

This document will comply with all applicable EN 301 549, WCAG 2.0, and WCAG 2.1 Level AA guidelines for accessible digital documents. We always strive for plain language; however, because we cannot write about policy and regulatory wording in simple language without losing critical meaning, we provide a simplified summary upon request.

# Technology Accessibility for Canadians with Communication Disabilities: Report

**By Canadian Association of the Deaf - Association des Sourds du Canada**

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## Executive Summary

The goal of this report is to provide timely and useful findings, analysis, strategies, tools and recommendations to strengthen marketplace attention to Canadians with communication disabilities and to remove barriers to their participation in that marketplace.

We note the importance of telecommunications as threefold: facilitating societal communications, contributing to community development across Canada, and providing a vital safety and security infrastructure for Canadians.

Canadians without access to technologies, and communications technologies especially, are disadvantaged in the global economy. Access to software programs, professional networking sites, and dedicated websites work to connect people professionally and advance careers; those without full communication access to these networks and programs are therefore significantly disadvantaged when it comes to making connections in their professional lives.

Many emerging technologies are social in nature and work to expand the social experience of users. Devices as simple as mobile phones, or even landline phones, serve the purpose of keeping their users connected with their social networks. Social networking sites could actually break down social barriers that often exist between individuals who are DHHDB and individuals who are hearing.

When designed properly, technology developments have the potential to benefit people with disabilities in the same way they benefit the general population. For example, telemedicine is a growing and developing method of delivering health care services. Scholars have noted a trend in the rise of videoconferencing, a trend enormously accelerated by the COVID-19 pandemic. Deaf participants overwhelmingly prefer communications through video calls using mobile phones or webcams because these allow for signing and lip-reading, whereas texting and emailing can prove a challenge to the Deaf users' literacy skills.

The past few years have seen the release of many new accessible technologies to the market, as well as the improvement of older systems. Audio amplification devices utilizing AI, emergency alert services, other alerting technologies (e.g., for environmental sounds, and “smart home” kits), relay services, sophisticated two-way communication devices and apps, user-driven captioning choices, and avatar interpretation are all examples of emerging communications technologies. Our report cautions that the difference between failure and success in such technologies is quite often the involvement of DHHDB people in the R&D, testing, and marketing stages: unfortunately, such involvement is found in few cases, as more often non-disabled people create devices and technologies that they think will be useful for and desired by DHHDB people.

A section of this report reviews legislative and regulatory frameworks, both in Canada and elsewhere in the world. This includes the Accessible Canada Act, the Americans with Disabilities Act, the United Nations Convention on the Rights of Persons with Disabilities, and WCAG.

It is followed by a comparison of accessibility plans, packages, contracts, and services that may be available for the benefit of people with disabilities from the Canadian internet and wireless service providers. This information is supplemented by the appendices on consumer experiences with these providers and their packages, as well as consumer preferences.

The report wraps up with a set of recommendations including the following examples:

**Recommendation:** The Canadian government should establish a program to support low-cost, high-data, high-speed connection for persons with disabilities.

**Recommendation:** Improve TRS in Canada, establishing minimum standards for TRS providers that are as strong as those already set by the USA.

**Recommendation:** AI-assisted captioning may drive down quality standards for captioning; Canada must continue to be diligent in demanding high quality captioning.

**Recommendation:** Canada needs to study both positive and negative lessons learned from the global COVID-19 pandemic to ensure that both the new normal and future emergency situations are permanently improved from the perspective of the DHHDB community in Canada.

# Definitions and Abbreviations<sup>1</sup>

## deaf

The word “deaf”, not capitalized, is a medical/audiological term referring to those people who have little or no functional hearing. May also be used as a collective noun (“the deaf”) to refer to people who are medically deaf but who do not necessarily identify with the Deaf community.

## Deaf

The word “Deaf”, capitalized, is a sociological term referring to those individuals who are medically deaf or hard of hearing who identify with and participate in the culture, society, and language of Deaf people, which is based on Sign language. Their preferred mode of communication is Sign.

## Deaf-Blind<sup>2</sup>

An individual who is Deaf-Blind is someone who has a combined loss of vision and hearing. In these situations, neither their vision nor their hearing can be used as a primary source of receiving or processing information.<sup>3</sup> Deafblindness is defined as a significant degree of hearing and vision loss, the combination of which affects communication and access to information.<sup>4</sup>

## DHHDB

An abbreviation which includes all people who are Deaf, hard of hearing, and Deaf-Blind.

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<sup>1</sup> Further definitions can be found at <http://cad.ca/issues-positions/terminology/> and [https://www.cdbanational.com/glossary\\_canadian\\_competency\\_framework/](https://www.cdbanational.com/glossary_canadian_competency_framework/)

<sup>2</sup> Deaf-Blind can be spelled in many different ways. In this report, we use the spelling “Deaf-Blind”, in line with the DWCC’s spelling of the term: <http://www.deafwireless.ca/index.php/terminology/>

<sup>3</sup> Definition adapted from the Canadian Deafblind Association British Columbia, <http://cdbabc.ca/deafblindness/definitions/>

<sup>4</sup> Adapted from the Canadian Deafblind Association National glossary, definition of “Deafblindness”, [https://www.cdbanational.com/glossary\\_canadian\\_competency\\_framework/](https://www.cdbanational.com/glossary_canadian_competency_framework/)

## **eAccessibility and digital accessibility**

The term “eAccessibility” has the same meaning as “digital accessibility”. For the purposes of this paper, we define “digital accessibility” as the ability of any information and communications technology (ICT) to be easily navigated, understood, and operated by users of all abilities.

### **EN 301 549**

*Accessibility requirements for ICT products and services* (EN 301 549) is one of many harmonised European standards produced under the leadership of the European Telecommunications Standards Institute (ETSI). EN 301 549 names *Web Content Accessibility Guidelines* (WCAG) version 2.1 as a normative standard for web accessibility. Version 2.1.2 of EN 301 549, also known as *EN 301 549 (2018)*, is the version adopted by the European Commission in 2018. In effect, it is the minimum standard for web accessibility for EU member states. The latest version is *EN 301 549 v3.1.1 (2019)*. It was commissioned by the European Commission to update EN 301 549 to include, among other areas, mobile and non-ICT web, and better coverage for various situations, such as speech impairment, cognitive disability, deafness, hard of hearing, and deafblindness.<sup>5</sup>

### **hard of hearing**

A person whose hearing loss ranges from mild to profound and whose usual means of communication is speech. It is both a medical and a sociological term.

### **IP relay<sup>6</sup>**

IP relay service is offered to all subscribers of home or mobile phone service in Canada. In an IP relay service call, a person with a hearing or speech disability uses an Internet-enabled

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<sup>5</sup> Gregg C. Vanderheiden, lead author of WCAG, World Wide Web Consortium (W3C).

<sup>6</sup> While many organizations capitalize the word relay in this term, we follow the Canadian Radio-television and Telecommunications Commission (CRTC) styling, which does not. See <https://crtc.gc.ca/eng/phone/acces/mrsrt.htm>

device (for example, computer, laptop, tablet, mobile phone) to reach a relay operator by logging into the IP relay provider’s web portal. Conversely, the other party may call the person with a disability by dialing a toll-free number to reach an IP relay operator.<sup>7</sup> IP relay is a text-based system, not a video system.

## **Person who is deaf**

Acceptable but overly sensitive substitute for “deaf”.

## **Real-time text (RTT)**

Real-time text – or RTT – is a technology that allows text to be sent immediately as it is created through wireless handsets that use IP-based technology on networks that support RTT. With RTT, there is no need to press a “send” key as there generally is for SMS, chat, or other types of texting. A recipient can read a message while the sender types it.<sup>8</sup>

## **Sign language**

The official language of the Deaf community. The word “Sign” in this phrase should always be capitalized, just as “English” and “French” are capitalized, because all three are legitimate languages.

## **Teletypewriter relay service (TTY)**

The proper acronym for the special devices used by deaf, hard of hearing, and hearing people to communicate with each other through the telephone system. The French term is ATS.

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<sup>7</sup> Adapted from the CRTC page, “Message Relay Services”, <https://crtc.gc.ca/eng/phone/acces/mrsrt.htm>

<sup>8</sup> *Real-Time Text: Improving Accessible Telecommunications*, Federal Communications Commission (FCC), last reviewed December 19, 2017, <https://www.fcc.gov/sites/default/files/real-time-text.pdf>

## **Video Relay Service (VRS)**

VRS is a basic telecommunications service that enables people with hearing or speech disabilities who use Sign language to communicate with voice telephone users. The Sign language user connects to a VRS operator using Internet-based videoconferencing. The operator then places a voice telephone call to the other party and relays the conversation from Sign language to voice and vice-versa.<sup>9</sup>

## **WCAG**

The *Web Content Accessibility Guidelines* (WCAG) are the de facto global standard for measuring the technical accessibility of websites, apps, and documents. WCAG is a publication of the World Wide Web Consortium (W3C).

## **WCAG2ICT**

*Guidance on Applying WCAG 2.0 to Non-Web Information and Communications Technologies* (WCAG2ICT) is an informative document that describes how to apply WCAG to non-web ICT. WCAG2ICT supports harmonized accessibility solutions across a range of technologies. It is relevant for all versions of WCAG 2. For example, WCAG 2.1 only adds more requirements.<sup>10</sup>

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<sup>9</sup> Adapted from the CRTC, "Video Relay Service (VRS)", <https://crtc.gc.ca/eng/phone/acces/rela.htm>

<sup>10</sup> W3C, "WCAG2ICT Overview", <https://www.w3.org/WAI/standards-guidelines/wcag/non-web-ict/>



## Introduction

Emma Logan is an accomplished Canadian curler competing for Nova Scotia on the national stage. Curling is a sport where victory typically depends upon swift and precise communication amongst teammates, which has not always been easy for Emma, who is Deaf. At this year's "Scotties", more formally known as the Scotties Tournament of Hearts and the Canadian women's curling championship, her team represented Nova Scotia. They pioneered the use of a Bluetooth system, where her teammates wore microphones that fed directly into Logan's cochlear implant.<sup>11</sup> This common technology, used in a novel way, reduced the communication barriers amongst players and allowed the team to fully leverage Emma's skills.

Innovative application of technology to overcome communication barriers is not uncommon, and increasingly widespread. From the simple to the complex, accessibility technologies are developing at an unprecedented pace, and with unprecedented media attention.<sup>12</sup> It is becoming increasingly important, then, that these technologies are produced, monitored, and made available in a responsible and accessible way.

The goal of this report is to provide timely and useful findings, analysis, strategies, tools and recommendations to strengthen marketplace attention to Canadians with communication disabilities. These communication disabilities, ironically, create barriers to consumer involvement in the marketplace of communications technologies. Such barriers include limited access to information, limited inclusion in matters of R&D and legislation and regulation, inappropriateness of adaptive technologies for this audience, unfair and unaffordable wireless packages, and general confusion regarding how the *Accessible Canada Act* applies to communication technologies and services. Throughout the report, we examine these and other challenges, and provide recommendations for change that enable everyone to participate more fully and equally in this marketplace.

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<sup>11</sup> Donna Spencer, "Nova Scotia lead Emma Logan finds curling workaround for deafness," *The Star*, 15 Feb. 2020, <https://www.thestar.com/sports/curling/2020/02/15/nova-scotia-lead-emma-logan-finds-curling-workaround-for-deafness.html>

<sup>12</sup> Kristin Toussaint, "The next decade will reshape how we think of technology accessibility," *Fast Company*, 26 Dec. 2019, <https://www.fastcompany.com/90444324/the-next-decade-will-reshape-how-we-think-of-technology-accessibility>

To this end, the report addresses two key questions:

- 1) How can we ensure emerging communication technologies for people who are Deaf, Deaf-Blind, hard of hearing, language deprived, developmentally delayed, have low literacy skills, or have other communication disabilities align with the Accessible Canada Act?
- 2) What barriers, including awareness, do these consumers face in deciding and switching among competitive offerings?

To address these questions, we begin with a literature review in two parts: reports and scholarly literature. The first section summarizes the findings of previous reports from the Deaf Wireless Canada Committee (DWCC), CAD-ASC, and various international organizations. It also includes a discussion of the CAD-ASC Communications Lens Guidelines, which outlines universal design principles to evaluate communications, language, and literacy accessibility. The second part of the literature review brings together scholarly literature addressing the question: What are the key issues faced by Deaf, hard of hearing, and Deaf-Blind (DHHDB) Canadians related to accessing emerging communication technologies? We give special attention to wireless service provider networks and telecommunications technologies.

Following the literature review is a review of emerging assistive technologies for people who are DHHDB. The list provided is not exhaustive: it is a sample of innovations demonstrating the scope and breadth of innovation taking place in the field of emerging accessible technologies.

Next, our report analyzes the legislative and regulatory framework of accessible communications technologies in Canada and internationally. The research team has given special attention to foreign jurisdictions that support more than one official language.

Following this is an analysis of contractual agreements, terms and conditions of mobile service and residential internet service providers. We define accessibility requirements for these plans and provide a cost comparison amongst providers for plans that comply with such requirements. The survey analysis reports from DWCC for this project offer more detailed descriptions of the terms and conditions analyzed in this section.

Finally, we provide recommendations for further action which would address the gaps and shortcomings in technology, legislation, and consumer protection laid out earlier in this report.

Interviews were conducted with experts in many fields, including people with lived experience of disability, within various levels of government, academia, standards development bodies, and the private sector. Pertinent findings from these interviews are embedded within the report in relevant sections. We also reached out to every major Canadian telecommunications provider and the Canadian Wireless Telecommunications Association (CWTA).

## Literature Review

The following review summarizes key literature related to communications technology accessibility for Deaf Canadians, and Canadians who are hard of hearing or Deaf-Blind (DHHDB), with a specific focus on wireless network services and technologies. The review draws from reports from Canadian and international organizations, as well as peer-reviewed literature, to explore the question: What are the key issues faced by Deaf, hard of hearing, and Deaf-Blind Canadians related to accessing emerging communication technologies?

### Review of Reports

#### Reports from the Deaf Wireless Canada Committee

The Deaf Wireless Canada Committee (DWCC) is a standing committee of the Canadian Association of the Deaf-Association des Sourds du Canada (CAD-ASC) with a mandate to advocate for functional equivalency in wireless telecommunications for Deaf, hard of hearing, and Deaf-Blind Canadians. It has administered surveys of DHHDB individuals, produced reports with these survey results and accompanying recommendations, and intervened in several government consultations. This first section of the literature review provides a chronological overview of these reports, showing the development of discussion surrounding accessible telecommunications over time.

In 2015, the DWCC undertook a survey of common wireless issues faced by DHHDB individuals in Canada.<sup>13</sup> Specifically geared towards Deafblind individuals, the survey asked respondents about their landline and TTY use, video communications habits, and wireless service contracts. Ultimately, the DWCC found that survey results supported the four pillars of their mandate, namely: (1) Fair and uniform wireless data plans for ASL and LSQ users; (2) Cost reasonable plans for ASL and LSQ users; (3) Transparent and clear advertisement of plans offered; and (4) Decreased disparity in disparity of product and service provisions.<sup>14</sup>

The subsequent report made a number of recommendations for all parties involved in the Canadian telecommunications landscape, including CAD-ASC, Canadian Radio-television and Telecommunications Commission (CRTC), Commission for Complaints for Telecom-television Services (CCTS), Canadian Wireless Telecommunications Association (CWTA) and Telecommunications Service Providers/Wireless Service Providers (TSPs/WSPs). These recommendations are divided into four categories: Transparency, Consumer Education, Affordability, and Accessibility. Recommendations for transparency and consumer education centre on the clear advertisement of wireless plans geared to DHHDB customers and clear terminology allowing ASL and LSQ users to more easily navigate their wireless contracts. The report recommends that affordability could be improved through the creation of an accessibility fund to, among other things, provide low-income individuals access to their smartphone devices and low-cost data plan packages they require to communicate with others through video communication. Accessibility recommendations include the overhaul of the Text with 9-1-1 service (also referred to as T-911); a minimum wireless communications speed standard of 10 Mbps; the provision of services in the native language of ASL and LSQ users; and the creation of an Accessibility Office within the Consumer Affairs and Strategy Planning Division of the CRTC.

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<sup>13</sup> Deaf Wireless Canada Committee, *Deaf Wireless Survey Analysis*, April 2016, <http://www.deafwireless.ca/wp-content/uploads/2016/05/Deaf-Wireless-Canada-Survey-Analysis-2016-REV02-APRIL-19-2016.pdf>

<sup>14</sup> *Ibid.*, p.3.

A joint report from the CAD-ASC and DWCC examined the Text with 9-1-1 service recommendation from the TNC 2015-134 report in more depth.<sup>15</sup> The Submission to the CRTC proceedings on establishment of a regulatory framework for next-generation 9-1-1 in Canada summarized survey findings collected in 2016-2017, reporting a “severe lack of 9-1-1 service for DHHSI Canadians” requiring immediate attention.”<sup>16</sup> This lack of service stemmed from a number of issues, including: the poorly designed Text with 9-1-1 website; an IP relay service that does not work with all devices; and limited hours for the Canada VRS service. Finally, the report found that service changes were being undertaken without consultation with the DHHSI and Deaf-Blind community.

The report also highlighted the confusion around which technologies or WSP services are required to access Text with 9-1-1. It also found that some requirements to access the service were unreasonable; for example, users were required to register for the service, and their wireless device contracts must have included a voice plan. Finally, the report offers recommendations in the aim of improving IP relay services and offering 24/7 availability of the VRS Canada service. It also recommends consulting the DHHDB community for additional improvements.

