology activities and their interactions with the society and the economy. It further provides a coherent classification into which the indicators of activities, linkages and outcomes can be placed and related to key analytical questions. The indicators and the corresponding questions follow below:

Activities
Who are the actors (individuals and organizations) involved in the activity?
What is the nature of the activity?
Where is the activity taking place?
When is the activity initiated and why is the actor doing the activity?

Linkages
What resources have been committed to the activity, where do they come from and what are their characteristics?
What are the social organizations, the supporting infrastructures, networks, constraints and linkages between actors involved?

Outcomes
What are the medium term consequences of the activity?
What are the longer-term socio-economic consequences that take more time to emerge?

The main objective of this paper is to examine issues related to outcomes of ICT. In doing so, the paper 'debunks' some of the predicted outcomes of the widespread use of ICTs in everyday life using a variety of statistical information and factual evidence. It also begins to address some of the longer-term impacts of ICT on people's behaviour, which are often more difficult to detect and impute back to their origins. Further work on the development of indicators for outcomes and impacts is required in order to accurately measure and fully understand the evolution and transformations of the Information Society.

2. Expectations and realities

In recent years, much has been learned through the quantification of ICT access and use (see, for instance, Statistics Canada 2003a). More competitive marketplaces, infrastructure deployment and falling prices have contributed to high uptake rates of ICTs in many countries[2]. As a result, *access* is no longer the dominant issue – at least in developed countries[3]. *Usage* takes place from many locations and, as applications and uptake move in tandem, it becomes more diversified. E-mail has emerged as an indispensable communications medium, while information and entertainment uses proliferate. As well, e-commerce is taking hold - whether browsing for product characteristics and prices or placing orders online.

In the process of such wholesale technological, economic and social transformations, progress has also been made in both quantifying ICT-related change and appreciating the value of such information. Nevertheless, it takes time to measure change and find analytical approaches to use the data. In the meantime, hypotheses are postulated and get frequently passed on as conclusions. Now, some harder quantitative evidence can be used to see what has really happened – and what has not. However, it is still early and this work must proceed with caution.

2.1 Expected outcomes

Quite frequently, the early stages of important new developments can be subject to euphoric hype and impatience regarding prospective possibilities. One manifestation of this is associated with premature inferences about allegedly 'predictable' outcomes. Take the example of rural electrification; the 1920s and the 1930s produced claims that with the development of this new technology, work and workers would move from the cities to the countryside once they adjusted. Today, cities are still growing while rural communities are still shrinking (Brown and Duguid 2000). Although not based on hard evidence, which is invariably non-existent during those early stages, such beliefs may become engrained into people's psyche and, consciously or not, begin to influence decision-making[4]. In the extreme, these beliefs are typically communicated as premature announcements of 'the end'; the end of distance (Cairncross 2001), the end of place[5] (Kelly 1998), and even the end of history (Fukuyama 1992). The emergence and rapid diffusion of new ICTs was no exception, but quite typical of such behaviour. It gave rise to several expected outcomes, which have not yet been realized or can not yet be supported by factual evidence. Some of these expectations are explored below.

2.1.1 The paperless office

The arrival of the personal computer in the early 1980s and its speedy diffusion later in the decade, combined with the arrival of networks that made it possible to electronically capture, store, access, display, manipulate and transmit documents, gave rise to much talk of a 'paperless office' and, by extension, a 'paperless society' (Sellen and Harper 2001; Business Week 1975).

However, the production and use of paper products is at an all-time high. Data reveal that consumption of paper for printing and writing alone has increased significantly over the last two decades (Table 1). In Canada, consumption more than doubled between 1983 and 2003 – with most of the growth occurring during the first of the two decades. As the growth rate of consumption (139.3%) outstripped the rate of growth of the population (23.6%), per capita consumption increased by 93.6% to 91.4 kilograms in 2003. This is equivalent to almost 20,000 pages[6] per individual, enough to cover an area of almost 1,200 square metres.

Per capita consumption in the U.S. is comparable to that of Canada; but increased consumption is not confined to developed countries. Worldwide production and consumption of paper also more than doubled over the last two decades, with especially high growth in emerging Asian economies (particularly China, which absorbs a significant amount of Canadian paper exports). Society's addiction to paper is expected to intensify; paper consumption is projected to continue to grow, and more so in developing countries. According to the Forest Products Association of Canada (2004), growth over the next 15 years is forecast at 3.2% annually; 5.5% for developing countries and 2.5% for developed ones (Forest Products Association of Canada 2004).

2. In some instances penetration rates begin to approach universality levels, especially in some geographically-defined communities. However, ICTs are still evolving and this is not the case for newer technologies (i.e. broadband).

3. It is known that a Digital Divide still exists even among advanced countries, part of which is related to incomes and part of which is related to many other factors. It is also known that the gap between developed and developing countries is huge – but this does not come as a surprise (Orbicom 2003, 2005). Some progress is being made and technological leapfrogging is occurring.

4. They do not become self-fulfilling prophecies, however, as will be demonstrated here.

5. In fact, recent evidence suggests that the role of place and community are more critical to economic life than ever before (Florida 2003).

6. Estimated on the basis of 216 mm x 279 mm (8 ½ x 11 inches) sheets of 50 lbs. thickness paper. These figures refer only to paper for printing and writing, not including newsprint and other types of paper products. In Canada, paper for printing and writing represented 21.2% of all paper products in 2003 – up from 20.5% in 2002 (Forest Products Association of Canada, Annual Review 2003).

Table 1
Production and consumption of printing and writing paper

	1983	1993	2003
		metric tonne	
Canada			
Production	1,726,000	4,194,000	6,457,000
Imports	185,200	506,166	1,037,123
Exports	713,100	2,117,000	4,626,681
Consumption	1,198,100	2,583,166	2,867,442
United States			
Production	15,405,000	21,511,008	20,304,502
Imports	1,201,900	2,891,000	7,300,332
Exports	167,300	1,017,000	1,286,954
Consumption	16,439,600	23,385,008	26,317,880
World			
Production	45,224,300	71,956,808	97,199,494

Note: Consumption is estimated as production plus imports minus exports.
Source: FAOSTAT, United Nations Food and Agriculture Organization, 2004.

