The Benefits of the Wireless Telecommunications Industry to the Canadian Economy in 2016

Prepared for:

The Canadian Wireless Telecommunications Association (CWTA)

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1. Key Findings

In terms of GDP (Gross Domestic Product) and employment, companies in the Canadian wireless telecommunications ecosystem continue to generate increasing economic benefits to the Canadian economy.

The key economic trends exhibited by the industry in 2016 are summarized below:

- **Impact on GDP**: In 2016, the industry contributed $25.21 billion to GDP[1], an increase of 1.9% from $24.75 billion in 2015. The GDP impact includes:
  - **Direct Impact**: Direct contribution of $13.38 billion to Canadian GDP, generated through the sale of wireless services, devices and content to end users by network operators, dealers and distributors.
  - **Indirect Impact**: $5.72 billion indirectly contributed to GDP, which represents procurements by network operators, dealers and distributors from suppliers of products, equipment and services.
  - **Induced Impact**: $6.11 billion is the additional contribution to GDP, which represents increased spending in other sectors of the economy induced by disposable incomes generated within the wireless ecosystem.
- **Impact on Employment**: The wireless industry generated 138,100 full-time equivalent (FTE) jobs in 2016, including direct, indirect and induced effects – a slight decrease of 700 FTEs or 0.5% from 2015, driven by optimization of labour inputs.
- **Capital Investment**: Canadian wireless network operators made capital investments totalling $2.58 billion in 2016, which is consistent with the $2.67 billion average of the previous five years (2011-2015).

Note: Due to rounding, numbers presented throughout this report may not add up precisely to the totals provided and percentages may not precisely reflect the absolute amounts.

2. Introduction

2.1. Context

Competitiveness of national economies is increasingly driven by developments in the ICT sector and in turn, the wireless ecosystem is a key component and enabler of the ICT development. The telecommunications industry is at the cusp of 5G - a new generation of network technologies, which will enable the digital transformation of the Canadian economy through software-defined network virtualization. 5G wireless broadband services will support diverse applications connecting both devices and objects (the "Internet of Things"). 5G will enable innovative business models across sectors as diverse as transportation, manufacturing, agriculture, logistics, energy distribution, tourism, media and entertainment, healthcare and education. While the transformation process has already started based on existing networks, the launch of commercial 5G services will require substantial investments on the part of operators. This investment requirement follows record levels of investment in 3G to 4G in recent years.

In 2010, the Canadian Wireless Telecommunications Association (CWTA) commissioned *The Benefit of the Wireless Telecommunications Industry to the Canadian Economy*, providing a detailed analysis of the economic contribution of the wireless industry in 2008. The current report is the 9th iteration of this publication, covering the 2016 calendar year. The report, prepared by Nordicity Group Ltd., is intended to provide an independent assessment of the economic contribution of companies in the Canadian wireless telecommunications ecosystem to the Canadian economy as a whole. More specifically, this report provides quantification of the economic impact of companies in the Canadian wireless telecommunications ecosystem in terms of direct, indirect and induced GDP; employment; and productivity gains.

2.2. Overview of Methodology

Our methodology consisted of three components: (i) primary research; (ii) secondary research; and (iii) economic analysis and modelling.

Nordicity collected data for the five Canadian wireless network operators, which represent roughly 92% of the wireless industry revenues in 2016[2]. The data was collected using a combination of sources including published sources such as annual reports of the wireless operators, Statistics Canada, ICTC, and the Canadian Radio-television and Telecommunications Commission's (CRTC's) *Communications Monitoring Reports (CMRs)*[3]*. The results were calibrated with previous years' results contained in* Nordicity's archive of data on the wireless industry – custom built for this report starting in 2013. The data inputs, after validation and verification, were fed into Nordicity's Canadian wireless telecommunications industry ecosystem model and

were further analyzed to determine the overall economic impact[4]. In addition, Nordicity analyzed employee productivity (GDP per employee) in the wireless ecosystem.

