

There's an app for that. Unless there isn't – The Challenges of Digital Inclusion in Canada in 2016¹

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Let me begin by thanking the Federation for the Humanities and Social Sciences, and the Royal Society of Canada, for the opportunity to speak to you about digital inclusion. It is a real honour to be here today. The research informing this talk was funded by the Canada Research Chair Program, the Social Sciences and Humanities Research Council and Ryerson University. I am very grateful for this support.

Introduction

“There’s an app for that,” we’re often told, when trying to do something. Perhaps you came here in an Uber. Or you may have found your way to the hotel by following the blue dot on Google Maps. Maybe you SnapChatted your kids when you woke up, or posted a picture of this magnificent view on Instagram. Did you check Donald Trump’s latest tweets from your phone this morning? At home and away from home, you might stream music on Spotify, figure out how to do something by watching a YouTube video and communicate with friends and family with Facetime or Skype or Viber or WhatsApp or Facebook Messenger.

But for many, these apps are inaccessible, unusable, or outside comfort zones. Even just a couple of years ago, it would have sounded like I was speaking a foreign language in reciting this list. Perhaps it still does. Indeed, my spellcheck program does not recognize many of these names.

Today’s reality though is that much of what we do in our everyday lives involves communication technologies. As citizens engaging with governments, as friends or family interacting with our loved ones, as consumers, as employers and employees, as students, as teachers, and as researchers, our interactions involve technology. Whether we need to use an app on a smartphone, a web browser on a computer, or a set-top box on a TV, there are many ordinary activities that are increasingly difficult to do without some interaction with technology. And that is a problem for many in our society.

¹ This is the text of a “Big Thinking” lecture delivered at the Royal Society of Canada Annual Meeting in Kingston, Ontario, on November 19, 2016.

Despite the title of this talk, I'm not going to focus on apps and smartphones, other than to note that 27% of Canadian adults don't have a smartphone, and 48% don't have a tablet. Even with a device that provides access to communication services, there are still barriers that make it challenging for many to make full use of the technologies becoming embedded in our society.

Before going any further, let me provide some definitions. This talk is about digital inclusion. Digitally included individuals can use computers or smartphones or tablets for transactions with businesses or governments, for communication, to create and consume entertainment, and to access information about anything they wish. That is, they can make use of these digital communication tools to be part of society. Given the prevalence of digital means of interaction, western societies are now often described as digital societies. Digital societies are supported by digital economies and populated by digital citizens.

The Internet is the location for many digital activities, as it allows communication between individuals and organizations across large or small distances. To be digitally included, citizens must have internet access, with broadband internet, that is – fast internet, preferred. So understanding the nature of internet access is important to any investigation of digital inclusion. Digital inclusion also requires that people can make use of the technologies to which they have access, meaning that the technologies should be affordable and simple to learn how to use. Digitally literate people know how to use digital technologies in ways that realize benefits, and in ways that are secure and protect their privacy. Digital literacy allows individuals to fully participate in digital society. When combined with good internet access, digital literacy enables digital inclusion.

The Challenges of Digital Inclusion in Canada

The Trudeau government has yet to offer any substantive plans to advance digital inclusion in Canada. But the current consultation on developing an Inclusive Innovation Agenda led by the Minister of Innovation, Science and Economic Development, and the cultural policy review on Canadian Content in a Digital World led by the Minister of Heritage will benefit from a strong understanding of the state of digital inclusion in Canada, and as I will argue at the end of this talk, immediate action to improve the status quo. This is because inclusive innovation, and the creation and consumption of content in a digital world both require a digitally literate citizenry with affordable, reliable access to digital tools and communication channels.

Access

Availability

Digital inclusion requires internet access, and access requires availability.

In its 2016 Communications Monitoring Report, the CRTC, Canada's telecommunications and broadcasting regulator, stated that broadband is available to more than 99% of Canadian households.¹ But a closer reading of the report reveals that in 2015, seven percent of households² did not have access to competitively priced broadband of the quality needed to support everyday internet use.³ More than 900,000 Canadian households⁴ could not, even if

they wanted to, subscribe to a service that supports multiple users accessing the web simultaneously, or that allows participation in distance learning, or online consultations with health professionals. Service at this level was just not available to them.

