

The Benefit of the Wireless Telecommunications Industry to the Canadian Economy

April 2010



Table of contents

1	Executive summary	1
2	Introduction	3
2.1	Scope of the study	3
2.2	Canadian wireless sector overview	4
2.3	The economic contribution of wireless telecoms services.....	7
2.4	The structure of the report	8
3	Supply side impacts of the Canadian wireless industry	10
3.1	Supply side impacts: our methodological framework	10
3.2	Canada’s wireless value chain	12
3.3	Total value add generated by the Canadian wireless sector	15
3.4	Geographic distribution of value add	17
3.5	Wireless services compared with other sectors	18
3.6	Employment Effects	19
3.7	Employee value add	22
4	Productivity gains from wireless telecom services	24
4.1	Introduction	24
4.2	Labour productivity growth and use of ICT in Canada	24
4.3	The role of wireless services in increasing productivity growth	26
5	The consumer surplus from wireless services	30
5.1	Summary	30
5.2	Consumer surplus as a measure of economic welfare	30
5.3	Estimate of the current consumer surplus.....	31
6	Conclusions	34
Annex A: Value chain categories		36
Annex B: Cellular licensees		38

1 Executive summary

This study assesses the impact of the wireless industry in Canada on the Canadian economy. We are grateful to the members of the CWTA for the data that they have provided.

The mobile industry provides economic value to the wider economy in Canada well beyond the revenues which flow to the network operators and service providers, and excluding the value generated to the government through taxes and spectrum licence fees. The CWTA believes that the Canadian wireless industry has made significant contributions to the public benefit through licence fees - the AWS and PCS auctions have generated \$4.26 billion and \$1.481 billion respectively.

Spectrum is a key resource which enables the wireless industry to provide its services to the benefit of its customers, shareholders and the economy. When seeking to value spectrum licences, with the objective of ensuring a fair return for the Canadian public, due account should be taken of the value and benefits that the Canadian public already receives from these services through the stimulation of the economy as a whole.

We have concluded that the wireless communications industry generates significant value for the Canadian economy. The total value of direct GDP contribution, output multiplier and consumer surplus is a significant economic value of \$39 billion¹.

This value is much more than the revenues earned by the operators, dealers and service providers resident in Canada. The direct economic impact of the Canadian wireless telecom services industry in 2008 included the following:

- the mobile network operators generated \$15.94 billion in revenues and the wireless communications services industry directly contributed \$16.3 billion to Canadian GDP. The greatest contribution to the national GDP from the wireless communications services industry comes from the mobile operators and the support services sector
- when this direct contribution to GDP is complemented by the Statistics Canada output multiplier² of 0.87 this leads to a total economic benefit from the supply of services of \$30 billion
- the use and availability of wireless telecom services and products created a consumer surplus of at least \$8.8 billion. This is the difference between what end-users are willing to pay for a service and what they are actually having to pay and is an additional economic value to Canada
- the Canadian wireless telecommunications industry creates 274,500 direct, support, and indirect jobs.

¹ Note: unless otherwise stated, all financial figures in this report are expressed in Canadian dollars

² The 'output multiplier' is a statistical tool which enables the economic impact of demand on contributing suppliers in the supply chain to be assessed, based on the demand for end-user services. Statistics Canada provides a multiplier of 0.87 for the integrated telecommunications industry. This has been applied to the wireless sector in this study.

- the wireless sector offers high value employment – it has an average salary level of \$59,000. This compares to a Canadian average salary of \$42,640
- the \$16.3 billion value of the Canadian wireless industry compares favourably with other major Canadian industries - automotive manufacturing (\$20.6 billion), food manufacturing (\$18.2 billion) and agricultural crop production (\$16.6 billion). It is also comparable to the 2008 GDP of Newfoundland and Labrador, which was \$20 billion
- within this total value:
 - the rapidly emerging service area of mobile broadband generated \$2.4 billion in 2008³ and we forecast this to grow at 22% CAGR through to 2014
 - the mobile content sector generated around \$176m in 2008. Although currently of modest value, this is a sector which is expected to grow strongly as users adopt mobile broadband.

The wireless industry in Canada has made substantial investments over many years. Both incumbent and new entrant operators continue to invest heavily, despite challenging economic conditions, to meet the increasing demand for services and to provide the significant additional capacity that will be demanded for mobile broadband. This investment is in the form of additional network nodes, fibre and microwave backhaul and new core network infrastructure.

³ Ovum analysis

2 Introduction

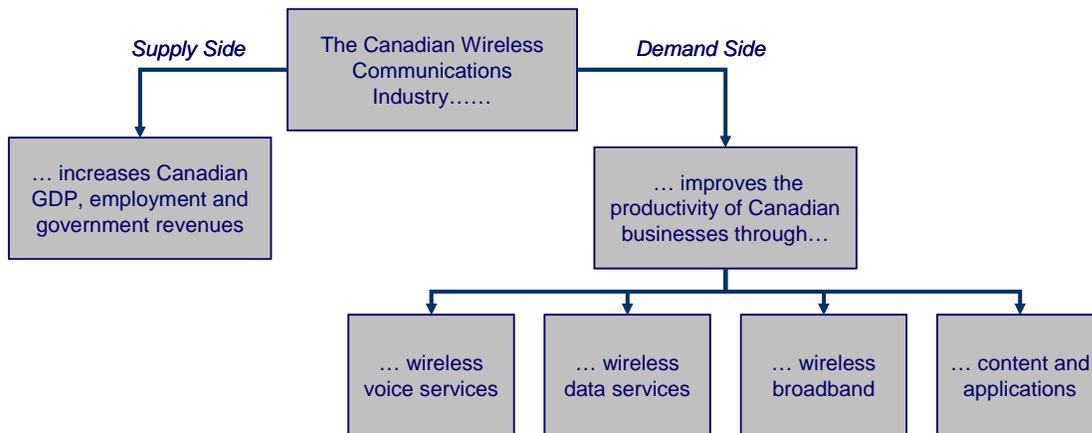
2.1 Scope of the study

This study was commissioned by the Canadian Wireless Telecommunications Association (CWTA) and reports on the beneficial impact that the Canadian wireless industry has had, and will continue to have, on the Canadian economy. CWTA is the authority on wireless issues, developments and trends in Canada. It represents cellular, PCS, messaging, mobile radio, fixed wireless and mobile satellite carriers as well as companies that develop and produce products and services for the industry.

This independent report has been prepared to demonstrate that the mobile industry provides economic value to the wider economy in Canada well beyond the revenues which flow to the network operators and service providers. This wider value must be considered when the changes to the Canadian spectrum pricing policy framework are under review.

The focus of the report is to quantify the economic impact of the industry in terms of the GDP, jobs and productivity gains for both the supply side and demand side of the economy.

Figure 1: Principal economic impacts of the Canadian wireless industry on the Canadian Economy



Source: Ovum

The key objectives of the study are:

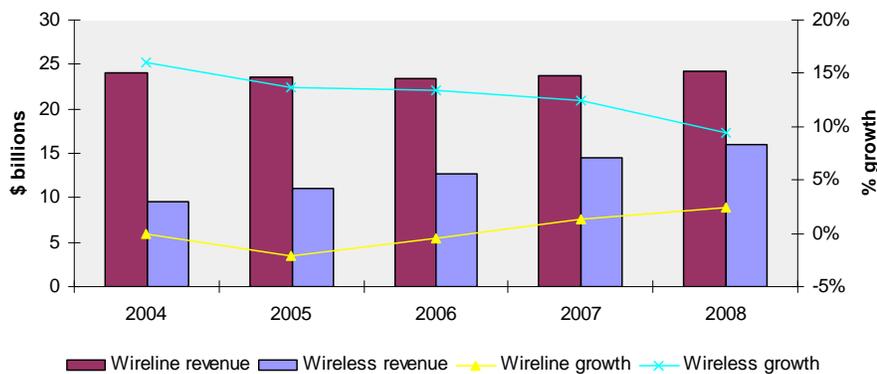
- to identify and demonstrate the supply side economic benefits of mobile services in Canada in terms of contribution to gross domestic product (GDP) and employment
- to identify the productivity gains that accrue from wireless services
- to assess the consumer surplus - the welfare and social benefits that mobile services provide for consumers, from a quantitative and qualitative perspective.

Our approach is based on an economic model that was previously developed in other studies undertaken by Ovum, including several studies for the GSM Association and studies for the CTIA in the USA. The approach has been successfully applied to the German, UK, Indian, Bangladesh, USA and European Union markets and the insights from these studies have informed this report.

2.2 Canadian wireless sector overview

The Canadian wireless telecommunications market is a driving force of the Canadian telecommunication industry.

Figure 2: Canadian wireless revenues continue to grow strongly

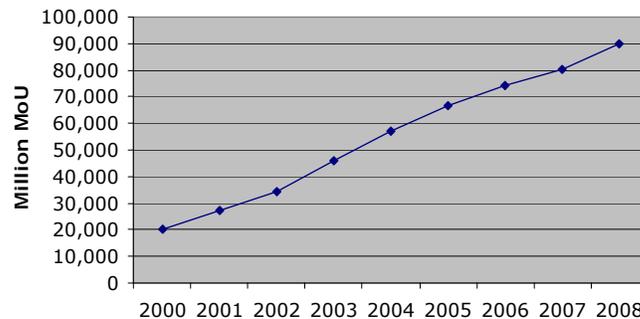


Source: CRTC

In 2008, the Canadian wireless communications market generated \$16.3 billion. This represents 40 percent of all Canadian telecommunication revenues and the sector showed a 14% compound growth in revenues in the four years from 2004 to 2008. Although the rate of growth has eased slightly, Canadian wireless revenues are still growing at 9% p.a., compared with the wireline side of the industry, which is essentially flat. As can be seen in Figure 3, wireless minutes of use continued to grow in a nearly linear manner, showing a 12% compound annual growth rate between 2004 and 2008. The growth in data consumption has now become significant, with an annual growth rate of 35.2% in 2008.