3. The Canadian Wireless Telecommunications Ecosystem

The main elements of the Canadian wireless telecommunications ecosystem are[5]:

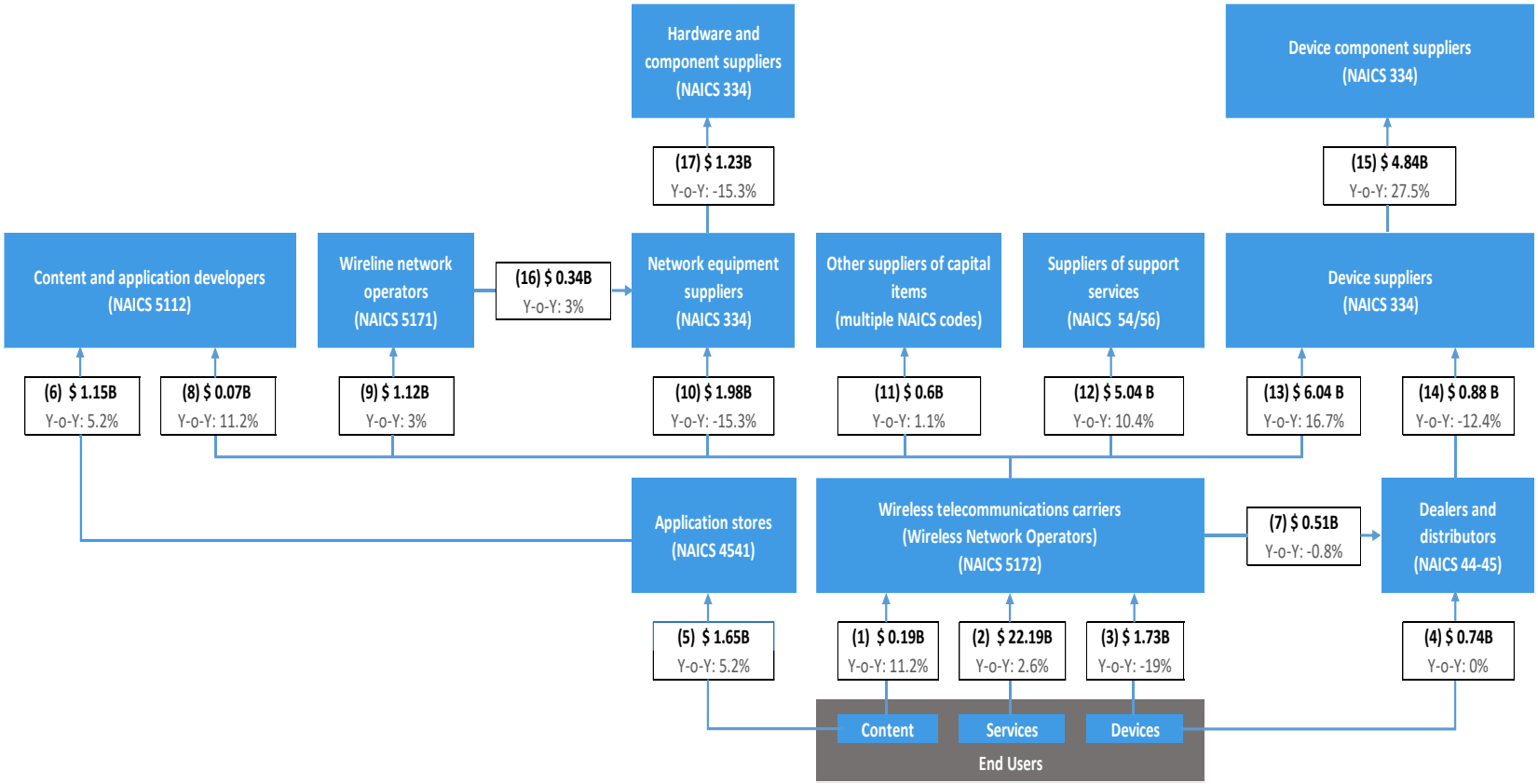
- **End-users**, who drive demand for services and products and obtain value from wireless network operators, applications-content and retail distributors of devices.
- **Service Providers,** who deliver wireless connectivity. This category includes providers of wireless telecommunications services, applications, content and devices.
- **Suppliers** of wireless network equipment, devices, computer hardware and software, and support services, as well as wireline network operators and developers of wireless applications and content.

