

Making Mobile Phones and Services Accessible for Persons with Disabilities



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A JOINT REPORT OF ITU – THE INTERNATIONAL TELECOMMUNICATION UNION AND
G3ICT – THE GLOBAL INITIATIVE FOR INCLUSIVE ICTS

RESEARCHED AND EDITED BY:



www.cis-india.org

DRAFT

November 2011

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Foreword

Mobile communications have become in less than two decades omnipresent in all countries, reaching out to the most isolated and underserved populations in developed and developing countries alike. In 2011 more than 5.4 billion mobile phones are in use, almost one per human being on the planet.

In the midst of this telecommunication revolution, however, populations of senior citizens and persons living with disabilities have been left out due to accessibility factors: complex human interfaces difficult to understand and activate for persons with cognitive impairments or learning disabilities, lack of alternative communications for persons living with low vision, blind, hard of hearing or deaf, or, quite often handset ergonomics too difficult for persons with physical disabilities such as dexterity or mobility limitations.

While a majority of persons living with disabilities are “invisible” to others either because their impairments do not show or they have less opportunities to interact in social life, censuses around the world applying the well accepted methods of functional identification rather than “medical” classification show that on average, 15% of the world population lives with a disability. The latest World Report on Disability published in June 2011 by the World Health Organization in cooperation with the World Bank¹ shows that one billion persons live with a disability. National censuses also confirm that disability, which can be acquired at birth, as a result of catastrophic events or a disease, or related to aging, severely limits the ability of individuals to enjoy the same opportunities than others in education, work and social life.

Those inequities are addressed by the Convention on the Rights of Persons with Disabilities which sets a universal framework for disability rights with guidelines for policy makers and regulators. Its article 9 sets obligations for States Parties to ensure that the physical environment, transportation and information and communication technologies are made accessible to persons with disabilities, both by public and private entities. Those dispositions apply to mobile telephony and have now to be integrated in the policies and programs developed by telecom regulators around the world, a complex endeavor which can hardly be successful without the involvement of all stakeholders.

Meanwhile, a few leading mobile operators from around the world are successfully addressing the needs of seniors and persons with disabilities, making a good business case to promoting mobile accessibility beyond compliance with laws and regulations. Cases described in this report show that major operators were able to expand their customer base, gain market share and improve the quality of service for all their customers by adopting Universal Design principles and crafting specific business processes to reach out, market to and service customers with disabilities.

This report contains references to the new legislative and regulatory framework set by the Convention on the Rights of Persons with Disabilities, an important resource for policy makers. It also covers practical elements required for a successful implementation of those programs and policies: technical accessibility

¹ http://www.who.int/disabilities/world_report/2011/en/index.html

features for handsets, accessible and assistive applications and services as well as business cases of companies which have implemented significant accessibility programs.

It is our hope that this report will be a useful resource for telecom regulators, mobile operators, organizations of persons with disabilities and other mobile stakeholders to develop successful accessibility policies and programs in their respective countries to equally serve persons of all abilities.

November 2011

Publisher's Note

This report is the result of several years of inquiry conducted by G3ict and ITU on the topic of mobile accessibility and made possible thanks to the dedication and editorial support of the Center for Internet and Society. The cooperation between our three organizations is driven by the same objective: to identify and promote effective mobile solutions to benefit persons with disabilities.

The present study compiles and analyzes different ways in which mainstream accessible mobile phone technologies and services are already implemented around the world by various stakeholders. It includes a wealth of practical information and case studies which can serve as a foundation to promoting accessible mobile phones and mobile assistive technologies.

As we publish the draft edition of this report on “Making Mobile Phones and Services Accessible for Persons with Disabilities” at the occasion of the 2011 M-Enabling Summit, new technologies and solutions keep appearing, bringing unprecedented benefits to persons with disabilities.

It is therefore our intent to update the contents of this report to cover the latest solutions available and evolving business models supporting mobile accessibility and mobile assistive technologies. Our editorial team will therefore continue to collect feedback, suggestions for additional coverage and new case studies in order to maintain it as a live updated resource. Please send us contributions or editorial suggestions at: axel_leblois@g3ict.org .

Our sincere appreciation goes to the International Telecommunication Union for facilitating our inquiry during its many international seminars on accessibility, to Susan Schorr, Head of the Special Initiatives Division of ITU – BDT without whom the development of this report would not have been possible, to our Editor, Nirmita Narasimhan, Program Manager at the Center for Internet and Society and to the team of contributors who supported her work.

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Chapter 1 Available accessibility features for mobile phones and services

This chapter examines the various features of mobile phones that are required to make them accessible to persons with different kinds of disabilities and special services that can be provided via mobile phones to improve accessibility and quality of life.

Mobile handsets can be made accessible to persons with different disabilities by integrating a variety of features in the hardware design and operating system, and providing specific services as well as by installing third party applications such as screen readers and magnifiers which can help users navigate menus and content. Information pertaining to accessibility enhancing features is often provided by manufacturers on their websites.² Very often assistive technologies, such as screen readers from a third party, can provide better experience than the original handset-embedded application or voice synthesizer. This chapter examines mainstream accessibility enhancing features and services found in mobile phones in some of the major markets around the world. Updated information on accessibility features of handsets are well documented in the Mobile Manufacturers Forum GARI database³. The same database has been adopted by CTIA in the United States as a resource for end-users⁴

1.1 Hearing - Basic Accessibility Features and Services

Problem: People who are deaf or hard-of-hearing are unable to communicate by telephone because they cannot hear the caller or automated electronic messages, such as those of a customer care of an airline or banking service. Hence, they are deprived of social interaction and unable to access vital emergency services like requesting police or medical assistance.