Growth still continues in the Canadian wireless sector and subscriber connections increased 7% between Q2 2008 to Q2 2009. However, in the wireline sector both subscriber numbers and revenues have been steadily declining since 2005.

Figure 3: Canadian wireless minutes of use



Source: Wireless Intelligence and Ovum analysis

There are many regional licensed wireless carriers and the main operators have many resale partners. A full list of mobile licensees is provided in Annex B. The three national carriers, Bell, Rogers, and TELUS in 2008 accounted for 94% of total wireless connections.

The Canadian wireless market is characterised by:

- a need to serve a huge geographic area. With a population density of 4 people per sq km, Canada is much more sparsely populated than Europe, which has 70 people per sq. km. and the US which has 30 people per sq. km. It is laudable that Canadian operators manage to cover 99% of the population⁴ – which does inevitably require a high level of capital expenditure
- the geography of Canada is served by 57 licensed operators, some with national coverage and others operating regionally, with network and site sharing as required by Industry Canada⁵. A full list of licensees in Canada is provided in Annex B.
- high operating costs for network operators. This is explained by the low population density in many provinces, which involves higher network deployment costs.

The market provides services via mobile access facilities, including mobile telephony, mobile data, roaming, wireless Internet access, and paging services. As with many other countries in the world, the importance of mobile data services is growing. The Canadian wireless market data revenues grew at an annual rate of 35.2% in 2008, primarily due to mobile broadband services.

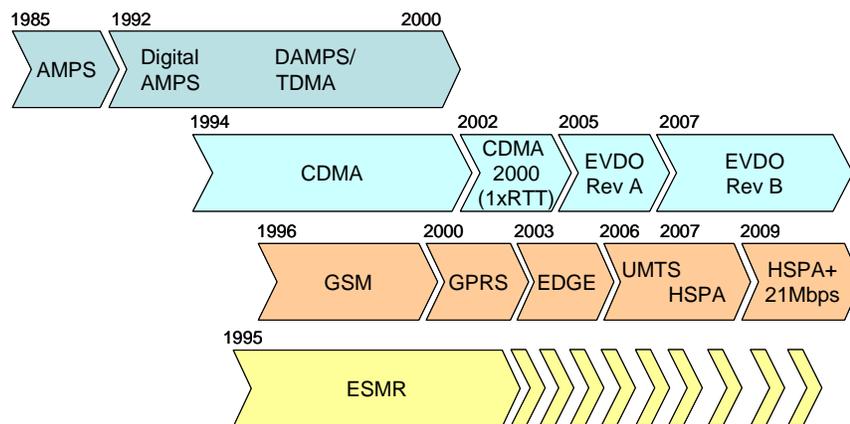
⁴ CRTC Communications Monitoring Report 2009

⁵ Conditions of Licence for Mandatory Roaming and Antenna Tower and Site Sharing and to Prohibit exclusive Site Arrangements

To ensure continuing world class service for Canadians the Canadian wireless networks are continuously evolving and Canadian national wireless carriers have recently migrated to HSDPA+, bringing the benefits of mobile broadband services of up to 21Mbit/s to consumers albeit with higher operating costs to operators. The CRTC Monitoring Report 2009 notes that approximately 91% of Canadians had access to 3G or 3G-equivalent broadband mobile services using handheld mobile devices. Since that report was issued, All three national wireless carriers have launched HSPA+ networks. 93% of the Canadian population currently has access to mobile broadband services with speeds of up to 21 Mbit/s.⁶

Due to the unceasing demand from Canadians for world class mobile technology and services the industry requires continual capital expenditure on new generation systems to address the evolving nature of technology, as shown in Figure 4. In 2008, the Canadian wireless industry increased its average network capital expenditure to spend an average of \$82 per subscriber connection⁷.

Figure 4: Canadian cellular network evolution



Source: CWTA, Ovum

As can be seen in Figure 4, there is a continual need for operators to invest in new technology. Prudent business management requires that this investment is spread reasonably evenly from year to year, and, as is shown in Figure 5, in the period from 1996

⁶ Rogers Wireless Next Generation 21 Mbps HSPA+ Network Goes Live in Canada's Five Largest Cities, Rogers Wireless Press Release, September 14, 2009

Bell clients to access the fastest, largest national wireless network deployment ever starting next month, Bell Canada Press Release, October 5, 2009

TELUS to launch Canada's largest 3G+ network on November 5, TELUS Press Release, October 26, 2009

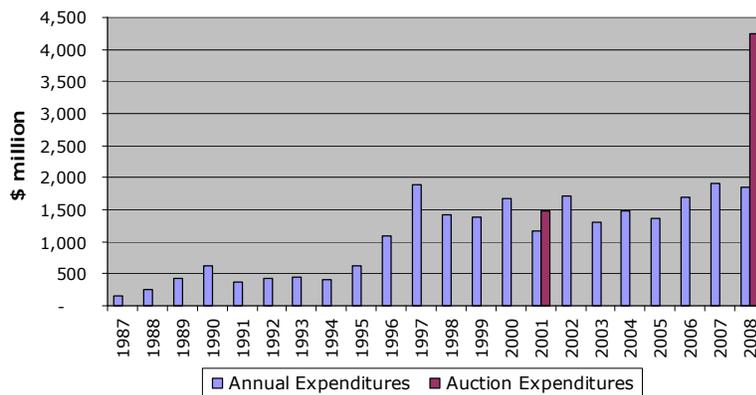
⁷ Company Annual Reports and Ovum analysis

to 2008, the industry invested between \$1.1 billion and \$1.9 billion every year in capitalised equipment and services.

In addition to these investments are the significant ongoing and one-time costs of the spectrum licences required to operate these networks. The incumbent cellular/PCS operators currently pay \$130 million annually for the spectrum that was not awarded by auction. Since 1998, Industry Canada has had a policy to award mobile spectrum licences via auction. In 2001, Canada’s wireless operators transferred \$1.481 billion to the government for 10 year PCS licences. In 2008 the industry transferred \$4.26 billion to the government for AWS spectrum.

Each licensing process results in intensified capital spending as new networks are deployed to make use of the spectrum. The AWS auction in July 2008 is resulting in significant capital investment by the operators across the sector, which will continue for many years as the operators invest to deliver services with their newly acquired spectrum.

Figure 5: Canadian cellular network investment



Source: The Canadian Cellular Service Industry: Historical Statistics 56-001-XIB (1987-1995); Statistics Canada Quarterly Telecommunications Statistics 56-002-XIE (1995-2005); CRTC Communications Monitoring Report 2009 (2006-2008)

2.3 The economic contribution of wireless telecoms services

This report provides an independent assessment of economic impacts that the Canadian wireless telecom industry had on the Canadian economy in the year 2008. The conclusions reached in this study are based on Ovum’s economic model for the Canadian wireless telecoms services industry. The model incorporates:

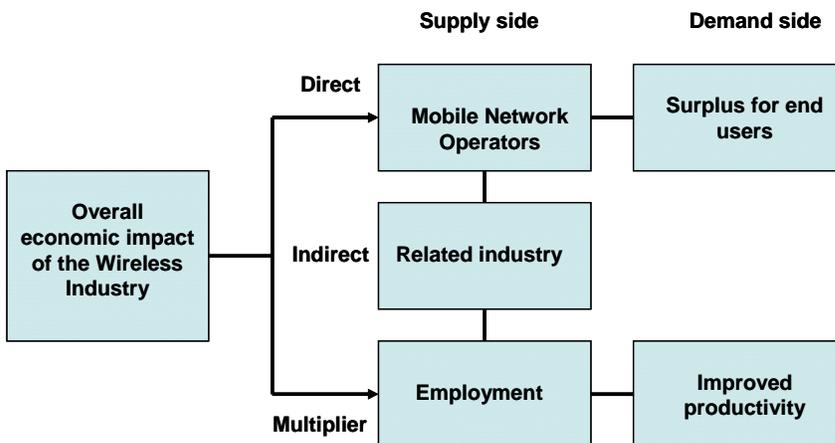
- financial and business data received under NDA from the major operators

- publicly available data concerning wireless carriers, wireless handset, equipment manufacturers and the overall wireless telecom industry
- Ovum’s own independent analysis, research and forecasts.

Our analysis indicates that in 2008 the wireless telecommunications industry in Canada has had the following impact on the Canadian economy:

- the Canadian wireless telecoms services industry contributed \$16.3 billion to national GDP in 2008. Of this \$16.3 billion contribution to GDP, \$11.7 billion was retained in the Canadian value chain and \$4.4 billion was sourced outside Canada
- the sector contributed directly and indirectly to employment of 274,500 in Canada. If induced employment it taken into account, this rises to more than 294,000 employed.

Figure 6: Principal economic impacts of the wireless industry on the Canadian economy



Source: Ovum

2.4 The structure of the report

The Canadian mobile services industry is performing strongly. We consider in this report what economic benefits the supply and use of mobile services is generating for the Canadian economy.

The report is structured as follows:

- Section 3 presents our estimates of the end user revenues generated by the mobile services industry in Canada, how these flow along the value chain and what value add is captured by which suppliers. It also estimates the GDP which is retained within Canada and the number of jobs in Canada which are dependent on the industry.