Not only is the notion of a paperless society defeated by existing data, but a visit to any modern office workplace will confirm that printers everywhere continue to spit out massive amounts of paper, and paper recycling bins are full. Jokes concerning the printing of e-mails abound, and there are reports that e-mail alone has significantly increased printing. Estimates for additional printing by businesses due to the use of the Internet and e-mail range from 30-35% (Ivey Business Consulting Group 2003) to 40% (Sellen and Harper 2001) depending on enterprise size. If anything, "shred-it" businesses proliferate like never before and printers have also found their way into people's homes. *At this juncture, the digital era appears hungry for paper.*

Surely, there are more parts to the story concerning the relationship between ICTs and paper. There is no doubt that ICTs have brought about numerous behavioural changes – gone are the days of hand-writing or dictating text, a substantial amount of reading is done on the screen, and there is even the occasional office that gives the semblance of being paperless. There are also many other reasons why paper is thriving, including its versatility and its physical properties of tangibility and portability. The fact remains, however, that *the paperless office is the office that never happened*. This leads to the related issue of transporting paper.

2.1.2 The end of mail

The arrival of the fax machine more than two decades ago gave rise to talk about the drastic reduction in mail, including the fall to relative insignificance of the post office, a fixture in every country. This was multiplied manifold in the early to mid-1990s with the arrival of e-mail in its commercial incarnation.

Indeed, as early as 1998 the International Labor Organization (ILO) noted: *"It is five years since the number of international messages sent by fax took a bigger share of the market than those conveyed by post. In 1996, for the first time, the volume of e-mail in the United States exceeded the number of letters delivered by the postal service"* (p.12). Today, the volume of e-mail is many times higher and still growing enormously. More recently, electronic messaging through cell phones and other handheld devices is also exploding in several parts of the world. In Finland, for example, four out of five mobile phone users (and there are many with 74% of the population aged 15-74 using mobiles in 2003) report sending text messages weekly, with 1% sending between 100 and 200 messages! Nearly all those in the 15-29 age group sent text messages, including picture messages (Nurmela and Sirkiä 2004).

Yet, despite the truly enormous rise in e-talk, data fail to validate the demise of transporting paper. The volume of postal deliveries, both by the public and private sectors, has increased, at the same time at which faxes are sent, and e-mails and text messages skyrocket. Canada Post's volume is up over a long period (Table 2) – albeit marginally lately, and down from its peak in the mid 1990s[7]. Even though the rates of growth are slower, or even if there was a decline, the trends of mail delivery are nowhere close to pointing to the imminent demise of postal offices. The additional volume of half a billion pieces moved around annually by private couriers and local messengers adds to the perspective, particularly if the growth of the last few years is factored in (Table 3).

7. While it increased every year until 95/96, it decreased in the next couple of years hitting a low in 97/98, but has since rebounded.

Table 2
Canada Post mail volume

Year	billions of pieces
1983	6.6
1993	10.4
2003	10.7

Note: Data for 1983 and 1993 refer to fiscal years (April-March), while data for 2003 refer to the calendar year.

Source: Canada Post Corporation Annual Reports.

Table 3
Private couriers mail volume

Year	millions of pieces
1997	260
1999	521
2000	466
2001	485
2002	501
2003	489

Notes: Data refer only to large and medium couriers with annual revenues of $250,000 and up. Data for 1997 are not exactly comparable as they refer to carriers with revenues over $150,000, while no data exist for 1998.

Source: Statistics Canada, Surface and Marine Transport Service Bulletin, Catalogue No. 50-002-XIE.

Couriers and local messengers are proliferating today, as is their employment. Tables 4 and 5 show the industry's firm demographics and employment, respectively, for selected years - during which Internet usage and e-mail were high in Canada. *These are clearly not signs of an industry in distress.*

Therefore, the business of moving paper around is alive and well. In large offices, there are still people whose job it is to physically move paper around from one floor to the next. Once again it must be re-iterated that many things may have changed, including the operations of postal offices and the *composition* of mail, but not the activity itself. For instance, personal mail is down, but other types of mail make up for it. Moreover, operators have undergone serious reorganization and re-allocation of their activities, including franchising, and express mail services[8] or e-mail (something more pronounced in countries where there was already a split between post and telecommunications). Junk mail makes up some of the lost ground as well, in parallel with the existence of spam and other telemarketing activities.

Table 4
Couriers and local messengers - demographics

	1998	1999	2000	2001	2002	2003
	number of firms					
Couriers	1,200	1,644	1,782	2,003	2,353	2,624
Local messengers and local delivery	10,121	16,276	16,357	16,960	17,339	17,888
Total	**11,321**	**17,920**	**18,139**	**18,963**	**19,691**	**20,512**

Source: Statistics Canada, Survey of the Couriers and Local Messengers Industry.

Table 5
Couriers and local messengers - employment

	1991	1993	1997	2000	2003
	number of employees				
Couriers	28,892	30,494	33,433	33,532	34,770
Local messengers and local delivery	4,158	4,410	4,727	4,739	6,306
Total	**33,050**	**34,904**	**38,160**	**38,271**	**41,076**

Source: Statistics Canada, Survey of Employment, Payroll and Hours (SEPH).

8. In 2003, next-day and overnight delivery services accounted for more than half of couriers' revenues; 91% of local messengers' revenues and pieces were for same-day delivery services (Statistics Canada, Surface and Marine Transport Service Bulletin, Catalogue No. 50-002-XIE).

2.1.3 The end of professional travel

The case of human transport, in conjunction with the need for physical gatherings, such as business meetings, conferences, workshops, symposia and the like is also worth exploring. E-mail, the Web and videoconferencing were said to lead to the end of such movement as it would be more practical and economical to telecommute (Lyon 1988). This has not yet been the case, according to research which suggests that the greater the availability of information about activities and people of interest, the greater the travel to participate in those activities or meet those people (Mokhtarian and Meenakshisundaram 1999). This work further observed that e-mail and face-to-face meetings are the fastest growing modes of communication, and that travel is unlikely to be significantly reduced by the use of newer ICTs.

Although comprehensive and reliable Canadian data are limited, there is evidence to suggest that professional travel was actually increasing in Canada during the same time that new ICTs were being introduced to markets. Between 1996 and 2000 – a major period of ICT adoption by businesses – the number of domestic business (and convention) trips made by Canadian residents grew from 20.9 million to 26.5 million (Table 6). Business travel to Canada was also expanding, resulting in 735 thousand trips in 1999, a 6% increase over the previous year. The events of 9/11 likely had some effect on both domestic and international travel, as trips for business began to decline in the years following (Statistics Canada, Catalogue No. 66-201).