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<sup>15</sup>*Accessibility Groups included as a Forethought in 9-1-1 System Design*, Submission by CAD-ASC, DWCC, and CNSDB to CRTC process TNC 2016-116, February 20, 2017, <http://www.deafwireless.ca/wp-content/uploads/2017/11/DWCC-CAD-ASC-CNSDB-FINAL-SUBMISSION-for-CRTC-TNC-2016-116-.pdf>

<sup>16</sup> *Ibid.*, p. 3.

In 2017, the DWCC surveyed DHHDB individuals on Message Relay Services (MRS) in Canada, namely Teletypewriter (TTY) and Internet Protocol (IP) relay services.<sup>17</sup> The survey asked respondents about the quality of service, ease of access, awareness surrounding, and future of Canadian MRS services. Based on survey findings, the subsequent report makes recommendations to consumer experience; standards; mechanism and reporting; and public awareness and education of TTY and IP relay services. These include: the development of two-way text based relay services; the ability to leave messages through IP relay services; decreased wait times for an IP relay operator; etc. Overall, the report highlights the need for legislation recognizing ASL and LSQ as official Canadian National Sign Languages in order to affirm accessible communication rights in Canada.

In 2018, the DWCC released a report titled *Lower-cost data-only plans for mobile wireless services: A Deaf, Deaf-Blind and Hard of Hearing Canadian Perspective* summarizing their previous reports and presenting results from an additional survey.<sup>18</sup> This follow-up survey was conducted as a result of continuing concerns from the DWCC over data pricing for DHHDB individuals.

The report recommended that WSPs offer higher volume data plans at cheaper rates generally, as well as offer Accessibility Plans to DHHDB. These Accessibility Plans would include cheaper data rates and free usage of Canada VRS. It also recommends that WSPs promote these Accessibility Plans through web pages and ASL/LSQ videos. Finally, it suggests improvements to public awareness and education; namely, that WSPs provide staff fluent in ASL or LSQ or Sign language interpreters in major flagship stores at specific dates and times, that Canada VRS and the CCTS create accessible ASL and LSQ videos about various aspects of their services, and that these videos be regularly distributed.

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<sup>17</sup> *Deaf, DeafBlind, Hard of Hearing TTY & IP Relay Services Survey Analysis*, Submission by DWCC, CAD-ASC, and CNSDB to CRTC process TNC 2017-33, <http://www.deafwireless.ca/wp-content/uploads/2017/07/DWCC-CADASC-CNSDB-TTY-IPRelay-Survey-Analysis-Report-27-June-2017-FINAL.pdf>

<sup>18</sup> *Lower-cost data-only plans for mobile wireless services: A Deaf, Deaf-Blind and Hard of Hearing Canadian Perspective*, Submission by DWCC, CAD-ASC, DAANS, and CNSDB to CRTC process TNC 2018-98, <http://www.deafwireless.ca/wp-content/uploads/2018/06/DWCC-et-al-TNC-2018-98-SURVEY-ANALYSIS-FULL-REPORT-12-June-2018.pdf>

Another 2018 report also highlights the concerns of the DWCC regarding accessible data plans.<sup>19</sup> It finds that WSP staff are often not aware of their own company's Accessibility Plans, and the WSPs are not engaging or informing their customers who are DHHDB about these plans. Sixty one percent of survey respondents reported experiencing difficulty getting an Accessibility Plan. The report offers recommendations similar to those from the TNC 2018-98 report, with some additions, including: Accessibility Plans cannot be refused if there is evidence that the customer qualifies; DHHDB should not pay for package services that they do not benefit from; people who are DHHDB should be employed in WSP stores; WSP store tablets should play ASL and LSQ videos; and, WSP staff should receive mandatory training on accessible company services and products.

Individuals who are DHHDB still experience significant difficulties obtaining ISP contracts in accessible or even simply written formats, modifying or cancelling contracts, or understanding language in these contracts.<sup>20</sup> There is also a serious lack of awareness of the CCTS and where customers can file complaints/the complaints process. A joint report from the CAD-ASC and DWCC responds to these and other issues with the primary recommendation that the CRTC create an Internet Code to safeguard the rights of Deaf, Deaf-Blind, and hard of hearing Canadians. This Code should be accompanied by ASL and LSQ videos explaining common contract terminologies and user rights, as well as the process for filing complaints with the CCTS.

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<sup>19</sup> DWCC et al's Final Submission for CRTC TNC 2018-246, Submission by DWCC, CAD-ASC, CNDSB, and DAANS, <http://www.deafwireless.ca/wp-content/uploads/2019/01/DWCC-et-al-FINAL-SUBMISSION-CRTC-TNC-2018-246-08-Nov-2018.pdf>

<sup>20</sup> *An Accessible Internet Code for Deaf, Deaf-Blind, and Hard of Hearing Canadians*, Submission by DWCC, CAD-ASC, CNDSB, and DAANS, to CRTC process TNC 2018-422, [http://www.deafwireless.ca/wp-content/uploads/2019/03/CAD-ASC-et-al-An-Accessible-Internet-Code-Survey-Analysis-TNC-2018-422\\_FINAL.pdf](http://www.deafwireless.ca/wp-content/uploads/2019/03/CAD-ASC-et-al-An-Accessible-Internet-Code-Survey-Analysis-TNC-2018-422_FINAL.pdf)



These reports from the DWCC highlight significant access barriers to wireless telecommunications services for people who are DHHDB. The high cost of data plans recurs in many of these reports. People who are DHHDB require video chat services to communicate through ASL or LSQ, which uses a significant amount of data. Many contracts also require that DHHDB individuals pay for a voice plan, even when they may not use these minutes. Even with the development of WSP Accessibility Plans, data plans remain prohibitively priced or otherwise inaccessible to many DHHDB customers. This is due in part to the lack of training of WSP staff on these plans, and the lack of promotion of these plans to people who are DHHDB.

In addition to the high cost of data plans and lack of promotion of WSP Accessibility Plans, people who are DHHDB face barriers when it comes to understanding and negotiating their service contracts. This can be due to difficulty getting a copy of their ISP contract, or to the contract's inaccessible complex legal language.

The above reports also come together in providing recommendations to address these barriers. Many of these recommendations center around lowering data costs or providing unlimited data to people who are DHHDB, and to appropriately educating the DHHDB community about the data options available to them. According to the DWCC and CAD-ASC, implementing these recommendations would increase communications equity in Canada for DHHDB people.

### **CAD-ASC presentations on Broadcasting and Telecommunications Legislative Review**

In June 2018, the Government of Canada undertook a review of its “communications legislative framework”.<sup>21</sup> The external Broadcasting and Telecommunications Legislative Review Panel was appointed to study the *Broadcasting Act*, the *Telecommunications Act* and the *Radiocommunications Act*, to consult Canadians and to produce a set of recommendations. Canadians were invited to submit comments for consideration during the review process. Both CAD-ASC and the Deafness Advocacy Association Nova Scotia (DAANS) provided written submissions for this review, offering a DDBHH perspective on Canada's communications legislation.

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<sup>21</sup> For more information on this review process, visit <https://www.ic.gc.ca/eic/site/110.nsf/eng/home>

The submission from CAD-ASC to this review process provides an overview of the legislative context as well as an analysis of the accessibility issues and challenges that are faced in broadcasting and telecommunications in Canada. The submission highlights the importance of telecommunications as threefold: facilitating societal communications, contributing to community development across Canada, and providing a vital safety and security infrastructure for Canadians.

However, the submission also notes several challenges to accessibility. Firstly, the “Text with 911” system is described as “very flawed”, in part because of the delay in response time which could take up to 2 minutes as compared to in the U.S. where a response takes between 11 and 18 seconds.<sup>22</sup> Secondly, the submission describes insufficient service to people who are DHHDB by telecommunications companies. The retail locations of Canadian telecommunications companies often do not have ASL or LSQ interpretation available, and company representatives are often unable to respond to accessibility questions and issues raised.<sup>23</sup>

To address this issue, the report recommends the creation of “Accessibility Centres of Excellence”, which would be designed accessible flagship stores equipped with Deaf staff fluent in ASL or LSQ, or at minimum Sign language interpreters who are available in-store at regularly scheduled hours, or who are available through video interpretation.<sup>24</sup> This submission also recommends that the CRTC establish a Telecommunications Accessibility Fund similar to the Broadcasting Accessibility Fund to advance accessibility to telecommunications for Deaf Canadians, as well as enact legislative amendments that would enforce telecommunications accessibility standards and ensure functional equivalency for Deaf persons and people with communications disabilities.<sup>25</sup>

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<sup>22</sup> *Review of the Canadian Communications Legislative Framework: Accessible Broadcasting and Telecommunications for Deaf Canadians*, Submission by CAD-ASC to the Government of Canada Broadcasting and Telecommunications Legislative Review, January 11, 2018, p. 12-13, [https://www.ic.gc.ca/eic/site/110.nsf/vwapj/1322\\_CanadianAssociationoftheDeaf\\_9\\_EN\\_CA.pdf/\\$file/1322\\_CanadianAssociationoftheDeaf\\_9\\_EN\\_CA.pdf](https://www.ic.gc.ca/eic/site/110.nsf/vwapj/1322_CanadianAssociationoftheDeaf_9_EN_CA.pdf/$file/1322_CanadianAssociationoftheDeaf_9_EN_CA.pdf)

<sup>23</sup> *Ibid.*, p. 13.

<sup>24</sup> *Ibid.*, p. 13.

<sup>25</sup> *Ibid.*, p. 14.

The Deaf Advocacy Association of Nova Scotia (DAANS) also provided feedback in this process.<sup>26</sup> They first recommend the creation of one unified “Communications Act” to consolidate the *Broadcasting Act*, *Telecommunications Act*, and *Radiocommunications Act*. This new act would have control over all broadcasting and telecommunications activity. Secondly, they recommend that this new consolidated act regulate broadcasting, telecommunication, radiocommunication and internet (BTRI) industries to make them more accessible to people who are DHHDB. The proposed act would establish a mechanism for creating and enforcing mandatory accessibility requirements for all BTRI providers, and suggest the creation of a Disability Rights Office within the CRTC. Finally, they strongly recommend that the new consolidated act’s accessibility requirements are never forborn, and instead always enforced.

### **Reports from International Organizations**

The DWCC and CAD-ASC are two of many organizations worldwide reporting on accessible telecommunications services for DHHDB people. This section of the literature review highlights reports from international organizations and summarizes their recommendations.

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<sup>26</sup> *Feedback on how current federal legislation must change to accommodate the needs of Deaf, Deaf-Blind, hard of hearing and late deafened (DDBHH)*, Submission by DAANS to the Government of Canada Broadcasting and Telecommunications Legislative Review, January 11, 2019, [https://www.ic.gc.ca/eic/site/110.nsf/vwapj/1324\\_DeafnessAdvocacyAsssocationNovaScotia\\_9\\_EN\\_NS.pdf/\\$file/1324\\_DeafnessAdvocacyAsssocationNovaScotia\\_9\\_EN\\_NS.pdf](https://www.ic.gc.ca/eic/site/110.nsf/vwapj/1324_DeafnessAdvocacyAsssocationNovaScotia_9_EN_NS.pdf/$file/1324_DeafnessAdvocacyAsssocationNovaScotia_9_EN_NS.pdf)

In their *Position Statement on Functionally Equivalent Telecommunications for Deaf and Hard of Hearing People*, the National Association of the Deaf (US) asserts that all equipment and services related to telecommunications should comply with universal design principles, so that they are accessible and usable by those who are Deaf or hard of hearing.<sup>27</sup> Importantly, the statement highlights the importance of functional equivalents of telecommunications technologies. For example, typed text was at one time considered functionally equivalent to voice communication; with the advent of captioning and video technologies, however, typed text is no longer the functional equivalent of this type of communication. As technology develops, so do functional equivalency gaps, and these need to continually be closed. The NAD identifies many areas where these gaps are present and need to be addressed: unrestricted availability of relay services; emergency preparedness and response; international telephone services; telephone services; competition, innovation, and choice; available and affordable telephone service; underserved populations; instant connection to telephone service; telecommunications equipment; connection and interoperability; making and receiving calls through any relay service provider; quality of telephone service; 9-1-1 and other N-1-1 services; streamlined troubleshooting; specialized access to telephone services; and, universal design and emergent technologies.

The report's comments on available and affordable telephone service mirror those of the DWCC reports discussed above. The NAD asserts that due to their increased reliance on video communication, Deaf and hard of hearing individuals require high-speed broadband service with sufficient bandwidth in order to have functionally equivalent telephone service to a hearing population, and that some form of subsidization may be necessary.<sup>28</sup> They conclude by calling on government agencies to adapt to the new requirements of functional equivalence in order to finally achieve equivalent telephone services for Deaf and hard of hearing individuals.

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<sup>27</sup> National Association of the Deaf, *Position Statement on Functionally Equivalent Telecommunications for Deaf and Hard of Hearing People*, Adopted December 21, 2014 by NAD Board vote, <https://www.nad.org/about-us/position-statements/position-statement-on-functionally-equivalent-telecommunications-for-deaf-and-hard-of-hearing-people/>

<sup>28</sup> World Federation of the Deaf, *WFD Position Paper on Accessibility: Sign Language Interpreting and translation and technological developments*, 12 February 2019, <https://wfdeaf.org/news/resources/wfd-position-paper-accessibility-sign-language-interpreting-translation-technological-developments/>

The Position Paper on Accessibility Sign Language Interpreting and translation and technological developments published by the World Federation of the Deaf in February 2019 also discusses the increase in video use, specifically examining its impact on the provision of Sign language interpreting and translation services. Media interpreting and remote interpreting especially are becoming increasingly popular, due in part to improvements in video technology and the emergence of high speed internet and live-streaming tools. These tools are therefore becoming crucial to the work of sign language interpreters and translators worldwide.

The International Federation of Hard of Hearing People produced a set of *Accessibility Guidelines for Hard of Hearing People* in 2008.<sup>29</sup> Despite the age of these guidelines, its recommendations remain valid. Specifically, the guidelines highlight the requirement from Article 9 of the 2006 *UN Convention on the Rights of Persons with Disabilities* that “State Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems...” Hard of hearing users must be allowed to have “the same type of telephone experience that people using voice have,” requiring that universal technical solutions are implemented to this effect (p. 8).<sup>30</sup>

In September of 2018, the World Federation of the Deafblind in cooperation with Sense International published a report on the situation and rights of persons with deafblindness titled *At risk of exclusion from CRPD and SDGs implementation: Inequality and Persons with Deafblindness*. It offers an introduction to Deafblindness and its intersections with poverty, work, education, and health. It also examines the social, political, and public lives of persons with deafblindness. It highlights a key issue in service provision for Deaf-Blind individuals, which is that policymakers in some countries consider shelter and food to be fundamental needs but consider support services and assistive technology “luxuries”. Instead, the WFD holds that these services are also “essential for daily living.”<sup>31</sup>

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<sup>29</sup> International Federation of Hard of Hearing People, *Accessibility Guidelines for Hard of Hearing People*, July 2008, <https://www.ifhoh.org/position-papers>

<sup>30</sup> *At risk of exclusion from CRPD and SDGs implementation: Inequality and Persons with Deafblindness*, World Federation of the Deafblind, 2018, p. 8, <http://www.wfdb.eu/wp-content/uploads/2019/04/WFDB-global-report-2018.pdf>

<sup>31</sup> *Ibid.*, p. 21.

These assistive technologies can be said to include telecommunications technologies, on which the report makes several recommendations. It calls on governments to “understand and acknowledge the specific communications requirements of persons with deafblindness” so that telecommunications services may be made fully accessible.<sup>32</sup> It acknowledges the necessity of network connectivity to access these services, and further recommends that national governments include accessibility requirements in the accreditation and licensing process for telecommunications service.<sup>33</sup>

These reports from international agencies mirror the assertions in the DWCC reports above that functionally equivalent accessible communications services are not yet being provided to DHHDB individuals. Video services in particular are becoming increasingly important communications tools for people who are DHHDB and for Sign language interpreters, but many still face challenges accessing them.

### **CAD-ASC Communications Lens Guidelines**

CAD-ASC has advocated for the rights of DHHDB people to adequate telecommunications technology in part through collaborating with the DWCC on several of the above reports. CAD-ASC has also produced its own *Communications Lens Guidelines*, which outlines universal design principles to evaluate three kinds of accessibility: communications, language, and literacy. It compiles guidelines from the CAD-ASC, the Canadian Disability Policy Alliance, the Canadian Human Rights Commission, the American Center for Inclusive Design and Environmental Access, and the Norwegian Directorate for Children, Youth and Family Affairs to provide recommendations on improving access to goods, services, and public spaces.

The “Communications Lens Checklist” itself provides readers with a list of environments and communications accessibility requirements relevant to each space. The following checklist items and recommendations are some with particular relevance to the provision of wireless technology services:

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<sup>32</sup> *At risk of exclusion from CRPD and SDGs implementation: Inequality and Persons with Deafblindness*, World Federation of the Deafblind, 2018, p. 15

<sup>33</sup> *Ibid.*, p. 15.