- Section 4 discusses in qualitative terms the main demand side impacts of mobile services and compares the position in Canada with that in other countries
- Section 5 quantifies the consumer surplus generated by the industry to end users and describes the social benefits provided by the sector to the general economy
- finally in Section 6 we present our conclusions.

3 Supply side impacts of the Canadian wireless industry

3.1 Supply side impacts: our methodological framework

In this section of the report we discuss the supply side – the provision of services by mobile network operators and service providers – and the supply side benefits that are generated. These are considered for the year 2008. We do not consider the supply side benefits that come into the country which are generated by systems and device vendors which export to other parts of the world, e.g. Research In Motion (RIM), Ericsson Canada (including the former Nortel Networks, Wireless Division), as our focus is the wireless communications services industry only. It is however instructive to recognise the value of major product development industries.

Many major suppliers of the wireless communications industry have presence in Canada. In addition to companies which were founded in Canada (e.g. RIM, Ericsson Canada (Nortel) and Sierra Wireless) other manufacturing companies are also present: e.g. Alcatel Lucent, Huawei, Motorola, Nokia, Nokia Siemens Networks and others all have a presence in the country. Most of these companies undertake some R&D in the country, and increasingly the major vendors undertake operational support roles for their customers and provide network operations and management services.

RIM is a major national developer of mobile devices and applications and is a major supplier into the Canadian market. The company derives considerable revenues from its world-wide sales and is a major employer in Canada. Importantly, RIM invests heavily in Canadian R&D which stimulates investment in other companies, often local, leading to a complex and valuable ecosystem in the wireless services value chain of devices and applications.

In the last two years, RIM has identified⁸ that 76% (2009) and 90% (2008) of its capital assets, intangible assets and goodwill are based in Canada. Ericsson Canada is one of Canada's largest R&D investors, with \$126 million invested in 2008. Ericsson's Montreal R&D Centre is the company's largest outside of Sweden, and has invested more than \$2 billion in R&D over the last 10 years. Products and services developed in Canada are included in Ericsson offerings around the world.

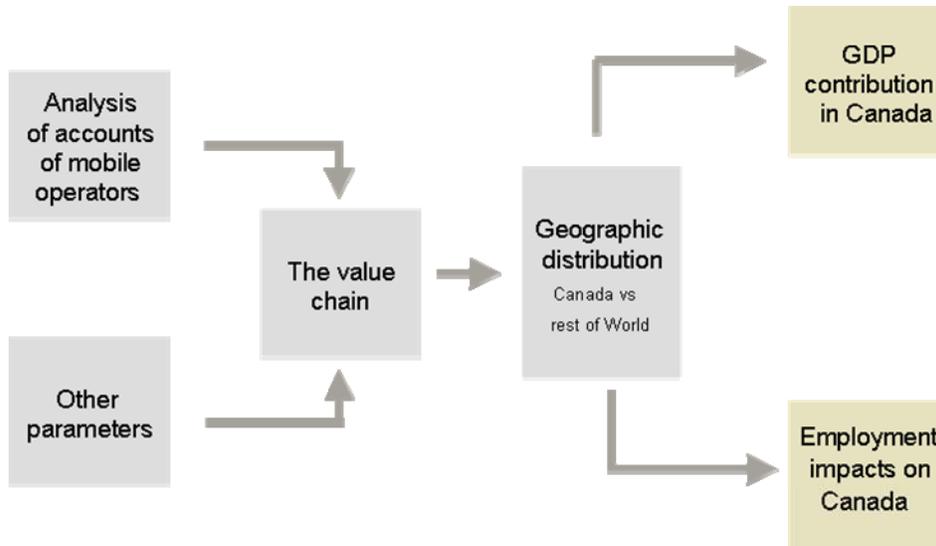
The presence of these major vendors helps the ecosystem develop. One listing⁹ identifies over 240 high tech companies in the Ottawa-Gatineau region, some of which have been

⁸ RIM Annual Report 2009

⁹ <http://www.cosmin.com/hightech.html>

established by employees of existing high technology companies, others such as Cisco and HP (EDS) attracted by the high tech environment.

Figure 7: Ovum’s model for estimating supply side effects



Source: Ovum

The model is essentially a three step process:

- **Step 1:** we started by quantifying the value chain for the industry - from the purchase of services and terminals by end users through to the creation of the components which go into making the network equipment used to supply these services
- **Step 2:** we then consider how the value added at each step in the chain is distributed geographically. In this report we simply look at the division of the value add¹⁰ between the Canada and the rest of the world.
- **Step 3:** we then use our findings to estimate the GDP and employment generated by the wireless communications services industry in Canada.

It is important to note that:

- we estimate the supply side economic impacts of the *Canadian wireless services industry alone*. We do not estimate the supply side impacts of the *rest of the world's wireless services industry* on Canada.

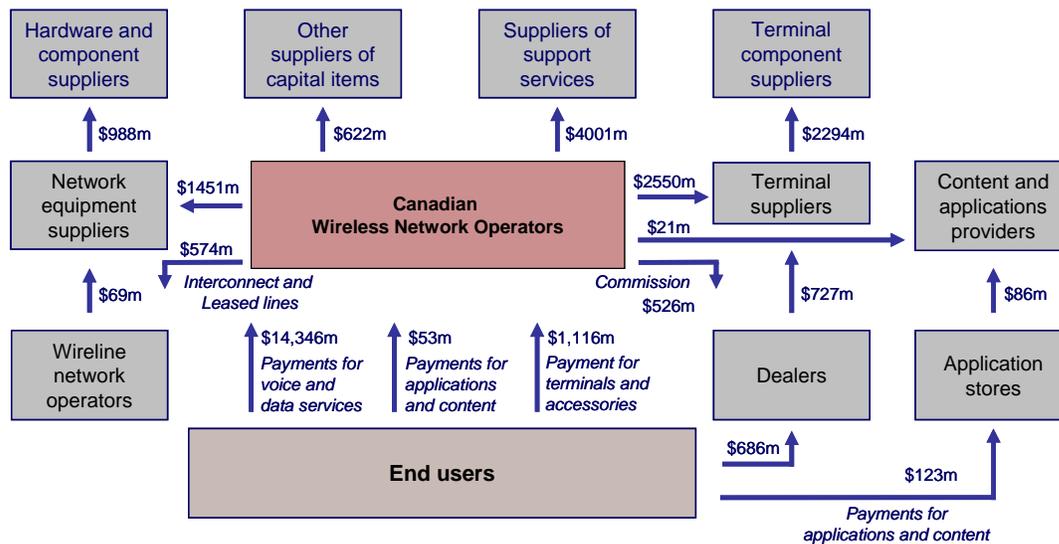
¹⁰ We use the terms *value add* and *GDP contribution* interchangeably since they are both terms for labelling the contribution to overall national GDP which a firm makes. In our simplified model, GDP is considered to be the sum of the value of final products and services sold.

- the estimates include the impact of inbound and outbound roaming revenues but assume that the flow of roaming revenues between Canada and the rest of the world is balanced.

3.2 Canada’s wireless value chain

Ovum has developed a model to estimate the value added (GDP contribution) and the effects on employment generated by the wireless sector in Canada. The model is based on a simplified version of the Canadian wireless sector value chain, as shown in Figure 8.

Figure 8: The value chain for wireless services in Canada



Source: Ovum. Note: definitions of value chain categories are provided in Annex A

We use the model to estimate:

- the GDP (or value add) generated by Canada’s mobile services industry. This is broken down in the model by industry sector (Figure 8), geographic region (Canada and the rest of the world), and the component of value add (wages, other operating costs and depreciation, and taxes, profit and interest)
- the direct, support services, indirect and induced employment generated within Canada by the mobile sector.

The Ovum model is built up as follows:

- basic statistics on the total revenues generated by the industry sourced from Statistics Canada, and the operators. These are combined with the detailed accounting breakdowns which were provided to us by the operators and relevant account

information derived from industry accounts. These enabled us to estimate and provide a relevant breakdown of the costs and revenues across the mobile services industry

- these estimates are combined with other key input parameters to estimate the revenue flows along the value chain and the value added by each industry segment. The value added is then distributed by geography (Canada and rest of world) and component. It uses, among other sources, estimates of the geographic distribution of the value added by terminal supplier.
- the model then calculates the number of jobs generated by Canada's mobile services industry by dividing the relevant value add by the relevant average annual unit wage cost for the industry segment
- finally, the model calculates the value add per employee in the mobile sector (within wireless operators and dealers) and compares it with the value add for the average worker in Canada.