In 2016, companies in the Canadian wireless telecommunications ecosystem generated **$50.30 billion**[6] in revenues, an **increase of 2.7% from $48.96 billion in 2015**. Exhibit 1 shows revenue estimates for the wireless ecosystem. These estimates were prepared using detailed accounting data of the Canadian wireless network operators (WNOs), and data collected from published sources. The assumptions made and the modelling coefficients used in this report were validated using publicly available data and previous editions of this report.

It is encouraging to note that revenue flows across all levels of the Canadian wireless ecosystem generally grew in 2016 as compared to 2015. This overall growth in 2016 was driven, among other things, by an increase in demand for wireless voice and data services (increase of 2.6% or $0.56B over 2015).

Exhibit 1 below provides an overview of the revenues generated across the Canadian wireless ecosystem.

Exhibit 1: Total Revenues Generated by the Canadian Wireless Ecosystem



Source: Nordicity calculations based on data collected from different sources including wireless operators, Statistics Canada, CRTC and ICTC reports, and calibrated using Nordicity's historical data archive.

The revenues shown in Exhibit 1 (above) are summarized in Exhibit 2 (below):

Exhibit 2: Summary of Revenues

From	To		Revenues ($ Billion)
End Users (Final Demand):	(1):	Content: Wireless telecommunications carriers	0.19
	(2):	Services: Wireless telecommunications carriers	22.19
	(3):	Devices: Wireless telecommunications carriers	1.73
	(4):	Dealers and distributors	0.74
	(5):	Application stores	1.65
			26.49
Service Providers	(6):	Content and application developers	1.15
	(7):	Dealers and distributors	0.51
	(8):	Content and application developers	0.07
	(9):	Wireline network operators	1.12
	(10):	Network equipment suppliers	1.98
	(11):	Other suppliers of capital items	0.60
	(12):	Suppliers of support services	5.04
	(13):	Device suppliers	6.04
	(14):	Device suppliers	0.88
			17.40
Suppliers (of equipment, devices, hardware, support services etc)	(15):	Device component suppliers	4.84
	(16):	Network equipment suppliers	0.34
	(17):	Hardware and component suppliers	1.23
			6.40
Total	**Sum of all activities**		**50.30**

Source: Nordicity calculations based on data collected from different sources including wireless operators, Statistics Canada, CRTC and ICTC reports, and calibrated using Nordicity's historical data archive.

4. Economic Impact Analysis

This section provides economic impact analysis of the wireless ecosystem on GDP[7] and employment in Canada. GDP and employment impacts were further used to estimate productivity gains in the Canadian wireless ecosystem[8].

In the first stage of analysis, industry GDP generated through direct, indirect and induced effects was determined[9]. In the second stage, the GDP results were translated into employment figures – measured in terms of FTE jobs. Finally, GDP and FTE results were used to quantify the impact on productivity.

4.1. Impact on Gross Domestic Product (GDP)

The revenue figures provided in section 3 were used to calculate the overall contribution of the Canadian wireless telecommunications industry in 2016 to Canada's GDP.

