

1 Chapter 1 The Need for Change



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A Tradition of Leadership

Canada has a long tradition of leadership in telecommunications. We have been global innovators since telecommunications began with the invention of the telegraph a century and a half ago. Since then, our policy and regulatory frameworks have supported the growth of a world-class industry that consistently has provided high-quality products and services to Canadian consumers and businesses at affordable prices.

Telecommunications has been one of Canada's great success stories. However, to continue this tradition of leadership, the industry and government players that make up the telecommunications sector must today respond to challenges unlike any they have faced before. These challenges spring from technology, product and service innovations that are transforming telecommunications worldwide. These innovations are creating opportunities and threats — for established players and new entrants in the telecommunications industry, for industries and public institutions that rely on telecommunications, and for Canadian consumers and citizens.

In its February 23, 2005, Budget Statement, the Government of Canada recognized the critical importance of telecommunications to Canada's future. It underlined the need for a modern policy framework to govern the sector, particularly to ensure that the telecommunications industry continues to support Canada's long-term competitiveness.

On April 11, 2005, the Telecommunications Policy Review Panel was appointed. The Panel was given a mandate to review the current telecommunications framework and to recommend a modern telecommunications policy and regulatory framework that would ensure Canada continues to have a strong, internationally competitive telecommunications industry that delivers world-class products and services at affordable prices for the economic and social benefit of all Canadians.

This chapter describes the major technology and market challenges the Panel believes must be addressed by a modern telecommunications policy:

- Chapters 2 to 6 set out the changes that must be made to Canada's telecommunications policy and regulatory frameworks to ensure that the Canadian telecommunications industry remains a world leader.
- Chapters 7 and 8 discuss measures needed to help Canadians access and make more effective use of information and communications technologies (ICTs) in order to increase productivity and improve the delivery of public services.
- Chapter 9 proposes reforms to improve the efficiency and effectiveness of government policy-making and regulatory institutions.
- Chapter 10 proposes how the new telecommunications and ICT policies recommended by the Panel can be implemented quickly and effectively.

Before looking ahead, however, it is worth recalling how we came to be world leaders in telecommunications. To retain our position in the future, we must understand the roots of our past success.

Industry Leadership

The Canadian telecommunications industry is one of Canada's most important industrial sectors.

The telecommunications services sector is the largest component of Canada's ICT industry (see text box). It produces almost half the industry's total gross domestic product (GDP). However, the importance of the telecommunications services sector cannot be measured by its size alone. It provides a fundamental infrastructure for the private enterprises and public services that use ICTs to design, develop and distribute their products, serve their customers and operate their businesses.

The Importance of Telecommunications Services

In addition to its enabling effects on the economy as a whole, the Canadian telecommunications services industry is a major industry sector in its own right, an important contributor to GDP and employment.

- The communications service industry, including telecommunications services and broadcast distribution accounts for 2.6 percent of Canada's GDP and 2.9 percent of capital expenditure.
- Canada's telecommunications market revenues amounted to \$32.9 billion in 2003 and as such ranked 8th among member countries of the Organisation for Economic Co-operation and Development (OECD).
- In 2004, the telecommunications services industry had 114 346 employees, while broadcast distribution had 16 580 employees.

Source: Data taken from Industry Canada, *Telecommunications Services in Canada: An Industry Overview*, <http://strategis.ic.gc.ca/telecomservicesoverview>; Statistics Canada, Annual Telecommunications Statistics Database; and OECD *Communications Outlook 2005*.

The greatest impact of telecommunications in a modern knowledge-based economy is its role as an enabler of efficiency, productivity and innovation — in all industry sectors and public services and in all forms of economic and social activity. For this reason, a world-class telecommunications industry is essential for enhancing Canada's competitiveness in global markets as well as for creating economic prosperity and improving social well-being and the quality of life in all parts of the country.

Telecommunications has been one of Canada's leading areas of technological achievement. Many significant telecommunications "firsts" have taken place in Canada, from the early days of the telephone and radiocommunications to the development of digital switching, satellite and fibre optic technologies.

Technological innovation is only one source of telecommunications success. An industry must also lead in the deployment of networks based on these new technologies. It must use these networks to offer high-quality products and services that respond to customer demands and generate revenue streams to attract and reward investors. The ultimate test of leadership is success in the telecommunications marketplace.

Today, as the following examples demonstrate, Canada is a world leader in the deployment of many kinds of telecommunications networks and services, and Canadian consumers and businesses benefit from access to high-quality services at affordable prices.

Local Telephony

Basic telephone service is ubiquitously available in Canada. Almost 99 percent of Canadian households subscribe to either a wireline or wireless access service, and residential wireline telephone service was subscribed to by approximately 96 percent of Canadian households in December 2004.¹ Canada's performance in this market segment measures up very well internationally. In 2004, Canada ranked seventh among OECD member countries and second among G7 member countries (behind Germany) in the percentage of mainline subscribers per 100 inhabitants.²

Canada's telephone services are also relatively inexpensive. An August 2004 OECD study on the prices of telephone services reported that Canada had the third lowest prices for residential users and the fourth lowest prices for business users among OECD countries, based on a comparison of composite baskets of telephone services and charges.³

Cable

The Canadian cable industry has been a world leader in the deployment of cable networks, and most of these have now been upgraded to an all-digital broadband infrastructure. Currently, over 11.1 million Canadian homes — or 93.5 percent of the homes passed by cable — have high-speed cable Internet access available to them, and there are over 2.8 million subscribers to the service.⁴ Advanced infrastructure and widespread availability has led Canada to be ranked first among OECD countries in terms of cable Internet penetration.⁵

¹ See Affordability Monitoring Reports filed by major incumbent carriers with the CRTC, June 30, 2005. Available online at: www.crtc.gc.ca/PartVII/eng/2004/8665/a53_200403345.htm

² Source: International Telecommunication Union (ITU) website: <http://www.itu.int/ITU-D/ict/statistics>. A mainline is a telephone line connecting the subscriber's terminal equipment to the public switched network and which has a dedicated port in the telephone exchange equipment.

³ OECD, *Communications Outlook 2005* (August 2005). Composite basket includes international calls and calls to mobile networks.

⁴ Statistics Canada, *Broadcasting and Telecommunications*, Catalogue no. 56-001-XIE, October 2005.

⁵ OECD, "Broadband subscribers per 100 inhabitants, by technology," June 2005. Available online at: http://www.oecd.org/document/16/0,2340,en_2649_34225_35526608_1_1_1_1,00.html#data2004

Digital Networks

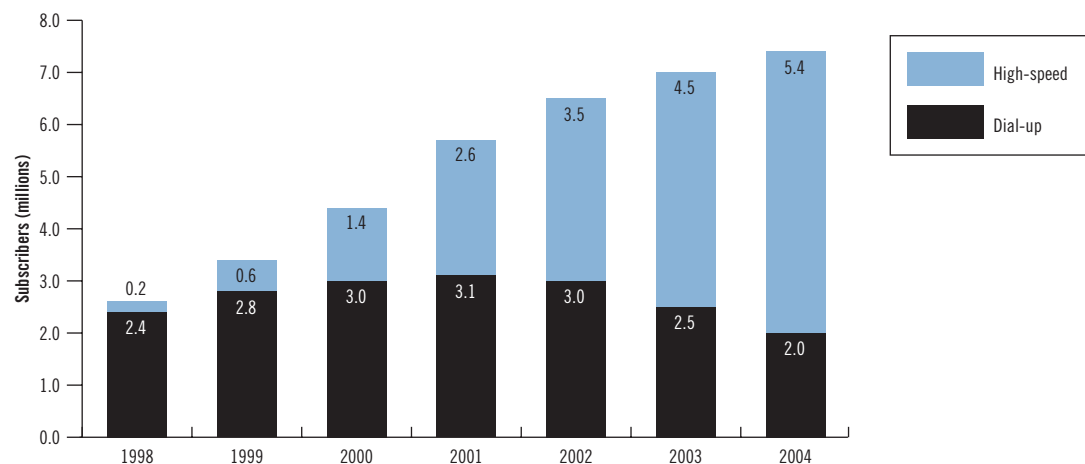
Canada has also been a world leader in deploying digital wireline networks. In 1993, Canada had 85 percent of its access lines digitized (the fourth highest percentage in the OECD at that time) and reached 100 percent digitization in 1998.

High-speed Internet

As a result of strong competition between the telecommunications and cable industries, Canada was also a world leader in the deployment of broadband Internet. In 1996, Canada became the first country to deploy DSL (digital subscriber line) technology, and among the first to deploy cable modem technology for high-speed Internet access.⁶ Canada's broadband networks are widely deployed throughout more densely populated areas. Penetration rates are also relatively high and are being extended into rural and remote areas as a result of private and public initiatives.

The number of retail Internet subscribers in Canada, including dial-up and high-speed customers, exceeded 7.4 million in 2004, representing 59 percent of households. High-speed access via DSL or cable modem, also known as "broadband," now is the dominant means of accessing the Internet in Canada. In 2004, some 73 percent of subscribers used one or other of these technologies, up from 17 percent in 1999.⁷ Figure 1-1 illustrates the growth in the residential Internet access market and the shift from low- to high-speed access technologies.