- *“If you ask questions of clients at the register, do you have written versions to show to clients who are Deaf or hard of hearing?”*
- *“Does the staff have the means of communicating with people who do not hear or speak?”*
- *“Is your website accessible for people with communication disabilities? Can it be easily browsed by people who are blind, deaf-blind, deaf, hard of hearing, functionally illiterate, cognitively disabled, unable to speak? Does it provide online assistance (good accessibility), or does it insist on providing help only via voice-phone (poor accessibility)?”*
- *“Many technical aids to accessibility are run from wireless apps, e.g., wayfinding, video Sign language interpreting services, etc. In some government buildings and medical clinics, the Wifi system is restricted to employees, with the public allowed to access the Wifi only in certain locations such as a waiting-room or an admissions desk. This means communication access is cut off to the public in other building locations where they need it...Wifi needs to be available throughout all public buildings; security concerns can be alleviated by the use of restricted access to files, contacts, etc., rather than by the denial of access to the Wifi system itself.”*

The *Communications Lens Guidelines* document also suggests the adoption of “simple language” rather than “plain language” when material needs to be read by those with communications disabilities (those who are born Deaf, or who have intellectual or developmental disabilities, or who have other kinds of cognitive and/or learning disabilities, or who are language deprived, or who have low literacy skills from any other cause). Writing with simple language requires removing all unnecessary wording, using one to two-syllable words, and employing very short sentences and paragraphs. Writers should also use graphics when possible, and reduce colloquialisms and analogies.

Finally, the *Communications Lens Guidelines* provide recommendations from CAD-ASC and their partner organizations for improving accessibility for those with communications disabilities. Of particular interest in this review are guidelines for Service accessibility:

- “Recommendation #1 - attitude: Staff should be given proper sensitivity training, design, and methodically implemented at all levels directed at providing accessible and friendly services to customers with visible and invisible disabilities...
- Recommendation #2 - information: Staff should have the means of communicating with people who do not hear or speak, such as being able to summon a responsible employee or to provide a two-way communication means...
- Recommendation #3 - collaboration: Accessibility policies for the disabled customers must only be developed in cooperation with disability specialists...
- Recommendation #4 - systemic change: An organization should establish a process for receiving and responding to feedback about the way the organization provides goods or services to people with disabilities, including the actions to be taken if a complaint is received, and make information about the process readily available to the public.”

The universal design principles highlighted in these guidelines and underlying its recommendations could inform improvements to the provision of communications services to people who are DHHDB by WSPs and related associations.



## Scholarly Literature

While accessible technologies have been gaining attention in academic literature in recent years, studies on this topic are still limited. A 2014 study on technology use among adults who are DHH conducted a rigorous review of the topic, and found that “despite an extensive search of various databases, including ERIC, Google Scholar, and ProQuest, just 15 studies were found. Ten out of the 15 studies focused exclusively or primarily on the use of text communication, including short message service (SMS), two-way text messaging, instant messaging (IM), and e-mail.”<sup>34</sup> The next section of this report compiles available research which addresses the question: What are the key issues faced by Deaf, hard of hearing, and Deaf-Blind (DHHDB) Canadians related to accessing emerging communication technologies? Following in the theme of the DWCC reports mentioned above, we give specific attention to wireless networks and telecommunications technologies.

### Importance of Technology Accessibility

The literature presents several reasons why equitable access to emerging technologies is important for people with disabilities and specifically people who are DHHDB. A full examination of the “digital divide” and its associated inequalities is beyond the scope of this review, but scholars agree that those without access to technologies, and communications technologies especially, are generally “disadvantaged in the global economy.”<sup>35</sup> Access to software programs, professional networking sites, and websites generally also work to connect people professionally and advance careers.<sup>36</sup> Those without access to these networks and programs are therefore significantly disadvantaged when it comes to making connections in their professional lives.

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<sup>34</sup> M. Maiorana-Basas and C. Pagliaro, “Technology Use Among Adults Who Are Deaf and Hard of Hearing: A National Survey,” *Journal Of Deaf Studies And Deaf Education*, 19(3),2014: 401, <https://doi.org/10.1093/deafed/enu005>

<sup>35</sup> Sey et al. (2013), p. 27, cited in Maiorana-Bases and Pagliaro, “Technology Use Among Adults Who Are Deaf and Hard of Hearing,” 409.

<sup>36</sup> Rowland, Burgsthaler, Smith, and Coombs, (2013), cited in Maiorana-Basas and Pagliaro (2014),, 409.

Additionally, many emerging technologies are social in nature and work to expand the social experience of users. Devices as simple as mobile phones, or even landline phones, serve the purpose of keeping their users connected with their social networks; this is true not just for hearing populations, but for hard of hearing individuals as well.<sup>37</sup> Newer developments such as social networking sites also serve to meet the social needs of their users, providing new ways to share information and stay connected with friends. Not only do these sites allow for connections with one's existing network, but studies have found that when technologies that are popular amongst hearing populations are also accessible to people who are DHH, "there are more opportunities for individuals who are DHH to make connections with a wider variety of people."<sup>38</sup> These studies suggest that social networking sites could actually work to "break down social barriers that often exist between individuals who are DHH and individuals who are hearing, perhaps also bringing a mutual understanding of each other's needs and cultures."<sup>39</sup>

When designed properly, technology developments have the potential to benefit people with disabilities in the same way as they are designed to benefit the general population. For example, telemedicine is a growing and developing method of delivering health care services. This development has the potential to greatly benefit DHHDB people; authors of one study note that there is an extreme shortage in access to mental health professionals within the deaf population, as few mental health professionals are fluent in Sign languages and have appropriate knowledge of Deaf community culture. Their study found this shortage could be partially addressed using videoconferencing technology and that as a result, "telehealth can be regarded as an efficacious and cost-effective option in delivering health care to the deaf population."<sup>40</sup>

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<sup>37</sup> Bakken, 2005; M. R. Power & Power, 2004, cited in H. Chiu, C. Liu, C. Hsieh, and R. Li, "Essential Needs and Requirements of Mobile Phones for the Deaf," *Assistive Technology*, 22(3), 2010: 172, <https://doi.org/10.1080/10400435.2010.483652>

<sup>38</sup> Maiorana-Basas and Pagliaro (2014), 407.

<sup>39</sup> *Ibid.*, 407.

<sup>40</sup> J. Wilson and J. Wells, "Telehealth and the Deaf: A Comparison Study. *Journal of Deaf Studies and Deaf Education*," 14(3), 2009: 386, <https://doi.org/10.1093/deafed/enp008>

Members of the Deaf community have been raising their concerns on this technological divide for decades. In 1982, Glaser wrote that “telephones present a great barrier to the deaf. The severity of this problem is increasing in recent years as much personal contact is being supplanted by the telephone due to rising costs of fuel and transportation. This tendency is causing even greater isolation of the deaf community from the speaking/hearing community. The psychological and educational impact of this additional and most obvious separation of the deaf from the rest of the world is certain to be significant, if not directly measurable.”<sup>41</sup>

### **Trends in technology use**

As the world becomes increasingly digital, the use of the aforementioned technologies is increasing globally. These technologies are also developing rapidly, at such a rate that some products initially developed as assistive technologies are now being replaced by systems designed for mainstream use. For example, in their 2014 study on technology use among adults who are Deaf and hard of hearing, Maiorana-Basas and Pagliaro found that “technologies once exclusively used by DHH individuals (i.e., TTY/TDD and video relay service) are being replaced with those that are more universally used, personal, and convenient such as Internet-based video conferencing, mobile person-to-person video conferencing (e.g., Facetime, ooVoo, and Skype), and social networking sites (Facebook, for example).”<sup>42</sup>

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<sup>41</sup> R. Glaser, “Telephone Communication for the Deaf. *American Annals of the Deaf*,” 127(5), 1982: 550. Retrieved from [http://muse.jhu.edu/journals/american\\_annals\\_of\\_the\\_deaf/v127/127.5.glaser.html](http://muse.jhu.edu/journals/american_annals_of_the_deaf/v127/127.5.glaser.html)

<sup>42</sup> M. Maiorana-Basas and C. Pagliaro, “Technology Use Among Adults Who Are Deaf and Hard of Hearing,” 401.

Mobile technologies have, of course, also been gaining popularity in recent years. Studies conducted in 2000 and 2004 in particular have found that “SMS and mobile video communication via mobile phone have become essential communication technologies and that there is a significant trend toward increasing use of these technologies.”<sup>43</sup> More recently, scholars have noted a trend in the rise of videoconferencing. In fact, according to one study, “videoconferencing technologies perform better for communication between deaf persons than TTY, showing a better efficacy/time ratio.”<sup>44</sup> This could be in part due to a “significant reduction in communication time” using videoconferencing over TTY that was noted by the same study.<sup>45</sup> Deaf participants in another study noted that they preferred communications through video calls using mobile phones or webcams because they allowed for signing and lip-reading.<sup>46</sup>

Finally, mobile phones can have a positive accessibility impact beyond their built-in communication functions, such as SMS and videoconferencing; they can also be used as an “assistive platform” for other technologies and applications that can be used “to improve the living quality of individuals who are deaf.”<sup>47</sup> The potential of these added functionalities are rapidly expanding in scope and have a huge potential to increase the accessibility of many other parts of life for people who are DHHDB.

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<sup>43</sup> Ichiro and Hiroshi (2000) and Ulla-Christel, Jan, and Dick (2004), cited in C. Liu, H. Chiu, C. Hsieh, and R. Li, “Optimizing the Usability of Mobile Phones for Individuals Who Are Deaf. *Assistive Technology*,” 22(2), 2010, <https://doi.org/10.1080/10400435.2010.483649>

<sup>44</sup> C. Vincent, F. Bergeron, M. Hotton, and I. Deaudelin, “Message transmission efficiency through five telecommunication technologies for signing deaf users,” *Assistive Technology: the Official Journal of RESNA*, 22(3), 2010: 148, <https://doi.org/10.1080/10400430903519928>

<sup>45</sup> *Ibid.*, 148.

<sup>46</sup> Marisa Liebenberg and Hugo Lotriet, “An exploration of Deaf telecommunication processes and associated social issues in South Africa,” *South African Computer Journal*, (45), 2010: 16. Retrieved from <https://doaj.org/article/eb7f01b3827e47b1bfc3af89f21c7d5b>

<sup>47</sup> C. Liu, H. Chiu, C. Hsieh, and R. Li, “Optimizing the Usability of Mobile Phones for Individuals Who Are Deaf. *Assistive Technology*,” 22(2), 2010: 115, <https://doi.org/10.1080/10400435.2010.483649>

## Barriers

Unfortunately, people who are DHHDB still face many barriers when accessing technologies. Some of these barriers are purely technological. For example, a 2017 study on automatic speech recognition (ASR) software says that while it is “inexpensive and available on-demand...its low accuracy in many real settings makes it unusable. Both ASR and the software used to assist real-time captionists often make errors that can change the meaning of the original speech. As DHH people use context to compensate for errors, they often have trouble following the speaker.”<sup>48</sup>

However, many of the barriers that arise in technological accessibility are, fundamentally, social challenges. In a 2010 paper on optimizing the usability of mobile phones for individuals who are Deaf, the authors note that “despite the explosive growth of mobile phones worldwide, mobile phones still lack functionality (inadequate or insufficient) for deaf people,” and that “the reason for these inadequate and insufficient designs of mobile phones was that the demands of deaf users were rarely considered during the development phase.”<sup>49</sup>

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<sup>48</sup> W. Lasecki et al., “Scribe: Deep Integration of Human and Machine Intelligence to Caption Speech in Real Time,” *Association for Computing Machinery. Communications of the ACM*, 60(9), 2017:, 93. <https://doi.org/10.1145/3068663>

<sup>49</sup> Matthews, Carter, Pai, Fong, & Mankoff, 2006; Tóth & Németh, 2006, as cited in Chiu et al. 2010, 172-3.

Telecommunication technologies specifically have some unique barriers, due to the use of mobile phones and wireless networks. In particular, poor network connections or low bandwidth can lead to poor real-time videoconferencing quality. In their study on telehealth and the Deaf, each of the trials using video technology experienced forms of technical difficulties, mainly related to the video freezing, creating “significant communication gaps.”<sup>50</sup> These gaps impacted participants’ experiences of the trial, as they raised these issues in the feedback they provided about their use of telemedicine, noting the “slow speed-bad picture” of the video transmission and how it was “hard to see what the interpreter was saying.”<sup>51</sup> Several other studies also note that while video communication is now supported in many mobile systems, video quality is a “main concern” for the deaf when using mobile video communication.<sup>52</sup>

Cost remains a significant barrier to the use of mobile communication technology among the DHHDB people. One study evaluating the usability of mobile phones for people who are Deaf concluded that many of the usability concerns with mobile phones lie outside of the devices themselves, as participants “are not only concerned about features and functions of mobile phones, but also about other issues including fees, privacy, and safety.”<sup>53</sup> In particular, they note that while video communication has the potential to be particularly useful for deaf people, mobile data “is very expensive...and this limits access to videoconferencing technologies that would need this connection to operate.”<sup>54</sup> The authors suggest that the government therefore “evaluate and modify the pricing of mobile telecommunication systems for minority groups such as the deaf community.”<sup>55</sup>

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<sup>50</sup> Wilson and Wells (2010), 395.

<sup>51</sup> Wilson and Wells 2009, 397.

<sup>52</sup> Chiu et al. 2010, 173.

<sup>53</sup> Ibid., 179-180.

<sup>54</sup> Tihanyi, 2007, cited in Chiu et al. 2010, 179-180.

<sup>55</sup> Chiu et al. 2010, 182. Note that the authors of this paper are based in China.

## Suggestions

This research has led some authors to offer suggestions to address these barriers and gaps. Firstly, new technology developments need to be designed with the input and involvement of people with disabilities. As noted in Liu et al. (2010), “ideal products, especially those for users with special needs, will need to be designed through an iterative procedure.”<sup>56</sup> In addition, the focus of this technology development is important. While many assistive technology developments focus on the translation between spoken languages and signed languages, some instead feel that “the best way to give Deaf people access to the conveniences of mobile communication is to bring together existing technology (such as large screen mobile video phones) with existing social networks (such as ASL interpreting services). The only missing link in this chain of communication is a way to transfer intelligible Sign language video over the mobile telephone network in real time.”<sup>57</sup>

Ultimately, what makes a specific technology development successful is not reliant solely on the technology itself, but also on the way that it fits into a specific use context.<sup>58</sup> Because designers working on assistive technologies often are not part of the disability community themselves, they often “understand much less about the needs and requirements of users than do the users themselves,” and therefore “the difficult part of developing systems is not building them but, rather, knowing what to build, namely focusing on users’ needs and requirements.”<sup>59</sup>

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<sup>56</sup> Liu et al. 2010, 126.

<sup>57</sup> A. Cavender, R. Ladner, and E. Riskin, “MobileASL: intelligibility of sign language video as constrained by mobile phone technology.” *Proceedings of the 8th International ACM SIGACCESS Conference on Computers and Accessibility*, 23-25 Oct. 2006: 72, <https://doi.org/10.1145/1168987.1169001>

<sup>58</sup> El-Kiki and Lawrence, 2008; Kujala, 2008 as cited in Chiu et al. 2010, 173.

<sup>59</sup> Armour, 2000 as cited in Chiu et al. 2010,173.

Mobile phone designs specifically could greatly benefit from considering the needs of users who are Deaf. As well as producing no adverse effects for other users, these improvements have the potential to improve everyone's experience.<sup>60</sup> Specifically, mobile phones could be trained to perceive environmental sounds such as fire alarms and doorbells, and then to "output this information via a non-sound channel (e.g., through visual display or vibration)," specifically noting the importance of developing these visual and vibrating alerts.<sup>61</sup> This suggestion was supported by study participants, who indicated a desire for the following new mobile phone functions: "kickstand, SMS emergency announcements, MMS emergency announcements, doorbell announcements, and fire announcements."<sup>62</sup>

When it comes to wireless networks, according to Cavender et al., fundamentally, "fair access to the cell phone network means utilizing the already existing network such that Deaf people can make a mobile video call just as a hearing person could make a mobile voice call: without special accommodations, more expensive bandwidth packages, or additional geographic limitations."<sup>63</sup>

Finally, Maiorana-Bases and Pagliaro summarize their recommendations as such:

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<sup>60</sup> Liu et al. 2010,116.

<sup>61</sup> Ornella and Stephanie (2006), cited in Chiu et al. 2010,173.

<sup>62</sup> Liu et al. 2010, 124.

<sup>63</sup> Cavender, Ladner, and Riskin (2006), 72.



“In order that this “digital divide” does not further itself to become “digital marginalization,” we urge legal, educational, and humanitarian professionals in both the hearing and deaf communities to work to create full and equal access to technology and the Internet so that DHH persons worldwide can participate fully and successfully in society. This includes requirements for captioning of all videos uploaded to the Internet. We appeal to those in business, health, and education in particular to be conscious of the needs and wishes of the deaf community when designing courses, interventions, and Web sites. We suggest, specifically giving consideration to the balance of images to text, and to bandwidth requirements as most DHH persons use the Internet at home where high-speed access may not be available. Finally, it is imperative that ongoing, updated surveys be conducted to keep pace with technology and allow the deaf community to maintain equal opportunity.”<sup>64</sup>

Further research on topics of accessible communications technology is also recommended.<sup>65</sup>

## **Conclusion**

Ultimately, technology has the potential to “reduce isolation, increase independence, and provide educational, financial, and social opportunities” to DHHDB populations.<sup>66</sup> However, factors such as cost and product design can create barriers to technology use for people with disabilities, making them effectively unusable. Greater attention to the specific needs of people who are DHHDB and to addressing the specific barriers and limitations identified above is vital in order for new technology developments to be truly accessible and for access to be equitable.

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<sup>64</sup> Maiorana-Basas and Pagliaro (2014), 409.

<sup>65</sup> For example, the CRTC is pursuing such research, and is continually compiling an Accessibility Research List Database:

[https://surveys.advanis.ca/asllsq?utm\\_medium=email&utm\\_source=sharpspring&sslid=MzSwMDM1MDI1MTa2BAA&sseid=M7S0MDIxNTY3MwYA&jobid=55e96172-feac-4d7d-816d-b8ed6e020bc8](https://surveys.advanis.ca/asllsq?utm_medium=email&utm_source=sharpspring&sslid=MzSwMDM1MDI1MTa2BAA&sseid=M7S0MDIxNTY3MwYA&jobid=55e96172-feac-4d7d-816d-b8ed6e020bc8)

<sup>66</sup> Maiorana-Basas and Pagliaro (2014), 400.