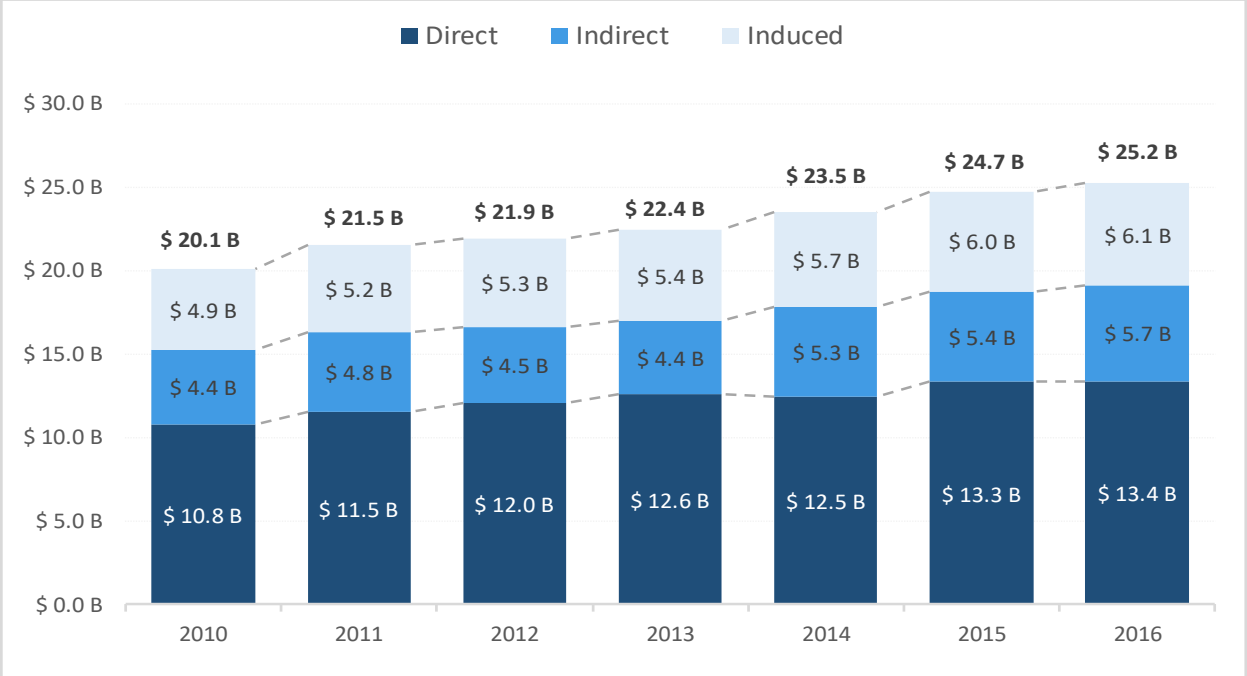
Direct and indirect GDP estimates were derived as follows:

- Based on the financial data collected by Nordicity, the revenues within the wireless ecosystem (as shown in Exhibit 1 above) were calculated.
- For any missing financial data, estimates were developed based on industry averages, historical trends, and re-validation of assumptions used in previous years' reports.
- Estimated revenues were then converted into GDP estimates based on relevant Statistics Canada GDP-to-revenue ratios.
- Finally, estimates were developed for sub-industries in order to calculate the portion of GDP that is retained in Canada[10].

The induced effects by sub-industry were calculated using multipliers from Statistics Canada.

Exhibit 3 (below) provides a comparative view of the contribution of companies in the wireless ecosystem to Canadian GDP in the period 2010-2016.

Exhibit 3: Total GDP Contribution of the Wireless Ecosystem to the Canadian Economy, 2010-2016



Source: Nordicity calculations based on data collected from different sources including wireless operators, Statistics Canada, CRTC and ICTC reports, and calibrated using Nordicity's historical data archive.

Exhibit 4 (below), shows that in 2016 companies in Canada's wireless ecosystem contributed a total of **$19.10 billion** to **GDP** through direct and indirect impacts. This represents an increase of $0.35 billion or 1.9% from $18.75 billion in 2014. The major contributor to this overall GDP increase was the **$0.33 billon (or 10.4%) increase in the contribution of suppliers of support services to the GDP** (from $3.15 billion in 2015 to $3.48 billion in 2016).

Exhibit 4: Direct and Indirect GDP Generated within the Canadian Wireless Ecosystem

Sub-industry	2015		2016		Growth
	$M	%	$M	%	%
Direct Impact	**13,316**	**71%**	**13,377**	**70%**	**0.5%**
Wireless network operators	13,020	69%	13,112	69%	0.7%
Dealers and distributors	267	1%	234	1%	-12.4%
Application stores	29	0%	31	0%	5.2%
Indirect Impact	**5,432**	**29%**	**5,724**	**30%**	**5.4%**
Content and application developers	570	3%	601	3%	5.5%
Wireline network operators	591	3%	609	3%	3.0%
Network equipment suppliers	681	4%	592	3%	-13.1%
Hardware and component suppliers	145	1%	123	1%	-15.3%
Other suppliers of capital items	95	1%	97	1%	1.1%
Suppliers of support services	3,149	17%	3,477	18%	10.4%
Device suppliers	201	1%	225	1%	12.0%
Device component suppliers	-	-	-	-	-
Total (Direct + Indirect)	**18,749**	**100%**	**19,100**	**100%**	**1.9%**
Induced Impact	6,000	..	6,112	..	1.9%
Total (Direct+Indirect+Induced)	**24,748**	**..**	**25,212**	**..**	**1.9%**