Figure 1-1. Residential Internet Subscribers



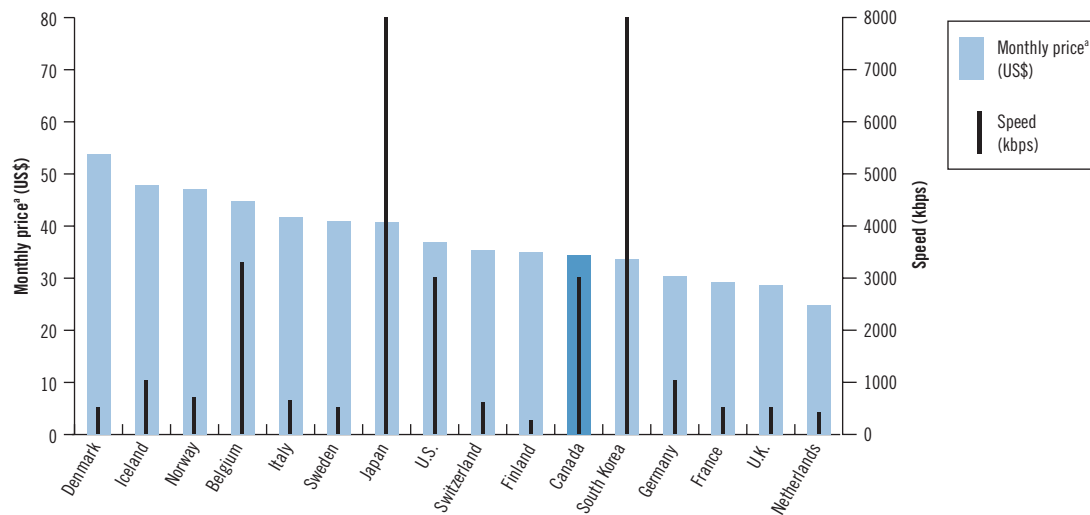
Source: CRTC, *Report to the Governor in Council: Status of Competition in Canadian Telecommunications Markets* (Ottawa: CRTC, various years).

⁶ Source: OECD, *Communications Outlook 2005* (August 2005), Table 4.12; and OECD, October 2001 and November 2003.

⁷ CRTC, *Report to the Governor in Council: Status of Competition in Canadian Telecommunications Markets* (Ottawa: various years); 2005 report available online at: <http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2005/gic2005.pdf>

In terms of price and speed, Canada's broadband services measure up well against the services available in many other countries. Figure 1-2 compares the relative price and speed for DSL service in a number of countries in November 2004. The comparisons are based on selected DSL service provider offerings in the respective countries.

Figure 1-2. Comparison of Price and Speed of DSL Services, Selected OECD Countries, November 2004



^aIncludes tax.

Source: Based on OECD, *Communications Outlook 2005* (August 2005), Table 6.16.

The Evolution of Policy and Regulation

For most of its history, telecommunications has been a regulated industry. In spite of the significant amount of deregulation that has taken place in Canada and other countries in recent years, key elements of the industry remain subject to a detailed regulatory framework that applies specifically to the telecommunications sector. This means that the performance of the telecommunications industry is heavily influenced by the laws, policies and regulations that govern the telecommunications industry, as well as on the products and services developed and deployed by individual companies.

Over the past century and a half, Canada's telecommunications policy and regulatory framework has evolved in parallel with the industry, beginning with the passage of the first *Telegraphs Act* in 1852. The invention of the telephone by Alexander Graham Bell was followed by a flurry of investment in new local telephone systems by the Bell Telephone Company of Canada as well

as dozens of other investors and governments. Following an initial period of largely unregulated growth that saw competing telegraph and telephone service providers established at the local, provincial and national levels, there have been three main stages in the history of Canadian telecommunications policy and regulation.⁸

Public Utility Regulation of Telephone Services (1906–1969)

The *Special Act* passed by Parliament in 1880 gave Bell Canada a charter to provide telephone service throughout the country, but the company concentrated its investment in Ontario and Quebec. In the Atlantic provinces and British Columbia, private companies were chartered to provide these services. In Manitoba, Saskatchewan and Alberta, the provincial governments assumed this responsibility, after acquiring Bell Canada's regional networks. In addition, municipally owned and small-scale independent companies continued to provide service under provincial regulation in many areas of the country.

As a result of the bottom-up growth of the telecommunications industry during the late 19th and early 20th centuries, jurisdiction over the industry came to be divided between the federal government, which, for example, regulated Bell Canada in Ontario and Quebec as well as the Telephone Company in British Columbia and the provinces that regulated provincial, independent and municipal telecommunications service providers. In Saskatchewan, the government-owned telephone company for most of its history was run as an unregulated public utility, with pricing and major investment decisions approved by the provincial Cabinet.

In spite of these jurisdictional divisions, a similar approach to telecommunications policy emerged. Whether they were privately or publicly owned, telecommunications companies were regulated according to general principles that applied not only to telecommunications but also to other kinds of common carriers, such as railways, and other kinds of public utilities.

In the case of the federal government, the telecommunications industry was regulated by the Canadian Transport Commission and its predecessors pursuant to sections of the 1906 *Railway Act*, which required telecommunications carriers to provide service at just and reasonable rates and which prohibited unjust discrimination. In addition, following a model that had been developed in the United States early in the 20th century, there was an implicit bargain that telephone companies would provide affordable service to customers and to make it available throughout their territory, in return for the privilege of operating on a monopoly basis. The tariffs and rates of return of private telephone companies were regulated in line with these principles. Over time, similar approaches were applied to provincially owned telecommunications companies, which were largely regulated by provincial public utility commissions.

⁸ See Peter Grant, *Canadian Communications Law and Policy, Vol. 1* (Toronto: Law Society of Upper Canada, 1988) for a history of the evolution of Canadian telecommunications policy and regulation. See also Robert E. Babe, *Telecommunications in Canada* (Toronto: University of Toronto Press, 1990).

Responding to the Growth of Information Services (1969–93)

By the late 1960s, it had become clear to Canadian policy makers that telecommunications had the potential to be more than Plain Old Telephone Service (POTS). In the previous two decades, economic and social trends had created greater demand for telecommunications services in both business and consumer markets. Television broadcasting had transformed popular culture and was beginning to have a major impact on business practices and social life. In addition, mainframe computers were becoming more common in large businesses, government departments and universities, and were beginning to be linked by data communication networks.

In recognition of the expanding scope and growing importance of telecommunications, the federal government established a Department of Communications in 1969. The responsibilities of the department included telecommunications and broadcasting policy, radiocommunications policy and regulation, programs to extend telecommunications and broadcasting service in remote areas, research and development, and procurement of telecommunications services for the federal government. In 1980, reflecting convergence between various communications media, responsibility for the federal government's arts and culture programs was added to the mandate of the Department of Communications.

Convergence also led to the establishment of a regulatory authority responsible for both broadcasting and telecommunications in 1976, when responsibility for regulation of telecommunications services was added to the broadcasting regulation mandate of the Canadian Radio and Television Commission, which was renamed the Canadian Radio-television and Telecommunications Commission.

The Growth of Competitive Markets (1993 to Present)

The current era in Canada's telecommunications policy was heavily influenced by two major developments: the finding by the Supreme Court that the federal government had sole jurisdiction over telecommunications carriers throughout the country⁹; and the passage of the 1993 *Telecommunications Act*.

The 1993 Act did not implement a comprehensive new regulatory framework. Many of the key regulatory provisions of the Act were based on two predecessor statutes, the *Railway Act*¹⁰ and the *National Telecommunications Powers and Procedures Act*.¹¹ In particular, the new Act continued, with only minor amendments, the traditional regulatory standards for approval of the rates and conditions of service of telecommunications carriers; namely, that rates should be "just and reasonable" and that there should be no "unjust discrimination" in the charging of rates or in the provision of services.¹²

⁹ See *Alberta Government Telephones v. (Canada) Canadian Radio-television and Telecommunications Commission* [1989] 2 S.C.R. 225, and *Téléphone Guèvremont Inc. c. Québec (Régie des télécommunications)* [1994] 1 R.C.S. 878.

¹⁰ *Railway Act*, repealed, 1996, c.10, s. 185.

¹¹ *National Telecommunications Powers and Procedures Act*, repealed, 1993, c.38, s. 130.

¹² See ss. 27.(1) and (2) of the *Telecommunications Act*. Available online at: http://laws.justice.gc.ca/en/t_3.4/162202.html

However, the 1993 Act was significant in several ways. It established for the first time a set of national telecommunications policy objectives. It also paved the way for gradual deregulation of the telecommunications industry as competition emerged. It gave the Canadian Radio-television and Telecommunications Commission (CRTC) the power to forbear from regulating markets that had become sufficiently competitive to protect consumer interests. It enacted into law, for the first time, a 1987 policy to limit foreign ownership of facilities-based telecommunications carriers, but placed no restrictions on the ownership of resellers.

The CRTC used the powers under the *Telecommunications Act* to introduce a detailed new regulatory framework.¹³ This framework was designed to increase competition and reduce the number of services subject to regulation, while ensuring that Canadians living in rural and remote areas of the country continued to have access to affordable services.