Solutions: There are a variety of features and services which make it possible for the hearing impaired to make and receive calls on a mobile phone, ranging from basic features like provision

² Examples include the websites of Motorola, Nokia and Samsung

³ <http://www.mobileaccessibility.info/>

⁴ <http://accesswireless.org/Find/Gari.aspx>

of volume adjustment and speakers to provision of video relay services. A few instances are given below:

Accessibility features

Visual or vibrating alerts: mobile phones can be set to vibrate or give visual alerts to inform the user about incoming calls, emails, messages, calendar appointments, and wake up alarms.

Adjustable volume control: is especially useful for persons who are partially hearing impaired as well as for enhancing functionality of hearing aids for deaf persons.

Call logs: display of missed, received or dialed calls allows deaf persons to be apprised of calls, which they may have missed if they didn't feel the vibrator or see the lights.

Visual or tactile indicators for the keypad: highlighting the buttons pressed on the keypad through either lights or vibration, will give hearing impaired people visual confirmation of all their activities.

Messaging options: the most crucial function that a cell phone serves for the hearing impaired community is to allow them to contact people in the form of text messages either SMS (short messaging service), email or MMS (multimedia messaging service), thus offering an alternative to verbal communication.

Text Teletypewriter (TTY): This is a dedicated device that is used for transmitting typed text conversation over telephone lines for those who cannot use spoken conversation. Deaf, hard-of-hearing or speech-impaired individuals communicate through these devices by sending and receiving text messages in the same manner that regular phone calls are made and received when TTY machines are used at both ends of the conversation.

Multimedia Messaging Service: While messaging originally began with only text, there is a whole range of multimedia messaging options available today, for instance, sending picture or videos through cell phones. The threaded message-view in most 'smart phones' enhances the texting experience. This is an especially important feature for deaf users who are illiterate and rely primarily on communications via pictures or sign language.

Mono Audio: transferring both left and right-channel audio content to both ear buds makes enjoying music and making calls easier for people with hearing difficulty in one ear.⁵

Video conferencing is yet another feature increasingly available on smart phones that has significantly altered the means of communicating for persons who are partially or totally hearing impaired. Face-to-face calling (video calling) is simpler to use over 3G and Wi-Fi networks. Deaf persons can now communicate instantly and more effectively using video chat via sign language instead of relying on texting.

Captioning: Many mobile phones such as the iPhone, support playback of videos and movies with closed captioning, open captioning, and subtitles. While closed captioning refers to the display of transcribed audio to people who specifically request it, open captioning means display of transcribed audio for all.

Services

Relay services: Relay services are human operated services for media and mode translation during phone conversations. These are covered in detail in section 2.3.

Tailor made plans for the deaf: Cell phone plans are now tailored for the deaf community so that they pay only for messaging and not for voice calls as is the practice in a regular plan. In addition to such “text only” plans, some operators also offer “text and data” plans without voice as in other bundled options. This allows deaf users to enjoy special payment plans for mobile data services.

T-Mobile⁶ in the US has come up with a “data only” plan that offers the freedom to pay only for text and not for call minutes. AT&T also has its own Text Accessibility Plan (TAP) for select smart phones as well as non-smart phones.⁷

SMS to Avatar translation for the illiterate hearing impaired (Tunisia): Websign is a project of the University of Tunis, based on the technology of avatar (animation in virtual world). The

⁵ <http://www.apple.com/accessibility/iphone/hearing.html>

⁶ <http://phoneboy.com/1945/why-the-deaf-heart-t-mobile>

⁷ http://relayservices.att.com/content/225/Text_Accessibility_Plan_TAP.html

software converts typed text into a real-time and on-line interpretation in sign language with the help of a dictionary of words and signs. The dictionary has a very simple interface and even allows persons to create their own signs and words.⁸

Open Issues:

Some issues, for which solutions are currently being developed, include access to automated customer services. For instance, successful systems need to be put in place to ensure that deaf people are able to access customer services and value added services over an automated system, which requires one to listen to several automated options and select a channel of service using the keypad.

Cost is another issue. In several developing countries, persons with disabilities, including the hearing and visually impaired, have to use high-end mobile phones since they are the only devices that support accessibility features and services for disabled persons. This results in technology not being available to persons who need it the most. For instance, a phone costing upwards of USD 350 is expensive for most disabled people anywhere in the world, given their low employment rate and education opportunities.

1.2 Vision – Basic Accessibility Features and Services

Problem: Persons with blindness or low vision are unable to see screens and hence cannot access contact lists to call numbers stored in the address book, send and receive messages or navigate the keypad and menu.

Solution: People with visual impairments rely -- either fully or partially depending on the level of impairment -- on a screen reader to make use of a computer or a cell phone. A screen reader is software that translates and converts information displayed on the screen into speech, non-speech sounds and Braille for a Braille display.

⁸ <http://hebergcck224.rnu.tn/ws/index.php>

Accessibility Features

Screen readers are used extensively by people with visual impairments to operate computers and mobile phones. While some mobile phones have a built-in screen reader, it is also possible to equip a mobile phone with a third party screen reader.