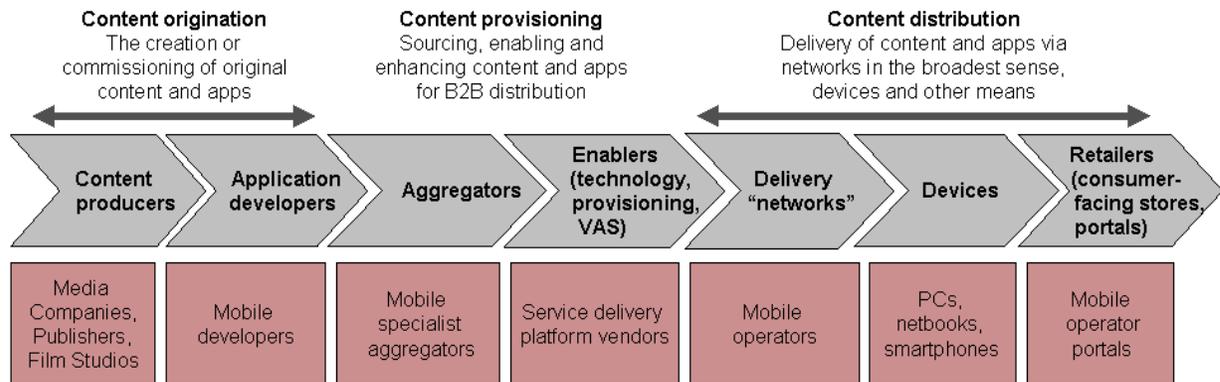
Content and applications value chain

Currently these revenues and the value added are quite modest. The model takes into account the revenues generated by content (music, video) and applications, although currently these revenues and the value added are quite modest. Ovum's estimate for the total consumer spend on mobile content and applications in Canada 2008 is \$176m. These services include:

- personalised content (\$43m): unique digital downloads of ringtones, logos, wallpapers and screensavers, mastertones, skins and video ringtones
- mobile games (\$39m): that are delivered over the mobile (cellular) network. Mobile games are purchased using pay-per-download or subscription services over the mobile network
- music (\$23m): digital downloads of full-track music and full-length music videos, and music streaming services, purchased either per download or on a subscription basis. We do not include music ringtones, which are included in the mobile personalisation estimate
- mobile TV (\$17m): streamed and download video services to mobile phones over cellular networks or over dedicated mobile broadcast networks (such as DVB-H, T-DMB and MediaFLO). Includes both live and on-demand (VoD) formats. We do not include 'music videos', which are included in the music estimate
- other content (\$30m): which includes: alert services (including traffic updates, sports, weather, travel alerts, music news, cinema listings, horoscopes and pop text gossip); Premium/branded news and information service subscriptions; Pay-on-request information services (for example, text me a licensed cab number, live traffic information). The main distinction between these and 'alerts' is that each information delivery is initiated and paid for individually by the customer, rather than the subscription/automatic delivery model used by alerts; Betting and gambling; Utilities: e.g. location-based applications and mobile payment (paying for car parks, etc.).

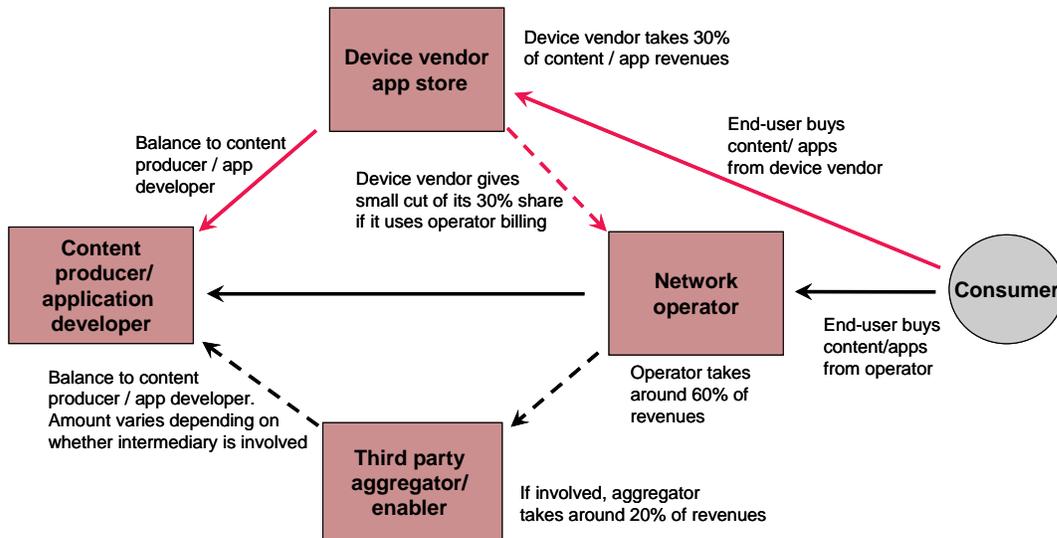
Figure 9 and Figure 10 show the content value chain and the approximate distribution of revenues for applications and content between the service providers, app. stores and developers.

Figure 9: Content value chain



Source: Ovum

Figure 10: Content value distribution



Source: Ovum

These services and applications are an important and developing sector of the mobile industry, enabled by higher speed, lower priced mobile broadband and devices designed to exploit the content.

Data sources

Data was provided by a number of companies in the Canadian wireless sector.

Data was also obtained from a number of publicly available data sources including CRTC, Statistics Canada, Industry Canada, annual accounts of wireless operators, terminal suppliers and network equipment manufacturers.

Ovum forecasts for revenues and services in the wireless sector have also been used in the modelling.

3.3 Total value add generated by the Canadian wireless sector

We quantify the monetary flows between key players in the value chain. In 2008, we found that:

- the total end user spend on wireless services and devices in the Canadian economy is \$16,271 million. This comprises:
 - \$14,346 million directly from consumers to mobile network operators for communications services
 - \$1,802 million spent by consumers on handset terminals and accessories. Of this \$1,116 million flows directly to wireless operators and \$686 million to independent dealers. Operators pay terminal manufacturers \$2,550 million. The difference between their receipts and payments is due to handset subsidies by the operators, and the difference is included in the \$14,346 million, above.
- the wireless operators reward independent dealers for sales to end users through commission payments of \$526 million giving dealers a total revenue of \$1,212 million. Of this total revenue, we estimate that approximately \$727 million is paid to terminal suppliers
- terminal suppliers receive the bulk of their revenue from wireless operators in Canada, with \$2,550 million flowing to them from this source. Of their total revenue of \$3,278 million, roughly \$2,294, or 70%, is paid for terminal components, to suppliers or internally, within the same corporate organisation
- in addition to commission payments, wireless operators also have a number of other outgoing revenue flows:
 - Ovum estimates that wireless operators make significant payments of \$4,001 million to support service suppliers. These services cover those which have traditionally been handled by external agencies, such as advertising, professional services (lawyers and accountants) and IT, but which now also encompass customer support and outsourced network operations and maintenance services. These payments represent around 30% of wireless operators' total costs.

- additionally, wireless operators undertake total capital expenditure of \$2,072 million, of which \$1,451 million flows to network equipment suppliers
- finally, wireless operators make payments of \$574 million to wireline operators, primarily for leased lines
- wireline operators also play a role in the total value added of the Canadian wireless sector. Roughly 12% of the revenue they receive from wireless operators for leased line services is paid to network equipment suppliers for the equipment used to provide these services. This gives network equipment suppliers total revenue of \$1,520 million of which \$988 million flows to suppliers of the network equipment component vendors.

Table 1 below summarises the contributory value added generated by each part of the value chain as a result of these payment flows:

Table 1 Value added in Canada which is generated within the value chain

	Value added, and retained in Canada (\$ million)	Percentage of total value added
Dealers and app. stores	534	5%
Wireless operators	5351	45%
Wireline operators	505	4%
Support service suppliers	4001	34%
Network equipment suppliers	133	1%
Hardware and components	247	2%
Terminal suppliers	181	2%
Terminal component suppliers	211	2%
Other capex suppliers	622	5%
Total	11,785	100%

Source: Ovum. Note definitions of value chain categories are provided in Annex A

When assessing the value of industries to the Canadian economy, the Government statisticians use a modelling technique which is referred to as the 'output multiplier'. This is a statistical tool which enables the economic impact of demand on contributing suppliers in the supply chain to be assessed, based on the demand for end-user services. Statistics Canada provides a multiplier of 0.87 for the integrated telecommunications industry. We have applied to the wireless sector in this study, which leads to a total economic benefit from the supply of services of \$30 billion (\$16.3 billion * 1.87).

3.4 Geographic distribution of value add

Of the total value add accruing from the wireless sector in Canada in 2008 (\$16.3 billion), roughly \$11.8 billion (72%) of the total GDP generated by the wireless operators and the companies which provide support services, is retained in Canada. The main areas of value which are not retained in Canada are generated by the terminal suppliers as the components that they source for device manufacture are typically manufactured in the US, Europe and Asia. Research In Motion is a major national developer of mobile devices and applications. Our analysis includes the value that this company derives from its sales of devices in Canada and the use of its wireless services in Canada. We do not include the significant value that is generated by RIM from its sales and support in other regions of the world.

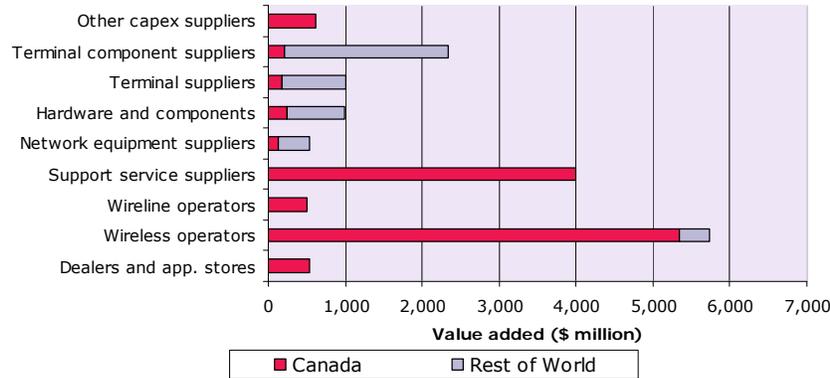
Table 2 below shows how the value add is distributed between Canada and the rest of the world for each player in the value chain.