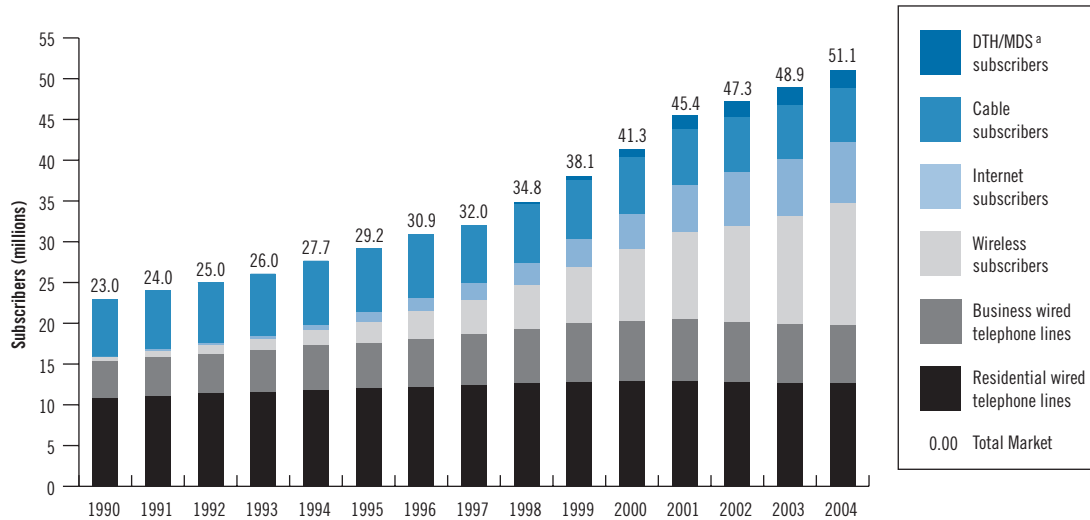
The *Telecommunications Act* gave the Governor-in-Council (effectively the federal Cabinet) the power to issue policy directives to the CRTC. However, successive governments have taken a “hands off” approach to regulatory policy and have left it to the CRTC to use its broad powers and discretion under the Act to regulate the transformation of the Canadian telecommunications industry from one characterized by monopolistic public utilities into a dynamically competitive industry. The policies of the federal government have focused on increasing telecommunications “connectivity” among Canadians and on promoting the adoption of ICTs throughout the economy as well as in government. These policies have included the various components of the Information Highway initiative and the Connecting Canadians agenda, as well as the e-Commerce strategy, the Government On-Line initiative and the Task Force on Spam.¹⁴

As Figure 1-3 illustrates, Canada’s past policy and regulatory framework has been successful in supporting the modernization of the Canadian telecommunications industry. It has allowed the industry to continue to provide universal access to high-quality, affordable traditional telecommunications services. At the same time, it has fostered the growth of newer services such as wireless, Internet access and direct-to-home (DTH) satellite television.

¹³ Review of Regulatory Framework, Telecom Decision CRTC 94-19. Available online at: <http://www.crtc.gc.ca/archive/ENG/Decisions/1994/DT94-19.HTM>

¹⁴ See Information Highway Advisory Council, *Connection, Community, Content: The Challenge of the Information Highway* (Ottawa: Supply and Services Canada, September 1995); Information Highway Advisory Council, *Preparing Canada for a Digital World*, Final Report (Ottawa: Supply and Services Canada, September 1997), available online at: http://www.iigr.ca/pdf/documents/768_Preparing_Canada_for_a_D.pdf; National Broadband Task Force, *The New National Dream: Networking the Nation for Broadband Access* (Ottawa: Industry Canada, June 2001), available online at: <http://broadband.gc.ca/pub/program/NBTF/index.html>; Government On-Line Advisory Panel, *Connecting with Canadians: Pursuing Service Transformation* (Ottawa: Government of Canada, December 2003), available online at: http://www.gol-ged.gc.ca/pnl-grp/reports/final/final00_e.asp; *The Challenge of Change: Building the 21st Century Economy*, Background Paper for the Conference on e-Commerce to e-Economy Strategies for the 21st Century, Ottawa, September 27–28, 2004, available online at: <http://www.e-economy.ca/epic/internet/inec2ee-ceace.nsf/en/home>; and Task Force On Spam, *Stopping Spam: Creating a Stronger Safer Internet* (Ottawa: Industry Canada, May 2005), p. 1, available online at: [http://e-com.ic.gc.ca/epic/internet/inecic-ceac.nsf/vwapj/stopping_spam_May2005.pdf/\\$file/stopping_spam_May2005.pdf](http://e-com.ic.gc.ca/epic/internet/inecic-ceac.nsf/vwapj/stopping_spam_May2005.pdf/$file/stopping_spam_May2005.pdf)

Figure 1-3. Communications Service Subscribers, 1990–2004



^aDTH = direct-to-home systems; MDS = multipoint distribution systems.

Source: Compilations by the Telecommunications Policy Review Panel based on Statistics Canada's quarterly survey of telecommunications service providers, Catalogue no. 56-002-XIB; the CRTC's *Broadcast Distribution Statistical and Financial Summaries*, various years; and selected company annual reports.

Where Do We Stand Today?

Canadian telecommunications industry performance ranks at or near the top in most traditional telecommunications service markets. However, the pace of change in the telecommunications sector is accelerating on a worldwide basis. Change is being driven by new technologies, increasing consumer and business demand for new products and services, and new approaches to policy and regulation. In today's rapidly evolving telecommunications environment, many other countries are catching up with Canada — and some have begun to surpass us. In such a fast-moving world, the Panel believes that looking backwards and congratulating ourselves on past performance is of diminishing value.

Benchmarking Canada's Performance

Telecommunications Market

- In 2003, Canada's telecommunications market, as measured by revenue, was the eighth largest among OECD member countries. Canada ranked 12th in terms of population, 18th in terms of revenue per capita, 12th in terms of revenue per subscriber, and 23rd in terms of revenue per gross domestic product.
- Canada's largest telecom carrier, Bell Canada, was the 13th largest telecommunications company in the OECD, generating 1.44 percent of total OECD telecom revenue.

Wireline

- Canada has achieved 99.5 percent coverage and 96 percent penetration of wireline telephone service, as measured by households (down slightly from 98 percent penetration in 1999, largely because of wireless substitution).
- Canada ranks seventh in the OECD and second among G7 member countries in the proportion of mainline subscribers per 100 inhabitants.
- Canada ranks third and fourth in the OECD in pricing for residential and business users, respectively.
- In 1993, Canada had 85 percent of its access lines digitized and, as such, was the fourth to achieve this level in the OECD.

Cable and DSL Networks

- Canada was the second country to deploy cable modem technology, in 1996.
- Canada was the first country to deploy DSL technology, in 1997.
- Canada ranks first in the OECD in terms of cable Internet penetration (June 2005), with 93.5 percent of Canadian homes passed by cable having high-speed cable Internet access.

Broadband Availability and Use

- Until 2003, Canada ranked second in terms of broadband penetration, or broadband subscribers per 100 inhabitants. In June 2005, Canada ranked sixth.
- Canada ranks sixth in terms of lowest available broadband pricing in the OECD.

Wireless

- Wireless coverage is available to 97.7 percent of the Canadian population.
- Wireless penetration in Canada ranks second last in the OECD, and represents fewer than 50 subscribers per 100 inhabitants.
- In pricing of wireless services, Canada ranks 10th in the OECD based on low usage, seventh based on medium usage, and 13th based on high usage.

Note: All data are as of mid-year or year-end 2004, unless otherwise indicated.

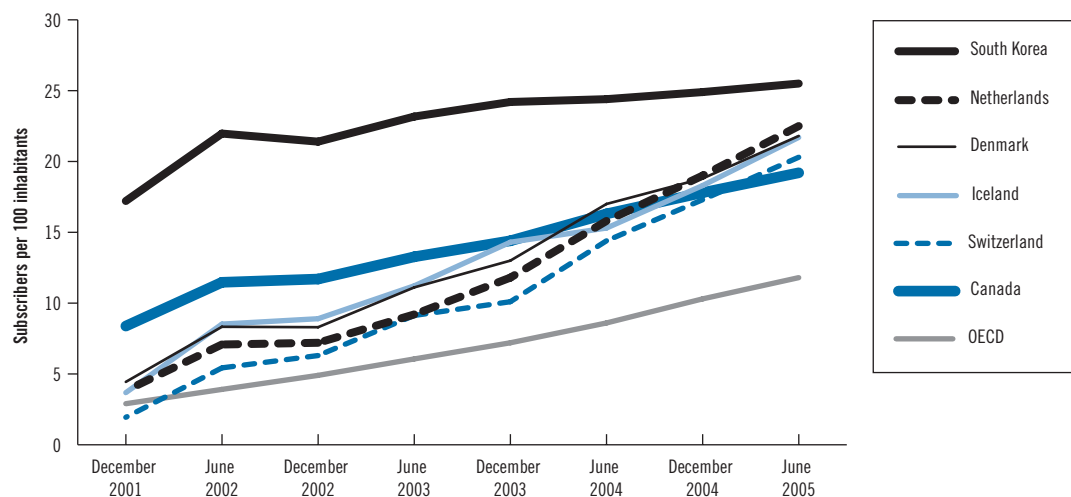
The Canadian Telecommunications Industry: Leadership Threatened

Over the course of its work, the Panel has become concerned that the Canadian telecommunications sector performance has not kept pace with its earlier achievements. In particular, Canada has not remained at the leading edge of development and deployment in the two key growth areas of the telecommunications sector — broadband and wireless. Although we have made progress in both these areas, we are not moving forward as quickly as other countries. Unless it improves its performance in delivering advanced broadband and wireless services, Canada risks slipping behind other countries in providing the infrastructure to deliver the kinds of economic and social benefits needed to improve the productivity and competitiveness of the Canadian economy, improve the quality and efficiency of government and public services, and build a more inclusive society. In the Panel's view, Canada cannot afford to be complacent.

Broadband: Our Lead Is Slipping

Canada has been a world leader in broadband availability and use. In June 2005, we still ranked sixth among OECD countries in broadband penetration per 100 inhabitants.¹⁵ However, we ranked second only two years ago, and our position is beginning to slip as other countries pursue aggressive strategies for rolling out broadband access at increasingly higher speeds. Our rate of growth in broadband penetration has been surpassed by competitor nations (Figure 1-4), as other countries also deploy fibre and other advanced access technologies and services at very affordable rates. Some of the countries that have surpassed us may offer a better environment for broadband deployment because of size, terrain and population density. Nevertheless, the Panel believes that losing ground in this area is cause for concern because of the economic advantages and social benefits that widespread use of broadband telecommunications services can yield.

Figure 1-4. Broadband Penetration, Top Six OECD Countries, 2001–2005



Source: Based on OECD *Communications Outlook*, various years.