Handset accessibility features: A list of accessibility features for handsets is given below

- **Tactile markers** to help orient fingers on the keypad - the raised Dot on the number five on telephones and mobile phones helps them to navigate the keypad.
- **Audible or tactile feedback** to confirm that a button has been pressed.
- **Adjustable font sizes**
- **Audible cues** for specific services or features, including low battery, caller waiting or ending a call, and adjusting volume level.
- **Adjustable brightness/contrast controls for display;** colors can be reversed on BlackBerry smart phones. Depending on the comfort level of a partially sighted user, the foreground and background colors can be changed from light to dark or vice versa. Colors can also be converted to their particular shades of grey.⁹
- **Changeable size for main display**
- **Backlit display**
- **Basic text-to-speech functionality** for checking caller id and reading text messages
- **Scanner and OCR (Optical Character Recognition):** to provide highly accurate print-to-electronic text conversion¹⁰
- **Screen magnifiers** are essential for those with certain degree of usable vision.

⁹ http://us.blackberry.com/support/devices/blackberry_accessibility/#tab_tab_vision

¹⁰ One example is the KNFB Reader¹⁰ by the K-NFB Reading Technology, Inc. which runs on a few models of Nokia phones. See <http://www.knfbreader.com/>

Services

In addition, people with low vision also benefit from a variety of services such as digital libraries and GPS, described later in the chapter.

1.3 Dexterity - Basic Accessibility Features and Services

Problem: Persons who are unable to use their limbs, or flex their arms/fingers easily due to a disability/ impairment will not be able to press or otherwise physically navigate buttons on a mobile phone.

Solutions: They need to be able to use the phone with minimal use of hands and should benefit from advanced speech recognition software that will help them undertake basic communication using a cell phone.

Accessibility Features

Voice recognition: Quadriplegics and people with limited dexterity rely heavily on voice commands for working on computers and cell phones for placing calls, writing text messages, composing documents, opening and closing applications, making calendar entries and setting reminders, playing music and videos, and surfing the web.

Auto Text: Messaging for users with limited hand movement is possible by using AutoText that replaces particular text with preloaded texts to reduce the number of keystrokes needed to type the message.¹¹

Other: Sensitive touch screen phones can benefit users with movements limited to their fingers. For people who may have trouble holding cell phones steady (such as people with Parkinson's, nervous disorders, hypothyroidism or elderly people), downloadable applications make it possible to take clear pictures by adding 'anti-shake' functionality to standard cell phone cameras.

¹¹ http://us.blackberry.com/support/devices/blackberry_accessibility/#tab_tab_mobility

Other useful features for dexterity impaired users include:

- Call answer by pressing any key
- Enabling the user to lock modifier keys on QWERTY keypad phones to perform with a single keystroke actions requiring multiple keystrokes
- Voice activated answering with a speakerphone
- Candy bar design to avoid extra movements that a phone with a folding or sliding design requires since the extra movement of unfolding or sliding open the phone to speak is difficult for persons who have impaired dexterity
- Flat back on the phone to allow for operation on a table top rather than having to be held
- Optional accessories such as a Bluetooth headset or keyboard, to make texting and talking easier; wireless headsets aid call management without the need to press numerous buttons
- Ergonomic grips and skid-free casing for improved stability

1.4 Cognition – Basic Accessibility Features and Services

Problem: People with cognitive disabilities struggle to carry out one or more functions that are performed with ease by an average person. Depending on the type of disability, a person may have problems related to memory, analytical skills, attention, reading skills, mathematical or computational comprehension, reading comprehension, and communication.

Solutions: It is important to have a clear and simple user interface (UI), and consistent UI elements for easy selection of options.

Accessibility Features

Predictive Texting: The phone's text editor predicts words as they type, thus making it easier to compose messages.¹²

¹² http://us.blackberry.com/support/devices/blackberry_accessibility/#tab_tab_cognitive

Speech recognition: This has become highly accurate and most voice dictation applications have the capability of recognizing various accents.

Text-to-speech: The ability to convert displayed electronic text into speech removes the anxiety associated with reading contact names, caller id, messages, emails, instructions/ directions, textbooks and much more. Phones with high-resolution cameras provide the option of converting printed text into electronic text with a single click. This text can then be read aloud using text-to-speech applications, enlarged for a clearer view or even highlighted and heard simultaneously.

Built-in calculator and schedule reminders: built-in schedule reminders with audio, visual and vibrating alerts help users to remember future events and to perform tasks. Synchronizing with desktop-based calendars like Microsoft Outlook and Google Calendar is especially useful.

Larger display screens and formatting options for text that allows users more spaces between each word (so that each word is highlighted boldly and in bigger font) along with increased brightness makes reading easier and more pleasurable.

Some other features that make access easier for persons with cognitive disabilities are:

- Clear and easy to understand instruction manuals
- Menus with simple and prominent icons and navigational ease, providing ‘to-do’ instructions when input is required from the user.
- Providing enough time for people to enter required information
- Ability to associate photos with telephone numbers.
- Choice between audio, visual or vibrating alerts to let users know when they are receiving a call
- Highly pictorial visual display to enable ease of use for non-readers.
- Ability to store emergency contact details
- Provision of audio, visual and /or tactile feedback upon pressing the keypad

- Pre-recorded voice commands for popular functions
- Predictive Help menus
- Keypad shortcuts to make every step quick and efficient

1.5 Illiteracy – Looking Beyond Disability

Although illiteracy is not classified as a disability, its prevalence among disabled persons and notably the visual and hearing-impaired community in developing nations deserves special attention. It is also important to note that a number of features designed for persons with disabilities may help illiterate persons use a mobile phone with greater ease and understanding, which in turn enhances the business case for service providers and handset manufacturers to include accessibility features.