Table 6
Domestic business and convention travel by residents of Canada

	1996	1998	2000
	thousands of person-trips		
Business	18,644	22,340	23,168
Convention	2,312	2,452	3,379
Total	**20,956**	**24,792**	**26,547**

Source: Statistics Canada, Canadian Travel Survey.

Consider also the anecdotal evidence of the volume of organized events today, not to mention comments by professionals about the need to be cloned in order to keep up with the demands for appearances, and the importance of personal interaction. All of this makes it abundantly clear that we have never had more movement, which probably reflects the need to meet, perhaps even more than before.

Even though there are definite advantages to distant forms of communications, and teleconferencing, videoconferencing and Web casting are indeed on the rise, they are still relatively small-scale, somewhat eclectic and seem to take place in parallel rather than replacing physical gatherings.

2.1.4 The end of traditional retail

Finally, there is the case of retail trade, which for many, was a cause for concern in the early days of e-commerce. Much has been written about the potential detrimental effects on retail of the new way to do commerce, including fears of unemployment, given the huge numbers of workers involved in the industry and their relatively lower qualifications, as well as fears that e-commerce may soon alter land use for bricks-and-mortar retail, particularly in downtown cores (Nie and Erbring 2002).

It is true that although e-commerce started small, it continues to grow steadily and at a healthy rate – just as retail is. Table 7 shows comparative data over recent years for which the value of e-commerce sales is measured in Canada. Total private sector sales over the Internet more than quadrupled between 2001 and 2004 (an average compound annual growth rate (CAGR) of 43%), to account for 1.05% of total sales. Similarly, e-sales in the retail industry more than tripled (35%), accounting for 0.8% of the total (Statistics Canada 2005a).

While e-commerce takes hold and begins to mature, data show that the number of retailers, retail space and employment in the industry have all increased – at stronger rates in recent years (Table 8).

Table 7
E-commerce sales - share and growth

	2001		2004		Average compound annual growth rate (CAGR) 2001 to 2004
	billion $	% of sales	billions $	% of sales	percentage
Retail trade industry	0.9	0.29	2.95	0.80	35
Total private sector	6.3	0.28	26.4	1.05	43

Source: Statistics Canada, Survey of Electronic Commerce and Technology and Quarterly Survey of Financial Statistics for Enterprises.

Table 8
Retail trends

	1983	1993	1998
Number of stores	19,776	22,989	24,784
Total floor area (m^2)	11,051,190	12,430,885	15,471,815
Employment (,000)	..	1,624	1,889

.. not available for specific reference period
Source: Statistics Canada, Annual Retail Chain and Retail Store Surveys.

While 'clicks did not destroy bricks', e-commerce has permanently stamped its mark on the retail – and wholesale - industry, as consumers use the new medium for information, product characteristics, pricing, etc. The Economist (2004) states that not only do people buy more online but *"…they are also increasingly adept at using the Internet to decide where and how to spend their money offline" (p. 9)*. The fact remains that retail does not seem to be in danger, although there are indications that online retail sales are now growing more quickly than off-line sales (Uhrbach 2005). Moreover, other adjustments are taking place which are not necessarily linked to e-commerce.

Parallel developments during the 1990s, like the 'big box' phenomenon, "sprouted across the country, dramatically changing the face of retail" (Lussier et al. 2003). At the same time, many stores bought into the one-stop shopping philosophy, expanding both their physical size and selection of merchandise. There have also been many *shifts in the composition of sales*, such as the increased share of health and personal care products, and automotive products at the expense of food and beverage, and clothing.

2.1.5 A time of change

These are some of the expected outcomes associated with ICTs that have made the news over the last several years. While all of them contain implied causality, and even grains of logic, so far they have not materialized. The paperless society, the end of mail, the end of traditional retail and numerous other such proclamations have all been grossly exaggerated with quantification at this point in time proving them faulty.

Presumably, it can always be argued that these predicted outcomes may still happen – they just have not happened yet. Another way to explain *why* what was supposed to happen has not yet happened is by acknowledging that many forces are at work simultaneously, some of which concern people's behaviour. Thus, it may well be that the ICT forces are indeed pointing in the alleged directions, but all kinds of other influences, pointing in opposite ways, dominate. Such interactions are quite complex and do not result in straight-line movements for a multitude of reasons. In the very least, the *ceteris paribus* assumption (all other things equal) does not hold true between ICT causes and their supposed effects.

In addition to macro factors, ICTs involve people's behaviours, reaction to the new, inertia, inter-generational attitudes and more. In any event, such a view would manifest itself in *changing composition and patterns of usage*, and this seems to be the case. It is evident that ICTs have significant implications on each of the above areas. For example, although the paperless office is not here, people's behaviour has changed profoundly and continues to do so. Working lives are certainly not what they used to be, and even family lives have changed - with implications for time-use and personal interactions. The composition of mail has changed, as have the operations of the post office, including prices. Retail will never be the same as consumers have never been more empowered. The list can go on and on. Thus, *ICTs have powerful and lasting influences, albeit different from the "obvious" ones predicted at early stages of deployment and use*. By all accounts, the transformations associated with ICTs are not yet complete.

2.2 Realities

Having explored what has not yet happened, it is instructive to examine the realities of what has happened.

Fact 1. People talk on the phone more than they ever have

Years ago, and at a time when the telecommunications industry was still dominated by monopolies, a vast amount of literature was converging on the low price elasticity of the demand for telecommunications services (voice telephony and particularly long distance). Of course, it is easy to refute now, but the literature could not have been more wrong. This conventional wisdom came crashing down from the very early stages of opening up the markets.