¹⁵ OECD, *OECD Broadband Statistics, June 2005*. Available online at: http://www.oecd.org/document/16/0,2340,en_2825_495656_35526608_1_1_1_1,00.html

In addition to falling behind in broadband penetration, Canada lags other countries, including Japan, South Korea and the United States, in the deployment of fibre broadband technology. In Japan, telecommunications providers such as NTT and USEN Broad Networks have been providing service via ultra-high-speed Internet access (fibre-to-the-home (FTTH)) with speeds up to 100 Mbps since 2001. Other providers such as KDDI have been offering FTTH services since 2003. By mid-2004, ultra-high-speed broadband access was already available to 80 percent of Japan's citizens through a combination of FTTH and fibre-to-the-node (FTTN) technologies and, as of September 2005, Japan had 2.8 million FTTH customers connected.¹⁶ In South Korea, the first FTTH installations began in 2001 and, by 2004, 85 percent of South Korean households had access to FTTH. It is expected that, in 2007, all South Korean households will be able to have 100–1000 Mbps broadband access.¹⁷ The incumbent telecommunications provider, Korea Telecom, launched its commercial FTTH service in 2005, offering upstream and downstream data speeds of up to 100 Mbps.¹⁸

In North America by September 2005, FTTH systems passed 2.7 million homes, primarily in the U.S. with over 320 000 connected customers.¹⁹ In the U.S., smaller incumbent local exchange carriers (ILECs), competitive local exchange carriers (CLECs) and government-supported projects were the first to deploy FTTH locally, some before 2001. Some of the national telecommunications providers such as Verizon and SBC have now begun large-scale deployments of their fibre-based networks. Verizon began deploying its fibre-to-the-premises (FTTP) network in May 2004, and began offering fibre broadband service in July 2004 and fibre-based television service in October 2005 in selected markets, currently allowing a maximum speed of 30 Mbps downstream and 5 Mbps upstream.²⁰ SBC plans to complete the deployment of its fibre network to 18 million customers by mid-2008, using a combination of FTTP and FTTN technologies, offering download speeds of 20–25 Mbps.²¹ It expects to begin offering services on its fibre network in early 2006 in selected markets.

¹⁶ Thomas Bleha, "Down to the Wire," *Foreign Affairs* 84 (May/June 2005); and Steven Ross, "Fibre Systems Triple in a Year," *Broadband Properties* (November 2005), available online at: <http://www.broadbandproperties.com/2005issues/nov05issues/Fiber%20Systems%20Triple,%20Steven%20Ross.pdf>

¹⁷ Roxanne B. Batson, *FTTH Content Business Case Study and the FTTH Industry in Korea* (WSN TV 75, Inc., 2004). Available online at: <http://www.ftthcouncil.org/documents/860825.pdf>

¹⁸ World Markets Research Centre, *World Markets Telecoms: South Korea*, July 4, 2005.

¹⁹ Render Vanderslice & Associates, *FTTH/FTTP Update* (October 4, 2005), available online at: <http://www.ftthcouncil.org/documents/732751.pdf>; and Ross, "Fibre Systems Triple in a Year."

²⁰ Verizon announced plans to have three million homes passed for its fibre broadband system, and one million homes passed for its fibre-based FiOS TV service by the end of 2005. Additionally, Verizon plans to pass an additional three million homes by year-end 2006. Source: Verizon press releases, May 19, 2004 onward; Dennis Weller, Chief Economist, Verizon, Presentation at TPRP Policy Forum, October 24, 2005; and Ross, "Fibre Systems Triple in a Year."

²¹ SBC expects to scale up the offerings and markets offered beginning in mid-2006; see SBC press release, November 3, 2005, available online at: <http://www.sbc.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=21874>

In Canada, by contrast, deployment of FTTH is still in its early stages, with only a very limited number of residential communities having access to fibre networks. For example, in February 2005, Aliant announced plans to conduct Atlantic Canada's first FTTH trial during 2005 (30 Mbps of bandwidth).²² By year-end 2005, Bell Canada deployed FTTN in 2048 neighbourhoods serving over 500 000 households, mainly in the greater Toronto and Montréal areas. Bell plans to offer service to these neighbourhoods in 2006 with speeds of up to 12 Mbps. Bell also plans FTTH and FTTN deployment to reach 85 percent of urban households in the Windsor–Québec City corridor by 2008, offering speeds of up to 26 Mbps.²³

In addition to fibre deployment, some countries are already converging their wireless and wireline networks to provide connectivity “anytime, anywhere and by anyone.”

In South Korea, Korea Telecom (KT) launched a pilot of the Broadband convergence Network (BcN) in October 2005. This project aims at providing seamless broadband connectivity across wireline and wireless networks over an upgraded Internet Protocol (IP) platform. KT hopes to have 24 million fixed phone users on the BcN by 2010.²⁴

In Japan, the U-Japan (Ubiquitous Network Society) strategy, launched in 2003, aims to facilitate seamless connectivity from any location and to develop applications that make use of the ubiquitous network to solve social issues such as nursing and welfare support systems, food traceability systems, and home security systems. Japan's targeted national ICT strategy aims to support seamless and secure human-to-human, human-to-machine, machine-to-human, and machine-to-machine communications over its pervasive next-generation network (NGN) infrastructure. Japan also plans to shift its focus from wireline to wireless networks and hopes to have reached 100 percent of its citizens with high-speed or ultra-high-speed Internet access by 2010. Japan intends to accomplish this goal by facilitating access to spectrum and upgrading its IP infrastructure.²⁵

²² Aliant Inc. press release, February 7, 2005, “Aliant launches Atlantic Canada's fastest broadband connection,” available online at: <http://www.aliant.ca/english/news/news2.asp?YYYY=2005¤tPage=11&Keyword=&BU1=&BU2=&BU3=&BU4=&BU5=&BU6=&BU7=&BU8=&FromDay=1&FromMonth=1&FromYear=2005&ToDay=31&ToMonth=12&ToYear=2005&id=1167&frompage=news>

²³ Bell Canada VP Network Planning and Provisioning statement, December 5, 2005; BCE 2005 year-end and fourth quarter results; and presentation by Eugene Rotman, BCE Business Review Conference 2005, December 15, 2004.

²⁴ KT news release, October 6, 2005, available online at: http://147.6.114.70/kthome/eng/press/press/press_kt_view.jsp?page=1&news_seq=69&actiontype=&sel_year=&sel_mon=&key_word=

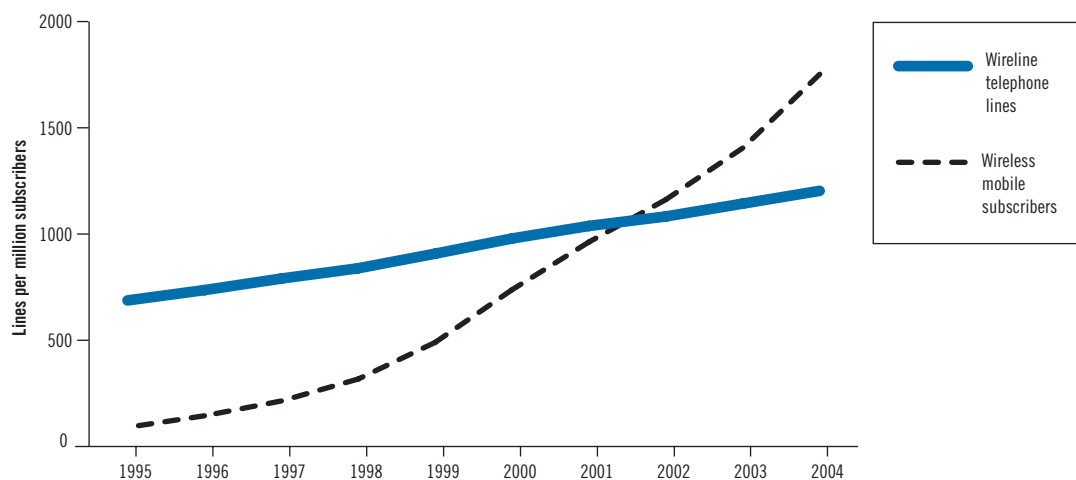
²⁵ Presentation by Takuo Imagawa, Ministry of Internal Affairs and Communications (MIC), Japan, “Japan's Policy Initiatives toward Ubiquitous Network Societies,” April 7, 2005. Available online at: http://www.itu.int/osg/spu/ni/ubiquitous/Presentations/5_imagawa_japan.pdf

Deployment of next-generation networks has been relatively slow in Canada in both the wireline and wireless environments. The Panel believes this lag will affect Canada's international competitiveness. More rapid deployment of advanced telecommunications infrastructure would allow Canada to capitalize on the potential of high-speed networks to improve productivity and foster economic growth through the provision of advanced services. The Panel is concerned that by losing its lead in broadband, Canada may be missing out on a multitude of economic and social benefits, and may be losing "first mover" advantages from rapid deployment of advanced network infrastructure.

Wireless: Are We Really in the Game?

A shift from wireline to wireless services is taking place around the world. Over the past two decades, wireless has evolved from a marginal technology serving a relatively small number of customers into a mainstream technology deployed in all major market segments, including voice, data and broadcasting. Today there are significantly more wireless service subscribers in the world than fixed wireline subscribers (Figure 1-5).