Take as an example Michel Gammon, who lives less than 100 km from Montreal. Wanting to provide information about his internet services to a CRTC consultation on Canadians' telecommunications needs,⁵ he was offered the option to present to the Commission using Skype. "Oh, the irony," he said, telling the commission "in fact, I cannot reliably use Skype because of frequent interruptions and lost connections, all on account of slow internet provided by satellite."⁶

As one of more than 80 parties who participated in the public hearing⁷ that was part of the Commission's Review of Basic Telecommunications Services, Mr. Gammon was not alone in his concerns, or in his willingness to share them with the CRTC. Participants' testimonies and the follow-up dialogue between them and the CRTC commissioners is recorded in more than 1600 pages of transcripts.⁸ The hearing transcripts supplement the hundreds of written interventions lodged with the Commission in 2015 and 2016.⁹ The CRTC also got input from more than 30,000 respondents to a survey asking about the sorts of telecommunications services needed for Canadians to participate in the digital economy.¹⁰

The richness of these data is incredible, with the public record of the consultation offering a phenomenal resource for scholars to explore. A dominant message to the CRTC from Canadians is that despite the extensive wired, mobile and satellite broadband networks spanning the country, many households simply cannot get a quality service where they live. For these Canadians, access to high quality broadband services is a barrier to digital inclusion.

Allow me to pause here to note that I am using the words "Canadians" and "citizens" as inclusive terms to describe anyone using a communication service in Canada to participate in society, regardless of their nationality.

Affordability

Many Canadians told the CRTC that they have trouble getting the internet access they require to live, work and to play in a digital world. For those for whom access is available, affordability is often also an issue. Very diverse groups of Canadians provided compelling information to the CRTC about the challenges faced in paying for internet access at existing rates.¹¹ Among those with affordability concerns were low and moderate income Canadians, members of First Nations, Canadians with disabilities and those reliant upon mobile or satellite broadband for whom data caps were a particular concern. Among Canadians who do not use the internet, 24% report it is the costs of an internet service or a computer that keep them offline.¹²

Adoption

According to the CRTC, in 2015 only 70% of Canadian households subscribed to internet services with sufficient capacity to engage in the everyday activities that we now conduct online.¹³ While the Harper Government's 2014 Digital Canada 150 plan claimed that "Canada

will rank among world leaders in adopting digital technologies”,¹⁴ with upwards of 4 million households¹⁵ either not connected to the internet, or connected at slow speeds, it seems that there is work to be done just to ensure that all Canadians are able to participate as digital citizens.

Availability and affordability of quality broadband services are not the only barriers to digital inclusion. Consistent with many previous studies, Ipsos reported that the most common reason for not having an internet subscription in 2015 was that individuals were not interested in the internet or didn't find it useful. Also consistent with previous research, Ipsos reports that the people least likely to have home internet access and to use the internet are those who are older, have low household incomes, live in rural or remote communities or have a high school education or less.¹⁶

Literacy

The Minister of Innovation, Science and Economic Development said in a speech earlier this week that “the digital economy *is* the economy.”¹⁷ And in a digital economy, having the skills to access information and services online matters. In Ontario for example, the new Minister Responsible for Digital Government has a mandate to “drive digital transformation across government and modernize public service delivery,” with a digital by default approach.¹⁸

Digital government. Digital transformation. Digital by default. This language, and the changes that it will bring, may be intimidating for those not comfortable in this new world. Digital by default means that the government's preferred way of providing services is over the internet, through mobile apps or a web interface. Although in-person or telephone based services may still be available, digital delivery is touted as offering more convenience and a better overall experience. But a large body of research on digital literacy and internet use indicates that many internet users are not able to, or simply do not perform the sorts of basic tasks needed to communicate and transact online. Speaking at the hearing on basic telecommunication services, CRTC Chair Jean-Pierre Blais observed: “Individual Canadians came to testify that they did not choose to face life in poverty or challenged by physical or mental disabilities. Yet governments at all levels have chosen to ask these citizens to seek government services through digital platforms,” saying “This has had consequences.”¹⁹

While Ipsos reports that 95% of Canadians have some form of internet access, it categorizes close to 30% of internet users as having low or very low digital participation rates.²⁰ Low participation means individuals' use of the internet is quite limited, indicating they are unlikely to benefit from the digital transformations underway.