Traffic data reveal that the use of wireline networks alone has increased enormously over the last twenty years. Both the frequency of calls and the talking time have gone up. In Canada, lines increased from about 11.5 million in 1983 to approach 20 million by 2003[9], and in the U.S. from 102.2 million in 1980 to 188 million by 2001. *Notwithstanding the big increase in the number of lines, average calls per line increased, as did average calls per capita.* More significant was the

9. Refers to voice-grade equivalents (VGE) due to ISDN channels.

increase in time spent on the phone[10]. In the U.S., the estimated volume of conversation time increased from about 1.7 trillion minutes in 1980 to approach 5 trillion by 2001, while in Canada, the volume in 2003 was estimated at just short of half a billion minutes[11] (Table 9). In 2001, this represented 71 minutes per line per day in the U.S., up from 46 minutes in 1980. Estimates for Canada are a bit lower (see Technical Box for complete methodological explanations).

This increase is even more telling because it happened during the period of the introduction of cell phones – which did not exist in the early 1980s – and their increased use, particularly over the last decade. Cell phone traffic follows the same pattern as the diffusion of cell phones – rather slow in the beginning but more rapid in recent years. In Canada, cell phone subscribers grew from 98 thousand in 1987 to 13.5 million by 2003; mobile subscribers in the U.S. increased from 92 thousand in 1984 to over 140 million by 2002.

At the same time, data show that in Canada the number of billed minutes increased by a factor of 20 over the last 10 years, from just over 2 billion in 1993 to approach 40 billion by 2003. Gradually, this has added an average of 8 minutes a day per cell phone subscriber or 4 minutes a day per capita in Canada (Table 10). In the U.S. billed minutes increased even more, from almost 27 billion to more than 720 billion by 2002. This amounted to 14 minutes per day per mobile subscriber or 7 minutes per capita in the U.S. This phenomenon is on the rise and there is no indication that a ceiling has been reached[12]. These trends may be more pronounced in several European countries which are heavier users, and elsewhere in the world, where cell phones have overtaken fixed lines for some time now (International Telecommunication Union (ITU) 2004).

Table 9
Traffic over wireline networks, U.S. and Canada

	Lines	Calls	Minutes	Calls per day		Minutes per day	
	millions	billions	billions	per line	per capita	per line	per capita
United States							
1980	102	312	1,734	8.4	3.8	46	21
2001	188	609[1]	4,866	8.9	5.9	71	47
Canada							
1983	11.5[1]	29	..	6.9	3.3	..	..
1987	12.8	37	..	7.9	3.8	..	..
1997	18.4	..	340[1]	..	..	51	39
2003	19.5[1]	..	461[1]	..	..	65	47

.. not available for a specific reference period

1. Author's estimates.

Note: See technical box for methodological explanations.

Source: Federal Communications Commission, Statistics Canada.

Table 10
Traffic volume over cell phones, U.S. and Canada

	Subscribers	Minutes	Minutes	
	millions	billions	per line/day	per capita/day
United States				
1993	16	26.9	4.7	0.3
2002	140.8	721.3	14.2	6.7
Canada				
1993	1.3	2.1	4.4	0.2
2003	13.5	39.4	8.2	3.5

Source: Federal Communications Commission and Statistics Canada.

10. Cannot use average duration with these data (see technical box and later).
11. This is not due to network effects (externalities) as penetration was complete by the early 80s. As well, while network effects may be present with respect to international traffic, this is a tiny proportion of the calling volumes and times for local and domestic long distance.
12. There may be substitutions from fixed lines, but overall this is not the case - more of both are used.

Technical box

Accurate and systematic data on calling volumes for wireline telephone traffic are hard to come by in North America, mostly due to the flat pricing which bundles access and unlimited local calling. In Canada, while the Annual Telephone Survey collected the number of calls for some time until 1993, the Quarterly Telecommunications Survey collects data on long distance traffic from 1999 onwards (Statistics Canada 2003b). In the U.S., periodic studies are conducted to arrive at such estimates, which are subject to wide margins of error. (These are used, for example, to estimate the proportion of interstate calling to allocate the costs between intrastate and interstate calling among companies).

Several adjustments are made in order to arrive at the figures shown in this paper, which are therefore subject to a margin of error. They are used to provide estimates of the order of magnitude - the exact figures are not critical in the analysis contained in this paper.

The U.S. data in Table 9 are constructed from data contained in the 2003 report of the Federal Communications Commission (FCC). Local minutes refer to dial equipment minutes (DEMs) with two minutes captured for every DEM. In the intrastate and interstate long distance, only the domestic portion of the outgoing international calls is captured. Thus, the minutes for international traffic are added to the estimates available for local and domestic long distance (the source of the 1980 incoming traffic is the International Telecommunication Union (ITU)). International traffic does not really affect the estimated number of minutes per line per day.

To arrive at the data for Canada in Table 9, the following steps took place: starting with the long distance data contained in Cat. No. 56-002, an average figure is extracted from the quarterly series on voice-grade equivalent (VGE) lines and long distance minutes (which includes inbound, outbound and toll free calls). From that number, the outgoing international minutes, reported by the ITU, are subtracted and the remainder is multiplied by two to capture the volume of all conversation minutes within Canada. The factor 56/15 (3.73333) from the U.S. is then applied to arrive at some estimate of local minutes. Obviously, this assumes that the pattern is the same in the two countries. (It turns out that the figures are in line with the rough factor of 10 sometimes used in Canada-U.S. comparisons). In international calling, Canada's proportion is much higher – and has been so historically. Then, the international calls are added (not multiplied by two, as only one of them reflects Canadian conversations).

The wireless billed minutes are those reported by the companies and they are subject to some undercoverage. Among the problems with the estimates are that the cell phones are not adjusted for the two calling parties – since both calling and receiving parties are billed for air time in North America. While this captures the air time for calls between cell phones, to the very likely extent that calls from cell phones go to fixed lines in Canada, only the billed cell phone air time will be captured resulting in an underestimate.

The combination of wireline and wireless voice communications points to the fact that, at this juncture of evolution, *the Information Society is also a "talkative society"*. On the basis of the Canadian and U.S. figures, the amount of time spent talking on the phone went up somewhere in the range of half-an-hour to 45 minutes per person per day. This is only an average figure – if there was a distribution to take into account that just over half of the population has a cell phone, the time increases substantially for that part of our society that possesses and uses them.