Figure 1-5. World Wireline and Mobile Wireless Subscribers, 1995–2004



Source: International Telecommunication Union website database: <http://www.itu.int/ITU-D/ict/statistics/>

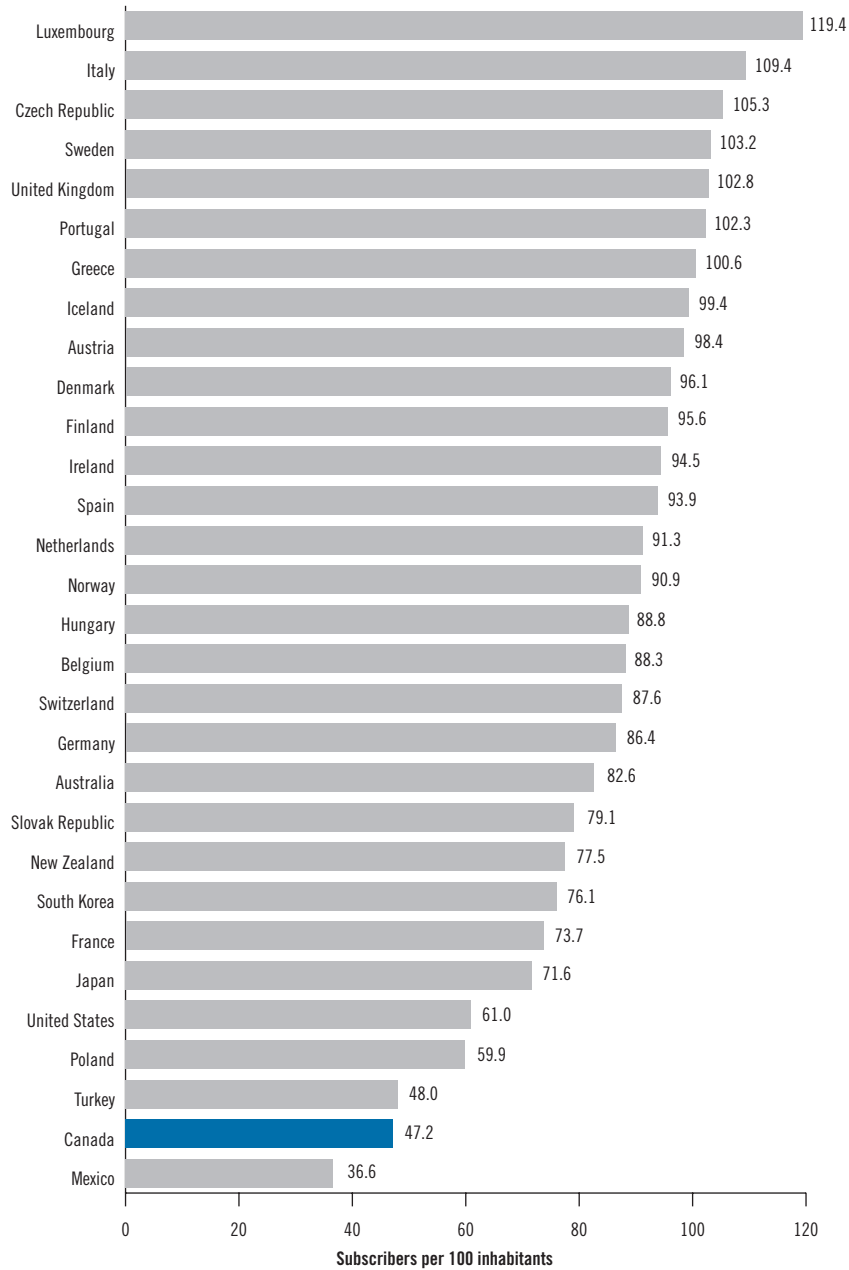
The rapid rise of wireless penetration has been driven by a combination of demand pull and technology push.

- For a number of countries lacking universally accessible, affordable, high-quality telecommunications services — but recognizing that such services were necessary for their economic and social development — wireless technology has provided an opportunity to achieve these objectives by “technology leapfrogging”; that is, by rolling out services more quickly, more cheaply and with greater flexibility than would have been possible using wireline technology. Thanks to the development of wireless telecommunications services, substantial progress has been made toward closing the “digital divide” on a global basis, particularly in countries like China, India, Brazil, Russia and the transition economies of eastern Europe and South East Asia.
- In highly developed economies, the “any time, any place” attributes of wireless technology initially were seen as productivity-enhancing complements to wireline technology in both the private and public sectors. As the functionality of wireless technology increased, it has become increasingly clear that wireless not only has the potential to substitute for wireline technologies in many market segments, but also better matches the communication needs of many businesses and consumers.
- The explosive growth of wireless markets has led telecommunications equipment manufacturers to focus R&D efforts on the wireless market. As a result, there has been an upsurge in innovation in wireless products, which has further increased user demand for wireless services.

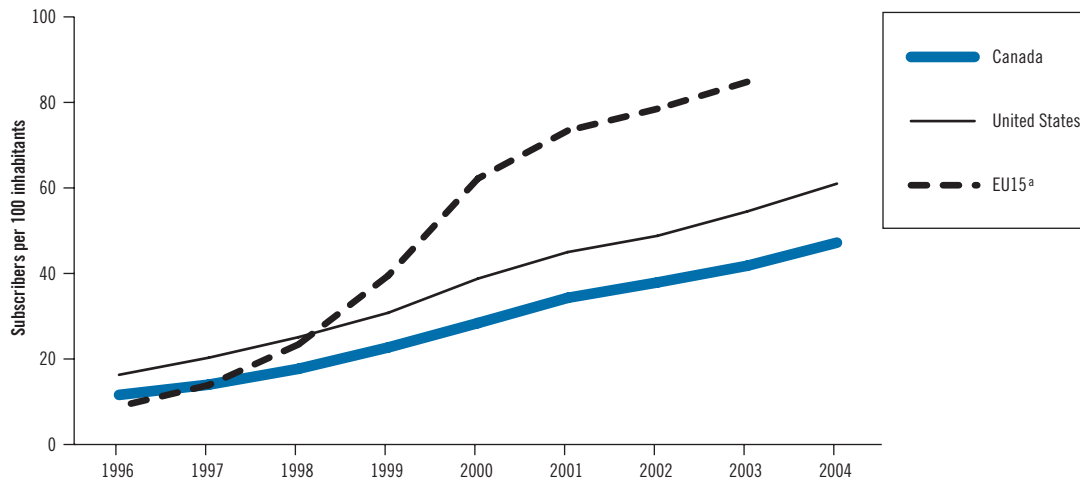
Today, Canada’s wireless carriers provide coverage to around 98 percent of the Canadian population, and there are approximately 15 million wireless subscribers in the country, representing almost 50 percent penetration.²⁶ Even though Canada has done well in terms of growth in wireless and data services relative to traditional telecommunications services, as Figure 1-6 illustrates, our wireless penetration is second last in the OECD. Compared with our major trading partner, the U.S., Canada lags significantly, but both countries have fallen far behind European nations. Figure 1-7 shows that the penetration gap between Canada, the U.S. and Europe has grown over time.

²⁶ Source: CRTC, *Status of Competition in Canadian Telecommunications Markets* (Ottawa: CRTC, October 31, 2005), available online at: <http://www.crtc.gc.ca/ENG/publications/reports/PolicyMonitoring/2005/gic2005.pdf>; and CRTC, Telecom Data Collection 2004, available online at: <http://www.crtc.gc.ca/dcs/eng/2004/>

Figure 1-6. Mobile Wireless Subscribers per 100 Inhabitants, OECD Countries, 2004



Source: ITU website.

Figure 1-7. Mobile Wireless Penetration, 1996–2004

^aEU15 refers to the European Union member states prior to 2004

Source: 1996–2003 data taken from OECD, *Communications Outlook 2005*; 2004 data taken from ITU website.

A number of factors are often cited to explain why wireless services have achieved a significantly higher level of penetration in Europe than in North America. These factors include:

- historical differences in the quality, availability and pricing of wireline telephone services in the two regions, which are said to have made wireless more attractive to European consumers
- different approaches to tariffing wireless services, which may have created stronger incentives to subscribe in Europe
- Europe's leadership in developing and deploying second- and third-generation wireless technologies, which resulted in superior products and services being available to European consumers for a period of time.

In the Panel's view, there is relatively little to be gained by focusing on historical differences between the performance of the wireless industry in Europe and North America. Canada's most important comparator is the United States, because of our similar geography, demographics and telecommunications markets, and because the United States is our principal trade partner and competitor. Additionally, the U.S. and Canada have historically adopted comparable approaches to pricing wireless services and have followed one another closely in the deployment of new services and technologies. Nevertheless, an examination of the growth of wireless in the United States and Canada reveals a persistent and growing gap between the rates of the two countries.

In addition to having lower mobile wireless penetration than the U.S., Canada has much lower usage of wireless services. Merrill Lynch estimates that Canadian usage is approximately 52 percent of the average U.S. usage, measured in minutes of use (MOU) per month.²⁷ Table 1-1 presents Merrill Lynch's estimates for Canada, the U.S. and a number of other developed OECD countries. Although Canadian monthly usage per subscriber appears to compare favourably with that of other countries having higher levels of penetration, European countries and Japan have significantly higher usage of data services than Canada and the U.S. Although this is not reflected in the minutes of use statistics, it is demonstrated in Canada and the U.S.'s lower wireless data share of average revenue per user (ARPU). While Canadian and U.S. data share of ARPU is similar, Canada's ARPU is significantly lower than that in the U.S.

Table 1-1. Wireless Minutes of Use and Average Revenue per User, Second Quarter 2005

	Minutes of Use (monthly)	Average Revenue per User (US\$)	Data Share of Average Revenue per User (%)
Canada	392	44	8
United States	757	55	7
United Kingdom	148	42	21
France	223	47	14
Germany	73	31	17
Italy	124	35	15
Japan	149	62	25

Source: Merrill Lynch, *Global Wireless Matrix 2Q05* (December 2005). Used with permission.