Source: Nordicity calculations based on data collected from different sources including wireless operators, Statistics Canada, CRTC and ICTC reports, and calibrated using Nordicity's historical data archive.

Using Statistics Canada multipliers, GDP generated through the induced economic impact of the Canadian wireless industry was estimated at $6.11 billion in 2016, an increase of 1.9% from $6.00 billion in 2015. In 2016, the Canadian wireless ecosystem contributed $25.21 billion to GDP (including direct, indirect and induced impacts), which represents a 1.9% increase in overall economic benefits from $24.75 billion in 2015.

4.2. Impact on Employment

The wireless industry creates and supports thousands of jobs across the Canadian economy, many of which pay wages well above the Canadian average[11]. Similar to GDP calculations, estimates of jobs generated in the Canadian wireless industry were based on calculations in terms of direct, indirect and induced impact. The employment estimate is based on total FTE jobs, which equals the number of employees that worked full-time plus the number of employees that worked part-time, converted to a full-time basis.

For this purpose, estimates were developed based on the salary and wage, financial, and employment data Nordicity collected, as well as employee data provided in operators' annual reports. These amounts were used to calculate the labour share of GDP. In addition, estimates for the labour share of GDP were developed for sub-industries using relevant Statistics Canada data[12]. In the case of wireless telecommunications operators, the labour share of GDP was then converted into number of employees for each sub-industry using applicable data provided by Statistics Canada[13].

Exhibit 5 provides a detailed view of employment generated by companies in the Canadian wireless ecosystem through **direct** and **indirect** impacts. In 2016, the Canadian wireless industry was directly responsible for approximately **31,000 FTE jobs** and indirectly responsible for **50,800 FTE jobs**. In addition, the Canadian wireless ecosystem generated **56,300 FTE jobs** through its induced impact, for a grand total of **138,000 FTEs**.

In 2016, employment generated through direct impacts decreased by 7.5% or 2,600 FTEs, which is primarily the result of a 6.5% or 1,600 FTE reduction by wireless network operators. The principal reason for the reduction in FTEs generated by direct impacts was that level of capital investment in 2016 returned to levels closer to historic trends after record investments by the wireless networks operators in the last few years. Thus, Canadian wireless network operators made capital investments totalling $2.58 billion in 2016, which is consistent with the $2.67 billion average of the previous five years (2011-2015).

Employment generated through indirect impacts increased by 4.1% or 2,000 FTEs, which is primarily driven by a 10.4% or 2,900 FTE increase in one subsector - suppliers of support services - that represented 38% of the employment generated by the wireless ecosystem. The employment generated through induced impact decreased marginally, by 0.4% compared to 2015. The overall effect of direct, indirect and induced impacts was a marginal decrease in employment of 0.5%.

Exhibit 5: Direct and Indirect Employment Generated within the Canadian Wireless Ecosystem

Sub-industry	2015		2016		Growth
	FTEs	%	FTEs	%	%
Direct Impact	**33,466**	**41%**	**30,967**	**38%**	**-7.5%**
Wireless network operators	26,776	33%	25,180	31%	-6.0%
Dealers and distributors	6,451	8%	5,537	7%	-14.2%
Application stores	239	0%	251	0%	5.2%
Indirect Impact	**48,813**	**59%**	**50,814**	**62%**	**4.1%**
Content and application developers	4,582	6%	4,835	6%	5.5%
Wireline network operators	2,924	4%	2,951	4%	0.9%
Network equipment suppliers	9,273	11%	8,060	10%	-13.1%
Hardware and component suppliers	1,338	2%	1,133	1%	-15.3%
Other suppliers of capital items	918	1%	929	1%	1.1%
Suppliers of support services	28,291	34%	31,241	38%	10.4%
Device suppliers	1,487	2%	1,666	2%	12.0%
Device component suppliers	0	-	0	-	-
Total (Direct + Indirect)	**82,278**	**100%**	**81,781**	**100%**	**-0.6%**
Induced Impact	56,501	..	56,301	..	-0.4%
Total (Direct+Indirect+Induced)	**138,779**	**..**	**138,082**	**..**	**-0.5%**