Fact 2. People communicate more than ever with e-mail and spend more time on ICTs

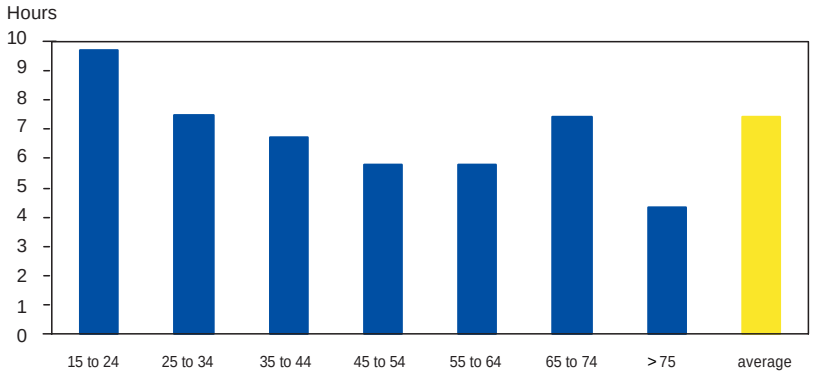
The extra time spent on the phone as part of daily routines today is substantial, but still pales in comparison to the amounts of time absorbed by other ICT activities that did not even exist over two decades ago. Computers and the Internet – and more particularly e-mail - are inextricably linked to images of people in their daily lives, at the workplace and at home. Whether people actually type away on the keyboard, use printers and

scanners, browse the Web or shop electronically, they do things of the past differently, and they also do new things.

E-mail has surfaced as the number one activity associated with Internet use. In Canada, for example, of the 64% of households that used the Internet in 2003, 95.7% used e-mail (Statistics Canada 2004a), and for many people everywhere this is a daily activity. Obviously, such usage claims an amount of time that was devoted elsewhere in pre-e-mail times. Moreover, this time represents a fraction of the time devoted to other ICTs. While precise estimates of such time-use are not available, and it differs by country, according to several marketing information sources estimates of total time spent on-line is 75 hours a month at work and somewhere between 25-30 hours at home. This order of magnitude is corroborated by data from Statistics Canada (Chart 1).

On average, individual Internet users (52.8% in 2000) spent 7.4 hrs a week on-line, averaging more than one hour per day. Younger people spend even more time and some are very heavy users. For instance, 10% of those in the 15-24 age group spent more than 2 hours daily – perhaps a lot more. There are also indications that such usage expands over time and would probably be even higher today. For instance, 2004 data for Canada show that the average time spent online per user ranged from 31 hours per month for the Prairies to 37 hours in Ontario (Comscore Media Metrix 2004). Time spent on off-line use of computers and other ICTs must be undoubtedly added to the total. For instance, 43.3% of Canadian computer users aged 16-25 years used computers at home for an average of one hour or more per day, while 18.1% used them for 2 hours or more (Veenhof et al. 2005) (See also Veenhof 2006).

Chart 1
Average weekly hours spent on the Internet, by age group, Canada, 2000



Source: Statistics Canada, General Social Survey, Cycle 14: Access to and use of information communication technology (ICT), 2000.

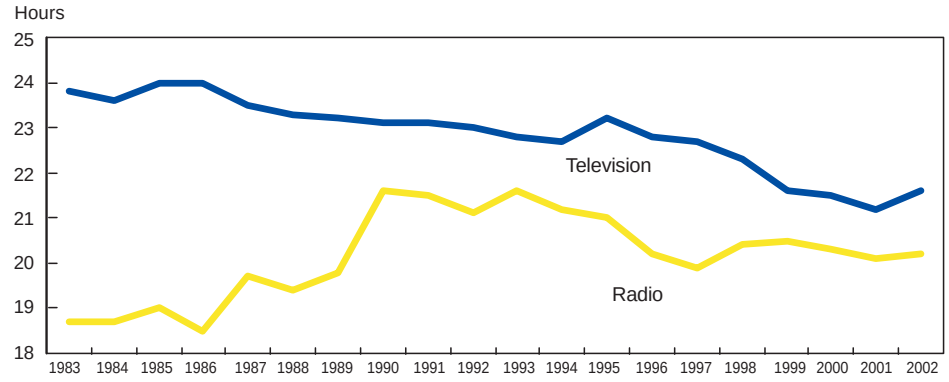
Fact 3. The extra time spent talking on the phone, communicating with e-mail and using other ICTs is in no way matched by decreases in the use of older, more passive and less interactive ICTs, such as television.

Some of this extra time devoted to new ICTs is taken away from more traditional media, notably radio and television. There is statistical evidence that time spent on television viewing and radio listening is declining. In Canada, for instance, data show a decline of just over two hours per week for television between 1983 and 2002, while radio listening has actually increased somewhat given its relative revival in the '90s (Chart 2). Similar evidence exists in the U.S. and many other countries. Aggregate data mask the fact that this decline is more pronounced among Internet users than non-users (UCLA 2004). On the other hand, however, such declines barely make up for the extra time spent on wireline phones alone[13]. For instance, it is estimated that on average one hour on the Internet reduces time spent watching television by about 10 minutes, and one-half hour per day for the user who is online about three hours a day (Beacham 2005).

It seems, therefore, that the time taken away from the television is a far cry from the extra time spent on the newer ICTs.

13. There is also the fact that time spent in front of television sets for videos, games and many applications other than television viewing is exploding– even more so than was the case in the early '80s.

Chart 2
Average weekly hours spent on television viewing and radio listening, Canada, 1983 to 2002



Note: Data for television viewing refer to all persons aged 2 years and over. Data for radio listening refer to all persons aged 12 years and over, except for the 1983-1986 period which refers to all persons aged 7 years and over.

Source: Statistics Canada, Television Viewing Databank and Radio Listening Databank.

Fact 4. The pattern of communications is changing

It is therefore well established that today people use the new means at our disposal and communicate much more than ever before. Data also reveal that within our significantly expanded communications, the pattern has changed quite a bit as well.

The rise of long distance...

While the number of all kinds of telephone calls and time spent on them went up, more telling is the growth associated with long distance. This is a process that has gone on for some time – Chart 3 shows the evolution of local and long distance calls in Canada from 1963 to 1987, data permitting – but it intensified in the '90s with market liberalization and the virtual collapse of prices (tariff re-balancing, etc.).