Table 2: GDP impact of wireless services in Canada

	Value Added (\$ million)	Percentage of total value added	Value added, and retained in Canada (\$ million)	Percentage of retained total value added
Dealers and app. stores	534	3%	534	5%
Wireless operators	5739	35%	5351	45%
Wireline operators	505	3%	505	4%
Support service suppliers	4001	25%	4001	34%
Network equipment suppliers	532	3%	133	1%
Hardware and components	988	6%	247	2%
Terminal suppliers	1005	6%	181	2%
Terminal component suppliers	2346	14%	211	2%
Other capex suppliers	622	4%	622	5%
Total	16,271	100%	11,785	100%

Source: Ovum

Figure 11: Value added – geographic distribution



Source: Ovum

3.5 Wireless services compared with other sectors

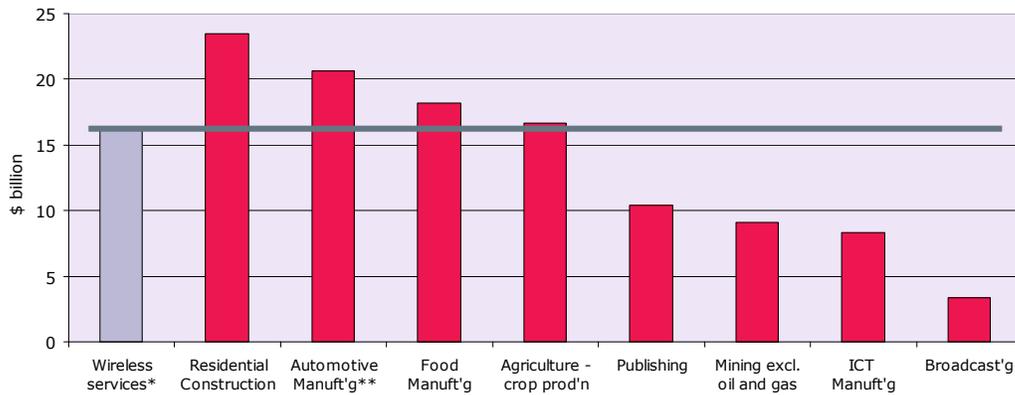
Industry Canada notes that the sectors of the Canadian economy can be regrouped to form five largely goods-producing industries and fifteen services-producing industries. The former are primarily associated with the production of goods:

- Agriculture, forestry, fishing and hunting
- Mining and oil and gas extraction
- Utilities
- Construction
- Manufacturing.

The services sector is considered in fifteen wide-ranging sectors, which range from wholesale and retail trade, transportation and warehousing, finance and insurance, through to the public administration sector. Wireless communications services are included in the Information and Cultural Industries category.

The statistics for these major good-producing industries are well established and it is instructive to compare the contribution that the wireless telecommunications services sector makes to the Canadian economy against them. Figure 12 presents a selection of data points for other industry sectors which are recognised as major contributors to the economy. The wireless communications sector contributes \$16,271 million to GDP. This is a significant contribution, comparable to other major economic sectors, and wireless is a sector which brings significant benefits to all Canadians – they get a very good return from the wireless industry.

Figure 12: Comparison of contribution to GDP 2008 – selected sectors



Source: Statistics Canada; *Ovum; **CVMA and Statistics Canada¹¹

3.6 Employment Effects

Ovum’s model also provides an estimate of the total employment created in Canada as a result of the wireless sector. This has been achieved in the following manner.

We first disaggregate the employment effects into:

Direct employment – the number of workers employed directly by the various players in the value chain. We estimate this based on the total value add accruing from wages for each part of the value chain divided by average wage for that part of the value chain

Support employment – the number of workers employed by firms providing support services (e.g. professional services, IT, outsourced customer support and outsourced network operations and maintenance) to the various players in the value chain. We estimate this using the total value add accruing from other operating expenses for each part of the value chain divided by average wage for the Canadian economy

Indirect employment – we assume that the tax, interest payments and profit component of value added also generates employment as the spending by Government using tax revenues and the spending by financial institutions and shareholders using their income from Canada’s mobile services industry will create new jobs. As with support employment, we divide by the average wage for the Canadian economy

¹¹ The Canadian Vehicle Manufacturers’ Association (CVMA) reports that automotive manufacturing contributes approximately 12% of Canada’s manufacturing GDP, which, based on Statistics Canada data for manufacturing GDP (<http://www40.statcan.gc.ca/l01/cst01/manuf10-eng.htm>) equates to around \$20 billion in value added by automotive manufacturing in Canada.

Induced employment – is due to the beneficial effect of the spending power of those employed directly in the industry or in support services. As consumers, these employees will spend some of their income on products and services which contribute further to employment and tax revenues to the government. Induced employment differs from the indirect employment effect, which is the beneficial effect derived from tax and interest to the Government and financial institutions.

The results of our analysis of the employment in Canada that results from the wireless communications sector are summarised In Table 3. This shows Ovum’s estimates of the employment created by each part of the Canadian wireless sector value chain. The estimate of the number of employees within the wireless network operators is based on full time equivalent staff numbers from major operators, pro-rated for the whole industry. Our methodology and the effect of induced employment are discussed in the text following the table.

Table 3: Canadian employment from mobile communications services

	(000)	Direct	Support	Indirect	Total
Dealers and app. stores		4.5	3.4	3.4	11.4
Wireless network operators		26.3	37.7	51.5	115.4
Support service suppliers (incl. n/w support)		12.0	75.1	18.8	105.8
Wireline network operators		3.4	4.7	2.4	10.5
Other capex suppliers		5.8	5.8	2.9	14.6
Terminal suppliers		1.6	1.9	0.4	3.9
Terminal component suppliers		1.9	2.2	0.5	4.5
Network equipment supply		1.2	1.4	0.3	2.9
N/w IT platforms and component suppliers		2.2	2.6	0.6	5.4
Total		58.9	134.8	80.7	274.5
Total with Induced Employment factor of 1.1		64.8	148.3	80.7	293.8
Total with Induced Employment factor of 1.7		100.2	229.1	80.7	410.1

Source: Ovum

The calculation of employment in the network equipment supply sector, and in other sectors, is based on the value-added by the sector, divided by the estimated average wage within the sector. Two additional points should be noted with respect to the network equipment supply sector:

- this estimate is based only on only those staff employed in the production of systems for use in the Canadian wireless service industry
- staff in the network equipment supply industry, involved in network operations and support are included in the support service sector.

The network equipment suppliers play an important role in the Canadian wireless industry. Whilst the staff who are directly involved in equipment supply are fairly modest in number, a far greater number are involved in supplying support services to the network operators, e.g. systems installation, commissioning, network operations and management.

The value to the economy is not just the jobs created in the provision of mobile networks and the delivery of wireless services – the employment benefits flow deeply throughout the rest of the value chain. This is particularly noticeable in the support services sector, which leads to the employment of nearly 106,000 – demonstrating the contributory benefit throughout the economy. The total direct, support and indirect employment in Canada which results from the wireless telecommunications services industry is 274,500, which is 2.4 times that of the employment generated by the wireless network operators (115,000 in total, of which 26,300 are directly employed). The size of the support services is a reflection of the interdependence of many industries. Not only are traditional support services (advertising, legal, accounting, etc.) included in this category, but so too are some of the network support functions as wireless network operators come to rely on outsourced services from vendors and managed services companies. The outsourcing of services can ensure that the operator can employ centre of excellence teams, and at the same time help achieve cost savings.

We have determined the employment figures in Table 3 by dividing the value added in each sector, by the associated estimated wage rates.

We also need to consider induced employment is generated by the spending of those employed either directly in the communications sector or in the support services to the sector. A number of economic studies have made estimates of the induced employment effect, which is presented as a multiplier of the direct and support services employment. A summary of the results of these studies, which shows that the multiplier ranges from 1.1 and 1.7, is provided in Table 4. The impact of multipliers within this range is shown in Table 3, and the final result is that we estimate that the number of jobs dependent on the Canadian wireless services industry is within the range 294,000 to 410,000.

The approach of considering induced employment is recognised in Ireland also. ComReg, the national telecommunications regulatory authority has made an assessment of the contribution that radio communications services have on the Irish economy¹². In 2006 ComReg estimated that mobile network services contributed 0.85% to the country's GDP, including an estimate of the induced employment factor of 1.1. Our analysis for Canada compares favourably with this. Our estimate is that the wireless communications services sector in Canada contributes around 1.02% to GDP, which excludes any induced contribution factor.

¹² Spectrum Management Strategy Statement 2008-2010:
<http://www.comreg.ie/fileupload/publications/ComReq0850.pdf>

Table 4: Multiplier benchmarks

Title of study	Multiplier
The contribution of mobile phones to the UK economy. O2 for ONS	1.13
Ovum studies on economic impact of mobile telephony in Bangladesh and USA, based on review of various other studies*	1.6
Association Française des Opérateurs Mobiles*	1.7
Economic impact of spectrum use in the UK. Europe economics, based on ONS	1.1
Sicrana, R., and de Bonis, R.: "The Multiplier Effects of Telecommunications Investments on Economic Growth and Restructuring" **	1.5
Radio authority, UK 1995, Economic impact of radio	1.4
Deloitte for GSMA, 2006, Economic Impact of mobile telephony in East Africa	1.2
Deloitte for GSMA, 2006, Economic Impact of mobile telephony in Pakistan	1.4
Range	1.1 - 1.7

Notes: * On employment, ** On GDP

Original Source: As given in table

Source: Table compiled by Deloitte, 2008

3.7 Employee value add

We can also use the information above to calculate the value added per employee in the wireless sector (including dealers and mobile operators), using the following formula:

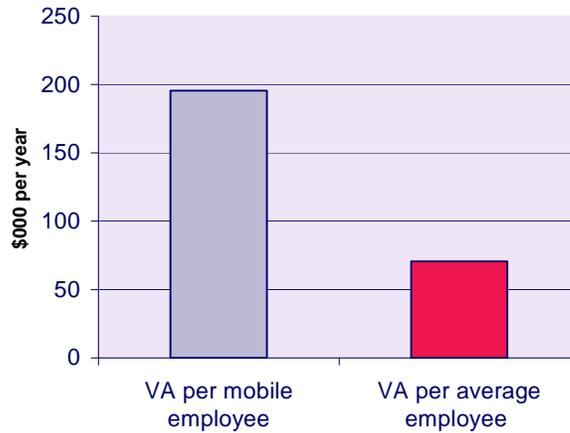
- $\Sigma [\text{Value add (wage costs) + Value add (profit, interest, tax)}] \div \Sigma \text{ Employment}$
- Our estimates suggest that the value added per employee in Canada is considerably higher in the wireless sector, at \$195,000¹³ per year, than for the economy as a whole, in which there is an added value per employee of \$71,000¹⁴.