Canada also lags in the rollout of many new mobile wireless services and features. Perhaps the largest gap between Canada, the U.S. and other countries is with respect to the implementation of third-generation (3G) high-speed data services. Canadian deployment of 3G wireless systems lags not only the U.S. (2004), where every major operator is in the late stages of building and marketing these services, but also significantly lags deployment in Europe (2002), South Korea (2002) and Japan (2001). As already mentioned, 3G networks in Japan and South Korea are well under way and both countries are nearly at the point of convergence between their wireless and broadband networks nationally. In Canada to date, there has been only limited 3G rollout in a few large cities, and the Panel notes that separate spectrum for the service has yet to be allocated.

²⁷ Source: Merrill Lynch, *Global Wireless Matrix 2Q05* (December 2005). Used with permission.

Canada has also lagged in the introduction of wireless local number portability.²⁸ This service was offered in several European and Asian countries between 1998 and 2000 (e.g. U.K., Netherlands, Sweden) and in the U.S. in 2003. In Canada, however, the wireless industry only recently announced its number portability implementation plan, with mandated nationwide availability scheduled not until March 2007 for national carriers.

In addition, mobile wireless pricing is significantly higher in Canada than in the U.S. and other countries. The Seaboard Group reported in July 2005 that the average mobile wireless customers in Canada pay 60 percent more than they would have if they had used a U.S. plan, and 19 percent more than the rates charged by European carriers.²⁹ These pricing differences may be explained by the relatively small number of mobile service providers in Canada. In the U.S., 97 percent of the population live in areas with three or more mobile providers, 87 percent live in areas with five or more mobile wireless operators, and 41 percent live in areas with at least six.³⁰ This is in contrast to Canada where, although 94 percent of the Canadian population has access to three or more wireless service providers, the maximum number of wireless carriers in any given area is three.³¹

The smaller number of mobile providers in Canada — and the fact that all three national wireless service providers are also owned by large telecommunications service providers that also provide wireline services³² — may mean that there is less competition in the Canadian wireless market than in the U.S. market, which consequently has resulted in higher prices, less innovation, lower uptake and lower rates of usage.

After reviewing this evidence, the Panel concludes that Canada's mobile wireless industry lags behind its major trading partners on a number of key measures. This finding reinforces the Panel's belief that because of the growing importance of this segment, Canada should develop a more efficient and vibrant wireless industry.

²⁸ Wireless local number portability enables mobile wireless customers to transfer phone numbers between wireless service providers and also between landline and wireless service.

²⁹ Seaboard Group, *Lessons for Canada: Wireless Pricing — A Cross-National Survey: U.S., Canada, and Europe* (July 2005). Available online at: <http://www.seaboardgroup.com/main/index.php?option=content&task=view&id=290&Itemid=123>

³⁰ FCC, *Tenth Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services* (September 30, 2005). Available online at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-173A1.pdf

³¹ CRTC 2004 Telecom Data Collection. Available online at: <http://www.crtc.gc.ca/dcs/eng/2004/>. Note: A limited number of larger centres have resellers and MVNOs (mobile virtual network operators), but even these are not all independently owned from the three national carriers.

³² In Canada, BCE Inc. owns Bell Mobility, Rogers Communications Inc. owns Rogers Wireless and Microcell, and TELUS Corp. owns TELUS Mobility. In the U.S., SBC-AT&T and Bellsouth own Cingular-AT&T Wireless, and Verizon Communications Inc. owns Verizon Wireless. Sprint Nextel Corp. is the largest remaining independent wireless carrier, followed by T-Mobile USA, Inc. and All-Tel Corp.

Policy and Regulation: Falling Behind the Times

The world is a different place today from what it was in 1993 when the current *Telecommunications Act* was passed and the federal government launched its Information Highway initiative.

Telecommunications Policy

Over the past decade and a half, there has been a worldwide transformation of policy and regulatory frameworks in the telecommunications sector. This trend began with the privatization of publicly owned telecommunications operators and the introduction of competition in markets previously reserved for monopoly service providers. It continued as many countries sought to introduce policy and regulatory frameworks that relied primarily on market mechanisms and economic incentives. More recently, many countries have begun to supplement telecommunications sector-specific regulatory measures with a greater reliance on the principles of general competition law.

The results of these trends have been dramatic in every region of the world, whether measured by investment, product and service innovation, market growth, penetration rates, prices or employment. The telecommunications sectors of many developing countries and emerging economies have been transformed. Countries such as China, India and South Korea have emerged as major sources of demand and supply in the global market for telecommunications products and services. The digital divide is beginning to close in even the world's least developed regions.

Profound changes have also taken place in the telecommunications policy and regulatory frameworks of many industrialized countries. The European Union, individual European countries, Australia and New Zealand have all made significant changes in their telecommunications frameworks. So has the United States, which began the worldwide trend to transform telecommunications policy and regulation several decades ago.

In the Panel's view, the time has come to reform Canada's telecommunications policy and regulatory framework. In spite of the fact that Canada has one of the most competitive telecommunications markets in the world, we continue to have one of the most detailed, prescriptive and costly regulatory frameworks. This framework is particularly burdensome for Canada's major telecommunications service providers, who now face stronger competition in a number of market segments from well-established facilities-based rivals as well as from new entrants. The Panel believes the Canadian telecommunications industry has evolved to the point where market forces can largely be relied on to achieve economic and social benefits for Canadians, and where detailed, prescriptive regulation is no longer needed in many areas.

The issues related to reforming Canada's policy and regulatory framework as well as specific proposals for reform are set out in the balance of this report, particularly in Chapters 2, 3, 4, 5, 6 and 9.

ICT Policy

Looking beyond the telecommunications industry to the ICT sector as a whole, the Panel notes that many developed countries and the emerging giants of the developing world have adopted policies that identify the ICT sector as a whole, including the telecommunications industry, as a foundation for their national strategies for promoting economic growth and more efficient government as well as achieving certain social development goals.

As noted in a previous subsection, since the 1970s, Canadian telecommunications policy has focused on much more than the regulation of the telecommunications industry. The multifaceted policy approach originally developed by the former Department of Communications in the 1970s and 1980s was continued in the 1990s by the Information Highway Advisory Council and the Connecting Canadians agenda. These policy initiatives have enhanced Canada's profile in various areas of ICT development.

For example, since 2000, the Broadband for Rural and Northern Development (BRAND) pilot program and the Government On-Line (GOL) initiative have made notable contributions to Canada's ICT policy. However, in comparing what the federal government is currently doing in the area of ICT policy with the initiatives that have been taken in many other countries, the Panel concludes that the Canadian government is not currently focusing sufficiently on ICT policy — an area that is critical to Canada's economic prosperity and social well-being. This conclusion is supported by our steadily declining standing in the various indices that have been constructed to compare the performances of various countries in using ICTs to further economic and social development.³³

The Panel believes it is essential for the federal government to recognize the vital role that telecommunications and ICTs now play in every area of public policy, and to re-establish ICT policy as a national priority. Specific proposals related to establishing a national ICT strategy, including a program to complete the deployment of broadband networks in Canada, are set out in Chapters 7 and 8 of this report.

³³ The Economist Intelligence Unit e-readiness rankings, 2005, ranked Canada tied for 12th with Germany, whereas Canada was 11th the year before. The World Economic Forum ranked Canada 10th in its 2004–2005 Network Readiness Index, dropping from sixth place in 2003–2004. See World Economic Forum, "The Global Information Technology Report 2004–2005," available online at: <http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5CGlobal+Information+Technology+Report>

Regaining Leadership

A vibrant, competitive telecommunications industry is needed to make Canada a world leader in telecommunications and to deliver economic and social benefits to all Canadians. To regain leadership, the Canadian telecommunications industry needs a policy and regulatory framework that removes impediments to competition and innovation, while protecting and advancing the interests of consumers and citizens. In constructing a framework that will achieve these objectives, the Panel believes it is necessary to recognize that the telecommunications industry is undergoing a fundamental transformation, which has profound implications for policy and regulation.

Telecommunications Industry Transformation

The rapid change that is taking place in the telecommunications industry has been made possible by an ongoing revolution in the fundamental technologies for creating, processing, transmitting and storing information that underlie modern telecommunications networks. The same set of basic technologies now can be applied to many types of telecommunications, whether they involve voice, sound, text, data or video, or a mixture of media. The processing power and speed as well as the bandwidth capacity of these basic technologies continue to increase and their price continues to fall at exponential rates.³⁴

The subsections that follow describe how these underlying technological trends have made it possible to break down and blur the boundaries that previously existed between different segments of the telecommunications industry, such as wireline and wireless. They have also made it possible to begin breaking down the boundaries between telecommunications, the Internet, broadcasting and other electronic media. As these boundaries disappear, competition is intensifying not only within the traditional telecommunications industry, but also among different industry sectors. These developments in turn are expanding the range of communication and information products and services available to businesses, public institutions and individual customers.

In this respect, the Panel focuses on three particularly important trends: the shift to Internet Protocol, open network architectures, and the convergence of industries.

³⁴ The expression “Moore’s Law” refers to the very rapid rate of increase in the information processing capacity of ICTs relative to cost for the past several decades, and the prediction that this will continue for the foreseeable future. Gordon Moore, one of the founders of Intel, made the original observation and prediction in 1965 in relation to the number and cost of components on integrated circuits. “Moore’s Law” has since been applied to other ICTs, and debate continues over whether it will continue to hold. See, for example, Charles A. Eldering, Mouhamadou Lamine Sylla, and Jeffrey A. Eisenach, “Is There a Moore’s Law for Bandwidth?,” *IEEE Communications* 37 (10, October 1999): 117–21, available online at: <http://dl.comsoc.org/cocoon/comsoc/servlets/GetPublication?id=164125>

The Shift to IP

Perhaps the most profound change taking place in telecommunications today is the recognition that the Internet and other technological developments that rely on IP are providing highly functional, new and efficient ways to transmit all forms of telecommunications, including voice, data and video services.