Accessibility Features

Some accessibility features that are relevant for illiterate persons are:

Intuitive UI: An intuitive user interface that is largely understandable based on graphical icons facilitates the use of cell phones.

Audio-based interface: A primarily audio-based interface has to support not only the native language of people with limited literacy skills, but also their local dialect for convenience and ease of use.

Other features include

- Audible or tactile feedback for the keypad
- Ability to associate photos with telephone numbers
- Keypad shortcuts
- Voice recognition
- SMS to Avatar translation for the hearing impaired illiterate (Tunisia)

In addition to features, innovative use of smart phones can help people gain literacy skills around the world. For instance, Celedu (Mobile + Education) has started a project in this direction in India by spreading language skills and other learning content through downloadable games on cell phones.¹³ Answering a question advances the person in the game.

The following table gives an overview of the accessibility solutions, which are available for some of the devices and platforms in the market today.

Table 1 – Examples of handsets with accessibility features from selected manufacturers

Device Manufacturers	Platform	Assistive Product	Devices
Nokia and a few devices from Panasonic and Sony Ericsson	S60	Screen Reader and Screen Magnifier (Mobile Speak and Talks)	Nokia All E and N Series and others like c5, 5800, Sony Vivaz Pro, Panasonic P900
Nokia	Symbian ^3	Screen Reader (Mobile Speak)	C7, N8 and upcoming models
RIM	BlackBerry	Screen Reader (Oratio)	BlackBerry Curve 8520
Apple	iphone	Screen Reader (Voice Over)	iPhone 3GS and above
HTC, Samsung, LG, Motorola etc.	Windows Mobile From Microsoft	Screen Reader and Magnifier (Mobile Speak)	HTC S740, HTC Touch Pro II, Samsung Intrepid, Samsung Ace, MotoQ
HTC, Samsung, Sony Ericsson, Motorola	Android –Google	Screen Reader (Spiel and Talk	Moto Droid, Samsung Galaxy,

¹³ <http://nextlab.mit.edu/spring2009/celedu/>

		Back)	HTC Desire, Sony Ericsson Xperia X10
HTC, Samsung, Sony Ericsson, Motorola	Android – Google	Navigation Utility (Talking Intersection, Talking Compass)	Moto Droid, Samsung Galaxy, HTC Desire, Sony Ericsson Xperia X10
HTC, Samsung, LG, Motorola etc.	Windows Mobile - Microsoft	Navigation Utility (Mobile Geo)	HTC S740, HTC Touch Pro II, Samsung Intrepid, Samsung Ace, MotoQ
Nokia	S60 / Symbian ^3	Navigation – OVI Maps and LoadStone Accessible using Mobile Speak	Nokia All E and N Series and others like Nokia C5, Nokia 5800, Sony Vivaz Pro, Panasonic P900
Nokia	S60 / Symbian ^3	Learning (DAISY Player)	Nokia All E and N Series and others like Nokia C5, Nokia 5800, Sony Vivaz Pro, Panasonic P900
Nokia	S60	Optical Character Recognition (KNFB Reader)	Some Nokia camera phones (Above 5 MP)

Chapter 2 Special Services offered by Wireless Service Providers

This chapter looks at some of the special services available for persons with disabilities on mobile platforms.

2.1 Digital libraries for visual or reading-impaired users

For visually impaired users, one of the most appreciated features of next-generation mobile phones is the ability to download eBooks. This enables disabled users to read books anywhere, anytime, while traveling or at home, via a screen reader or by accessing digital ‘talking’ books. The ability to download Internet files through smart phones has opened up many possibilities for visually challenged users. In Japan, for example, mobile phones are being used in the classroom to record, take notes and work.¹⁴

Digital Accessible Information System (DAISY) is a system of creating digital talking books for presenting written content in an audio-based format. It is possible and easy for print-impaired individuals to navigate DAISY material, which is presented in a sequential and hierarchical arrangement that consists of marked-up text synchronized with audio.

Mini Daisy players have made it possible to listen to DAISY books on mobile phones, doing away with the need to carry laptops or specialized devices.¹⁵ Users can download books from special libraries for the visually impaired like Biblio-Net and Bookshare. Some examples of digital libraries, which are used by print and visually impaired users from around the world, are:

- **Biblio-Net in Japan (distributed by NTT-DoCoMo):** access to a network of talking books. The Japan Braille Library together with the Nippon Lighthouse Welfare Center for the Blind, based in Osaka, launched the Biblio-Net and the Biblio-Studio, which are distribution systems for Braille and talking books. Text, directions, editing and related material is kept on the server at the library so that work can simultaneously be undertaken on shared content using a groupware solution. Registered individual users are free to use

¹⁴ <http://edict2010.in/files/2010/09/mobile-phone-and-sped-2010-web-version.pdf>

¹⁵ Two examples of DAISY players for Nokia’s Symbian-based phones are Code Factory’s Mobile DAISY player and Nuance’s DAISY2Go. <http://www.codefactory.es/en/products.asp?id=314>

this system as a personal library on the Internet any time.¹⁶ Books are easily searchable and downloadable and since the talking books are in DAISY format, they are easy to navigate as well.

- **Bookshare:** is a very popular digital library in the US with approximately 90,000 DAISY books, including textbooks and periodicals for people with print disabilities and a worldwide membership. It has an easy and quick download facility and members can download up to 100 books a month and carry them on their computers, digital book readers (eReaders) or mobile phones, and read at their convenience.¹⁷
- **Project Gutenberg:** is a digital library with over 33,000 free eBooks, including DAISY books.¹⁸ These books are usually out of copyright.