As can be seen from Figure 13, the value added in the wireless services sector compared against Canadian average value added per employee, and the comparison of average Canadian salaries shown in Figure 14, the wireless communications services industry values its employees highly when compared with others industry sectors. This reflects the efficiency of the sector, the need for highly skilled staff to respond to demands for continual innovation and the value added in the sector.

¹³ The value added per employee in the wireless sector is derived from: [Wireless operator revenues - (commission to dealers + payments to terminal suppliers, network equipment vendors + other capex + payments to wireline operators + support services) + (70%*dealer revenues)] / (wireless and dealer staff)

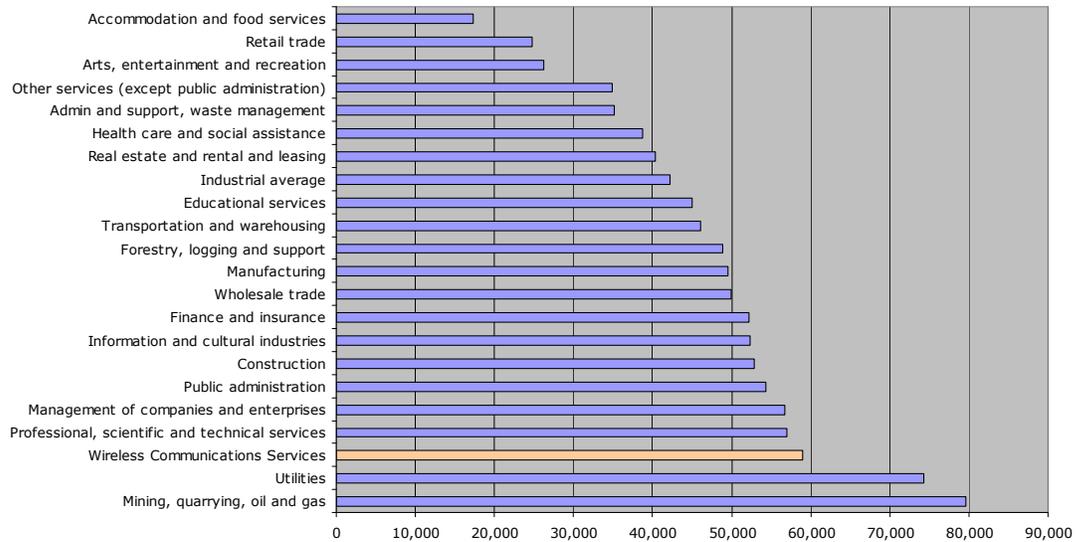
¹⁴ Statistics Canada

Figure 13: Value add - wireless services versus average Canadian employee



Source: Ovum

Figure 14: Average annual earnings (\$) across Canadian industry sectors



Source: Statistics Canada – Average Weekly Earnings by Industry¹⁵, Ovum

¹⁵ <http://www40.statcan.gc.ca/l01/cst01/labr73a-eng.htm>

4 Productivity gains from wireless telecom services

4.1 Introduction

There is a growing consensus amongst leading economists that efficient use of Information and Communication Technology (ICT) has a major impact on economic growth and prosperity. There is a huge body of economic literature on the multiple channels through which ICT adoption can impact on the economic system. The main strand of literature is, unsurprisingly, concentrated on the effects of ICT on economic growth and productivity, at both the micro and macro level.

For the purpose of this study we focus on the impact that ICT has on labour productivity¹⁶, with particular focus on the wireless Canadian industry.

In a country which has the opportunity to grow its wireless sector, with the consequent value to the economy, it is reasonable for the sector to be supported with policies, regulations and actions that will reduce barriers which might inhibit investment and expansion.

4.2 Labour productivity growth and use of ICT in Canada

Productivity is usually measured by ratios of changes in inputs to changes in outputs. The most common and least complex measure of productivity is labour productivity, which considers a single input like labour and is generally measured by gross domestic product (GDP) per hour worked. The main advantage of this partial productivity indicator is that it is easy to compute and to understand - as such, it is often computed to form a preliminary view of a country's comparative growth.

A 2008 study¹⁷ investigated wireless penetration and productivity for 49 states of the US from 1999 to 2006. The results showed that wireless penetration has a positive and significant relationship to productivity. A 1% increase in wireless subscribers per capita raises GDP per employee by about US\$69. If wireless penetration is increased by ten percentage points this would increase productivity by 0.36%. The study concluded that wireless penetration, high-speed connectivity and the convergence of these technologies

¹⁶ More complex measures which take into account more than one input simultaneously, i.e. multifactor productivity estimates, are not considered in this study

¹⁷ Wireless Telephone Penetration And Productivity: State Level Evidence From The United States 1999 To 2006. Kalpesh Unune

in the near future could reduce transaction costs further and continue to increase productivity. This may be an appropriate guide to use for the potential increase in productivity in Canada. However, penetration is an imperfect measure of wireless usage. A more accurate measure of wireless usage is minutes of use. Major operators in Canada report usage of between 300 and 400 minutes of use per month¹⁸.

In Table 5 we show that there is high usage of mobile phones in Canada. On a *per capita* basis, Canada has an average of 2700 minutes/person/year, and on a *per subscriber* basis, Canada has an average of over 4000 minutes/person/year, higher than the average in European countries where mobile penetration rates are much higher.

Table 5: National comparison of mobile minutes of use – 2008

	Minutes of use per head of population per year	Minutes of use per mobile subscription per year
Canada	2700	>4000
UK	2779	2300
Italy	2534	1500
Germany	1466	1400
France	2095	2800
Finland	4300	2700

Source: Based on Ovum Knowledge Centre data

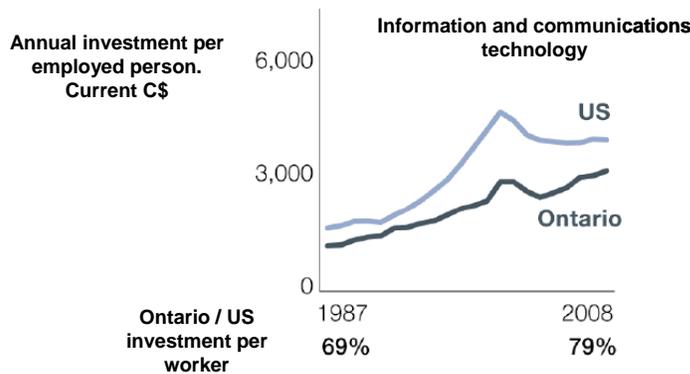
In a speech to the Winnipeg Chamber of Commerce¹⁹, 4 February 2010, Mark Carne, Governor of the Bank of Canada recognised that increased investment in new technologies could have helped businesses in the economic downturn:

"The significant drop in investment that occurred during the recession included spending on new technology, which could have helped firms address coming economic challenges. The relatively slow recovery expected in our most important trading partner, along with ongoing sectoral adjustments, means that firms have to find new markets. In doing so, they will face increased competition. For example, due to exchange rate moves and stellar productivity performance, the competitiveness of the U.S. corporate sector has improved significantly. The need for capital investment by Canadian businesses to meet these challenges is clear."

¹⁸ Annual reports

¹⁹ <http://www.bankofcanada.ca/en/speeches/2010/sp040210.html>

Figure 15: The Canada (Ontario) - US ICT Gap, Canada (Ontario) as a Percentage of the United States, 1987 - 2008



Source: The Institute for Competitiveness & Prosperity²⁰

Canadian mobile operators are spending heavily on the deployment of new broadband networks, such as HSPA+. The continuing development of an environment that encourages investment in mobile communications and mobile broadband capabilities will lead to increased use of mobile services and will directly create a flow through of value to the economy, helping Canada to close the productivity gap with the USA, as shown in Figure 15. As demand for mobile broadband increases, there will be a continuing need for additional investment in the wireless services industry, which as one component of the overall ICT sector, will help to close this Canada/ US ICT investment gap. As discussed in Section 2.2 of this report, the industry has invested over \$1.1 billion every year for the decade to 2008.

4.3 The role of wireless services in increasing productivity growth

Wireless communications services have established themselves as an essential driver of increased productivity. Historically, the most significant benefits have come from the provision and use of voice services. Most countries are now developing and implementing national broadband strategies, in which mobile broadband will play a very important role – this is especially the case in countries, like Canada, with large rural areas of low population. With more than 90% of the population already able to access 3G or 3G-equivalent broadband mobile services, Canada is well placed to benefit from the productivity benefits that can be achieved from the wide availability of mobile broadband.

²⁰ Navigating through the recovery, Roger L. Martin, 23 November 2009
http://www.competeprosper.ca/download.php?file=ICP_AR8_final.pdf

The productivity gains are hard to quantify. However, one simple measure of the productivity benefit is the consumer surplus from wireless services, which we discuss in Section 5 of this report. We estimate that the lower bound of the consumer surplus is \$8.8 billion per year at the end of 2008.