Unlike conventional telecommunications technology, which sets up dedicated communication paths between end-users (for example, the parties to a telephone conversation), IP allows any signal — whether voice, data or video — to be broken up into packets of information. These packets are then mixed together with packets generated from other sources and are routed to their final destination, sometimes through different interconnected networks, where they are reassembled and presented to the recipient of the message. This simultaneous sharing of transmission facilities leads to more efficient use of network resources, thereby lowering the cost of communication.

As it rapidly becomes the *de facto* standard for all kinds of communications, IP is creating a converged communications space in which all types of telecommunications media (voice, data or video) can be coded and carried, either exclusively or simultaneously, over a common underlying facility, or through the “network of networks” that make up the Internet.

The Panel observes that the shift to IP is affecting the telecommunications industry in several ways.

- Profound changes are taking place in network economics in relation to both capital and operating expenses. IP makes it possible to merge all services on the same infrastructure and the same logical network (the latter is often referred to as a “platform” for the different services it supports). This has the potential to significantly reduce the amount of capital that is required to build and maintain facilities. It also allows for better management of operating costs. The cable industry’s rollout of IP-based voice services provides an example of the economic advantages of IP-based networks. Cox Communications, a U.S. cable company, estimates that the cost of deploying IP-based voice technology — US\$267 per customer — is approximately half the cost of deploying traditional circuit-switched technology — US\$527 per customer.³⁵ Over time, the costs of IP technology are expected to continue to fall more rapidly than circuit-switched costs. In Canada, Shaw Communications, a cable company, announced that its VoIP (voice over IP) service would require capital expenditures of \$425–450 per subscriber for the first 200 000 subscribers, and \$350 per incremental subscriber. RBC Capital Markets estimates a cable company would need 89 500 subscribers to break even on an investment in VoIP. In contrast, it estimates that capital expenditures for a telephone company to deploy video service would be \$830 per line, and that 245 000 subscribers would be needed to break even.³⁶

³⁵ Cox Communications, “Whitepaper: Voice over Internet Protocol: Ready for Prime Time,” May 2004. Available online at: http://www.fcc.gov/oet/tac/7.28.04_TAC_Cox_VoIP_whitepaper.pdf

³⁶ R. Talbot, “Canadian Telecom Services: Battle for the Broadband Home,” *RBC Capital Markets*, January 27, 2004.

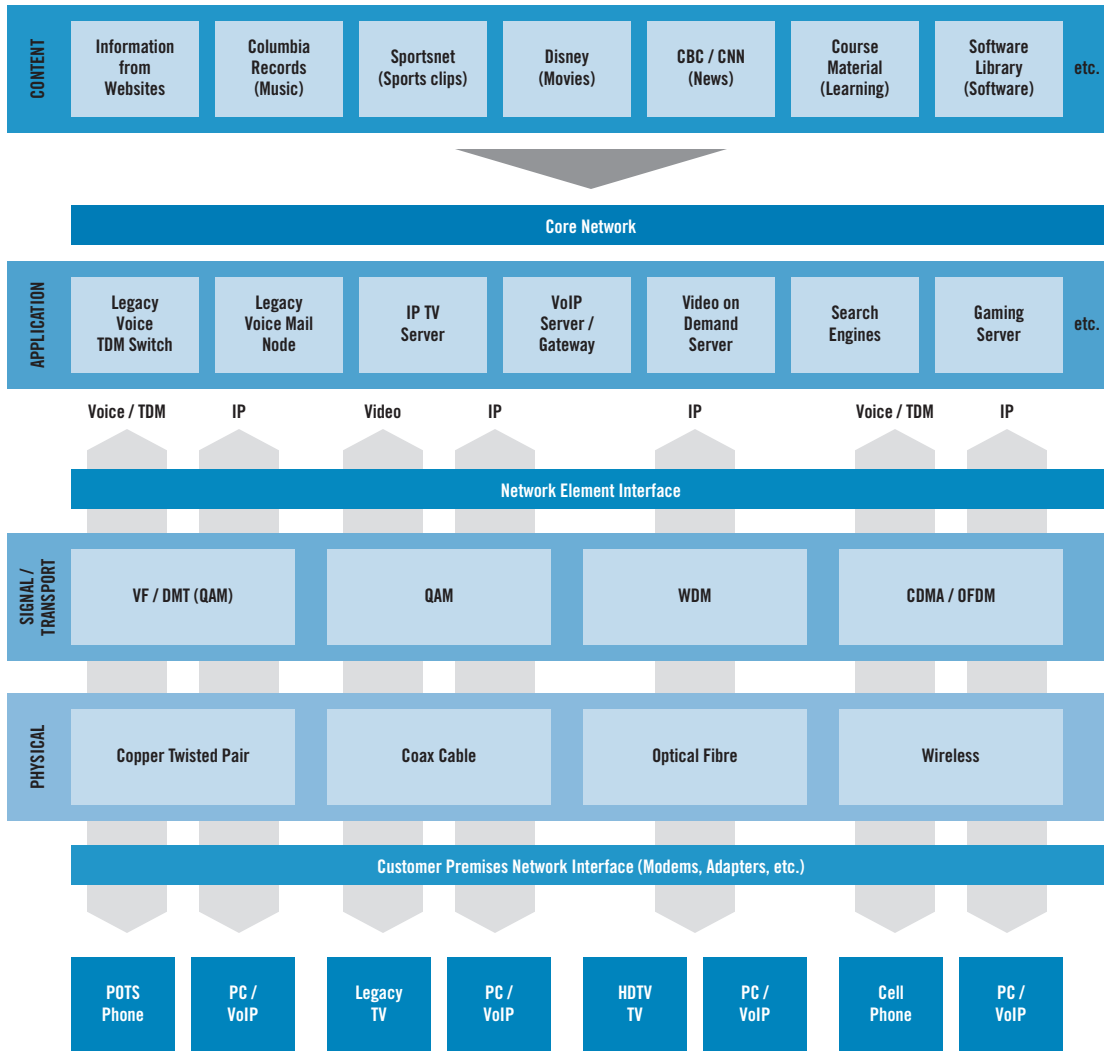
- Competition is increasing as IP reduces and in some cases almost eliminates economic barriers to entry in selected telecommunications market segments. This trend is clearly visible in the marketplace, as cable operators begin to offer local telephone services and as telecommunications network operators begin to offer video services on their broadband infrastructure. In addition to this facilities-based competition, companies like Primus and Vonage have entered both local and long distance telephone markets in competition with incumbent telephone and cable companies, without having to build their own facilities.
- The increasing use of IP in telecommunications networks provides increased flexibility in combining and developing new products and services. Today, these services are largely provided on distinct technology platforms. In the future, when the shift to IP is complete, it will be possible not only to offer all these services on the same platform but also to develop new and more functional integrated voice, data and video services.

Open Network Architectures

The shift toward IP and the parallel development of open standards for both local and wide area networks as well as for end-user devices are driving significant changes in the structure of telecommunications networks. These changes in turn are increasingly being reflected in the structure of the telecommunications industry and in the markets for its products and services.

With the advent of multiple access technologies and the use of IP for all forms of communication, clear lines of demarcation are emerging between the different functional layers that are found in modern communication networks. The “horizontal” separation between the different network layers or functions depicted in Figure 1-8 and described in the accompanying text box is creating a new network architecture that contrasts sharply with traditional “vertical” models in which different networks were needed to provide different kinds of services (e.g. telephone, data and broadcasting services) and in which the various functions performed by these different kinds of networks were much less distinct.

Figure 1-8. Network Layer Architecture



A Four-layer Model of Network Architecture

In the emerging network architecture depicted in Figure 1-8, a variety of devices connect to the network at the customer's premises' end of the network. In the interests of simplification, only some key examples of devices and functions are shown. As illustrated by the bottom row of the figure, a separate "box" is usually required to connect an end device to the network. Well-known examples are a DSL modem, a cable modem, a TV set-top box or a VoIP modem. Only legacy voice telephones and cell phones connect directly with the network.

A key element of the network is the **physical layer**, which represents the basic medium of connectivity between the customer premises and the nearest network node. Historically, different types of service providers have used different physical media to provide their service offerings.

To make the physical medium carry traffic, a variety of signal transmission/modulation schemes are used. This constitutes the **signal or transport layer** of the network. The signalling scheme used is appropriate to the physical medium under it. For example, a discrete multi-tone (DMT) signalling scheme is used on copper wires to deliver data speeds required for a DSL service. Wavelength division multiplexing (WDM) is used to "light up" a dark fibre, and orthogonal frequency division multiplexing (OFDM) is used in more contemporary wireless systems to boost speeds and spectrum efficiency.

Most of the time, the signal layer is invisible to the average end-user. For all practical purposes, the end-user/customer sees the physical layer and the transport layer as one seamless package. This may, however, not necessarily be true for the more sophisticated enterprise customers.

The key point of divergence between traditional architectures and new network architectures is the **applications layer**. The applications contained in this layer are highly visible to the end-user, and range from the ability to dial a number and have the call connected, to being able to access a Video-on-Demand server and spontaneously view a movie of choice.

The applications layer uses the core network to reach the actual source material that resides in the **content layer**. Driven by a completely different industry segment — the content or media industry — this layer provides the actual telecommunications payload such as music for downloads, TV coverage of sports events or navigational information. In a typical transaction, a user may use a wireless device to reach an Internet portal (residing in the applications layer) and request navigational information from a source like MapQuest® (residing in the content layer).