2.2 Global Positioning System (GPS)

Lack of information to navigate streets is a major barrier to independent mobility for the visually impaired. Cell phones have become a source of GPS information through the use of built-in GPS receivers, and in most cases freely available maps. Information displayed on these maps must be accessible with a compatible screen reader in order to benefit the visually impaired,

GPS software allows users to:

- Pre-plan their travel route; especially helpful to decide the mode of transportation and the duration of travel
- Explore their surroundings with the ‘announcement’ of nearby addresses and points of interest
- Announce the current location of the user with a reasonable degree of accuracy
- Give notifications regarding intersections, street exits, and other vital details while walking
- Provide turn-by-turn directions
- Access voice-based guidance systems

¹⁶ http://www.dinf.ne.jp/doc/english/access/0705_IFLA-rightscom/part2/116_japan_special.html

¹⁷ www.bookshare.org

¹⁸ www.gutenberg.org

There are numerous examples of accessible GPS applications.¹⁹

2.3 Relay Services

Relay services are human operated services for media and mode translation during phone conversations. They usually have financial support since the operation of those requires human resources.

The different types of relay services are:

Video relay services: VRS is used to enable sign language communication between a hearing or speech impaired person using a sign language interpreter and a videophone/ webcam and anyone who owns a regular phone.

Text relay services: these are traditional relay services for TTY devices that translate between text-to-speech or speech-to-text, usually for people with speech impairments, hearing difficulties, total hearing impairment or hearing and visual impairment.

Speech-to-speech relay services: support speech calls for users with speech impairments or cognitive disabilities.

Captioned speech relay services: captioned telephony or CapTel service translates real-time conversation into captions and is useful for people who can communicate orally, but have difficulty in hearing. Real-time captioning provides both voice and text forms of conversations. Users of these services need a CapTel telephone as well as a captioning service.

Instant Messaging relay: is a text-based solution on mobile phones for individuals who are hard-of-hearing, or have speech loss. In the United States, AT&T offers IM relay for users with hearing impairments. Customers can also use an Internet connection and an AIM account.

¹⁹ These include WalkyTalky and Intersection Explorer, GPS applications based on Google Maps (usable with the screen reader TalkBack), the open source GPS solution Loadstone, Ovi Maps, Navigon (which is accessible with the screen reader VoiceOver) and Mobile Geo. See http://www.navigon.com/portal/int/produkte/navigationsoftware/mobile_navigator_iphone_eu.html and <http://www.codefactory.es/en/products.asp?id=336>

To relay with one-step dialing, users send the phone number they are dialing via instant message to a screen name “ATTRelay.” An AT&T relay operator calls the phone number and translates the text to voice to the other party. There is no charge to use this service, but users must register.

Aside from using IM relay on personal computers, it is accessible on several mobile platforms on which AOL is available. Customers can also get a personal 10-digit phone number and people can call them via the AT&T IM Relay.

Requirements for the integration of relay services:

- Calls to a number for a person with disability should be able to automatically connect through a relay service selected by the user if the user so decides.
- Calls from a person with a disability to another number should be able to connect through a relay service selected by the user if the user so decides.
- Calls between two users who can and want to use the same mode of communication (text/voice/video) during the call should be possible without any relay service.
- Relay services should work with all commonly used handsets and terminals.
- Users should be able to use the same phone for calls in those modes they handle themselves, as for calls placed through relay services and to emergency services.
- Advanced video relay services and peer to peer video for sign language should be available on regular mobile phones with video transmission capabilities
- Relay service should cost no more than a regular phone call

2.4 Independent Living

Since wireless technologies provide easy and instantaneous access, persons with disabilities can use them in a variety of ways to live independently and conduct their daily activities. Provision of hands-free capability, screen reading and text-to-speech functionality, relay services, Internet

browsing, home automation, emergency response and all the assistive features and services outlined in this chapter promote independent living for persons with disabilities.²⁰

In addition to enabling them to perform tasks such as paying bills, shopping, booking tickets, reading books and working, mobile phones also impact the social fabric of the disability community.

2.5 Emergency Phone Services

Making emergency calls can be nearly impossible for persons with disabilities, thereby restricting their ability to convey essential information pertaining to the emergency. Some of the ways in which this can happen are:

- Hearing and speech impaired people may not be able to call and request assistance.
- Visually impaired people may not be able to pinpoint the exact location where emergency assistance is required.
- Under a stressful situation, people with cognitive impairment may not be able to fully explain the emergency.

Emergency services thus need to be designed to accommodate these calls. Some of the ways in which this is done around the world are:

- In Europe, a single number (112) is used for placing emergency calls. REACH112²¹ -- funded under EU's ICT Policy Support Programme – allows disabled users to communicate with each other as well as directly with the emergency services using alternative means of communication including texting. Under the scheme, alternatives like IP devices will be supplied to the disabled users to initiate simultaneous video, voice and text-based contact with the emergency services.

²⁰ <http://www.wirelessrerc.org/about-us/background-addressing-a-significant-need.html>

²¹ <http://www.reach112.eu/view/en/index.html>

- The Australian government has initiated an SMS-based emergency service for the hearing impaired and hard of hearing community.²² They can now request assistance by sending an SMS to the national emergency number 106.
- In the US, the Americans with Disabilities Act (ADA) requires all emergency service centers to have a Telecommunications Device for the Deaf (TDD) available for receiving emergency calls from similar devices.²³ People with a hearing impairment using Video Relay Service (VRS) or IP Relay on their cell phones can register and get 10-digit telephone numbers from their VRS or IP Relay provider in the US to make and receive calls, including calls to 911 emergency service centers.