Source: Nordicity calculations based on data collected from different sources including wireless operators, Statistics Canada, CRTC and ICTC reports, and calibrated using Nordicity's historical data archive.

4.3. Impact on Productivity

This section provides analysis of **productivity** in the Canadian wireless ecosystem. Productivity denotes the average GDP generated per FTE in the industry[14]. Exhibit 6 below provides a detailed view of productivity in terms of **direct** and **indirect** impacts.

As illustrated in Exhibit 6, **productivity** in terms of direct impacts showed an increase of 8.6% compared to 2015. Wireless network operators exhibited the highest productivity gains, with a 7.1% increase compared to 2015. **These productivity gains likely occurred through optimization of capital and labour inputs – in 2016, overall wireless service demand increased despite decrease in salaries and wages, and capital expenditure by wireless network operators**.

Furthermore, according to Exhibit 6, most of the sub-sectors of the wireless ecosystem showed productivity gains in terms of direct and indirect impact in 2016 compared to 2015.

Exhibit 6: Productivity in the Canadian Wireless Ecosystem

Sub-industry	2015	2016	Growth
	$	$	%
Direct Impact	**397,911**	**431,956**	**8.6%**
Wireless network operators	486,261	520,731	7.1%
Dealers and distributors	41,433	42,283	2.1%
Application stores	122,019	122,019	0.0%
Indirect Impact	**111,290**	**112,638**	**1.2%**
Content and application developers	124,358	124,358	0.0%
Wireline network operators	202,278	206,324	2.0%
Network equipment suppliers	73,451	73,451	0.0%
Hardware and component suppliers	108,208	108,208	0.0%
Other suppliers of capital items	103,997	103,997	0.0%
Suppliers of support services	111,308	111,308	0.0%
Device suppliers	135,020	135,020	0.0%
Device component suppliers	..	..	..
Total (Direct + Indirect)	**227,869**	**233,552**	**2.5%**

Source: Nordicity calculations based on data collected from different sources including wireless operators, Statistics Canada, CRTC and ICTC reports, and calibrated using Nordicity's historical data archive.

5. Conclusion

Canada's wireless industry is critical to enabling key sectors to shift to the digital economy. The telecommunications industry is at the cusp of 5G - a new generation of network technologies, which will enable the digital transformation of the Canadian economy through software-defined network virtualization. While the transformation process has already started based on existing networks, the launch of commercial 5G services will require substantial investments on the part of operators – on top of record levels of investment in 3G to 4G in recent years.

The wireless industry continues to increase its contribution to Canadian GDP. It is also a key growth enabler of the overall Canadian ICT sector. In 2016, the wireless industry generated a total of $50.30 billion revenues, an increase of 2.7% from 2015.

In terms of GDP contribution, Canada's wireless industry generated an overall GDP of $25.21 billion (including direct, indirect and induced) in 2016.

Furthermore, the wireless industry provided over 138,082 FTEs in 2016, consisting of direct employment (30,967 FTEs), indirect employment (50,814 FTEs), and induced employment (56,301 FTEs).

Productivity in terms of direct impacts showed an increase of 8.6% compared to 2015. Wireless network operators exhibited the highest productivity gains, with a 7.1% increase compared to 2015.

6. End Notes

[1] The GDP numbers presented in this report are at current prices.

[2] For example, see the *2016 Communications Monitoring Report* published by the Canadian Radio-television and Telecommunications (CRTC), p. 287. Also for the purpose of this study, Nordicity has focused primarily on mobile wireless voice and broadband services. This report does not include data specific to the fixed wireless segment of the Canadian wireless telecommunications industry.