## Examples of Emerging Assistive Communications Technologies

In today's increasingly digital world, technology evolves rapidly. The past few years have seen the release of many new accessible technologies to the market, as well as the improvement of older systems. This section of the report provides a brief overview of some of these new developments and devices. The list is not exhaustive, but rather is a sample of innovations demonstrating the scope and breadth of innovation taking place in the field of emerging accessible technologies.

### Audio amplification devices

Hearing aids are perhaps the most widely recognized type of assistive technology designed for people with limited hearing. Their history dates back to the 17th century, when ear trumpets first originated. Recently, some companies have begun incorporating artificial intelligence (AI) technology into their hearing aids. The addition of AI allows the device to, among other things, better distinguish between sounds users want amplified and those they want filtered out. The particular model produced by Starkey also includes a microphone, and boasts added features including the ability to transcribe what it hears, and the capacity for simultaneous translation.<sup>67</sup> In all, the possibilities opened up by hearing aids augmented with artificial intelligence are numerous, and make it all the more realistic for them to serve not just as sound amplifiers, but as sound modifiers as well.

While recent innovations like AI promise many future improvements to hearing aids, for many people there are still barriers to accessing hearing aids that deserve bearing in mind. Despite their age and widespread use relative to other assistive technologies, the cost of these devices can reach over \$5,000 a pair, which is prohibitive to many. With recent studies linking hearing loss and cognitive decline, the availability of these devices becomes an even larger public health concern that deserves more serious attention.

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<sup>67</sup> For example, <https://www.starkey.com/hearing-aids/livio-edge-artificial-intelligence-hearing-aids>

PSAPs (Personal Sound Amplification Products) are a new type of sound amplification device whose cost is substantially lower than that of a traditional hearing aid. They can be bought without a prescription, similar to reading glasses.<sup>68</sup> They cost less than traditional hearing aids, largely because they have fewer features and are generally less technologically sophisticated than traditional hearing aids. Despite their limitations, we consider this technology emergent because of the incredible increase in audience and ubiquity their low cost allows.<sup>69</sup> Furthermore their potential role as a disruptive technology in the mainstream would potentially accelerate innovation in that space (such as the potential for integration with smartphone apps that would consider factors such as geolocation). They are currently widely available in the US, but not in Canada.

## **Alerting services**

### **Emergency alerts**

Emergency alerting systems are an important arena for assistive technology development. Traditionally, emergency messages have been broadcast on radio or television, often with limited Sign language interpretation or captioning. The availability and now near-ubiquity of smartphones and digital technologies offers a new tool with which to pass along emergency messages accessibly, not to mention more broadly and more immediately.

Emergency alert phone applications, such as HipLink, offer an alternative format to radio or TV for emergency messaging.<sup>70</sup> In this system, emergency messages are distributed as text through an encrypted push notification instead of a live broadcast. For this reason, there is no need for captioning. Smartphones are already well-equipped to notify DHHDB users of these notifications through visual and vibrational cues (which can also be perceived tactilely through a braille dynamic display connected to the smartphone), so there is little need for other add-ons. Either also has the capacity to include links to Sign language versions of the messages.

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<sup>68</sup> Interview by David Berman with Vint Cerf, Vice President, Google Inc.

<sup>69</sup> The low cost means not only that some users can now afford to purchase a pair, but that many users could afford to purchase multiple sets, to keep in multiple places at home, at work, or elsewhere.

<sup>70</sup> See more at <https://www.hiplink.com/landing-emergency-alerting>

While phone applications provide a useful alerting system for topics such as emergency weather warnings and child abduction alerts, they require drafting and take time to prepare. Sometimes, more urgent communications are needed, such as notifying occupants of a building of a fire or an armed intruder. Many schools and workplaces have public address (PA) systems, including speakers that relay real-time emergency messages. Most traditional PA systems are not fitted with screens to provide video or text accompaniment to these messages. When lacking, this leaves people who cannot hear messages uninformed and vulnerable.

There are examples of PA systems that are part of many current dynamic public information systems (for example, in the main train stations and airports in Washington, DC), including a mode where such messaging appears in text or augmented with icons or illustrations.

ConvoAlert is one such emergency alert system currently in development, and is designed for use in schools, workplaces, and other organizations. Adopting principles of universal design, it uses animated icons, visual cues, and sounds to relay emergency messages in an accessible way. While the product is still under development, its mission to create widespread accessible alerting is promising.

## **Telecommunications alerts**

Alerting mechanisms are, of course, important in everyday life, not just emergencies. Many alert technologies designed for everyday devices are auditory; however, alternatives are becoming increasingly available. The most simple of accessible telecommunications alerts might be the vibration setting on a smartphone, whose usefulness is obvious to hearing as well as DHHDB populations.

Smartwatches and fitness trackers can offer an extension of these vibration alerts, as they are wearable and therefore users can receive notifications even when their phone is not with them. For those without a smartwatch, products like Ditto, a small pod which can clip to clothing or be placed in a tiny pocket, relay alerts from a smartphone by vibrating in customizable patterns. These remote alerting options allow users to leave their phone in a bag, on a table, or in another room, and still be alerted of new messages. Innovations like the Soundshirt, a shirt with 30 sensors which “lets deaf people feel music on their skin,” demonstrates that even more immersive ways of converting audio information into tactile information are feasible.<sup>71</sup> It is the harbinger of even more sophisticated (and hopefully more economically accessible) vibrational sensor technologies are still to come.

## **Alternative telecommunications accessibility**

Message relay services (MRS), in which DHHDB individuals connect with another person on a phone line with the assistance of an interpreter, are the most widespread accessible alternative to voice phone calls. These are also known as Telecommunications relay services (TRS). There are several types of MRS, some of which use text (TTY, RTT, and IP relay), and one which uses Sign language (VRS).<sup>72</sup> The FCC identifies eight types of TRS, and lays out mandatory minimum standards for TRS providers.<sup>73</sup>

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<sup>71</sup> “The sound shirt lets deaf people feel music on their skin,” *designboom* (no date). Retrieved from <https://www.designboom.com/technology/cute-circuit-deaf-people-feel-music-skin-soundshirt-haptic-sensors-10-04-2019/>

<sup>72</sup> CRTC, “Message Relay Services,” <https://crtc.gc.ca/eng/phone/acces/mrsrt.htm>

<sup>73</sup> FCC, “Telecommunications Relay Service - TRS,” <https://www.fcc.gov/consumers/guides/telecommunications-relay-service-trs>

TTY, IP relay, and VRS are already well established in Canada, while RTT is still emerging. RTT allows characters to be transmitted instantly, as they are typed. The recipient can read the text while the sender is still typing.<sup>74</sup> This is especially useful for people with a hearing or speech disability that have been relying on TTY for that type of interaction. It will ultimately replace TTY in the coming years, and currently has limited support in the US.<sup>75</sup> Its adoption in Canada is anticipated soon; the CRTC has directed Canadian wireless service providers to implement RTT-based 911 service in Canada by 31 December 2020 (supporting wireless devices that natively support RTT).

Advancements in MRS technologies come in several forms. Firstly, the devices required to use them can be improved upon; for example, videophone devices for VRS services can become even more advanced, with added functionality and improved resolution, like those created by California's ZVRS. Secondly, these systems can better integrate with other technologies. iOS devices with VoiceOver enabled, as well as Android devices with TalkBack enabled and/or BrailleBack installed, can now pair with many types of braille displays.

Alternatives to these MRSs also exist. Only available in the US, the Captel telephone is a desktop handset that includes a large screen to display text, and which automatically connects to a professional captioning service when a conventional phone call is placed or received. A human captioner types out a realtime transcript of the call on the phone's video screen. There is no way to type into the machine, so users on both ends of the call must speak into their phones. Having a Captel machine makes it possible for English speakers who are Deaf or hard of hearing to make and receive conventional phone calls, with anyone.

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<sup>74</sup> *Real-Time Text: Improving Accessible Telecommunications*, Federal Communications Commission (FCC), <https://www.fcc.gov/sites/default/files/real-time-text.pdf>

<sup>75</sup> *2019 Sprint Real-Time Text Talking Points*, Sprint, <https://www.sprintrelay.com/news/announcements/2019-sprint-real-time-text-talking-points>

Video call services like Skype, FaceTime, or Glide have also provided an important step forward in telecommunications accessibility for Deaf people using Sign language, whether on desktop or on large screen smartphones and tablets. Because video calls allow users to see each other, people who know the same Sign language can communicate, as well as potentially lipread those participants who are not literate in a Sign language. Importantly, this means that calls can be made at any time without needing to wait for an interpreter to become available, while using technology with which many people are already familiar. However, oftentimes the video quality is not sufficient for smooth communication.

While they are not strictly a telecommunications technology nor designed as an assistive technology, smart home kits (such as Google Home and Amazon Alexa) can perform many assistive functions and offer solutions to many accessibility challenges. Because the systems in smart home kits are interconnected, they can perform alerting functions in a myriad of new ways. For example, the company SquareGlow has designed a square light box connected to transmitters which turns different colours based on different types of alerts. Smart light bulbs like Hue bulbs can be programmed to perform a similar function, or even to blink when a smart doorbell (such as a Google Nest or Ring) is rung, or to turn a different colour when a certain type of notification arrives on a smartphone. These convert traditionally auditory alerts into visual or tactile ones, which can be useful for everyone and especially for people who are DHHDB. Some new technologies even offer sound recognition, where a monitoring device is trained to recognize certain sounds in your home (such as a smoke alarm, glass breaking, a dog barking) and to integrate with other systems to send out notifications when those triggers are present. These systems serve as examples of how technologies designed for typically abled populations can function accessibly when they are thoughtfully designed and properly set up.

## Other Sign language interpretation and captioning developments

For DBDHH individuals who use Sign language, access to Sign language interpretation is often necessary. Traditional onsite interpretation services are extremely useful, but often require booking in advance and are costly and require the interpreter to travel. In medical emergencies, such as an epidemic, such travel is often simply not feasible. Some regions may also lack qualified interpreters in a given sign language, and so interpretation may not be available at all when it's needed.

Newly available on-demand Sign language interpretation through video addresses these gaps. Sign language interpreters can provide their services from anywhere in the world, to anywhere in the world with sufficient high quality data service. Because they do not need to travel to accompany a person who is DBDHH, they do not require pre-booking and so the cost of their services are lower.<sup>76</sup> The same is true of captioning services such as the Canadian Hearing Services “Communication Access Realtime Translation” (CART) service, which offers remote professional captioning for in-person events including meetings, classrooms, and conferences. The company SignGlasses has taken this concept even further by developing a pair of smart glasses for students to see a live video of a remote interpreter overlaid onto their classroom.

Finally, whenever video captioning is provided, it is not just the quality of the captions themselves that matter, but the way these captions appear on screen. The ability to customize the font type, size, and colour of captions is an important feature in making them fully accessible to users. While not all televisions provide this capability, most streaming services now provide this option.<sup>77</sup>

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<sup>76</sup> For example, The DeafTawk startup out of Pakistan uses human sign language interpreters, but takes advantage of video platforms to provide interpretation services from a distance. The company aims to address the lack of available qualified sign language interpreters in Pakistan with a technological solution, but also by increasing interpreter capacity. For more information, see <https://deaftawk.com/>

<sup>77</sup> J. D. Biersdorfer, “Closed Captions You Can Actually See,” *New York Times*, March 9, 2018, <https://www.nytimes.com/2018/03/09/technology/personaltech/closed-captions-size.html>



In addition, “smart” televisions are gaining the feature set that allows the consumer to customize the appearance of captions. For example, the Android TV platform (in use by major manufacturers such as Sony and Samsung) allows Canadian users to set many preferences for captions, including typeface, size, colour, background, transparency, and outline. Similarly, PVR services (such as Rogers’ Infinite service) provide the same set of preferences.

### **Tools That Use Artificial Intelligence**

With the growing prominence and sophistication of artificial intelligence (AI), it is inevitable that developers would try to take advantage of these technologies when developing new assistive tools. Artificial intelligence can offer many benefits, but the same cautions that apply to developments for typically abled people need also be considered when creating and applying assistive technology. Most importantly, artificial intelligence is not and cannot be a suitable replacement for human intelligence where critical thought and interpretation is required.

### **Avatar Interpreters**

A first example of such AI tools is avatar interpreters. Avatar interpreters are computer models which aim to mimic the role of a human Sign language interpreter by automatically translating speech into Sign language, then using a digital animated figure to sign that translation. This technology was originally developed by IBM, who unveiled their “Say It Sign It (SiSi)” avatar prototype in 2007. The goal of these avatar projects is to replace human interpreters where appropriate, providing a lower cost alternative to human translation.

While this technology is perhaps promising, any decision to make use of it should be made cautiously. Sign languages are, like any spoken language, fully-formed independent languages with complex structures. They are not the direct equivalent of any spoken language, and as there is no exact word-to-sign equivalent, their translation requires interpretation. For example, avatars which only have the ability to fingerspell will never be able to fully represent any Sign language, nor communicate at an adequate speed. The same limitations of automated translation engines which work with text languages apply to Sign language translation. Translations into and from Sign languages, like any spoken language, are of the highest quality when they are produced by skilled, trained, human interpreters.

That said, while human Sign language interpreters provide the highest quality Sign language interpretation, there is a significant time and monetary cost involved in their services. This unfortunately means that many projects which do not strictly require but could still benefit from translation, are never translated. Human interpreters inarguably provide the highest quality, most accurate interpretive services, but there are cases when automated sign language may be appropriate. For example, the WFD and WALSI agree that signing avatars may be an appropriate delivery method for “pre-recorded static customer information, for example, in hotels or train stations where instructions might be given about where to check in or queue up.” These avatars can also be used in video games and other animated environments to increase accessibility of the gameplay experience. In brief, these groups argue that signing avatars may be suitable in cases where there is no live signing or interaction required, and where Deaf people have been consulted to ensure that the signed messages are appropriate and clear, and where there is no danger to health or safety.

Where avatars are used to deliver signed messages that have been automatically translated, such as in the case of SiSi technology, they serve a similar purpose to automated text translation engines; they can provide value to many situations by easily and freely giving users the sense of a text’s general ideas and concepts. Just like text translation engines, they should never be used in place of a human translator where a high-quality, professional interpretation is required. Instead, avatars are better used to deliver strings of pre-recorded message snippets where the language used and typical combinations of signs have been vetted by a human interpreter.

### **Captioning Using Artificial Intelligence**

A similar logic can be applied to AI captioning. Captioning has long been a staple of video accessibility, and traditionally these captions are authored by humans -- either in real time in the case of live transmissions, or in post-production in the case of pre-recorded videos. Manual captioning by a human interpreter provides the highest quality and most reliable captioning. However, the process is labour-intensive and time-consuming.

The growing availability of AI technology has allowed for the development of AI captioning. While its accuracy is lower, it allows for real time on-demand captioning on a larger scale than human captioning can offer. This is not to say that machine captioning is a sufficient replacement for professional manual captioning; in most cases, it is not. There are many examples of the overuse or misuse of AI captioning tools which have resulted in captioning so inaccurate that the video is unintelligible or misleading to a DHHDB audience. That said, the quality of machine-generated captioning, now augmented by deep learning, is continuously improving. This allows us to caption many things which have not been captioned before: for example, voice and video calls made through Skype or Google Hangouts Meet, and live in-person conversations using Google Live Transcribe.

In 2018, the FCC proposed using automated speech recognition (ASR) in place of live captioning assistants for its Internet Protocol Captioned Telephone Service (IP CTS).<sup>78</sup> This is met with criticism from many DHHDB communities, who protest that this type of captioning would not be able to provide a functionally equivalent service to a voice telephone call. Nonetheless, on May 5, 2020, the FCC granted its first ASR IP CTS certification to the company MachineGenius, stating that the company has demonstrated its service “will meet or exceed the FCC’s minimum TRS standards, including those for speed of answer, transcription speed, and accuracy and readability of captions.”<sup>79</sup>

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<sup>78</sup> Stefani Kim, “FCC Proposes Automating Phone Captioning,” *The Hearing Review*, 1 August 2018, <https://www.hearingreview.com/hearing-products/amplification/amplified-caption-phones/fcc-proposes-automating-phone-captioning>; and, Zack Budryk, “Deaf activists warn against FCC push for automatic phone-captioning service,” *The Hill*, 24 September 2019, <https://thehill.com/policy/technology/462810-deaf-activists-warn-against-fcc-proposal-to-automate-phone-captioning>

<sup>79</sup> *FCC Grants Conditional, First-Ever Certification For IP Captioned Telephone Service Using Only Automatic Speech Recognition*, Federal Communications Commission (FCC), 5 May 2020, <https://docs.fcc.gov/public/attachments/DOC-364163A1.pdf>

Integration of AI captioning tools also has the potential to positively impact the chronically low employment rate of persons with disabilities compared to the general population. For example, we are aware of at least one case where live AI captioning integrated into incoming VOIP calls has made it possible for a Deaf person to act in the role of receptionist at a Canadian company.<sup>80</sup>

Ultimately, the captioning in these tools is no replacement for professional human interpretation, and should never replace manual captioning where an accurate and high-quality transcript is required, but the improved accessibility it offers these tools is still valuable. Recognizing the limitations of captioning purely conducted using AI, some companies now offer captioning services that take advantage of AI for an initial draft of the transcript, which is then edited by human interpreters in real-time.<sup>81</sup> Taking advantage of AI to produce a draft means that captions can be produced faster, while the human captioners involved can ensure that the captions are of a high quality and can take into account contextual information when editing the transcript. Clients of this service can indicate whether they prefer captions to be produced faster, or at a higher accuracy, or even at a happy medium between the two. Further development and refinement of these tools has the potential to produce high quality captions which take advantage of technology advancements while still respecting the need for human interpretation.