2.6 Customer services

Customer service is a critical component of any program offered by service providers to reach out to the community of disabled mobile phone users. Major success stories and good practices are well established by mainstream international service providers. Some examples are:

- **Orange:** has an accessibility charter expressing its commitment to accessibility and mentions among other things that it has made both its internal and external websites WCAG (Web Content Accessibility Guidelines)-compliant and also developed a dedicated distribution network to improve access to its special offers by disabled users and older people with disabilities.²⁴
- **AT&T:** offers several services for users with disabilities. For people with visual impairment, it offers services like Braille and large print billing and free voice dial. Free local directory assistance is also provided. AT&T also has dedicated customer care centers to assist disabled customers such as the National Center for Customers with Disabilities for AT&T Mobility and the AT&T Sales and Service Centre for Disability and Aging for AT&T's landline customers. These centers can arrange for an alternate billing format such as Braille or large print and can advise customers with hearing, vision,

²² <http://www.deafau.org.au/download/SMSemergencyserVICESapril2010.pdf>

²³ <http://www.ada.gov/cguide.htm>

²⁴ http://www.iso.org/sites/WSC_Accessibility_2010/presentations/4_Group_3_04_Monique_Mai_Francois-Rene%20Germain_Geneve2010Nov03VD.pdf

mobility, and/or speech disabilities about equipment, accessories, features and calling plans.²⁵

- Both AT&T and Orange also train their staff about accessibility features and the needs of persons with disabilities.
- NTT DoCoMo implemented accessible distribution and customer service processes as part of its Universal Design strategy. Its concept of “Hearty Plaza”, a series of stores designed with a number of accessibility features, has been most successful in promoting its “Raku-Raku” accessible mobile phones and services among senior users and persons with disabilities. Dedicated stores include fully accessible floors, indoor directions by artificial voice guide, accessible counters and toilets, and are operated by sign language proficient staff, with a number of accessible services such as Braille peripherals and documentation, or a concierge service for assistance.²⁶
- An additional good resource is the Mobile Industry Good Practice Guide for Service Delivery for Disabled and Elderly Customers in the UK.²⁷ Endorsed by all major mobile service providers, it covers all aspects of accessible customer service including recommendations for retail environment.

²⁵ <http://www.disabled-world.com/communication/messenger/instant-messaging.php>

²⁶ http://www.g3ict.org/download/p/fileId_813/productId_152

²⁷ http://consumers.ofcom.org.uk/files/2010/06/gp_guide_eld_dis.pdf

Chapter 3 Mobile Applications for Persons with Disabilities and Senior Users offered by third parties

3.1 Mobile applications ecosystem, application stores

The availability of assistive technology coupled with a very high degree of penetration make the mobile phone as an ideal platform for delivering a wide range of applications and services –such as email, music players, navigation, barcode readers and many more.

Developing on the mobile platform holds many attractions to programmers, including the visibility offered by application stores, the comparative ease of developing and deploying an application and the possibility of making some revenue depending on the business model offered by the platform.

Main categories of application stores



Source: Distimo web site

Today, there are companies exclusively carrying on the business of making iPhone/ Android applications, in addition to the several thousands of hobbyist developers writing code for these. Application markets (Apple’s Appstore / Nokia’s Ovi Store/ Android Market/ RIM’s Blackberry

App World) are popular locations for developers to feature their applications and for users to download them. However, an increasing number of app stores offer alternative options for users. An excellent resource to explore application stores available by vendor, operator independent organization, operating system and country is offered by Distimo²⁸.

Although accessibility factors were not accorded much attention in the early years, there has recently been considerable awareness about incorporating these into design. There is also mounting excitement on the potential of the smartphone as an ideal assistive technology device – one that can replace multiple devices worth 1000s of dollars in one go for a few hundred dollars, offering tremendous cost advantage. Among others, the following factors are important to enhancing the accessibility experience on the mobile application ecosystem:

- Accessibility of the App Stores themselves: How easy/difficult it is for a disabled person or senior citizen to find, buy, download and install an application from the various stores. Are the stores user interfaces compatible with text to speech features, do they include alternative text for images, transcripts for podcasts etc., which facilitate such use?
- Ease with which independent developers are able to incorporate accessibility features into their applications: How easy does the platform make incorporation of accessibility features into a generic application, and perhaps evaluation of an application for accessibility conformance? Do the SDK and developer forums offer any support (APIs/ example applications/ tutorials and tips on designing for accessibility) in this regard so that the average developer is incentivized to weave these into his application rather than having to build them from scratch. Initiatives like Apps4Android's Camstreams²⁹ are useful resources.
- Identifying phones that support applications on App Stores. While websites like the PhoneFinder³⁰ can help narrow down the search for phone features, a well-indexed and tagged repository of apps and phones on an App Store is most effective.

The fact that the mobile application market is largely limited to smart phones and tablets makes

²⁸ <http://www.distimo.com/appstores/>

²⁹ <http://www.apps4android.org/?p=2355>

³⁰ <http://www.phonescoop.com/phones/finder.php>

it economically inaccessible to a large part of the disabled population (among others), especially in developing countries. There is hope that this might change as the prices of smartphones are predicted to go down, but despite predictions such as those for a 100\$ Android phone, there still are very few phones that have managed to hit those prices.