[3] Includes 2013-2016 annual reports (BCE, Rogers, TELUS, Quebecor, Sasktel, MTS), 2014-2016 CRTC *Communications Monitoring Reports*, Statistic Canada Input-Output Multipliers Tables, CANSIM Tables (281-0027, 381-0022), and reports by the Information and Communications Technology Council, such as its 2016 *Annual Review* and *The Application of Everything* (2014).

[4] In cases where data from operators were not available, Nordicity developed estimates using industry and historical trends, as well as its data archive.

[5] The wireless industry has traditionally been viewed in terms of a value chain, with separate and independent components. In recent years, the development of the sector suggests that it is probably best viewed as an ecosystem, with a high degree of interdependence among the constituent segments.

[6] See Exhibits 1 and 2 for details.

[7] The GDP numbers presented in this report are at current prices.

[8] For the purpose of this analysis, productivity is defined as GDP divided by the number of FTEs (jobs): **Productivity = GDP ÷ FTE**.

[9] The definition of direct, indirect, induced and total economic impacts is provided as follows:

- **Direct impact:** Refers to GDP and employment generated by Canadian wireless network operators themselves, as well as other sub-industries in the wireless ecosystem geared towards the final consumer, such as dealers, distributors and application-content stores.
- **Indirect impact:** Refers to GDP and employment generated by the sub-industries that supply inputs to Canadian wireless network operators, dealers, distributors and application-content retailers (including online and "bricks and mortar" stores). The sub-industries include wireline network operators, network equipment, computer hardware, component suppliers, and device suppliers, support services providers and so forth. The purchase of goods and services from these suppliers increases income and employment, which, in turn, increases the demand for other upstream suppliers, i.e. suppliers' suppliers.
- **Induced impact:** Refers to GDP and employment generated through the re-spending of income earned by the participants in the direct and indirect components of the ecosystem. That is, induced impact arises from re-spending that occurs in the economy at the household level, e.g. employees of wireless network operators using their income to purchase goods and services in the general economy.
- **Total economic impact:** The total economic impact is equal to the sum of the direct, indirect and induced economic impacts.

[10] A key challenge in calculating the 2016 economic contribution of the Canadian wireless industry to the Canadian economy was the determination of the relative portion retained in Canada versus the portion generated outside of Canada. This study focuses only on the contribution of companies in the wireless telecommunications ecosystem to the Canadian economy. For some sub-industries within the wireless ecosystem – such as wireless network operators –most (or all) of the value added occurs in Canada; for other sub-industries – such as device component suppliers – the value added occurs almost entirely outside Canada, specifically in countries where the components are designed or manufactured. To address this issue, after calculating the global GDP impact of the Canadian wireless industry, we estimated how much of the total GDP generated by companies in the Canadian wireless ecosystem is retained in Canada. Estimates of the share of economic activity retained in Canada by sub-industry were constructed based on secondary research.

[11] According to Statistics Canada (CANSIM 281-0027), average weekly earnings of employees in Canada were $956.50 (or an annual average of $49,738) in 2016. As per Nordicity's estimates, average annual wages (earnings) in the Canadian wireless ecosystem were $70,115 in 2016.

[12] CANSIM Table 381-0022 (Input-Output Structure of the Canadian Economy in Current Prices). CANSIM stopped further updates to the series: Table 381-0022 (Input-Output Structure of the Canadian Economy in Current Prices).

[13] CANSIM Table 281-0027 (Survey of Employment, Payroll and Hours).

[14] **Productivity** is commonly defined as a ratio between the output (e.g. GDP) and inputs (unit of labour). That is, it measures how efficiently production inputs such as labour are being used in an economy to produce a given level of output. "There are different measures of productivity and the choice between them depends either on the purpose of the productivity measurement and/or data availability. One of the most widely used measures of productivity is Gross Domestic Product (GDP) per hour worked." http://www.oecd.org/std/productivity-stats/40526851.pdf. Since it was not possible to estimate total hours worked by employees in the Canadian wireless ecosystem, the number of FTEs has been used, which is consistent with standard practice.