Such individuals also risk exclusion from a society where social interactions and information exchange increasingly take place through digital communication tools. While the internet might not have been relevant in the past, what happens when familiar services, including old media, disappear, replaced by new digital only offerings?

For instance, individuals without the skills to use the internet to search for, and read or watch news will find their options to remain informed limited in future. In my hometown, The Guelph Mercury, which had published a daily newspaper since 1867, printed its final edition in January 2016. Now it distributes news through Twitter, a Facebook page, a website and a mobile app.²¹

Outside our large cities, CBC television signals are no longer broadcast over the air.²² People who relied on those signals in the past are increasingly dependent on the internet to receive their television programming, but it can be quite complicated to work out how to find the programming they would like to watch. Despite the Canadian government's assertion that "Digital content is easily accessed and can be consumed anywhere,"²³ for many individuals the task of figuring out how to display their programs in a watchable format on their devices of choice is not a trivial one.

Research investigating how using communication technologies leads to improved outcomes in everyday life finds that development of technical skills is just the first step toward realizing the socio-economic benefits of digital society.²⁴ Individuals must also develop the capacity to critically assess information, and to understand the privacy and security concerns inherent in digital communication. As such, encouraging progress toward a digital society just by encouraging increased usage of technologies is an incomplete strategy, and measuring capacity to engage by looking at indicators of use is also insufficient.

To recap, a digitally inclusive society is one in which everyone has affordable access to high quality internet services and has sufficient capacity to use digital tools to participate meaningfully in society. A digitally inclusive society is easy to define and imagine, but much more difficult to realize.

Steps to digital inclusion

There are many players working to enable digital inclusion in Canada, through initiatives to extend access, improve affordability, increase participation rates and foster digital literacy.

Private sector broadband providers have invested tens of billions of dollars in broadband infrastructure,²⁵ and continue to make substantial investments to roll out faster mobile and fixed broadband services. To extend broadband infrastructure to rural and remote parts of the country that are not served by the private sector, the federal government has invested, or committed to invest, more than a billion dollars,²⁶ often working in partnership with provincial governments or First Nations. In addition, provincial governments have themselves invested billions of dollars to increase broadband availability within their jurisdictions.²⁷

Local communities also see value in investing in broadband. In Olds, Alberta the Olds Institute for Community and Regional Development built its own broadband network, driven by "passion to create a connected community in Olds where residents and businesses have access to the kinds of technology services and experiences you'd find in larger cities."²⁸ The O-Net network

now offers the fastest internet available in Canada, provided by an organization committed to use technology to enrich the lives of members of its community.

There are many other individuals and organizations making extraordinary efforts to help more Canadians access the internet. Andrew Wright, from the Chebucto Community Net Society, in Nova Scotia, told the CRTC “the answer to Canada’s access woes is to empower non-profit community-based groups, to build high speed infrastructure with a community Internet fund. Internet is relatively expensive to install. The costs are front end loaded. But once in, is cheap to run.”²⁹ As he noted, the importance of community involvement has been demonstrated repeatedly, both in Canada and internationally.

But what I find remarkable about Mr. Wright’s intervention is the statement that followed his call for more empowerment of community-based groups. Noting that his organization has installed affordable high quality internet service for residents in low-income provincially owned apartment buildings he commented that the first phase of the project was funded by board members of the organization. He then said “I used to have a car. Now 309 residents in two 10-storey buildings have low-cost public run access. It was a good trade.” When CRTC Commissioner Molnar observed that she was “not sure that everybody’s willing to sell their car for the betterment of their community” Mr. Wright responded “It needed to be done. It wasn’t getting done. Talking about it for years didn’t do a thing. We figured if we gave an example that people could actually look at, that people could see, yes, this is actually doable, that they would follow.”³⁰

Nevertheless, despite all this investment, from the private sector, across all levels of government, from community organizations and with significant contributions from volunteers, millions of Canadian households³¹ still do not subscribe to home broadband services of a quality that the CRTC determined should be available to all by 2015.

As the telecommunications regulator, it is the CRTC’s role to “ensure that all Canadians have access to a world-class communications system and that they are able to participate in the digital economy.”³² Over the past few years, the CRTC has taken action to improve the availability of very fast broadband services, and to improve access to mobile internet services across the country. But the companies the CRTC regulates are often resistant to the changes it imposes, and find ways to delay their implementation.