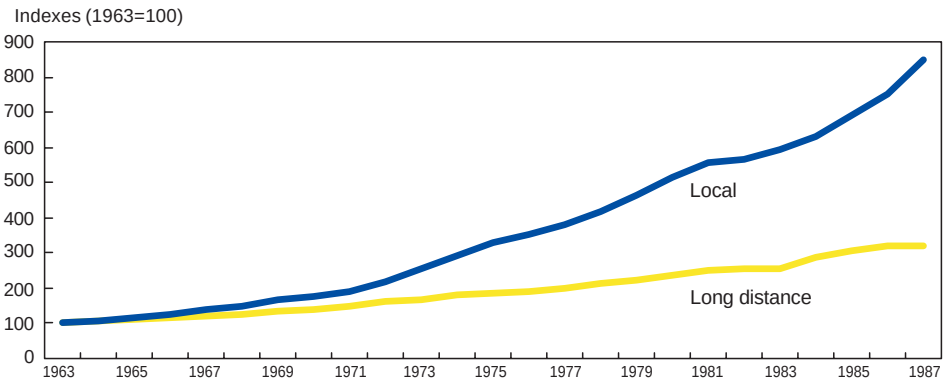
In Canada, the number of wireline long distance calls increased from about 1.5 billion in 1983 to almost 3.5 billion calls in 1992, while the volume of billed (not 'talked') long distance minutes almost tripled in a few short years, from 19.1 billion in 1995 to almost 56 billion by 2002 (Table 11). Long distance calling now accounts for a much larger proportion of total calling.

Table 11
Long distance billed minutes, Canada

	Outbound	Inbound	Toll-Free	Total
	millions of minutes			
1995	..	..	..	19,123
1998	28,530	4,363	5,143	38,037
2000	27,711	7,226	10,466	45,402
2002	38,638	7,307	9,317	55,262

.. not available for a specific reference period
Source: Statistics Canada, Telecommunications Statistics.

Chart 3
Number of wireline calls, Canada



Source: Statistics Canada, Telecommunications Statistics.

The situation is similar for cellular telephony. In Canada, the proportion of long distance minutes from cell phone calls has also increased more than local minutes (by a factor of 10 compared to 7) in only a six-year period from 1997 to 2003, even though it is still much more expensive to use cell phones for long distance calling (Table 12).

Table 12
Wireless billed minutes, Canada

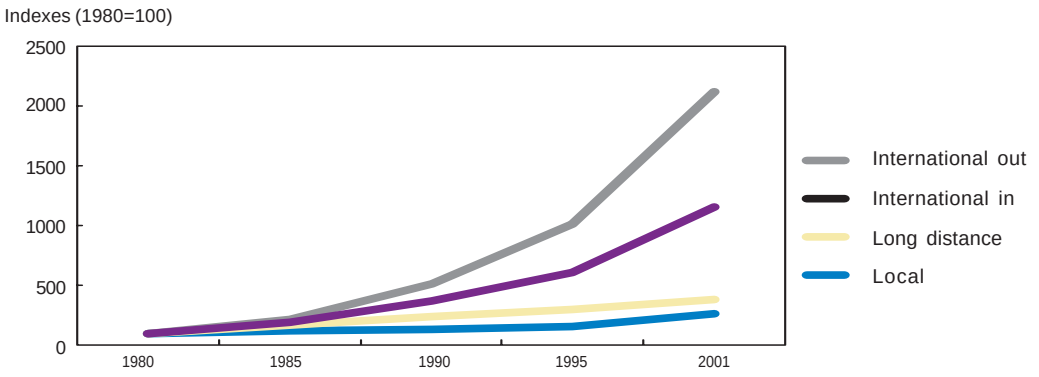
	Local	Long distance	Total
		millions of minutes	
1991	..	..	150
1997	4,044	332	4,376
2002	28,861	3,199	32,060

.. not available for a specific reference period
Source: Statistics Canada, Telecommunications Statistics.

...and the explosion in international calling

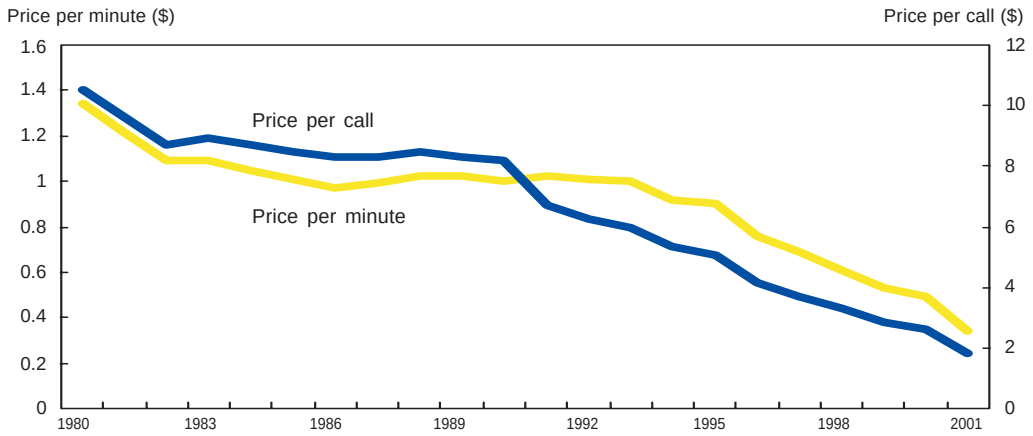
As well, the phenomenon of increasing long distance *increases with distance.* This can be seen by data referring to the situation within a country and internationally. The significant increase in local calling in the U.S. is much smaller than that of long distance (intrastate and interstate), which in turn does not even compare to the staggering rise in international calling – particularly outgoing. The number of calls from the U.S. to other countries increased from just under 200 million in 1980 to 6.3 billion in 2001, and the number of incoming calls from 165 million to over 2.9 billion (and as outgoing traffic has increased much faster than incoming it creates a large deficit, in the order of US$3.5 billion). Chart 4 shows the evolution of minutes in index form for local, interstate and intrastate long distance, and international calling in the U.S. Long distance now accounts for a much higher proportion of the expanded volume of calling.

Chart 4
Wireline minutes, by distance, U.S.



Source: Federal Communications Commission.

Chart 5
Prices for international calls, U.S.



Source: Federal Communications Commission.

This trend is mostly due to the collapse of long distance prices. For international calls, price per minute dropped from $1.34 U.S. in 1980 to 34 cents in 2001 (Chart 5). The decrease has been more precipitous in recent years – while prices decreased by less than one-third between 1980 and 1995, they dropped by almost an additional two-thirds between 1995 and 2001. The drop in average prices per call has been similar.