Voice services

The productivity benefits which come from wireless communications services are well known and some are particularly pertinent in countries like Canada which have large geographic areas with relatively low population density. Key voice services which improve productivity are:

- **reduce unproductive travelling time.** The use of wireless voice services enables field engineers and sales staff to use otherwise unproductive travel time. They can talk to customers, colleagues and suppliers, conduct business, confirm appointments and follow-up on questions in a safe and legal manner. Increasingly they also supply or source relevant data, which the traveller can use whilst on the move
- **significantly improve logistics.** Companies can contact field staff armed with wireless devices to schedule meetings and reassign tasks more efficiently. Traffic and other travel related information can be communicated in real-time while employees are in transit thereby improving the employees' ability to travel between jobs and assignments along the most efficient route. Companies dependent on fleet management can also better coordinate deliveries, pick-ups and other logistical issues
- **enable faster and more efficient decision-making.** Employees can contact each other from any location at any time to convene a teleconference or otherwise organize and host virtual meetings to reach time-sensitive, important decisions. Without the mobility and immediate accessibility that wireless devices provide, such meetings could take days or weeks to schedule and occur, thereby delaying progress or completion of tasks
- **empower small businesses.** Farmers, plumbers, contractors, builders, real estate agents and other businesses and workers who spend a high proportion of their work-day away from a fixed location can take advantage of the resource and management efficiencies created by a less capital intensive mobile, virtual office.

These are primarily business benefits. Consumer also benefit from productivity savings, particularly in rural areas where physical travel time and the lack of other communications methods make wireless communications particularly valuable. After new services have been introduced into urban areas, addressing up to 93% of the population, services are then typically rolled out to nearly all users, including those in rural areas, making the productivity benefits nationally available. The consumer benefit can be assessed through the consumer surplus, discussed in Section 5.

Data and broadband services

The growth of higher bandwidth mobile broadband will significantly increase the way in which wireless services will continue to provide opportunities for increased productivity. But, these benefits of high speed broadband do not come without significant investment in network infrastructure and backhaul. The initial network investment allows services to be established, but once the user base develops, additional investment is then required for two reasons:

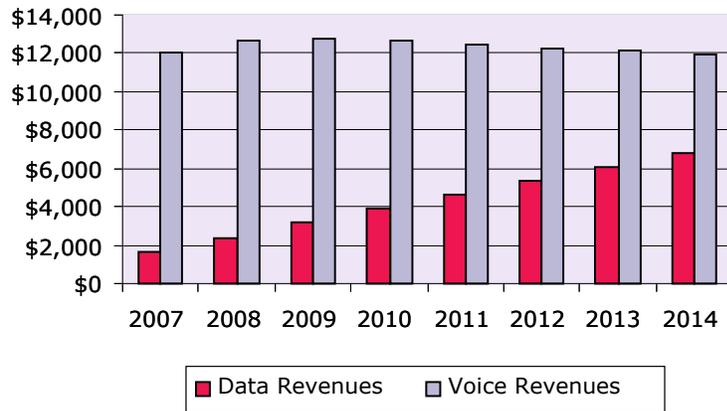
- the capacity within a cell has to be increased to meet demand, or additional cells added
- the backhaul needs to be upgraded – operators are commonly considering fibre and microwave backhaul to meet imminent growth forecasts.

A recent report by Cisco demonstrates the degree to which the market is growing. Cisco reports²¹ that mobile video will represent 66% of all mobile data traffic by 2014, increasing 66-fold from 2009 to 2014. The report also highlights that global mobile data traffic is growing 2.4 times faster than global fixed broadband data traffic, and with a trend for more people to use only a mobile broadband service – the demand on cell capacity will continue to increase. This will require additional capital expenditure as operators need to provision sufficient capacity and availability ahead of demand.

Ovum's forecast for mobile broadband and data services (Figure 16) shows a compound annual growth rate (CAGR) of 22% over the period from 2007 to 2014 – this may understate the value that consumers and businesses will enjoy, leading to an increase in our estimate of consumer surplus. Just as wireline broadband has become an access service through which a broad range of applications, content, media services and value added services are delivered - which far exceed the value of the connection service - so we expect that this will be replicated in the wireless domain. The services will encompass many which will contribute directly to increased productivity, especially as laptop support is improved and two way video can be established.

²¹ http://newsroom.cisco.com/dlls/2010/prod_020910b.html

Figure 16: Canadian mobile voice and data revenues forecast (\$ million)



Source: Ovum

5 The consumer surplus from wireless services

5.1 Summary

The consumer surplus is the amount that consumers benefit by being able to purchase a product for a price that is less than they would be willing to pay. It therefore reflects value that the consumer enjoys, above and beyond what they have to spend on the service.

Our estimates suggest that the consumer surplus accruing from the use of wireless services in Canada will be a minimum of \$8.8 billion. This is the additional benefit or satisfaction that consumers get from wireless services, above and beyond what they pay for the services. A consumer surplus such as this indicates that consumption is likely to grow, as more people become aware of the value that the services add to their lives and businesses.

As we have stated, **\$8.8 billion is a lower bound** figure which is derived from our model. The consumer surplus will grow over the coming years due to increased penetration and greater adoption of broadband services. Additionally, as access speeds increase, often without a significant increase in price, so the benefits to the consumer become more extended.

5.2 Consumer surplus as a measure of economic welfare

Consumer surplus is a standard measure which is used by economist to quantify the benefits that consumers receive. The concept was formally developed by Alfred Marshall in his Principles of Economics²². It can be defined as the difference between what a consumer would have been willing to pay for a certain quantity of a good, and what that consumer actually has to pay. In Marshall's words:

"the price which a person pays for a thing can never exceed and seldom comes up to that which he would be willing to pay rather than go without it: so that the satisfaction which he gets from its purchase generally exceeds that which he gives up in paying its price: and he thus derives from the purchase a surplus satisfaction. The excess of the price which he would be willing to pay rather than go without the thing, over that which actually does pay, is the economic measure of this surplus satisfaction."

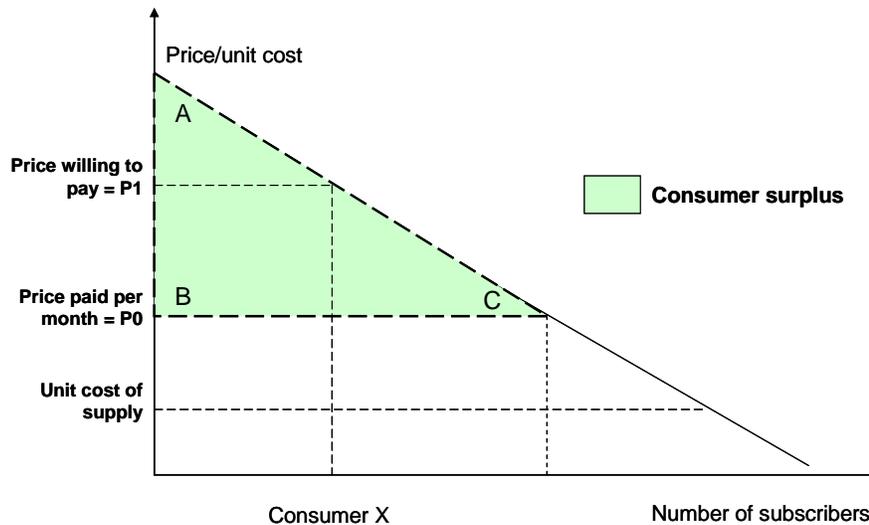
²² Principles of Economics. 2009 ISBN: 978-1-60520-802-2 Alfred Marshall

The consumer surplus which Canadian consumers and businesses enjoy as a result of using wireless services therefore is a function of:

- 1 the price which users are prepared to pay, on average, for wireless service, less
- 2 the price which they actually pay, multiplied by
- 3 the number of subscribers.

Consumer surplus is depicted by the area ABC shown in Figure 17.

Figure 17: A definition of consumer surplus



Source: Ovum

If Consumer X is willing to pay a price P1 per month for mobile service, but actually pays price P0, then Consumer X will enjoy a consumer surplus of P1 less P0 per month. The area ABC represents the total consumer surplus, which covers both early adopters, with a high valuation of wireless services, and marginal consumers, for whom the current price just tempts the use of wireless services. The consumer surplus measures the combined social and commercial benefits which Canadian users generate from purchasing wireless mobile services.