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<sup>80</sup> David Berman Communications, Ottawa, successful demonstration of a Deaf team member using Dialpad VOIP, Dialpad for Windows software, Jabra headset, February 2020.

<sup>81</sup> For example, two companies doing such work are Verbit and Scribe.

## **Translation from Sign languages**

A repeated accessibility project theme taken on in recent years is the idea of a signing or “talking” glove. In this type of project, engineers create a glove with sensors to detect hand movements, and these hand movements are fed into software which attempts to translate them into a text-based language. In creating these gloves, designers often express the hope that “people in the deaf community will be able to communicate effortlessly with those who don’t understand their language” as a result. The idea of the talking glove has been revisited time and time again since its first iteration designed by Stanford in 1988, and while the technology used has become increasingly advanced, the overarching concept of these gloves has stayed the same.

These projects are often lauded by the hearing community and media. However, while designers may have a well-intentioned desire to create accessible technology, this type of project is fundamentally flawed and simply does not address any need or wish of the Deaf community. The reasons are manifold: firstly, it is a misunderstanding of how signed languages work. The focus on the hands forgets the other parts of the body that play a key role in communication, including movement of the eyebrows, torso orientation, and facial expression/mouth movement. In a statement by the WFD and WALSI on the importance of human interpreters, they explain that “individuals who are fluent in a signed language and qualified to present information on particular subjects not only use the hands, arms, shoulders and torso, movements of the head, facial expression and mouth patterns, but also include cultural information where necessary to convey the intended meaning contained within a message.” Just as spoken word recognition software would not work if it only focused on lip movement, and did not recognize movements of the cheeks, tongue, or vocal cords, a Sign language recognition software cannot work if it only recognizes hands. It also can never account for the cultural and linguistic context brought to translation by human interpreters. Furthermore, while Sign language users use complex combinations of signs to communicate, these projects often limit themselves entirely to fingerspelling. This would be the spoken language equivalent of recognizing only letters of the alphabet spoken out loud, which would require speakers to spell out each word they say, and is therefore not sufficient to translate any language as a whole. To be more precise, it is even weaker than that, as the fingerspelled version of thoughts, spelled out in a supporting written language (for example, English supporting ASL), can only approximate the rich nuance of full Sign language expression.

Perhaps most fundamentally, these glove projects are not led by and do not consult with Deaf people. If they did, developers would likely recognize the futility of these projects and choose to focus their energies elsewhere. This not only results in wasted time and resources, but some have argued that “the development of a technology based on a Sign language constituted cultural appropriation. College students were gaining accolades and scholarships for technologies based on an element of Deaf culture, while Deaf people themselves are legally and medically underserved.”<sup>82</sup> These gloves are simply examples of technologies designed by hearing people to meet the needs of a community they have not made an adequate attempt to understand, and as such they cannot expect to yield a useful solution.

A better focus for automatic translation of Sign language would be projects like SignAll, which uses cameras to record and interpret the movements of all parts of the body used in Sign language, not just the hands. Importantly, the project is a collaboration with Gallaudet University, a promising indicator that the needs of DBDHH people are a fundamental consideration of the development of this system.

Ottawa’s Lionbridge is conducting research in their Sign Language Video Research Study. They are experimenting with having an AI learning engine analyze 5-minute conversations of a group of 4 to 6 people chatting on Zoom video in ASL (presumably in conjunction with an English adaptation of the conversations). The goal is to discover what is possible when machine learning tries to learn to roughly translate ASL to English, taking into account all of the facets of Sign language expression. Their 2020 study hoped to include approximately 500 participants proficient in ASL, paid to participate each in a series of conversations.

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<sup>82</sup> Michael Erard, “Why Sign-Language Gloves Don’t Help Deaf People,” *The Atlantic*, 9 November, 2017, <https://www.theatlantic.com/technology/archive/2017/11/why-sign-language-gloves-dont-help-deaf-people/545441/>

Of course, there are many more technologies being developed than can be listed in this report. The devices mentioned above are all electronic in nature, but assistive devices for DHHDB people do not need to be electronic to be innovative. For example, at the time this report was completed during the global COVID-19 pandemic, face masks built with clear plastic panels were gaining media attention. These masks facilitate communication by allowing for others to read the wearer's lips and facial expressions.<sup>83</sup> While this report focuses on electronic technologies, such low-tech innovations can be equally meaningful accessible innovations.

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<sup>83</sup> For example, see <https://safenclear.com/>; see also Kaleb Vinton, "Mount Pleasant Nurse Makes Masks for Those Hard of hearing," *9&10 News*, 10 April, 2020, <https://www.9and10news.com/2020/04/10/mount-pleasant-nurse-makes-mask-for-those-hard-of-hearing/>



# Analysis of Legislative and Regulatory Framework

## Canadian federal legislation and regulations

One of the first laws to demand accessibility in Canada is the *Canadian Human Rights Act* of 1977. The Act says that everyone has a right to have their needs accommodated without discrimination (including discrimination based on disability). Organizations in all provinces and territories are also subject to the broader and less well-defined obligations of the *Canadian Human Rights Act*. The majority of complaints accepted by grounds of discrimination by the Canadian Human Rights Commission concern accessibility.<sup>84</sup>

The *Canadian Charter of Rights and Freedoms* of 1982 further developed these rights by guaranteeing Canadians the right to equal protection under the law and equal benefit of the law. It promises this without discrimination (including discrimination based on disability).

Accessibility rights are not only legislated in these Acts that guarantee basic human rights. Specific requirements for accessibility within certain federally regulated industries are also ensured through regulations made under specific Acts such as the *Canada Transportation Act*.

Now that the federal Bill C-81 has become law as the *Accessible Canada Act (ACA)*, all federally regulated entities (such as airlines, broadcasters, and telecommunications providers) have obligations regarding accessibility and technology. Some of these entities (such as national transportation carriers and broadcasters) also have accessibility obligations that were defined pre-ACA.

Meanwhile, all federal government departments and agencies must already abide by the existing Treasury Board of Canada accessibility policies.

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<sup>84</sup> 52% of complaints in 2019 categorized as “disability”, as per <http://chrcreport.ca/by-the-numbers.php>

## Accessible Canada Act

In 2019, the *Accessible Canada Act: An Act to ensure a barrier-free Canada* came into force.<sup>85</sup> The Act benefits everyone, especially persons with disabilities, through the realization of a Canada without barriers by January 1, 2040. This is achieved through the identification and removal of barriers, and the prevention of new barriers, in the areas under federal jurisdiction, including information and communication technologies as well as communication.

Communication “includes the use of American Sign Language, Quebec Sign Language and Indigenous sign languages;” and “does not include broadcasting as defined in subsection 2(1) of the *Broadcasting Act* or telecommunications as defined in subsection 2(1) of the *Telecommunications Act*... American Sign Language, Quebec Sign Language and Indigenous sign languages are recognized as the primary languages for communication by deaf persons in Canada.”<sup>86</sup>

The ACA obligates specific departments and agencies.

The Canadian Radio-television and Telecommunications Commission (CRTC) continues to manage the accessibility of broadcasting and telecommunications services federally, as well as gaining new responsibilities for accessibility plans and progress reports. The Government may also give new powers to the CRTC, as part of the review of the legal framework for broadcasting and telecommunications announced within the 2017 federal budget. The CRTC has an obligation to have a regulation in place that supports its ACA obligations by July 11, 2021.<sup>87</sup>

The Canadian Transportation Agency (CTA) continues to be responsible for compliance and enforcement of accessibility in the transportation sector. The ACA affords the CTA stronger powers to do so.

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<sup>85</sup> Kerri Joffe, “Accessible Canada Act Receives Royal Assent!” *ARCH Alert*, 20(2), 12 July 2019, [https://archdisabilitylaw.ca/arch\\_alert/arch-alert-volume-20-issue-2/#accessible-canada-act-receives-royal-assent](https://archdisabilitylaw.ca/arch_alert/arch-alert-volume-20-issue-2/#accessible-canada-act-receives-royal-assent)

<sup>86</sup> *Accessible Canada Act*, S.C. 2019, c. 10, s.5.1(1)(a) and s.5.1(2): <https://laws-lois.justice.gc.ca/eng/acts/A-0.6/index.html>

<sup>87</sup> *Accessible Canada Act*, S.C. 2019, c. 10, s. 45(1.1), 54(1.1), 63(1.1): <https://laws-lois.justice.gc.ca/eng/acts/A-0.6/index.html>

The ACA calls for the Government of Canada to appoint an Accessibility Commissioner, which it has done. As a member of the Canadian Human Rights Commission, the Accessibility Commissioner reports to the Minister, who handles compliance, enforcement, and complaints about regulated entities. The Minister is in charge of the Act for all other federally regulated sectors (in other words, not those governed by the CRTC and the CTA). The Minister also is responsible for employment and built environment issues for all federally regulated sectors.

Parliament has a responsibility to review the Act five years after the first regulation goes into force.

These are the organizations regulated by the Act (“regulated entities”):

- Parliament, Senators, and Members of Parliament (and their constituency offices)
- The Government of Canada, including government departments, Crown Corporations, and agencies
- Private sector organizations that are federally regulated (including organizations in the transportation sectors, broadcasting and telecommunications services, and the banking and financial sectors)

The Act also outlines what changes need to be made to specific other existing Acts, in order to align with the ACA, while not weakening their existing provisions. For example, the ACA prescribes changes to the *Canadian Human Rights Act*, supporting its goals, while not weakening it.

An analysis was conducted on pertinent Canada’s federal legislation and regulatory framework. ARCH Disability Law Centre led a federally funded project on regulatory development pursuant to the Accessible Canada Act, to which CAD-ASC is a partner. A full analysis is available within the document *Recommendations for Strengthening Bill C-81, the Accessible Canada Act (2018)*.<sup>88</sup>

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<sup>88</sup> *Submission – ARCH’s Recommendations for Strengthening Bill C-81, the Accessible Canada Act (2018)*, ARCH Disability Law Centre, <https://archdisabilitylaw.ca/resource/archs-recommendations-for-strengthening-bill-c-81-the-accessible-canada-act/>

## Languages acts

Canada's *Official Languages Act*, originally passed in 1969, has as its core purpose the respect of English and French as the official languages of Canada, and supporting English and French linguistic minority communities. It also requires that federal organizations, including Parliament, offer services and make public documents available in both English and French.

Canada's new *Indigenous Languages Act* of 2019 works in concert with existing official languages legislation. Its arrival should trigger discussion of the apparent deficit in speech synthesizers and tactile alphabets for Canada's Indigenous language communities.

## Broadcasting Act, Telecommunications Act, Radiocommunication Act, and upcoming changes

Broadcasting legislation in Canada originated in 1932 with the creation of the CBC. The *Broadcasting Act* only came into force in 1968, creating the CRTC and assigning it regulatory powers. This Act has four parts covering: broadcasting policy generally; the CRTC and its regulatory powers; the CBC and its powers; and amendments.<sup>89</sup>

The CRTC, which became Canada's broadcasting regulator in 1968, was subsequently given the power to regulate telecommunications in 1976. The *Telecommunications Act* was not passed until 1993, marking the first time that telecommunications carriers were regulated under a single Act. This 1993 Act importantly includes definitions of telecommunications services, as well as regulatory provisions related to forbearance power and requirements for Canadian ownership.<sup>90</sup>

The *Radiocommunications Act* was originally passed in 1985, and was amended in 1993 to make reference to the *Telecommunications Act*, as both pieces of legislation had similar policy

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<sup>89</sup> *The Broadcasting Act: Structure and Background*, presentation by Industry Canada, last modified 2018, <https://www.ic.gc.ca/eic/site/110.nsf/eng/00005.html>

<sup>90</sup> *An Overview of the Telecommunications Act*, presentation by Industry Canada, last modified 2018, <https://www.ic.gc.ca/eic/site/110.nsf/eng/00006.html>

objectives. In brief, the Act regulates Canada’s radiocommunication transmission facilities and radio apparatus.<sup>91</sup>

The legislation is currently under review.<sup>92</sup> The Broadcasting and Telecommunications Legislative Review Panel released its report and recommendations regarding potential changes to regulations on January 29, 2020<sup>93</sup>. Meanwhile, the current Government has also told the industry in March of 2020 that they must reduce general wireless plan rates by at least 25% within two years.<sup>94</sup>

CAD-ASC succeeded in having the NER Model accepted as the standard by which to evaluate accuracy in Canadian captioning of live TV programming.<sup>95</sup> Specifically, the Commission has established a minimum score of 98 (out of 100) for English-language live programming, based on the NER model as described in the Canadian NER Evaluation Guidelines, which is consistent with the international standard. From 1 September 2019 to 29 February 2020, broadcasters were expected to reach this accuracy rate. Beginning 1 March 2020, this expectation became a requirement.

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<sup>91</sup> *Overview of the Radiocommunication Act, R.S.C. 1985, c R-2*, presentation by Industry Canada, last modified 2018, <https://www.ic.gc.ca/eic/site/110.nsf/eng/00007.html>

<sup>92</sup> Government of Canada, (n.d.), *Broadcasting and Telecommunications Legislative Review*, <http://www.ic.gc.ca/eic/site/110.nsf/eng/home>

<sup>93</sup> Government of Canada, “Broadcasting & Telecommunications Panel releases Canada’s Communications Future: Time to Act,” news release from Innovation, Science, and Economic Development Canada, 29 January, 2020, <https://www.canada.ca/en/innovation-science-economic-development/news/2020/01/broadcasting--telecommunications-panel-releases-canadas-communications-future-time-to-act.html>

<sup>94</sup> Government of Canada, “Government of Canada takes action to offer more affordable options for wireless services,” news release from Innovation, Science, and Economic Development Canada, 5 March 2020, <https://www.canada.ca/en/innovation-science-economic-development/news/2020/03/government-of-canada-takes-action-to-offer-more-affordable-options-for-wireless-services.html>

<sup>95</sup> CRTC, *Broadcasting Regulatory Policy CRTC 2019-308*, 30 August 2019, <https://crtc.gc.ca/eng/archive/2019/2019-308.htm>

## Canadian provincial legislation

The Province of Ontario was the first region in the world to regulate ICT compliance for the general private sector (not just specific federally regulated industries), making it a bellwether for regulatory compliance worldwide.<sup>96</sup> The Government of Ontario enacted the *Accessibility for Ontarians with Disabilities Act* (AODA) on June 13, 2005.<sup>97</sup> Precise regulations called *Integrated Accessibility Standards Regulations* (IASR) 191/11 came into force on July 1, 2011.<sup>98</sup> These regulations include specific descriptions as to which organizations must make their electronic products compliant. The regulations specify what type of web content needs to conform, by what deadlines, and to what level.

In Ontario, many organizations (private sector, non-government organizations, and all levels of government) are mandated that all their staff must have basic accessibility awareness training. This is typically a short online self-directed course.

Outside of Ontario, various provinces are developing their own provincial accessibility acts and regulations, including the *Accessibility for Manitobans Act* (AMA Bill 26, 2013), the *Nova Scotia Accessibility Act* (Bill 59, 2017) and the *British Columbia Accessibility Act* (Bill M 219, 2018).

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<sup>96</sup> W3C's thewebindex.org project, for whom David Berman studied accessibility legislation from over 40 countries.

<sup>97</sup> *Accessibility for Ontarians with Disabilities Act*, S.O. 2005, c. 11, <https://www.ontario.ca/laws/statute/05a11/v1>

<sup>98</sup> *Integrated Accessibility Standards*, O. Reg. 191/11, <https://www.ontario.ca/laws/regulation/110191>

## U.S. federal legislation and regulations

### Americans with Disabilities Act and Revised Section 508

The *Americans with Disabilities Act* (ADA) was passed in 1991, before the Internet and ICT were ubiquitous, and so the ADA does not mention digital accessibility directly, though it does mention telecommunications. This ambiguity has resulted in many multi-million-dollar lawsuits in the U.S. regarding accessible websites, apps, documents, multimedia, and other ICT.

The U.S. has had very precise regulations in place for ICT for their federal government longer than anyone. In 1998, amendments to Section 508 of the *Rehabilitation Act of 1973* introduced specific technical rules that federal government agencies and federally-funded organizations must comply with ... a world first. In 2017, the U.S. Access Board updated Section 508 to reference WCAG 2.0, with a compliance deadline in January 2018.

Meanwhile, the U.S. Department of Justice (DOJ) has repeatedly committed to releasing rulings for ADA Title II organizations (originally by the end of 2016) and for ADA Title III organizations (by the end of 2018). Government and government-funded organizations (not just federal government, but local government as well) fall under Title II, while most US private sector organizations fall under Title III. To unpack this further, in July 2010 the Department of Justice (DOJ) released a notice of proposed rulemaking for web accessibility under the ADA, 42 U.S.C. Section 12101. To date, no rulemaking has occurred. Until the DOJ fully provides this clarity, lawsuits continue to be decided case-by-case in the courts.<sup>99</sup>

Title IV “Communications”, regulated by the FCC, requires telephone and Internet companies, in addition to their obligations under Title III, to provide a nationwide system of interstate and intrastate telecommunications relay services that allow individuals with hearing and speech disabilities to communicate via telephone, and requires closed captioning of federally funded public service announcements.<sup>100</sup>

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<sup>99</sup> (no author), “DOJ Reaffirms Position that ADA Applies to Websites,” *Level Access*, September 2018, <https://www.levelaccess.com/doj-reaffirms-position-that-ada-applies-to-websites/>

<sup>100</sup> ADA National Network, “What is the Americans with Disabilities Act (ADA)?” (n.d.), <https://adata.org/learn-about-ada>

The U.S. Department of Justice has identified WCAG as their intended measuring stick for eAccessibility regarding the ADA. Although the situation remains ambiguous, if you were to interview David Berman or any of the other couple of hundred accessibility experts who hold the CPWA certification for digital accessibility (issued by Washington's IAAP), we predict that they would all say that the DOJ will name WCAG as the measuring stick whenever a rule is made.