Despite an ambitious agenda and a strong and demonstrated commitment to acting in the public interest, the CRTC cannot single handedly enable all Canadians to participate in the digital economy. Commission Chair JP Blais made this point very forcefully, in what he himself indicated was an unusual intervention midway through the April 2016 hearing on basic telecommunications services.

This consultation is expected to result in new policies to ensure all Canadians have access to a basic level of communications services, with the characteristics of basic service determined based on the evidence submitted through the hearing. The point that Chairman Blais made with

his intervention is that the world is changing quickly, and Canada needs a plan. He called on the government to work with the CRTC and industry to develop a coherent national broadband strategy using an open and transparent process, and based on evidence from all Canadians. Let me quote several sentences from Blais's remarks:

"Every day that goes by without a more robust Canadian broadband strategy means Canadians who are socially and economically vulnerable continue to be profoundly disadvantaged.

Every week that goes by without a more robust Canadian broadband strategy means many regions in this country are unable to attract or keep residents, and businesses, to ensure social progress as well as economic prosperity and growth.

Every month that goes by without a more robust Canadian broadband strategy means Canada is competitively disadvantaged as other countries move ahead and advance on their digital productivity, innovation, and competitiveness."³³

In my own intervention to this consultation, copied to the Federal ministers of Innovation³⁴ and of Infrastructure,³⁵ I argued that Canada actually needs more than just a broadband strategy. I called for development of a comprehensive digital strategy offering a vision of how digital technologies can be used "to improve delivery of services across all levels of the economy, realizing economic efficiencies, enabling innovation and improving quality of life in Canadian communities."³⁶

Months have passed. The government still appears to be in consultation mode, with no evidence of any real plan. There appears to be no focus to its digital infrastructure initiatives. In addition to the \$500 million earmarked for rural broadband in the March budget, further infrastructure funds for internet connectivity were promised to rural and northern communities in the Fall economic statement.³⁷ A Smart Cities challenge was proposed, with mention of advanced digital connectivity for homes and businesses – plans to follow in 2017. And there's also the new Canada Infrastructure Bank, which will invest in "revenue-generating infrastructure projects and plans that contribute to the long-term sustainability of infrastructure across the country."³⁸

Just this week, Navdeep Bains, Minister of Innovation, Science and Economic Development promoted his Innovation Agenda to Canada's telecom industry and policy makers at a conference in Ottawa, offering the following remarks:

"Our government is prepared to think big, aim high and act boldly. We imagine networks ten times faster than the current standard.

We want to close the digital divide and give all Canadians access to broadband.

We want all Canadians to benefit from a competitive marketplace with affordable and innovative services."³⁹

These are fine words, but they must be supported with tangible actions. *Imagining* networks ten times faster than the current standard is not enough. Similar networks are already in place in many countries around the world, as a result of policy initiatives first envisioned a decade or more ago. If Minister Bains truly intends to close the digital divide and give all Canadians access to broadband, a plan, and action are needed, now. If Heritage Minister Joly wishes to make Canadian content available in a digital world, more affordable broadband access is required, along with initiatives to increase Canadians' capacity to discover and consume content in digital form. If the Canada Infrastructure Bank wants to encourage private investment in social infrastructure, there is a strong business case to be made for investment in broadband.

The CRTC, civil society, academics, industry, communities and governments have been working to foster digital inclusion in Canada for the past decade or more. There have been countless initiatives to extend broadband access, improve affordability and service quality, encourage adoption and help Canadians to develop digital literacy, but often the initiatives have been undertaken in isolation, or even at cross- purposes. The Minister of Innovation, Science and Economic Development says the government is prepared to think big, aim high and act boldly. Canadians are engaged on this file, with many already working through the CRTC to advance our digital society and realize the potential of full digital inclusion. The challenges we face are well understood, and we have the collective capacity to develop solutions locally or adapt approaches adopted in other countries. Transition to the digital economy continues rapidly, and now is the time to bring together the disparate actors to develop a plan to deliver the benefits of digital society to all.