As illustrated in the preceding figure and box, a key development associated with the shift to IP-based networks is the increasing separation of applications and content from network infrastructure. In the past, many applications were controlled by network operators as part of an integrated, end-to-end service offering. In the future, consumers increasingly will have control over the specific applications and services to which they subscribe and use. This trend toward the decoupling of applications from underlying networks is illustrated by the introduction of VoIP services that can make use of any broadband network, whether it is provided by a cable, telephone or fixed wireless provider. Traditional voice services of the kind still provided by incumbent telephone companies include network access and transport services as well as the

voice application itself. In contrast, VoIP services can be provided on a stand-alone application basis by companies other than those that provide the underlying transport services, in this case, high-speed Internet access. As a result of the shift to IP and the decoupling of applications from underlying infrastructure, new service providers can enter the voice services market without first having to build an access network. For their part, customers can choose a VoIP service provider other than their broadband access provider.

The Panel believes the opening up of network architectures will affect the telecommunications industry in several ways.

- By separating the provision of services and applications from the provision of infrastructure and access and by putting more intelligence at the edges of the telecommunication networks, the open network architectures associated with IP will give consumers much greater opportunities to define their product and service needs, to choose a mix of suppliers, and even to create their own applications. In the future, the telecommunications marketplace will increasingly shift from one where applications are “pushed” to consumers by network providers, to one where there are greater opportunities for consumers to “pull” the applications, services and content of their choice.
- As consumers are able to “mix and match” from an expanding range of suppliers, facilities-based service providers will have less control over the value chain on which their business models traditionally relied. In particular, the emergence of VoIP highlights the fact that local and long distance voice services are unlikely to remain a core business segment for facilities-based telecommunications service providers. As the provision of voice services becomes decoupled from the provision of network access and is eventually offered to consumers at very little or no cost, traditional telecommunications service providers will have to develop new business models that replace lost voice revenue with new sources of income, and attract the investments that will be required to deploy IP-based, broadband, next-generation networks. In this respect, the Panel notes that there is an ongoing international debate involving, on the one hand, the benefits and costs associated with policies designed to facilitate the opening up of network architectures so that they are available to all application developers and content providers on a non-discriminatory basis and, on the other hand, the benefits and costs associated with policies designed to encourage the investments that will be required to build NGNs. This issue is discussed further in Chapter 6, which deals with social regulation.
- The servers that provide applications at the edge of IP-based networks can be located anywhere in the world. The distance insensitivity of these networks will expand competition on a global basis and bring new competitors into the telecommunications industry. For example, global peer-to-peer Internet telephony providers, such as Estonia-based Skype Technologies, now are offering voice over IP-based PC-to-PC and PC-to-phone communications in local markets all over the world, competing with traditional telecommunications service providers.

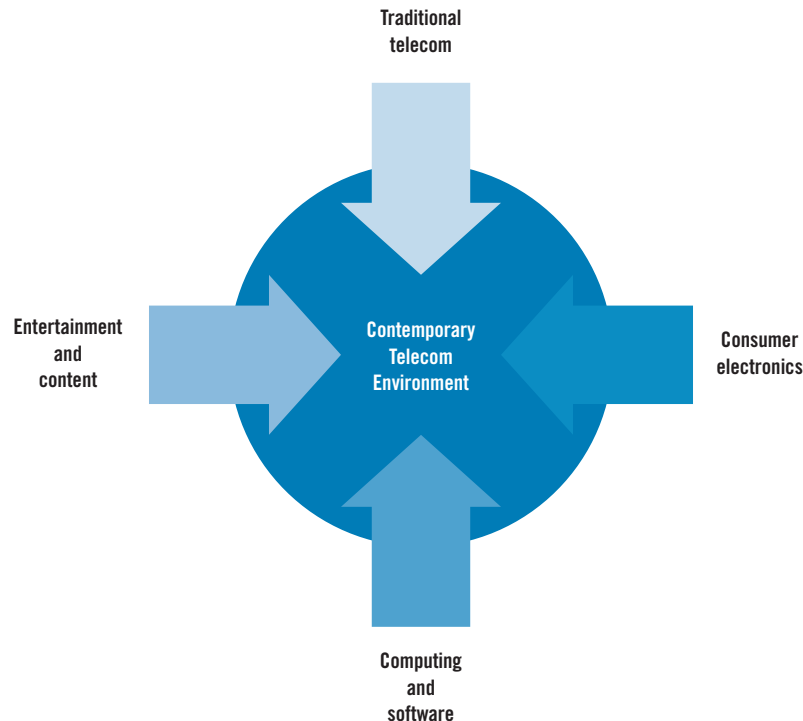
- The opening of networks to independent application and service providers has resulted in new levels of collaboration and competition between product and service providers in the telecommunications, computer and consumer electronics industries. This has resulted in major benefits for consumers, as innovations in each one of these areas have spurred innovations in the others. However, these benefits have come at a price. The opening up of telecommunications networks that were centrally controlled by network operators has created privacy and security concerns that must continue to be managed by network operators and service providers, and to be addressed by policy makers.

Convergence of Industries

Along with the shift to IP and open standards, the opening up of network architectures is creating a new, converged telecommunications marketplace where previously distinct industries now are both competing and collaborating not only to create new applications, products and services, but also to distribute existing applications, products and services in new ways.

One way to understand the collaborative dimension of the new telecommunications marketplace is to examine the role played by four formerly independent communications industry segments — the telecom infrastructure industry, the computing industry, the consumer electronics industry and the entertainment industry — in the development of new products and services such as music downloading and multimedia messaging services (MMS) (Figure 1-9).

Figure 1-9. Four-way Convergence



The consumer electronics industry has revolutionized the music industry with the introduction of compact, portable and inexpensive portable music players such as MP3 players and Apple's iPod. The same technology, when incorporated into cell phones, allows MP3 music files to be downloaded over wireless networks. The servers that host these applications are the products of the computing industry. The actual music tracks are created by the entertainment industry. A similar four-way convergence underlies MMS, an application that was triggered by the development of low-cost digital camera technology by the consumer electronics industry. With the evolution from short messaging service (SMS) to MMS, short messaging over wireless is no longer confined to text-only messages. Designed to work with mobile packet data services such as those offered by 2.5 G and 3G networks, MMS enables consumers to send and receive multimedia messages containing graphics, photos and video as well as music and other audio clips. Watching digital television on a mobile phone, personal digital assistant (PDA) or even perhaps a wireless-enabled watch is another example of this four-way convergence.

The Panel believes that convergence between formerly distinct industry segments is reshaping the telecommunications industry in a number of ways.

- Convergence is changing the way consumers see the telecommunications industry and is altering their expectations regarding telecommunications services. When downloading an MP3 song or a video clip to a computer, or consulting email on a BlackBerry®, a consumer is dealing with a number of different service providers from different industry segments rather than with a single service provider. To serve the customer, each of these different service providers must master the new skills that are required to partner and collaborate with other companies from very different industries in order to solve complex problems related to such matters as intellectual property rights. The increasing need for different industries to collaborate in turn creates opportunities to build new businesses that specialize in resolving these kinds of issues for other companies. Apple's iPod device and iTunes service are good examples of the complex arrangements that are needed to combine Internet infrastructure, consumer electronics, software solutions and financial arrangements with the music, film and television entertainment industry in a single product offering legal downloads on a per-item basis.
- These evolving arrangements are creating new and more efficient channels for distributing digital content to consumers, who increasingly are switching from traditional broadcasters to new media producers whose products and services are better suited to personal interests and the realities of modern life. The average consumer now spends more time, for both personal and professional reasons, in front of a computer than a television set. MP3-encoded music, which can be played through a variety of electronic media, is displacing traditional radio broadcasting and previous-generation audio technologies. Similar changes are likely to occur in the consumption of video content, which is already available on mobile devices as well as downloadable on personal computers and will soon be easily accessible on demand through televisions that are linked to the Internet via entertainment servers. Media are becoming increasingly personalized: consumers not only are increasing control over what content they consume and, through time-shifting, when they consume it, but also, as the recent explosion in blogging and photo-sharing attests, they are becoming increasingly important producers of content as well.

- As part of this general trend to convergence between formerly distinct industry sectors, there is an increasing overlap between the services offered by the telecommunications industry and the services traditionally provided by the broadcasting industry. While the Panel certainly acknowledges the importance of supporting the viability of Canadian cultural industries and the availability of Canadian content, this overlap raises important and difficult questions about whether old rules can deal with new realities, and whether it makes sense to have different laws and different federal government policy and regulatory institutions dealing with converging communications industries that provide increasingly similar multimedia services, applications and content. This issue is briefly discussed in the report's Afterword.

Transforming Telecommunications Policy

To help the Canadian telecommunications industry regain its position as a world leader that delivers economic and social benefits to all Canadians, the Panel believes the federal government must transform its policy frameworks in each of the areas we were asked to review — telecommunications regulation, ICT policy and broadband connectivity. The Panel also believes it is essential to see these three areas as parts of a unified information and communications policy field, rather than as three separate challenges. In the past, the telecommunications industry was largely distinct from the broadcasting, information technology and consumer electronics industries. Today, these industries are converging. The pace of innovation is accelerating. Competition and collaboration are increasing. Industry and market structures are changing. A new electronic communications sector is being created.

The products and services of this new sector are fuelling productivity, economic growth and competition. They are changing the way Canadians communicate, create, learn, work, live and are entertained. They present the hope of better government, improved public services and a more inclusive society. They have the potential to strengthen communities and to help bridge the divides that exclude some Canadians from full participation in economic and social life.

Effective frameworks for telecommunications regulation, ICT policy and broadband connectivity all have a part to play in achieving these benefits. In considering what should be done to transform policy in each of these areas, the Panel believes it is important to ensure consistency and strengthen the connections between these different policy areas in the new economic and social spaces being created in the electronic communications sector.

The following chapters contain the Panel's recommendations for how this should be done.