Today in the U.S., judges ruling on litigation regarding the private sector or non-government organizations typically end up using WCAG, PDF/UA, and U.S. *Revised Section 508* (which points to WCAG 2.0 Level AA) as the arbiter of whether a product is accessible enough. Section 504 and various state laws also often comes to bear.

Whatever the future rulemaking, companies in the U.S. are already prohibited from discriminating against persons living with disabilities, and denying them access to services on the basis of their disability.

### **21st Century Communications and Video Accessibility Act**

The U.S. *21st Century Communications and Video Accessibility Act* (CVAA) updated federal communications law to increase the access of persons with disabilities to modern telecommunications. The CVAA makes sure that accessibility laws enacted in the 1980s and 1990s are brought up to date with 21st century technologies, including new digital, broadband, and mobile innovations. The Act is organized into two Titles, one for telecommunications and one for video. The Act is governed by the FCC, which itself must provide a complaint and reporting mechanism.

#### **Title I: Telecommunications Access**

- Advanced communications services and products must be accessible by people with disabilities. This includes, for example, text messaging, e-mail, instant messaging, and video communications.
- Applies the hearing aid compatibility mandates to telephone-like equipment used with advanced communications services.



- Updates the definition of telecommunications relay services (TRS) to include people who are deaf-blind and to allow communication amongst different types of relay users.
- Makes interconnected and non-interconnected VoIP service providers contribute money to the Interstate TRS Fund.
- Forces up to \$10 million a year of the Interstate TRS Fund to be used for distribution of specialized equipment to low-income people who are deaf-blind, to enable them to access telecommunications service, Internet access service, and advanced communications.
- Authorizes the FCC to ensure reliable and interoperable access to next generation 9-1-1 services by people with disabilities.

#### **Title II – Video Programming**

- Requires video programming closed captioned on TV to also be closed captioned when streamed on the Internet.
- Requires video programming distributors, providers, and owners to broadcast emergency information accessibly for people who are blind or visually impaired.
- Expands the requirement for equipment that shows TV programs to be capable of displaying closed captions to now include devices with screens smaller than 13 inches (for example, laptops and smartphones), and requires these devices to be able to present audio descriptions and emergency information accessibly to people who are blind or visually impaired.
- Requires devices designed to record TV programs to pass through closed captions, video description, and emergency information so viewers are able to turn on/off the closed captions and video description when the TV program is played back, if achievable.

- Requires user controls for TVs and other video programming devices (including on-screen text menus and program guides) to be accessible (for example, they must have a button, key, icon, or comparable mechanism designated for activating closed captioning and video description).<sup>101</sup>

### **U.S. FCC (and its impact on Canada)**

The Federal Communications Commission (FCC) publishes many decisions and notices regarding accessible technologies and services that other governments can learn from.<sup>102</sup> Here are some examples of recent policy innovations that illustrate the tricky balance of embracing new technologies rapidly versus the risk of undermining carefully won standards and quality for the long term:

- 1) 10-31-17 VRS At-Home Call Handling Pilot Program Authorizations (CG Docket Nos. 10-51, 03-123) (DA 17-1068)<sup>103</sup>
- 2) 3-16-20 FCC Grants Temporary Waiver of Certain TRS Rules During Coronavirus (DA 20-281) Order<sup>104</sup>
- 3) 4-9-19 FCC Releases Report on the 2018 Nationwide Emergency Alert Test (DOC 356902)<sup>105</sup>

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<sup>101</sup> Summarized from *21st Century Communications and Video Accessibility Act (CVAA)*, FCC Consumer Drive, <https://www.fcc.gov/consumers/guides/21st-century-communications-and-video-accessibility-act-cvaa>

<sup>102</sup> *Disability Rights Office Headlines*, FCC, <https://www.fcc.gov/general/disability-rights-office-headlines>

<sup>103</sup> *Authorization Granted to CSDVRS, LLC, and Purple Communications, Inc., to Participate in the VRS At-Home Call Handling Pilot Program*, FCC Public Notice, 31 October, 2017, <https://docs.fcc.gov/public/attachments/DA-17-1068A1.docx>

<sup>104</sup> *FCC Grants Temporary Waiver of Certain TRS Rules During Coronavirus*, FCC DA 20-281, 16 March, 2020, <https://docs.fcc.gov/public/attachments/DA-20-281A1.docx>

<sup>105</sup> *Report: October 3, 2018, Nationwide WEA and EAS Test*, April 2019, <https://docs.fcc.gov/public/attachments/DOC-356902A1.docx>

FCC leadership on accessibility policy and governance influences Canadian policy and what technologies are available in Canada with CRTC policies often reflecting earlier FCC policies. For example, under the Innovation, Science, and Economic Development Canada's (ISED) wireless program, ISED will accept an FCC test report for equipment already certified by the FCC provided it meets certain conditions.<sup>106</sup>

More specific to accessibility, what happens in the FCC often happens later in the CRTC. For example, the FCC's policy on phasing-out TTY relay services was announced in 2017-18 and promptly copied by the CRTC in 2018 with Canadian market modifications.

Consider how "smart" televisions are gaining the feature set that allows the consumer to customize the appearance of captions. For example, the Android TV platform (in use by major manufacturers such as Sony and Samsung) allows Canadian users to set many preferences for captions, including typeface, size, colour, background, transparency, and outline. Similarly, PVR services (such as Rogers' Infinite service, which is licensed from a U.S. company) provide the same set of preferences. Such operating system platforms and features all originate in the U.S., mostly in reaction to FCC policy.

Another example of how FCC activity can help positively influence the Canadian experience involves functional equivalent telecommunication. VRS providers presented a proposal to the FCC in 2015.<sup>107</sup> The concepts, especially speed of answer, skills based routing and deaf interpreters encapsulates how functional equivalent telecommunication may also be achieved in a Canadian context.<sup>108</sup>

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<sup>106</sup> Government of Canada, "Frequently asked questions," *Wireless Program - Innovation, Science, and Economic Development Canada*, [https://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h\\_tt00051.html#Q19](https://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h_tt00051.html#Q19)

<sup>107</sup> (no author), "With Support Of Deaf Consumers And Interpreters, VRS Providers Present FCC with Joint Proposal to Improve Service and Expand Offerings, Upholding ADA Promise Of Functionally Equivalent Telecommunication Services," *Cision PR Newswire*, 9 April 2015, <https://www.prnewswire.com/news-releases/with-support-of-deaf-consumers-and-interpreters-vrs-providers-present-fcc-with-joint-proposal-to-improve-service-and-expand-offerings-upholding-ada-promise-of-functionally-equivalent-telecommunication-services-300063301.html>

<sup>108</sup> Elliott Richman, DAANS Executive Director

## International laws and standards

### United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)

Canada is a “State Party” to the *United Nations Convention on the Rights of Persons with Disabilities, 2006*. With 163 signatories to date, it states:

“... follows decades of work by the United Nations to change attitudes and approaches to persons with disabilities. It takes to a new height the movement from viewing persons with disabilities as ‘objects’ of charity, medical treatment and social protection towards viewing persons with disabilities as ‘subjects’ with rights, who are capable of claiming those rights and making decisions for their lives based on their free and informed consent as well as being active members of society.

The Convention is intended as a human rights instrument with an explicit, social development dimension. It adopts a broad categorization of persons with disabilities and reaffirms that all persons with all types of disabilities must enjoy all human rights and fundamental freedoms. It clarifies and qualifies how all categories of rights apply to persons with disabilities and identifies areas where adaptations have to be made for persons with disabilities to effectively exercise their rights and areas where their rights have been violated, and where protection of rights must be reinforced.”<sup>109</sup>

Many laws, regulations, and standards can trace their history back to the UNCRPD. For example, the Accessible Canada Act cites Canada’s commitment to the UNCRPD. Due to Canada’s federal structure, Canada’s degree of fulfillment of its commitment to the UNCRPD is often under debate: the provinces and territories are not signatories to the Convention (nor its optional protocol) and yet many of the obligations are out of the sphere of influence of federal law in Canada. The federal accessibility legislation pertains to federal jurisdiction only; some of the CRPD’s articles are relevant for federal jurisdiction, and there are ways that those particular

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<sup>109</sup> Signatories include countries or regional integration organizations that have signed the Convention and its Optional Protocol. UN.org, *Convention on the Rights of Persons with Disabilities (CRPD)*, <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>

articles could be incorporated into federal legislation. In a paper on this topic, ARCH Disability Law Centre also states, “in addition to the Articles [relevant to federal legislation], the Convention addresses a number of important issues that fall within provincial/ territorial jurisdiction in Canada, including Article 12, which addresses legal capacity and supported decision-making, and Article 24, which addresses inclusive education. The federal accessibility legislation should address the need for the Government of Canada to develop national strategies on these issues.”<sup>110</sup>

ARCH has also produced educational materials about the UNCRPD and its advancement in Canada.<sup>111</sup> Of particular note is the Committee on The Rights of Persons with Disabilities’ List of issues document that asks Canada to report on particular issues and rights for persons with disabilities and ARCH’s commentary about it.<sup>112</sup>

### ***International Telecommunication Union standard for international relay calls***

The International Telecommunication Union (ITU) published recommendation *F.930: Multimedia telecommunication relay services* in 2018, which is a recommendation on telecommunications relay services (TRS) that covers guidelines and best practices at the country level.<sup>113</sup> However, it does not cover international calls.

At present, there is no government sponsored VRS across international borders, due to a lack of technical standards and a lack of international agreements around translation between Sign languages and other technical issues.

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<sup>110</sup> *Paper – Discussion Paper on Proposed Federal Accessibility Legislation and the Convention on the Rights of Persons with Disabilities (2017)*, ARCH Disability Law, <https://archdisabilitylaw.ca/resource/discussion-paper-on-proposed-federal-accessibility-legislation-and-the-convention-on-the-rights-of-persons-with-disabilities/>

<sup>111</sup> *Advancing the UN CRPD*, ARCH Disability Law, <https://archdisabilitylaw.ca/initiatives/advancing-the-un-crpd/>

<sup>112</sup> See List of Issues document here: [https://tbinternet.ohchr.org/\\_layouts/15/treatybodyexternal/Download.aspx?symbolNo=CRPD/C/CAN/QPR/2&Lang=en](https://tbinternet.ohchr.org/_layouts/15/treatybodyexternal/Download.aspx?symbolNo=CRPD/C/CAN/QPR/2&Lang=en);

See ARCH commentary here: <https://archdisabilitylaw.ca/initiatives/advancing-the-un-crpd/united-nations-oversight/2nd-reporting-cycle/>

<sup>113</sup> *F.930 : Multimedia telecommunication relay services*, International Telecommunications Union (ITU), March 2018, <https://www.itu.int/rec/T-REC-F.930/en>

The ITU is exploring the development of a standard for international relay calls over the next few years. Many leaders in the Deaf community would argue the most important technological challenge to tackle today is to eliminate the barriers for country-to-country VRS communication, overcoming the hurdles of different Sign languages, non-aligned regulations from country-to-country, and non-aligned technical standards between countries.

The biggest hurdle is that governments are averse to the cost of international interpretation and the situation is complicated by governments that are not explicit regarding that concern.

## **EN 301 549**

EN 301 549 is the most thorough and up-to-date ICT accessibility standard in the world today.<sup>114</sup> ETSI led its development, under contract by the European Commission, in support of the Commission's obligation to create or secure an ICT accessibility standard.

EN 301 549 was originally developed to support accessible procurement of all ICT, and therefore it covers more than just websites, extranets, intranets, documents, and apps. The 2018 version of EN 301 549 was adopted by the Commission in 2018 as the harmonized standard that would provide presumption of conformity to the EU member states under the EU's Web Accessibility Directive (for websites, extranets, intranets, documents, and apps).

The 2019 version (v3.1.1) was commissioned at the same time as the 2018 version. The update was carried out in two stages to allow the update of the Web portion (including WCAG 2.1) to be completed in time for adoption by the Web Accessibility Directive deadline. The 2019 version better includes, among other areas, mobile and non-ICT web (such as telecommunications devices and televisions), and better coverage for various situations, such as speech impairment, cognitive disability, deafness, hard of hearing, and deafblindness.<sup>115</sup>

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<sup>114</sup> Interview by David Berman with Gregg Vanderheiden, lead author of WCAG, World Wide Web Consortium (W3C)

<sup>115</sup> Interview with Gregg Vanderheiden

Over a period spanning more than five years, EN 301 549 was developed in careful coordination with the U.S. Access Board's development of the *Revised Section 508* (the legislation supported by TTV5), resulting in intentional harmonisation between the two, with both referencing similar standards and functional accessibility statements. The U.S. Access Board intends to harmonize further with EN 301 549 in the future.<sup>116</sup>

EN 301 549, just like *Revised Section 508*, names WCAG Level AA as a normative standard for website accessibility (and also names WCAG2ICT as a reference standard for non-Web ICT, such as telecommunications devices). It bases many of its provisions for documents and software on WCAG as well.<sup>117</sup>

*EN 301 549* points to WCAG 2.1, while *Revised Section 508* points to WCAG 2.0 (WCAG 2.1 had not yet been finalized when *Revised Section 508* was finalized).

EN 301 549 and *Revised Section 508* are both referenced in the standard accessibility conformance report format called a *Voluntary Product Accessibility Template* (VPAT). The format was originally developed by the U.S. government and the Information Technology Industry Council (ITI). The current version of VPAT supports both EN 301 549 and *Revised Section 508* (with template variants available to cover each or both, as needed).<sup>118</sup>

There are no fees required for governments to adopt or endorse EN 301 549, and it has now been adopted by governments in non-EU countries such as Australia and Mexico.<sup>119</sup>

### **EN 17161: Design for All standard**

EN 17161, 2019, *Design for All - Accessibility following a Design for All approach in products, goods and services - Extending the range of users*, is a non-normative standard for universal design that is being adopted across the EU. It includes examples spanning all types of disabilities and age groups. This Design For All standard in many ways formalizes topics

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<sup>116</sup> Interview with Gregg Vanderheiden

<sup>117</sup> Interview with Gregg Vanderheiden

<sup>118</sup> Interview with Susanna Laurin, Global Leadership Council, International Association of Accessibility Professionals (IAAP)

<sup>119</sup> Interview with Susanna Laurin.

expressed in the *Communications Lens Guidelines*, as well as following through with specifics to topics opened up in the *Communications Lens Guidelines*.

## **WCAG 2.0**

The version of WCAG cited most often in regulations is WCAG 2.0. Almost every government in the world that has digital accessibility regulations that apply to public or private sector organizations uses WCAG to gauge compliance.<sup>120</sup>

To reach Level A compliance, a product must conform to all 25 Level A success criteria. To reach Level AA compliance, a product must conform to the Level A success criteria as well as the 13 Level AA success criteria. WCAG also has a third level: to reach Level AAA compliance, a product must conform with the Level A and AA success criteria as well as the 23 Level AAA success criteria. However, Level AAA is not generally recommended as a minimum standard.<sup>121</sup> Westudied legislation in over 40 countries and am confident that no legislation anywhere calls for Level AAA compliance.

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<sup>120</sup> W3C's thewebindex.org project, for whom David Berman studied accessibility legislation from over 40 countries

<sup>121</sup> According to W3C's Understanding WCAG 2.0, "It is not recommended that Level AAA conformance be required as a general policy for entire sites because it is not possible to satisfy all Level AAA Success Criteria for some content." See more at <https://www.w3.org/TR/UNDERSTANDING-WCAG20/>



## **WCAG 2.1 and beyond**

Version 2.1 of WCAG was finalized in 2018, though much digital accessibility legislation worldwide still references WCAG 2.0. WCAG 2.1 is made up of all the existing WCAG 2.0 success criteria, plus 17 new success criteria (5 more Level A, 7 more Level AA, and 5 more Level AAA). The new success criteria mainly address mobile and touch devices and other evolutions of technology since the release of WCAG 2.0 in 2008. It also addresses cognitive challenges better than WCAG 2.0 did. WCAG 2.2, currently under development with release targeted for Q4 2020, is structured similarly, and adds further success criteria.

## **Other foreign legislation**

Regulations vary from country to country. Every country or region in the world that does have web content accessibility legislation refers to WCAG. Some refer to WCAG 2.0 Level A, some to WCAG 2.0 Level AA, some to WCAG 2.1 Level AA, while others remain vague. Most countries don't have legislation at all, and when they do the legislation typically only applies to public-facing government websites (or to government-funded organizations or projects). However, the situation is rapidly evolving. Jurisdictions whose laws include precise regulations that apply to some or all of the private sector include: Ontario (Level A, Level AA by 2021), Australia (Level AA now) Israel (Level AA now), and Norway (Level AA now). How such laws apply to (and the degree to which they are enforced upon) organizations headquartered outside that region also vary from jurisdiction to jurisdiction.

## Analysis of Contractual agreements, terms and conditions

This section provides an overview of the accessibility discounts available from a representative sample of Canadian telecommunications companies providing mobile phone and residential internet service. Tables below summarize these plans, and further details are provided in descriptions that follow.