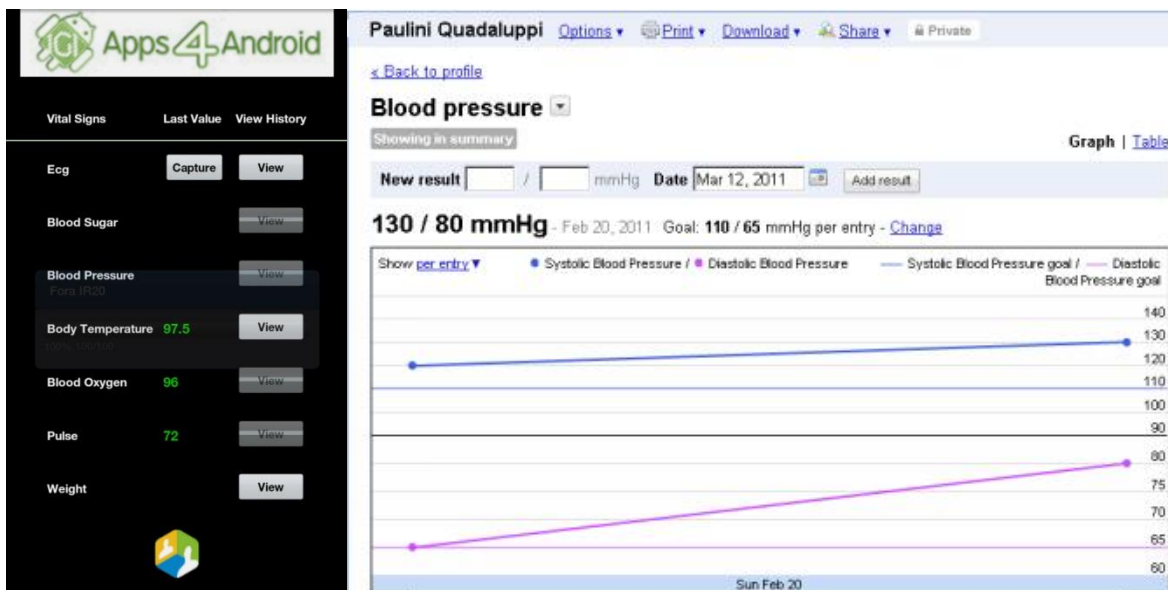
3.2 Stand-alone applications and applications linked to services

Third-party applications targeted at persons with disabilities and senior citizens include stand-alone applications as well as those linked to services. While the former includes a variety of applications largely written by individual developers, the latter includes applications tied to popular web-based services like Netflix. The following table lists some of these applications with a brief overview of each and links to the developer page.

Table 2 – Examples of third parties assistive technology mobile applications

Application	Platform	Need Addressed/ Problem Solved	Developer/ Download link	Approx. Price
Mobile Accessibility	Android	Suite of applications that allow people who are blind or have low vision to use an Android phone in an intuitive, easy and simple way.	http://www.codefactory.es/en/products.asp?id=415	\$89
Mobile Speak	Symbian and Windows Mobile	Text to speech as well as Braille device plugin support	http://www.codefactory.es/en/products.asp?id=318	Paid
Mobile Geo	Windows Mobile	Navigation aid for people with visual impairment (Separately licensed from Mobile Speak, but integrated and dependent on it)	http://www.codefactory.es/en/products.asp?id=336	
Mobile Magnifier	Symbian and Windows Mobile	Screen Magnifier	http://www.codefactory.es/en/products.asp?id=312	\$89
Mobile DAISY	Symbian	DAISY format e-book reader	http://www.codefactory.es/en/products.asp?id=314	Paid
Oratio	Blackberry	Screen reader	http://www.humanware.com/en-	\$449

			usa/products/blindness/oratio_for_blackberry_smartphones/details/id_131/oratio_for_blackberry_smartphones.html	
Nuance TALKS&ZOOMS	Symbian	Text to Speech and Large-print for blind/ low-vision users	http://www.nuance.com/for-individuals/by-solution/talks-zooms/index.htm	\$295
Color Identifier	iPhone	Color identifier for blind/low-vision users	http://www.greengar.com/apps/color-identifier/	\$1.99
Dragon tools	iPad/ iPhone/ iPod Touch/ Blackberry	Voice recognition based applications for people with physical disabilities who have difficulty typing	http://www.nuance.com/for-business/by-industry/dragon/Accessibility/index.htm	Paid
Looktel	Windows Mobile	Object Identifier (Needs to be paired with a PC for processing power) for blind/ low-vision users	http://www.looktel.com/	\$1.99
IDEAL Item Identifier	Android	Open Source Talking Barcode-Reader and Talking Barcode-Maker	http://www.apps4android.org/?p=1243	Free
Web Access Plugin	Android	Android Browser plugin for blind users	http://www.apps4android.org/?p=1238	Free
ClearCaptions	iPhone/ iPad/ iPod Touch	Near-real-time captions of telephone calls on Web browsers for the hearing impaired	http://www.clearcaptions.com/	Free
Teledroid	Android	Health monitoring application designed to provide individuals with print and other disabilities better access to health monitoring devices. Integrated with Google health.	http://code.google.com/p/teledroid/	Free



Teledroid screen shots – Phone screen and remote graphic monitoring output. Source: Apps4Android

3.3 Home automation and virtual remote consoles on mobile phones

Home automation refers to automation of home, housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, and other systems, to provide improved convenience, comfort, energy efficiency and security. Home automation systems have been in existence for more than a decade now, evolving from automation elements and embedded intelligence in simple household appliances like washing machines and coffeemakers to fully automated smart-homes that effectively run themselves. Despite many attempts, standardization has still not been achieved, and a plethora of hardware, software and communication protocols crowd the home automation space.