Moreover, from all indications this process is not complete. This pattern is expected to continue and even intensify due to Voice over Internet Protocol (VoIP), something with profound implications for the industry. Among other impacts, VoIP is expected to make long distance calls longer.

Duration and scope

Time spent on the phone is reflected by both the number of calls and their duration. As people talk more and more often, additional questions arise related to the circle of our associations and the management of the extra time needed. Do people talk with the same people more often, to new acquaintances or both, and does this mean calls are shorter?

Data clearly show that the frequency of calls has increased, especially long distance, presumably to both new and existing associations. One way to cope with this is that individual calls become shorter, a hypothesis to which existing data provide only partial proof. More direct and detailed data would be needed to confirm this generally, but some available data show that the duration of wireline international calls has decreased as the volume of calls has increased. However, data on the duration of local calls, where the bulk still is, show that these calls last longer (Table 13), while that of domestic long distance oscillates. Thus, the existing evidence is inconclusive.

Table 13
Average duration of wireline calls, U.S.

			International	
	Local	Long distance	Outgoing	Incoming
		minutes		
1980	2.6	4.3	7.9	7.0
1985	2.3	6.4	8.4	6.7
1990	2.3	5.1	8.2	5.9
1995	2.3	4.3	5.6	4.6
2001	3.8	5.2	5.3	4.6

Source: Federal Communications Commission.

Additional data from wireless residential calls in the U.S. show that in 2002 the average duration of intrastate calls was 2.9 minutes, while interstate was 6.3 minutes. In fact, more than half (51.7%) of wireless residential intrastate calls lasted one minute or less, while almost three-quarters lasted two minutes or less. Among interstate calls, fewer than 40% lasted less than one minute.

While there is indirect evidence from existing telephone statistics that people have expanded their networks of communications, this has clearly been the case with e-mail, which knows no limits. There are even some statistics on the average number of online 'friends who have never met in person', which range from 1.1 in Japan, to 2.6 in the U.S. and 7.7 in urban China – and the statistics are higher for younger males (UCLA 2004).

3. Outcomes: social interactions and behavioural change

Based on the facts above, the only inference that can be supported is that people communicate more than ever and their patterns of associations are wider. Whether or not this is done with shorter communication sessions remains to be confirmed, but it is definitely with more frequency. In any event, the theories of people becoming closed-in or socially withdrawn are not supported by the evidence presented here. (Surely there are those who spend all-day in on-line solitude, but this is not the case for the society at large). The pattern of communication and interaction has changed. The reality is that people are talking to other people – whether to the person next door or to someone thousands of miles and time zones away. Thus, *it is not that people are becoming anti-social; it is that people are becoming differently social.*

The point is that people find utility and must derive satisfaction from all this, as it is done through their own free will. People place value on having an extended network of people to communicate with, and a sense of community and belonging at a very different level (Florida 2003). Moreover, as shall be seen shortly, people are willing to pay for this.

Collectively, using ICTs absorbs several extra hours in daily routines and, estimating from the data, this is not all due to using ICTs for activities that were previously done without. This outcome certainly has consequences as it bumps against the inescapable 24-hour constraint. Where is this 'extra' time coming from?

First, this time reflects ICT usage everywhere, in our various capacities in daily lives, at work and at home. Certainly at work ICT usage has replaced other methods of work and ways of doing things. People use computers in the place of calculators and substitute ICTs for manual processes. Not only are there substitutions from non-ICT to ICT methods, but within ICTs too, i.e. due to e-mails fewer telephone calls may be made and received or fewer post-it notes used. Depending on the specific context at hand and the familiarity with the execution, such substitutions do not necessarily add time to working lives. There are, however, at least two areas for further exploration. One is that average time spent at work has increased, and the other is the frequent reference to the loss of distinction between work and play, which adds to the sense of being busier than before (Statistics Canada

1999b). Definitely, the use of ICTs by the employee does not provide the whole answer to the time issue – social lives must also be considered.

Data show that ICT usage at home has increased considerably too. Off-peak telephone calls (roughly, calls during non-working hours) have declined overall, which explains the pricing incentives of both wireline and wireless operators as peak time puts strains on the capacity of the networks. Indeed, some data from wireless usage in the U.S. indicate that in 2002, outgoing calls between 7 a.m. and 7 p.m. accounted for almost 70% of the total – albeit lower than the 73% in 2000. But interstate minutes alone, show that off peak talking (7p.m. to 7 a.m.), increased from less than 30% in 2000 to 41% in 2002. The data also indicate that more than 40% of volumes take place on the weekends, up from 31% in 2000. This points to the expansion social calls.

The second important fact is that time-use is subject to co-tasking or multi-tasking – handling two or more things at the same time. People talk on the cell phone while driving or running errands, or talk on the phone while doing household chores. Thus, it is not clear whether and to what extent this extra chunk of time cuts into other activities. Well-designed time-use surveys would be needed to shed more light on these issues. At the same time, people must be cognizant of the fact that studying time-use can be tricky, as it is subject to the prevailing technological possibilities, which are rapidly changing (See also Veenhof 2006). Suffice it to say that one hour spent on the Internet through a dial-up connection may not accomplish as much as a few minutes using high-speed Internet.

Generally, though, regardless of whether ICTs add to co-tasking or lead to the replacement of other activities for which a learning curve must be climbed - or both - all this adds to a sense of 'busyness'. The situation is obviously much more pronounced among the sizeable group of ICT users, and even more so among the smaller sub-group of heavy users. Although these people may feel the strain more than the others, it trickles over to the rest of society, contributing to the perception that people are busier than ever. In that sense, ICTs can be added to the broader spectrum of time-saving technologies that ironically lead to busier lives. Again, though, as people engage in all of this by their own volition it must be that they attach value to such transformation and change.