### Residential internet service providers

None of the major residential internet providers offer a discount specifically for people with disabilities on plans.

Our choice of plans to analyze was informed by this advice from Canada's VRS service:

“For the best images on your VRS calls, we recommend a minimum of 1.3 Megabits per seconds (MbPS) [sic] bandwidth for both upload and download. Any residential internet plan will work with Canada VRS. I also recommend to user [sic] a Wi-Fi with 5GHz. The data package that you subscribe to from your Internet Service Provider should include about 1,079 Megabytes or 1.05 Gigabytes per month for every two hours (120 minutes) that you use the service.”<sup>122</sup>

Vint Cerf, Vice President of Google, suggested higher numbers to us, pointing out the importance of considering VRS calls involving more than two people. That is why Google pushed for 1 gigabit per second for Google Fibre, in order to support 60 frames per second video, and preferably at 4K video quality. This would need a minimum of 10 Mbps for both upload and download, with substantially higher speeds being especially beneficial considering group conversations and the fact that residential internet is typically used simultaneously by multiple residents and processes.<sup>123</sup> Also of note is that “the Australian Communication Exchange VRS provides VRS broadband speeds up to 24 Mbps download and 8 Mbps upload 5

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<sup>122</sup> Email from [support@srvcanadavrs.ca](mailto:support@srvcanadavrs.ca), Canada VRS, 27 April 2020.

<sup>123</sup> Interview by David Berman with Vint Cerf, Vice President, Google Inc.

[sic], which provides a high video quality and ensures a full accessible [sic] to the telecommunication services.”<sup>124</sup>

Based on that information, 100GB of data a month would allow for approximately 190 hours of service a month, thus approximately 6 hours of VRS usage a day.

We therefore chose the cheapest internet plan from each of the major Canadian residential internet service providers that were available on the websites in April 2020 and that provided at least 100GB of data a month, at least 1.3 Mbps upload speed, and at least 1.3 Mbps download speed (as per the minimum requirements recommended by Canada VRS for successful VRS service).<sup>125</sup>

**Table 1: Cheapest VRS-capable residential internet plans from major Canadian residential internet providers**

<b>Brand</b>	<b>Name of plan</b>	<b>Maximum data per month (GB)</b>	<b>Minimum upload / download speed</b>	<b>Monthly price (without accessibility discounts)</b>	<b>Price (with accessibility discounts)</b>
Bell	Fibe 50	Unlimited	10 / 50 Mbps	\$79.95	No discount available
Cogeco	UltraFibre 40	175 GB	10 / 40 Mbps	\$83.00	No discount available
Rogers	Ignite Internet 75u	Unlimited	10 / 75 Mbps	\$84.99	No discount available

<sup>124</sup> CAD-ASC, *Telecom Notice of Consultation CRTC 2015-134: Final Intervention of the CAD-ASC*, point 10.

<sup>125</sup> Mbps is Megabits per second, not to be confused with MBps which is Megabytes per second.

Shaw	Internet 50	450 GB	5 / 50 Mbps	\$89.00	No discount available
Telus	Pure Fibre Internet 150	Unlimited	150 / 150 Mbps	\$70.00 for 24 months, then \$100.00	No discount available
Videotron	Hybrid Fibre 15	100 GB	10 / 15 Mbps	\$55.00	No discount available

**Mobile service providers<sup>126</sup>**

The accessibility discounts of most major wireless service providers consist of a \$20 discount off their most standard, mainstream mobile plan (usually costing around \$75/month before the discount). Accessibility plans from discount providers tend to vary more in cost, presumably because some discounts are already applied to their listed plan prices.

According to statements on their website, all mobile service providers and internet service providers declare compliance with the CRTC regulations that demand that consumers can easily migrate a number, unlock the phones, and pay out any remaining hardware lease without complication. The DWCC survey analysis and background report (available from CAD-ASC) for this project explores actual consumer experience with respect to these matters.

In most cases, the constraints of each plan (data limit, speed, etc.) remain the same whether the user is paying the typical pricing for the off-the-shelf plan or has an accessibility discount. Typically there is one discount plan for all customers requesting accommodation for disability (that is, no special accomodation for one disability versus another). However, Telus brings something especially valuable to the Deaf community through their accessibility plan: unlimited high-speed data when accessing the Canada VRS video relay service.

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<sup>126</sup> Data pulled from WhistleOut, <https://www.whistleout.ca/>. All prices represented are before tax.

Most plans listed below include 10GB of high-speed data. All plans with unlimited data service will reduce data speed after a certain amount of data usage. This eliminates the anxiety for all consumers of accidentally spending money for extra data in a given month. However, the reduction in speed when over the limit disproportionately impacts people who communicate using sign language over video streaming services rather than voice, as the reduction in speed slows the video to a point where sign language becomes unintelligible, effectively rendering the remaining ‘unlimited’ data useless for that type of communication.

Therefore, it is important to know how much data a typical sign language user needs a month. Opinions differ within the DHH community. Individual use varies depending upon how much one travels outside the home (thus using mobile data rather than residential wifi), and how much one uses their phone to communicate in general. Interviews with Canadian leaders in the Deaf community suggested between 8GB and 20GB<sup>127</sup>. As noted above, Vint Cerf, Vice President of Google, suggested higher numbers, pointing out the importance of considering VRS calls involving more than two people, and potentially at 4K resolution. Although it will not be technically nor economically available to all Canadians for at least another year or two, “5G technology’s ultra-low latency (the lag between sending a request and the network responding) will theoretically drop to one millisecond, 400 times faster than the blink of an eye.”<sup>128</sup>

There are some ways to affordably increase this limit, for example from 10GB to 20GB. Some providers will occasionally offer promotions increasing their high-speed data limit, such as the Freedom Mobile 85 for 75 Promo 25GB plan that was available at the time this report was written. Another creative approach is to take advantage of family plans which allow two or more plan holders to share their data “bucket”. If one person tends to use less data than the other in a given month (thus having a portion of their 10GB to share), this could free up more high-speed data for the user that needs more than 10GB that month.

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<sup>127</sup> Emails between David Berman and Lisa Anderson-Kellett, and between David Berman and Jim Roots (CAD-ASC).

<sup>128</sup> Post-interview email from Ruth Altman, Director, Consumer Policy, Rogers Communications

In many other countries, the cost of mobile data for the general public is far lower than in Canada. The experts we interviewed in those regions were not aware of any advocacy for special rates for people living with disabilities, and were surprised that it is an issue in Canada.<sup>129</sup>

The CRTC has produced a report on the accessibility of wireless mobile products, which is available on their website.<sup>130</sup>

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<sup>129</sup> Interview by David Berman with James E. Hubbard, National Disability Authority, Government of Ireland; interview by David Berman with Nagina Tahir, director, DeafTawk, Islamabad, Pakistan.

<sup>130</sup> *Mobility Accessibility Research Study*, CRTC, last modified 2019, <https://crtc.gc.ca/eng/publications/reports/19mobil.htm#1>

**Table 2: Summary of telecommunications company accessibility plans**

Based on the above information from Canada VRS, each 10 GB of data a month would allow for approximately 19 hours of VRS service a month, thus approximately 40 minutes a day of VRS usage a day at the “best” quality.

<b>Brand</b>	<b>Monthly plan name</b>	<b>Talk and text</b>	<b>High speed data</b>	<b>Price (without accessibility discounts)</b>	<b>Price (with accessibility discounts)</b>
Bell	Unlimited 10 with No Term Phone	Unlimited	10 GB	\$65/month + \$40 upfront	\$45 + \$40 upfront
Fido	Data, Talk & Text Plan with 10GB	Unlimited	10 GB	\$75/month	\$65/month
Freedom	Big Gig Unlimited 10GB plan	\$0.05/min + Unlimited text	10 GB	\$55/month plus \$20 upfront	\$55/ month + \$20 upfront
Rogers	Infinite 10GB Plan with Unlimited Canada Minutes	Unlimited	10 GB	\$75/month	\$55/month
Telus	Peace of Mind	Unlimited	10 GB	\$85/month	\$65/month
Videotron	10GB Zen Plan	Unlimited	10 GB	\$75/month + \$25 upfront	\$55/month + \$25 upfront

## Conclusion and recommendations

The arrival of the Accessible Canada Act affords a once-in-a-lifetime opportunity for Canadians to strengthen how we can use technology to improve our lives. We now live in a society where having data in your pocket is not optional: you need data to survive, whether to call for emergency responders or to call for food during a pandemic. Similarly, for all communications technologies, they have become essential workers in our day-to-day lives as Canadians, and it is therefore a human rights issue that they be accessible (both economically and technically) to all.

Here follow our recommendations. Regarding their timing, in general we urge that they be harmonized with existing deadlines that federally regulated bodies must adhere to (for example the CRTC's deadline to have a regulation in place by July 11 2021 as required by the ACA sections 45(1.1), 54(1.1), 63(1.1) to create a regulation within 2 years added).

### Recommendations

**Recommendation:** The Canadian government has already established a program where low-income Canadians with children receive residential service for \$10 a month (<https://connecting-families.ca>) with at least 100MB of data a month and 10 Mbps download speed. Some providers (for example, [Telus's Internet For Good program](#)) provide even more speed and data a month as part of their \$10 a month fee (Telus provides 25 Mbps, 300 GB). Therefore, we recommend that the government provide the same service for persons with disabilities (thus providing Deaf Canadians with affordable communications technology).

**Recommendation:** Taking into account that the EN 501 549 (2019) and EN 17161 standards, both released in late 2019, include excellent formalization of many of the ideas mentioned in the Communications Lens, we recommend that appropriate portions of those standards could be referenced within the next release of the *Communications Lens Guidelines*. Similarly, some of the latest FADS developed in Canada could also be referenced.



**Recommendation:** Advocate for the adoption of Canadian regulations poised to support the international VRS standard if and when one is adopted by the ITU, taking into account that the largest hurdle is financial rather than technical.

**Recommendation:** Improve TRS in Canada, establishing minimum standards for TRS providers that are as strong as those already set by the FCC.

**Recommendation:** Within the context of AI-assisted captioning potentially driving down quality standards for captioning, continue to be diligent in demanding high quality captioning.

**Recommendation:** Plan to study both positive and negative lessons learned from the global COVID-19 pandemic, ensuring that both the new normal and future emergency situations are permanently improved from the perspective of the DHHDB community in Canada.

**Recommendation:** The CRTC should include in their regulations that all mobile providers in Canada are exempt from the monthly data cap on all data use for all MRS services (including VRS), on all phone plans, following the example that Telus has already established in providing unlimited access to the Canada VRS video relay service.

**Recommendation:** The CRTC should require that mobile service providers reduce data costs for all Canadians, beyond the current federal government demand for a 25% drop in plan prices within two years.

**Recommendation:** Study whether PSAP uptake in Canada is possibly being discouraged by any existing regulatory hurdles.

**Recommendation:** Encourage the CRTC to adopt other appropriate policies expressed in the CVAA and its amendments, where they are stronger than Canadian policy and appropriate for Canada (for example, the depth to which CVAA requires video programming distributors, providers, and owners to broadcast emergency information accessibly for people who are blind or visually impaired).

**Recommendation:** The CRTC and the federal government should leverage technology to more effectively enforce broadcaster compliance to their obligations regarding Sign language

interpretation of emergency information (both live and pre-recorded), based on lessons learned from the shortfalls that have occurred during the COVID-19 emergency.

**Recommendation:** The federal government should consider making it mandatory for the sellers of all consumer communications technologies as well as any technologies being used in assistive technology (thus not just those technologies governed by the CRTC Wireless Code) that a longer return period be provided for people who self-identify as having a disability. Best Buy Canada is an example of a company arguably already doing so.<sup>131</sup> This will provide consumers with disabilities more time to understand, test, and determine whether these technological advancements work for them.

**Recommendation:** Explore ways that the many examples discovered during this project of how innovators are monetizing innovation accessibility can be used to encourage other players to be motivated by the potential financial dividends of innovating on their own.

**Recommendation:** Continue to advocate, citing commitments made within the Canadian Charter of Rights and Freedoms, that DDBHH Canadians have the same rights to buy, change and terminate their communication services as all Canadians.

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<sup>131</sup> Best Buy adheres to the CRTC Wireless Code of conduct and the rights of the consumer. Subject to usage restrictions set by the carriers, cell phones may be returned within up to 15 days of the purchase date, or up to 30 days after purchase for those who have self-identified themselves as a person with a disability. Access the Wireless Code of Canada: [http://www.crtc.gc.ca/eng/info\\_sht/t13.htm](http://www.crtc.gc.ca/eng/info_sht/t13.htm)

## Appendix A: Plan details for wireless plans listed in Table 2<sup>132</sup>

### Bell

#### Plan details for: Unlimited 10 with No Term Phone plan or SmartPay

The Bell Unlimited Plan includes unlimited Canada-Wide calling, unlimited nationwide text, picture and video messages plus unlimited data at reduced speed and between 10GB to 50GB of data at max data speeds. Beyond that allocated amount of full speed data, speeds will be reduced to minimum service such as light web browsing, email and texting.

All Unlimited plans are available on 2-year and no-term.

#### Accessibility Discounts

“Bell Mobility offers \$20 off per month for qualified customers with accessibility needs. Accessibility needs include: hearing, speech, vision, cognitive and physical (mobility and dexterity).

This discount can be paired with any of our current Connect Everything or Unlimited plans.

To find out if you qualify for the \$20/month discount, please contact the Accessibility Services Centre by calling 1 800 268-9243.”<sup>133</sup>

#### U.S. & Canada Calling option

Get unlimited Canada and U.S. calling on any of the Unlimited plans for an extra \$20/month.

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<sup>132</sup> Information in this appendix was pulled from [www.whistleout.ca](http://www.whistleout.ca) with permission and supplemented with information from individual vendor websites. Information from individual websites is cited below. Data is current to March 2020. Not all plans are available in all provinces.

<sup>133</sup> Accessibility discount information retrieved from [https://www.bell.ca/Accessibility\\_services/Mobile-Rate-Plan](https://www.bell.ca/Accessibility_services/Mobile-Rate-Plan)

## **Phone Prices Options**

Purchase a new smartphone with a Premium Ultra, Premium Plus, or Premium contract plan. With Premium Ultra, you will pay a lower upfront phone cost and a higher monthly fee for your data plan.

Available in-store only: Pay Less Upfront program is available on Premium Plus or Premium Ultra plans only for the latest select phones. It allows you to get a device at an even lower upfront cost and no additional monthly cost. At the end of the 2-year term, return your device to Bell and choose a new one, or keep it and repay the original Pay Less Upfront Program Amount (automatically applied to your bill).

Available in store only: Pay over 24 months with Bell Smartpay. \$0 down with any phone with no interest.

## **No Overages**

Once your high-speed data limit has been reached, you will be able to continue using your data at 512 kbps speeds at no extra charge.

## **Unlimited Talk & Text (Nationwide)**

Get Unlimited Nationwide Minutes to/from standard Canadian numbers.

Sent messages include text messages sent to a Canadian phone number while in Canada and excludes text messages sent to a U.S. or International phone number, premium messages, alerts, messages sent with a messaging application and roaming. Received messages include text messages received while in Canada and excludes roaming, premium messages, alerts or dial-up messages received from a messaging application.

## **Mobile Hotspot Capable**

Use your capable smartphones and tablets as Wi-Fi hotspots at no additional cost

### **Other Included Features**

With Unlimited Plans, the following features are also included:

- Call Display
- Message Centre
- Call Waiting
- Conference Calling

### **Additional plan information**

A one-time device activation fee applies to each member.

### **Large LTE and Wi-Fi Network across Canada**

Bell offers access to a large 4G network in Canada and covers 97% of the population, with 90% having access to the LTE Advanced network. Also, Bell offers over 4000 free hotspots across Canada to all mobile users at participating McDonald's, Chapters Indigo and Tim Hortons.

## Fido

### Plan details for: \$75 Data, Talk & Text Plan with 10GB (available with BYO/Full price phone and 2-year Fido Payment Program)

All Fido plans include:

- Unlimited Canada-wide Minutes (except Data & Text plans)
- Data (except Talk & Text plans)
- Unlimited International Text, Picture & Video Messaging

### Accessibility Discounts

“Giving you mobile plans and options that suit your needs is our commitment to you. New and existing Fido Mobile postpaid customers with special needs can obtain a \$10 a month discount on all of our in-market postpaid mobile plans by applying for our Disability Organization Membership Discount program...Once your documentation is verified and approved, a \$10/mo discount will be applied to your account.”<sup>134</sup>

Fido Home Phone and prepaid plans not eligible.

### Device Options

All plans available monthly or with a 2-year agreement:

- Purchase a new phone in 24 equal monthly payments on a 2-year term agreement with Fido Payment Program. If your phone agreement is terminated or your mobile plan is cancelled, the outstanding balance becomes due and the promo credit (if applicable) will end.
- Bring your Own Phone: Activate your unlocked phone on any plan
- Pay for your phone full price

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<sup>134</sup> Accessibility discount information retrieved from <https://www.fido.ca/consumer/accessibility/plans>

### **Unlimited International Text**

Includes messages sent from Canada on the Fido network to Canadian, U.S. and international wireless numbers. Sent/received premium messages and messages sent while roaming not included and charged at applicable rates.

### **No Data Overages**

Fido will pause your data once you've reached your limit so you won't get any data overage surprises. Valid on plans with talk, texts, and data plans (not available on data only plans).

### **Fido XTRA**

Postpaid customers get rewarded with deals and giveaways every Thursday on the Fido app.

### **Unlimited Circle Calling**

Enjoy unlimited Canada-wide calls between subscribers on the same account.