5.3 Estimate of the current consumer surplus

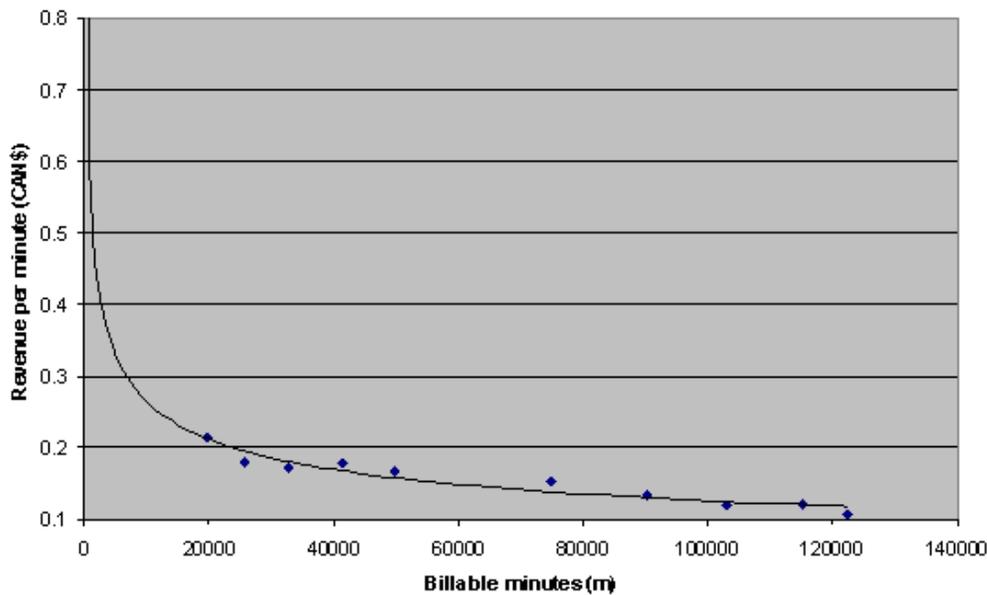
To accurately determine the consumer surplus would require a complex set of data, including the number of subscribers, detailed pricing information, including discounts, price changes, and the prices of service bundles. This detailed data for Canada was not available for this study and we are not aware of any other studies or reports which have

previously made estimates of the consumer surplus for the Canadian wireless sector. We have therefore followed an approach previously used by Ovum to estimate a lower bound for consumer surplus.

The approach is to produce a proxy lower bound demand curve by plotting the revenues per minute of voice services from mobile network operators, at actual prices, against the total number of billable minutes per year.

Using data for the post-paid market in Canada between 2000 and 2009, we have estimated the lower bound demand curve shown in Figure 18. As can be seen, the lower boundary for P0 is around \$0.1 per minute. There is no benefit to the service provider to reduce prices lower, as the shallow nature of the curve indicates that demand is not restricted by price.

Figure 18: A lower bound of the current consumer surplus in Canada



Source: Ovum

The area below this curve provides a proxy for the lower bound on consumer surplus in the Canadian post-paid wireless market, which we estimate to equal \$6.9 billion. As the post-paid market comprised on average 78% of subscribers during this period, to obtain a lower bound on consumer surplus for the total wireless market (i.e. both post-paid and pre-paid), we scale up our estimate of \$6.9 billion by 22%, to give a final estimate for the lower bound of consumer surplus of \$8.8 billion.

It should be noted that this is only a lower bound approximation. In practice the demand curve:

- is likely to shift rightwards over time as wireless sector services develop and the market matures, and
- will include additional services, e.g. SMS, MMS, mobile broadband and an increasing range of mobile applications and content services.

The effect of these points will be to significantly increase the consumer surplus.

The consumer surplus for the Canadian wireless communications sector can be put into perspective with the operating revenues of the wireless service providers and the contribution to GDP.

With the sector generating revenues of \$15.49 billion in 2008 and the value added to the country's GDP by the sector of \$12.05 billion, our estimated consumer surplus of \$8.8 billion is quite significant. The consumers benefit from the rapidly increasing breadth and depth of mobile communications services, which range from keeping in touch with family and friends, social networking – whether through voice or basic data / SMS services; business communications, improving efficiencies in the private and public sectors; personal security and social cohesion; entertainment; and more. It is the value of these personal, social and commercial benefits which contribute to the overall consumer surplus.

6 Conclusions

We reach the following conclusions from this study.

The wireless communications industry generates significant value for the Canadian economy. This value is much more than the revenues earned by the operators, dealers and service providers resident in Canada:

- in terms of direct contribution through the sale of goods and services, the sector generates over \$16 billion
- using the Statistics Canada 'output multiplier' for the sector, it generates an additional \$14 billion benefit due to the economic flow through to contributing suppliers in the supply chain
- there is an additional consumer benefit, in that consumers are provided with services which they value by nearly \$9 billion more than they pay for the services.

The wireless industry contributes to employment. We estimate that:

- 26,300 staff are employed by the mobile network operators
- a total of 59,000 are employed directly as a result of the industry and 135,000 in support services
- a further 81,000 are employed indirectly – as a result of spending by government of tax revenues and spending by financial institutions and shareholders
- for all of these employees, there will be further induced employment, by virtue of the employees spending in the economy. Our total estimate is that over 294,000 people are employed in Canada as a result of the wireless industry.

The wireless communication industry is continually evolving and in need of investment to bring new services to a growing and demanding market. Operators have already established mobile broadband services to 93% of the population. In the future new entrants to the Canadian market need to invest to grow their businesses and established operators have to maintain their investment to bring new services to market and to satisfy exponential growth for broadband mobile data services.

The link between ICT investment and productivity is recognized by the Bank of Canada and industry investment should be encouraged by government and regulatory policy makers, particularly as the economy seeks to recover from a recessionary period and a Canadian trade deficit.

Government and policy makers should recognise the wider benefits of wireless and set policy and operational processes that will allow the sector to maximise the value and contribution to the national economy. In particular, the significant contribution made by the wireless industry to the Canadian economy should be taken into account when setting the level of spectrum licence fees.

Annex A: Value chain categories

Dealers and application stores

Retail outlets which are independent of the wireless network operator. The dealers may be shops, franchises or online stores selling handsets, devices, terminals and accessories. More recently, online application stores have become established, selling applications and content (music, videos) for smart phones.

Wireless network operators

The companies which operate wireless networks and provide retail mobile voice, data and broadband communications services.

Support service suppliers (incl. n/w support)

This is a broad category. It includes two broad groups of suppliers:

- professional service firms such as accountants, lawyers, advertising agencies and associated media, corporate IT services
- outsourcing companies providing network and customer support services, such as call centres, network management, operations support services. It should be noted that some of the services in this category may be provided by the network equipment supply vendors.

Wireline network operators

The companies which operate wireline networks and provide retail and wholesale services. It is the wholesale services, such as leased lines, and, if applicable, interconnect charges which are relevant to this study.

Other capex suppliers

This is a broad category which includes office IT systems, vehicles and other non-network capital expenditure.

Terminal suppliers

The manufacturers and vendors of handsets, terminals, network cards/ dongles and smart phone devices.

Terminal component suppliers

The manufactures and vendors of components used in the terminals, such as displays, batteries, processors, chipsets, casings, keypads, operating systems and applications software.

Network equipment supply

The voice and data switching and routing systems used in the radio access network and core network, including ancillary equipment, such as frames, towers, power systems.

Network hardware and component suppliers

This is a broad category of systems and components which are supplied to the network equipment vendors. The category includes components used in the switching and routing systems, hardware platforms and base station equipment including towers, cables and power supplies.

Annex B: Cellular licensees

There are 57 licensed cellular operators in Canada²³.

Cellular 800 MHz / PCS 1900 MHz / AWS	
	Bell
	MTS Allstream Inc.
	Rogers Communications Inc.
	SaskTel
	TELUS COMMUNICATIONS
Cellular 800 MHz / PCS 1900 MHz	
	Amtelecom Limited Partnership
	BROOKE TELECOM CO-OP LTD
	EXECULINK TELECOM INC
	GOSFIELD NORTH COMMUNICATIONS
	HAY COMMUNICATIONS CO-OPERATIVE
	HURON TELECOMMUNICATIONS
	LANSDOWNE RURAL TELEPHONE CO
	MORNINGTON COMMUNICATIONS
	NEXICOM MOBILITY INC.
	NORTH FRONTENAC TELEPHONE CO
	NORTH RENFREW TELEPHONE CO LTD
	Peoples Tel Limited Partnership
	QUADRO COMMUNICATIONS CO-OPERATIVE
	ROXBOROUGH TELEPHONE CO LTD
	TBayTel
	TUCKERSMITH COMMUNICATIONS
	WIGHTMAN TELECOM LTD
	WTC COMMUNICATIONS
Cellular 800 MHz	
	BRUCE TELECOM
	CITY OF PRINCE RUPERT (SPEC LIC.)
	Cochrane Telecom Services of the
	COMPAGNIE DE TELEPHONE DE LAMBTON
	COMPAGNIE DE TELEPHONE DE ST-VICTOR
	COMPAGNIE DE TELEPHONE DE WARWICK
	COMPAGNIE DE TELEPHONE UPTON INC
	COOPTEL

²³ Source: <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09439.html>; <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09431.html>; <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09269.html>

	FIRST NETWORKS OPERATIONS INC.
	LA CIE DE TELEPHONE DE COURCELLES
	Latitude Wireless Inc.
	LE TELEPHONE DE ST-EPHREM INC
	NorthernTel L.P. (Vendor: 20027589)
	ONTEL INC. o/a ONTERA
	SOGETEL MOBILITE INC
	Telebec L.P. (Vendor: 0020027589)
	TELEPHONE GUEVREMONT INC
	TELEPHONE MILOT INC
	The Corp. of the City of Dryden
PCS 1900 MHz	
	ICE WIRELESS INC.
	Lynx Mobility Inc.
	Public Mobile Inc. (6934579 Canada Inc.)
	Yamatech Group Incorporated
AWS	
	2203733 Ontario Inc.
	7140282 Canada Inc.
	Blue Canada Wireless Inc.
	Bragg Communications Inc.
	Celluworld Inc.
	Data & Audio-Visual Enterprise Wireless Inc. (DAVE)
	Globalive Wireless Management Corp.
	Novus Wireless Inc.
	Shaw Communications
	Vidéotron Ltée

Ovum Consulting, 119 Farringdon Road, London EC1R 3DA

t +44 (0) 20 7551 9000 | f +44 (0) 20 7551 9090/1 | w www.ovumconsulting.com

© Ovum Consulting 2010. Unauthorised reproduction prohibited.