Consumer spending

To underscore this, there is evidence in the form of people's willingness to pay. The outcomes of ICTs in people's lives do not stop with their changed behaviour patterns, but they are manifested in the changing pattern of spending. In the early '80s, what would be considered ICT spending would be largely confined to telephones and the television. Today, household spending on ICT includes significant outlays on computers, cell phones, the Internet and satellite connections. Not only has ICT spending increased as new ICTs entered the consumption basket, but its composition has also changed. For instance, household expenditures for telephone services accounted for 35.4% of total ICT spending in 1997, but for 26.9% in 2003. On the other hand, Internet spending increased from 1.7% to 6.2% over the same period. Nearly 7 out of 10 households reported owning a computer in 2003 and about 22% of households reported buying new computer hardware during the same year, a figure which has risen steadily in recent years (Statistics Canada 2004b).

In Canada, average household spending on ICT increased from $2,118 to $2,780, in just a short period (between 1997 and 2003) (Statistics Canada 2004b). Not only does this represent a significant increase in absolute terms in very recent years, but it also represents an increase in the proportion of total spending from 4.2% to 4.5%. This is remarkable, as it happened over a period where ICT prices plummeted. In fact, computer prices dropped by 10% between 2002 and 2003 alone (Statistics Canada, Computer and Peripherals Price Indexes). Moreover, as prices fell and even as penetration of home computers increased from 39.8% in 1997 to 66.8% in 2003, spending on computer equipment and supplies over the same period grew from an average of $299 per household in 1997 to $326 in 2003 (Statistics Canada 2004b).

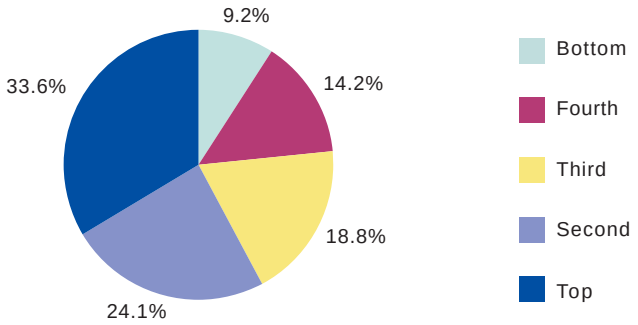
More detailed analysis reveals that most of the aggregate expenditure on ICTs comes from people with higher incomes, which links to the issue of the *digital divide*. In 2002, households in the top income quintile accounted for one-third of all spending, while households in the second highest income quintile accounted for almost one-quarter of total spending (Chart 6).

However, ICT spending represents a higher proportion of spending among lower-income households. In 2002, ICT expenditures accounted for 6.3% of average total spending among households at the bottom income quintile compared to 3.9% of average total spending among households at the top income quintile. Moreover, the desire to participate in the Information Society can be understood more dramatically by looking at the share of average current spending[14] among ICT expenditure reporting households in the bottom income quintile, which approached 20% (Table 14).

14. Current spending includes personal taxes, insurance and pension and gifts of money.

The reason for this is that a substantial amount of ICT-related expenses are fixed, such as the price of computers, basic telephone and cable services or Internet connections. On the other hand, discretionary spending, such as usage of long distance telephone services, can be controlled and thus accounts for a smaller proportion of total ICT spending.

Chart 6
Share of household ICT spending by income quintile, Canada, 2002



Source: Statistics Canada, Survey of Household Spending, 2002.

Table 14
Household ICT spending by income quintile, Canada, 2002

	Income quintiles					
	Bottom	Fourth	Third	Second	Top	**All**
Number of households	2,331,550	2,331,550	2,331,550	2,331,550	2,331,550	**11,657,730**
Average total spending ($)	20,222	35,625	52,633	71,741	120,227	**60,090**
Average current spending ($)	18,627	29,769	40,259	51,618	75,754	**43,206**
Average ICT spending - all households ($)	1,279	1,976	2,615	3,355	4,663	**2,779**
Average ICT spending - reporting households ($)	3,569	4,179	4,639	5,318	6,554	**5,107**
ICT as % of avg. total spending - all households	6.3	5.5	5.0	4.7	3.9	**4.6**
ICT as % of avg. current spending - reporting households	19.2	14.0	11.5	10.3	8.7	**11.8**

Note: Total spending differs from current spending as it includes personal taxes, insurance and pension and gifts of money.
Source: Statistics Canada, Survey of Household Spending, 2002.

4. Summary of key findings

Having satisfied basic curiosity with detailed measures and analyses of ICT penetration and use, the interest is now shifting to the understanding of their outcomes and impacts. This represents fertile ground for research that could lead to knowledge conducive to improved ICT use and future applications. ICT-induced outcomes touch virtually every aspect of life, ranging from the economic to the social, the political and the cultural domains. Understanding these outcomes provokes an endless list of questions, from how computers affect firm-level productivity, to how cell phones help the efficiency of markets, to how the Internet is used to facilitate arranged marriages.

Implicit throughout this exploration is the message that *integration of data* is needed to perform reality checks, explore linkages, test hypotheses and create new ones in the quest to understand ICT outcomes and impacts. This paper presented some of the expected outcomes associated with ICT and demonstrated that these outcomes have - so far - not materialized. The paperless office is the office that never happened, with consumption of paper at an all-time high and the business of transporting paper thriving. Professional travel has most likely increased during a period when the Internet and videoconferencing technology were taking-off, and; e-commerce sales do not justify recent fears of negative consequences on retail employment and real estate.

This study also demonstrates that the Information Society is a 'talkative society'. People have never spoken more on the telephone before, and particularly at a time when people also send and receive massive amounts of e-mails and other electronic communications. People spend large amounts of time using ICTs, in general. While naturally some ICT-related activities replace previous methods of doing things (at work or at home), a certain amount represents extra time that must come from somewhere. Whether some activities are displaced or people have become better at co-tasking, this is particularly the case for the sizeable and growing segment of the population using ICTs, but it trickles down to everyone adding to the sense of feeling busier than ever.

In summary, key outcomes of ICTs are manifested in shifting behavioural patterns everywhere, with real consequences. Moreover, the pattern of communications has changed, something exemplified by the rise in long distance and the explosion in international calling made possible by liberalized markets and falling prices. Such expanded circles of communication have found an even better expression through e-mail that knows no boundaries. People make the *choice* to expand their associations and move from geographically-defined communities to communities of interest. As well, they are willing to pay for their choices. ICT spending is on the rise and, within this higher spending, substitutions take place in favour of newer ICTs, such as the Internet, and against older ones, such as the telephone. The willingness of people to pay can also be seen by the fact that many low-income households choose to spend a relatively higher proportion of their income on ICTs.

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