### **Other Included Features**

With Fido, the following features are also included:

- Fido Roam allows you to deduct your data, talk & text from your plan when traveling, for \$7/day in the U.S. and \$12/day in many international destinations. It is available with all postpaid plans.
- Caller Display
- Voicemail
- No Activation Fee on online orders (\$40 in-store)
- Free Shipping
- Min. \$100 Bonus Trade-in Credit in-store for customers who trade in an eligible device and purchase a new phone on a 2-year plan (not available in all regions)

### **Additional information**

The following monthly government 9-1-1 fees apply: 62¢ in Saskatchewan, 46¢ in Québec, 43¢ in Nova Scotia, 53¢ in New Brunswick, 70¢ in Prince Edward Island, 44¢ in Alberta and 75¢ in Newfoundland and Labrador.

### **Network and coverage**

The Fido Network covers more than 93% of Canadians from coast to coast. When you travel in Canada on the Fido network, your calls will not incur roaming charges.



## Freedom

### Plan details for: Big Gig Unlimited 10GB plan

This plan includes unlimited incoming Canada-Wide Minutes, unlimited global text, picture, and video messaging, 10GB of full-speed data while on the Freedom network or 500MB of full-speed data on the Freedom Nationwide network.

Freedom Mobile offers a variety of plans with large amounts of data, picture and video messaging as well as unlimited global texting. You only pay for voice if, or when, you need it. This way there are no barriers for you to stream, snap, surf, post, upload, catch up with friends via videotelephony (for example, FaceTime) or use critical assistive technologies on the go. Plus, there are no data overage fees on our Big Gig Data plans. Our Big Gig plans enable the use of Text-to-911, where available. See all plans: <https://www.freedommobile.ca/plans>

### Accessibility Discounts

None.<sup>135</sup>

### Freedom vs Nationwide Network

Get access to **all of the data, talk, text and features of your plan when on the Freedom Network.**

While connected to the **Nationwide Network** (or Partner network), you may be charged pay per use rates for some usage:

- \$50 to \$115 Unlimited plans include unlimited talk & text, up to 30GB of data on Freedom Network and a small amount of data while on the Nationwide network
- Freedom plans include unlimited text and incoming calls and a small amount of data while on Freedom network

### Phone Options

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<sup>135</sup> Accessibility discount information retrieved from <https://www.freedommobile.ca/en-CA/accessibility>

If you are looking to purchase a new phone from Freedom Mobile, choose from a selection online and create your account or visit a Freedom Mobile store or authorized retailer to purchase and activate your new phone.

### **MyTab Boost**

Choose from one of the MyTab Boost tiers to lower your phone upfront cost when you choose a higher plan.

### **No Data Overages**

Once you have reached the end of your full-speed allotment, you will continue to have access to data services at slower speeds, with no data overage fees. Get up to 256 kbps on the Freedom Network, and up to 128 kbps on the Nationwide Network or in the US for the Canada-U.S. plans.

### **Additional Features**

- Voicemail+
- Call control (Caller ID, Missed Calls Alerts, Conference Calling, Call Forwarding, Call Waiting)
- Freedom Wi-Fi Access

### **Add-Ons**

Add options to your plans if needed:

- Additional data on Nationwide network
- Extra data and roaming in the U.S.
- Extra data and roaming in Mexico and parts of the Caribbean
- Extra data and roaming in International destinations
- Discounted rates to international countries
- U.S. unlimited long distance

### **Freedom Trade-In**

Save up to \$300 on the price of a new device by trading in your old phone.

### **Referral Credit**

Refer a friend to Freedom Mobile and you will both get a \$25 credit when the person activates a new account and registers their new Freedom Mobile phone number.

### **Activation Fee**

A one-time connection fee of \$20 will apply for each new postpaid line activation.

### **Network Coverage**

You can use your Freedom service across Canada but you will get different inclusions depending on the network you are on: Freedom or Nationwide (partner networks). **You should ensure that your home or the location where you use your phone the most is within the Freedom network coverage area.**

When on the Freedom network, you can access all the plans' features.

Outside of Freedom's network, you're covered coast-to-coast on the Nationwide network: usage on partner networks is included in some rate plans and add-ons; in other cases it is charged on a pay per use basis.

## Rogers

### Plan details for: Infinite 10GB Plan with Unlimited Canada Minutes with No Tab or Edge Financing

The Rogers Infinite Plan includes unlimited Canada-Wide calling, unlimited text, picture and video messaging, unlimited data at reduced speed and 10GB of shareable data at max data speeds.

Get Unlimited Canada-wide & US Calling for an extra \$20 per month.

#### Accessibility Discounts

“If you have a disability you might be eligible for a discounted Wireless plan.

We offer a \$20 discount on all of our in-market plans, including Rogers Infinite™ plans, which include Data Manager and Roam Like Home.

To apply for a plan discount please send your name, account number and a copy of your membership to a disability association to our Customer Care team.”<sup>136</sup>

“Disability Associations:

- Canada Pension Plan Disability Benefits
- Canadian Hearing Society (CHS)
- Canadian National Institute for the Blind (CNIB)
- Deaf Wireless Canada Committee ( DWCC)
- Easter Seals Canada
- March of Dimes
- Ontario Disability Support Program (ODSP)

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<sup>136</sup> Accessibility discount information retrieved from <https://www.rogers.com/consumer/support/accessibility-services/hearing-speech>

\*Please note that these are examples only and the customer you speak to may have a different association that is not listed here.

If you are a member of these associations (some maybe not listed here), kindly send your account number and proof of membership to a disability association to the Back Office Team who will apply the discount.

You can send the documentation via the following methods:

Fax: 1-800-219-6473

Mail: Customer Support Investigations Team

100 Westmorland St

Moncton NB

E0C 0G1

Email: [AccessibilityDiscount@rci.rogers.com](mailto:AccessibilityDiscount@rci.rogers.com)<sup>137</sup>

“Social media - our social media team is part of our Accessibility Services Group. Customers can reach out via Facebook Messenger or Twitter via direct message 24 hours a day, 7 days a week.”<sup>138</sup>

#### **Add-ons**

- Premium Voicemail-to-Text
- For an extra \$7 per month, get text and audio versions of your voicemail messages delivered to your device via text message.
- Store up to 35 five-minute voicemail messages and save each one for up to 10 days.
- Get text and audio versions of your voicemail sent to your device.
- Scan and respond to urgent messages.
- Choose how you wish to respond—by text or voice.

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<sup>137</sup> Excerpt from email from Rogers to David Berman.

<sup>138</sup> Post-interview email with Ruth Altman.

- Listen to your voicemail without dialling in or entering a password.
- Listen to your voicemail messages in any order you want.

### **Phone Options**

Get your phone with financing, pay full price upfront or Bring Your Own Smartphone.

With financing, get any smartphone for \$0 down and 0% interest with financing and pay it off in 24 equal monthly payments. You also have the option to make lump sum payments on your balance and when your financing term ends, your device payments drop off.

With financing and Upfront Edge, get any smartphone for \$0 down and 0% interest with a lower monthly price on the latest phones after a credit toward the total device cost. Within 2 years, you will need to return your phone and upgrade to a newer phone or you can keep it by paying off your Upfront Edge credit.

### **No Overages**

Once your high-speed data limit has been reached, you will be able to continue using your data at 512 kbps speeds at no extra charge.

### **Unlimited Talk & Text (Canada-Wide)**

The Rogers Infinite plans include Unlimited Canada-Wide Calling (where applicable, additional airtime, data, long distance, roaming, options and taxes are extra) and Unlimited texts/picture/video messages sent from Canada to a Canadian wireless number and received texts from anywhere. Sent/ received premium texts (alerts, messages related to content and promotions), sent international texts and sent/received picture/video/IM/email (as applicable) while roaming not included and charged at applicable rates.

### **Mobile Hotspot Capable**

Use your capable smartphones and tablets as Wi-Fi hotspots at no additional cost.

### **Pro On-the-Go**

Available with the latest device, get your new phone delivered in hours by a pro who will set it up for you the way you want it.

### **Roam Like Home**

Stay connected on your Infinite plan so you can use your phone's data, talk and text just like you do at home when traveling for a daily fee.

### **Other Included Features**

With the Infinite plans, the following features are also included:

- Free Activation on any device online (\$40 in-store)
- Free 2-day Shipping
- Call Display
- Voicemail
- Call Waiting
- Group Calling
- Call Forwarding Minutes

### **Fast LTE Network**

The Rogers LTE network is available in select cities across the country and currently expanding its network coast to coast. The Rogers network covers 97% of Canadians and extended coverage lets you stay connected in even more places across Canada. Check [rogers.com/coverage](http://rogers.com/coverage) for coverage details. When outside of LTE coverage area or if activated on a non-LTE SIM card, your LTE device will seamlessly connect to the Rogers 4G HSPA+ network.

## Telus

### Plan details for: Simple Share 10

Your Simple Share plans from Telus let you share texts and data but choose minutes individually, with up to 9 devices:

- Choose a new Smartphone or Bring Your Own
- Add more devices to your plan and get Family Discount
- All Simple Share plans are available on TELUS Easy Payment® or no term contract.

### Accessibility Discounts

“TELUS offers a \$20 monthly discount on Simple Share and Peace of Mind Smartphone plans. If you are deaf, deaf-blind or hard of hearing and do not require standard TELUS voice service, or if you are blind or deaf-blind and rely on mobile applications to determine your location, you may be eligible for a discounted mobile service plan. Participants of the Tech for Good program may also be eligible for this discount.

These plans include unlimited access to the Canada VRS video relay service. Canada VRS enables people to have video conversations over the internet. It is available in Canada in American Sign Language (ASL)/English and Langue des signes québécoise (LSQ)/French.

**How to apply:** To learn more, contact one of our client care representatives at 1-866-558-2273 about the TELUS Accessibility Discount. If you use a Teletypewriter (TTY), TELUS Relay Service is available 24 hours a day, 7 days a week by dialing 711.”<sup>139</sup>

### Phone Prices Options

Choose your new smartphone with TELUS Easy Payment® or full retail price.

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<sup>139</sup> Accessibility discount information retrieved from <https://www.telus.com/en/about/company-overview/accessibility/accessible-services#rate-plans>



TELUS Easy Payment® is a financing agreement over 24 months and get an Easy Payment Bonus when you choose this option. Balance will be repaid via equal monthly payment.

Bring-It Back program is available on Platinum plans only for the latest select phones. It allows you to get a device at an even lower upfront cost and no additional monthly cost. At the end of the 2-year term, return your device to Telus (or you are free to keep it by repaying the original Bring-It-Back Program Amount) and choose a new phone.

### **Family Discount**

Save up to \$15 per line every month on your account.

- 2 Family members: Save \$10 per month off your total monthly bill (After tax)
- 3 Family members: Save \$30 per month off your total monthly bill (After tax)
- 4 Family members: Save \$60 per month off your total monthly bill (After tax)

### **Unlimited Text**

Unlimited Text, Picture and Video messaging. Premium and subscription messages are not included. Text messages sent from Canada to a non-Canadian phone number will be charged at 40¢/message. Text messages sent or received while roaming outside of Canada will be charged at 60¢/message. Clients with non-capable phones will receive a text message that includes a web address where they can view the picture or video. Multimedia messaging used while outside of Canada is charged as data roaming. Messages sent using iMessage may incur data charges.

### **Other Included Features**

With the Your Choice Plans, the following features are also included:

- No Activation Fee online
- Call Display
- VoiceMail 25
- Call Waiting
- Conference Calling

- Min. \$100 trade-in credit when you trade-in a phone with at least \$25 value
- Connection Fee
- Save when you choose to activate or renew online with no connection fee. \$40 connection fee in-store.

### **Fast LTE Network**

97% of Canadians can access fast 4G on the Telus network. The latest 4G LTE is available in urban centres and is scheduled to roll out to the rest of Canada. You'll continue to have access to fast 4G speeds even when you move out of 4G LTE coverage areas.

## Videotron

### Plan details for: 10GB Zen Plan

Get unlimited Canada-wide Minutes, unlimited Text, Photo and Video messages, plus 10GB data.

### Accessibility Discounts

“Enjoy a \$20 discount on our Zen plans. Get a 100 GB bonus per year to avoid overage.

Everyone deserves the same level of mobile service.

That’s why Videotron offers people with impaired vision and/hearing a discount of \$20/month on its Zen plans. You can enjoy a flexible Mobile plan with lots of data, at the best price.

Read more at: <https://videotron.com/residential/p/mobile/plans/accessibility/accessibility-plans/A-psku13360121e>

Form needs to be filled out:

[https://videotron.com/vtrn/images/formulaires/preuve\\_dhandicap\\_en.pdf](https://videotron.com/vtrn/images/formulaires/preuve_dhandicap_en.pdf)<sup>140</sup>

### 100 GB Bonus Per Year

Receive an extra 100 GB per year to use when you go over your plan's data limit, free of charge, with a maximum limit of 20 GB per month. The 100 GB bonus resets every year.

### Unlimited Talk & Text

All Videotron plans include unlimited calls Canada-wide and unlimited text, picture & video messages in Canada and international phone numbers while you are within Canada.

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<sup>140</sup> Accessibility discount information retrieved from <https://videotron.com/residential/p/mobile/plans/accessibility/accessibility-plans/A-psku13360121e>

### **Club Illico Mobile**

Watch movies and series on your mobile phone with Club Illico included with this plan.

### **Multiservice Discount**

Receive a \$5/month discount when you add a mobile Zen plan to your Videotron service on the same account.

### **Multiline Plan**

Customers can bundle their plans when they choose a Zen plan and receive a:

- \$3/month per line discount with activation of 2 lines (\$6/mo total)
- \$6/month per line discount with activation of 3 lines (\$18/mo total)
- \$12/month per line discount with activation of 4 lines (\$48/mo total)

### **Special Offer - 2 FREE Talk & Text Lines**

Subscribe to 2 Zen plans and an internet access and get 2 FREE Talk & Text plans with unlimited calls across Canada and texting in Canada with BYO device. You can also add a recurring monthly data add-on to your free mobile lines.

### **Tethering Included**

Use your capable smartphone as Wi-Fi hotspot at no additional cost.

### **Other Included Features**

With all Videotron plans, the following features are also included:

- Choose two between: Call Display, Call Forwarding, Voicemail
- Call Waiting
- Conference Calling
- Transfer your current phone number
- Emergency Service (911)

## **Network and Coverage**

The Videotron mobile network now provides you with ultra fast 4G LTE with greater coverage within Québec and the greater Ottawa region. All inclusive plans have access to all services anywhere in Canada, thanks to new Videotron partners.

## Appendix B | Stakeholder interviews

Stakeholder interviews were conducted by David Berman of David Berman Communications with many parties, during the span of the project. These included:

- Ruth Altman (Director, Consumer Policy, Rogers Communications, Toronto)
- Talyah Aviran (Certified Usability Analyst, Access Israel, Tel Aviv)
- Torhild Brudvik (Senior Communications Advisor, Norwegian Authority for Universal Design of ICT, Government of Norway, Oslo)
- Vint Cerf (Vice President, Google Inc., Washington, DC)
- James Hubbard (National Disability Authority, Government of Ireland, Dublin)
- Susanna Laurin (EU WAD Expert Group Chair and ETSI EN 301 549 Technical Expert, Stockholm)
- Nagina Tahir (Director, DeafTawk, Islamabad)
- Gregg Vanderheiden (Co-editor and Co-chair of W3C WAI WCAG 1.0 and 2.0, Professor, Director of Trace R&D Center, University of Maryland, College Park)

We reached out to almost every national provider of mobile and residential internet services in Canada. Many declined to be interviewed, or did not respond to our requests. Several suggested we instead contact the Canadian Wireless Telecommunications Association (CWTA), which we did. They did not respond to our request for an interview.

## Biographies of contributors

**David Berman, CPWA, WAS, CPACC** (he/him) has over 30 years of experience in design and communications. He has worked extensively in accessible Web and software interface development. He is an International Advisor for G3ICT. David sits on the Global Council of the IAAP, is a member of the ISO committee for accessible PDF (PDF/UA), is an Invited Expert to the W3C (the publishers of WCAG), and serves on Ontario's AODA standards review committee for accessibility regulations. David advised the Government of Canada and a coalition of Canada's top accessibility organizations on the content of the *Accessible Canada Act* and its anticipated regulatory regime, including arguing for international harmonized adoption of EN 301 549 (2019).

**Krisandra Ivings, MLIS, MA** (she/her) is a researcher and librarian specializing in legal research. She holds a Master of Library and Information Sciences (MLIS) from Western University and Master of Arts (MA) from the University of Ottawa. She has received Social Sciences and Humanities Research Council (SSHRC) funding for her academic work. For the past ten years, she has worked with David Berman Communications on many projects, including the coordination of accessibility initiatives and projects.

**Lisa Anderson** is Acting Chairperson of the Deaf Wireless Canada Consultative Committee - Comité pour les Services Sans fil des Sourds du Canada (DWCC-CSSSC), and brings the advocacy and consultancy experience of 12 years of participating and appearing at CRTC public proceedings, supporting telecommunications functional equivalency for Deaf, Deaf-Blind and Hard of Hearing Canadians in public policy and regulatory processes. From 2008, Lisa was a key person in the long stretch of advocacy, from both the grassroots and consultant level, for video relay services in Canada, and Lisa was awarded the Queen Elizabeth II Diamond Jubilee Medal in 2013, for her "tireless volunteer work advocating for Video Relay Services in Canada." Lisa is currently Accessibility Director representing Deaf and hard of hearing Canadians on a cross-disability board of the Broadcasting Accessibility Fund (BAF).

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Typography: The headings throughout this document are in Lexend Deca, an open-license font specifically designed to be easier to read for all, developed by Bonnie Shaver-Troup and Thomas Jockin.



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