In a digital society, being told "there is an app for that" should not invoke fear, or lead to digital exclusion. Rather, devices will be affordable, broadband will be universally accessible, and support for using apps to access online information and services will be easily available. This future is possible. In closing, I call on our government to do more than just imagine this future, and to take immediate, tangible actions to achieve it.

Endnotes

¹ Canadian Radio-television and Telecommunications Commission. (2016). *Communications Monitoring Report*. Ottawa: Canadian Radio-television and Telecommunications Commission.

<http://www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2016/cmr.htm>. p. 246, footnote 8.

² CRTC. (2016). *Communications Monitoring Report*. p. 246. Note that this figure excludes coverage provided by satellite or mobile LTE.

³ Canadian Radio-television and Telecommunications Commission. (2011). Telecom Regulatory Policy CRTC 2011-291: Obligation to Serve and Other Matters. <http://www.crtc.gc.ca/eng/archive/2011/2011-291.htm>. See paragraphs 73 - 75 for a description of “the uses consumers should reasonably expect to make of the Internet.”

⁴ Statistics Canada data indicates there were 13,320,615 households in Canada in 2011.

https://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-312-x/98-312-x2011003_2-eng.cfm.

7% of this total is 932,443.

⁵ Canadian Radio-television and Telecommunications Commission. (2015). Telecom Notice of Consultation CRTC 2015-134: Review of Basic Telecommunications Services.

<http://crtc.gc.ca/eng/archive/2015/2015-134.htm>.

⁶ Michael Gammon, presentation to the CRTC, 25 April 2016 regarding TNC CRTC 2015-134 – Review of Basic Telecommunications Services.

<https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=226842&en=2015-134&dt=P&lang=e&S=C&PA=t&PT=nc&PST=a>.

⁷ The hearing agenda is available at http://www.crtc.gc.ca/Telecom/eng/HEARINGS/2016/ag11_04.htm.

⁸ Transcripts are available at <http://crtc.gc.ca/eng/transcripts/2016/index.htm>. The hearing dates were April 11 - 28, 2016.

⁹ All consultation documents are available at <https://services.crtc.gc.ca/pub/instances-proceedings/Default-default.aspx?EN=2015-134&Lang=eng>.

¹⁰ EKOS Research Associates. (2016). *Let's Talk Broadband Findings Report*. Ottawa: EKOS Research Associates Inc. <http://epe.lac-bac.gc.ca/100/200/301/pwgs-c-tps-gc/por-ef/crtc/2016/030-15-e/index.html>.

¹¹ These concerns are detailed in written and oral submissions to the CRTC's consultation on basic telecommunications services. All documents are available at <https://services.crtc.gc.ca/pub/instances-proceedings/Default-default.aspx?EN=2015-134&Lang=eng>.

¹² Data from Ipsos Public Affairs, *Participation in the Digital Economy 1.0 and 2.0*. Presented by Mike Colledge to the Telecommunications Policy Research Conference, Arlington, VA, September 2016.

¹³ CRTC. (2016). *Communications Monitoring Report*. p. 246. Note that this figure refers to demand for broadband as reflected by subscription numbers.

¹⁴ Government of Canada. (2014). *Digital Canada 150*.

[https://www.ic.gc.ca/eic/site/028.nsf/vwapj/DC150-EN.pdf/\\$FILE/DC150-EN.pdf](https://www.ic.gc.ca/eic/site/028.nsf/vwapj/DC150-EN.pdf/$FILE/DC150-EN.pdf). p. 14.

¹⁵ 30% of 13,320,615 is 3,996,185 (2011 data, the 2015 number is estimated to be above 4 million).

¹⁶ See Statistics Canada's Canadian Internet Use Survey results, e.g. as discussed by Landry, K. M., & Lacroix, A. (2014). *The Evolution of the Digital Divides in Canada*. <http://ssrn.com/abstract=2418462>.

These patterns have persisted for more than a decade, for instance as seen in earlier research by Middleton, C. A., & Sorensen, C. (2005). How Connected Are Canadians? Inequities in Canadian Households' Internet Access. *Canadian Journal of Communication*, 30(4), 463-483.

¹⁷ Bains, N. (2016). International Institute of Communications Canada Conference – Speaking Points.

<http://news.gc.ca/web/article-en.do?nid=1155469>.

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- ¹⁸ Ontario's digital government initiative recognizes the importance of "creating opportunities for people to advance or gain new digital skills." An action plan will be released in 2017.
<https://www.ontario.ca/page/september-2016-mandate-letter-digital-government>.
- ¹⁹ Blais, J.-P. (2016). Statement: Review of Basic Telecommunications Services.
<http://www.crtc.gc.ca/eng/transcripts/2016/tt0418.htm>.
- ²⁰ Ipsos Public Affairs, *Participation in the Digital Economy 1.0 and 2.0*.
- ²¹ <http://www.guelphmercury.com/community-static/2881972-guelphmercury-about-us>.
- ²² <http://www.cbc.radio-canada.ca/en/explore/strategies/dtv/>.
- ²³ Government of Canada. (2016). *Canadian Content in a Digital World. Focusing the Conversation – Consultation Paper*. https://ipsospasurveys.com/m/consultations/PCH/Documents/PCH-DigiCanCon-Consultation_Paper.pdf. p. 4.
- ²⁴ Helsper, E. J., Van Deursen, A. J. A. M., & Eynon, R. (2015). *Tangible Outcomes of Internet Use. From Digital Skills to Tangible Outcomes Project Report*.
<http://blogs.lse.ac.uk/mediapolicyproject/2015/05/06/new-forms-of-digital-inequality-disparities-in-offline-benefits-from-internet-use/>.
- ²⁵ Canada's largest internet service providers are Bell, Rogers, Shaw, Telus and Vidéotron. See their annual reports for information on their investments in broadband network infrastructure.
- ²⁶ McNally, M. B., Rathi, D., Evaniew, J., & Gareau-Brennan, C. (2015). Intervention in Response to Canadian Radio-Television and Telecommunications Commission Telecom Notice of Consultation CRTC 2015-134. <https://services.crtc.gc.ca/pub/ListeInterventionList/Documents.aspx?ID=223980&en=2015-134&dt=i&lang=e&S=C&PA=t&PT=nc&PST=a>. p. 29. An additional \$500 million was committed in the 2016 Federal budget. Canada. (2016). *Growing the Middle Class*. Ottawa: Her Majesty the Queen in Right of Canada. <http://www.budget.gc.ca/2016/docs/plan/budget2016-en.pdf>.
- ²⁷ See the submission by McNally and colleagues to CRTC 2015-134, noted above.
- ²⁸ <https://web.archive.org/web/20161026222654/http://o-net.ca/about-us/>.
- ²⁹ Andrew Wright, presentation to the CRTC, 25 April 2016 regarding TNC CRTC 2015-134 – Review of basic telecommunications services. <http://crtc.gc.ca/eng/transcripts/2016/tt0425.htm>.
- ³⁰ <http://crtc.gc.ca/eng/transcripts/2016/tt0425.htm>.
- ³¹ See footnote 15. 30% of Canadian households do not subscribe to an internet service offering 5 Mbps download and 1 Mbps upload speeds.
- ³² Canadian Radio-television and Telecommunications Commission. (2015). Telecom Notice of Consultation CRTC 2015-134: Review of Basic Telecommunications Services.
<http://crtc.gc.ca/eng/archive/2015/2015-134.htm>. Paragraph 5.
- ³³ Blais, J.-P. (2016). Statement: Review of Basic Telecommunications Services.
<http://www.crtc.gc.ca/eng/transcripts/2016/tt0418.htm>. The first paragraph has been edited for readability.
- ³⁴ The Honourable Navdeep Bains, Minister of Innovation, Science and Economic Development.
- ³⁵ The Honourable Amarjeet Sohi, Minister of Innovation.
- ³⁶ Middleton, C. (2016). *Final Reply Regarding Telecom Notice of Consultation CRTC 2015-134: Review of Basic Telecommunications Services*.
<https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=2630356>. Paragraph 9.
- ³⁷ Department of Finance. (2016). *2016 A Plan for Middle Class Progress – Fall Economic Statement 2016*.
<http://www.budget.gc.ca/fes-eea/2016/home-accueil-en.html>.
- ³⁸ Department of Finance (2016). p. 28.
- ³⁹ Bains, N. (2016, 17 November 2016). International institute of Communications Canada Conference – Speaking Points. <http://news.gc.ca/web/article-en.do?nid=1155469>.