Home automation and virtual remote consoles are of particular interest to the elderly and disabled since they are capable of providing them a better quality of life within the confines of their home while avoiding the loss of independence that often comes with a move to institutional care.

Given that most smartphones come with multiple communication protocols and radios, video cameras and web browsers, they are ideal control and monitoring devices for the smart-home and there are a variety of applications being written for them - including those for the elderly and

disabled population. Some of these are listed below:

3.4 Android Home Automation

1 Table 3 - Android Clients for various Home Automation Systems

Application	Home Automation System supported	Developer/ Download link	Paid/Free and approximate Price
Droidseer	HomeSeer: a home automation application: Allows users to manage their homes from anywhere using an internet connection	http://www.spvsoft.co.uk/droidseer/	7.5 GBP
Lightswitch	Automation Client for the iPhone/iPod Touch/iPad/Android that allows for remote control of home devices	http://melloware.com/products/lightswitch/	\$10.00
Home Buddy	Controller for Z-wave applications	https://market.android.com/details?id=org.rakstar.homebuddy	Free
wdISY	ISY Home Automation Controller (by Universal Devices)	https://market.android.com/details?id=com.wrd.wdISY	Free
ElkDroid	Elk M1G or EZ8 Home automation and security controller (by SmartHome USA)	https://market.android.com/details?id=com.williamsautomation.williamsmanor	\$99

2 Apps4Android Projects

Apps4Android ³¹, a company focussed on *enhancing accessibility of Android devices through low and no-cost applications*, has dedicated project-lines on various Home Automation Standards to make Android-based Building Automation and Remote Control applications for those standards. These include:

Apps4Android Zigbee Accessibility Project: Includes Zigbee certified Building Automation, Remote Control and Health Care. (<http://www.apps4android.org/?p=1402>)

³¹ <http://www.apps4android.org/?p=1065>

Apps4Android DLNA Accessibility Project: Develop and enhance accessible Android based DLNA control applications (<http://www.apps4android.org/?p=1381>)

Apps4Android Near Field Communications Accessibility Project: Develop and enhance accessible Android based DLNA control applications (<http://www.apps4android.org/?p=1394>)

3.5 Home Automation Applications for Apple iOS

Table 4: iPhone/iPad based Clients and Remote Controls

Application	Home Automation System supported	Developer/ Download link	Paid/Free approx Price
iMyHome	BTicino and Legrand home automation controller	http://imyhome.uptoweb.it/	
iLoveControl	Remote control for Creston and AMX systems	http://www.ilovecontrol.com/	\$3(Lite) / \$30
iViewer	Controls most systems that support TCP/IP communications (Creston/AMX/Control4/Global Cache)	http://www.commandfusion.com/	Free
ROSIE Home Automation	Controls Savant's ROSIE systems	http://www.savantav.com/savant_and_apple.aspx	\$50
X10 Commander	Controls X10 devices through Firecracker module (CM11, CM12, CM15, CM17, CM 19) connected to a PC	http://melloware.com/products/x10commander/	\$10
iDoControl	Controls iDo Automation-based residential and commercial building automation systems	http://www.idotech.net/iDoTech/iDoControl.html	\$12
H@me	Controls HAI's Omni and Lumina systems.	http://digitaldan.com/home/	Free
eKeypad Family of apps	Mobile keypad to control M1 panels, integrated IP camera viewing, control of IP cameras and DVRs, Insteon Controllers stc	http://www.ekeypad.net/eK_Family/Applications.html	Varies

AirRemote	all-in-one remote control for a smart-home on the iPhone	http://www.airremote.com/	\$100
Control4 MyHome	Whole house audio, video, lighting & HVAC control for Control4 house automations from iPhone or iPod Touch.	http://www.control4.com/myhome/	Free
HM Control	Enables remote monitoring of lighting, temperatures, window shades, thermostats and more for Z-Wave-based Homemanageables systems.	http://www.homemanageables.com/	Free

3.6 Mobile multi-media applications and services

Mobile multi-media applications for the disabled include closed captioning services, radio apps, e-book speakers and media players. Those applications are an important element of the mobile accessibility eco-system since multimedia contents and services available on mobile platforms are growing exponentially.

Table 5: Examples of applications for accessible mobile multi-media content

Application	Platform	Need Addressed/ Problem Solved	Developer/ Download link	Paid/Free approx. Price
Subtitles	iPhone/ iPod Touch/ iPad	Subtitles for latest and older movies in 20 languages.	http://itunes.apple.com/us/app/subtitles/id358913522?mt=8#	Free
SubtitlePlayer	Android	SRT Subrip subtitle format player	https://market.android.com/details?id=hu.vinczeg.subtitleplayer&feature=search_result	Free
DeafNation	iPhone/ iPod Touch and iPad	Radio app for DeafNation radio.	http://itunes.apple.com/us/app/deafnation/id378409150?mt=8#	Free
iBlink Radio	iPhone/ iPad	Radio stations, podcasts and reading services of special interest to	http://itunes.apple.com/us/app/iblink-	Free

		blind and visually impaired persons; as well as their friends, family, caregivers.	radio/id332027117?mt=8#	
My Blind Tunes	Android	Folder media player specially designed for visually impaired users (among others).	https://market.android.com/details?id=com.andblind.tunes&feature=search_result	Free
MultiReader	Android	eBook speaker that supports wide variety of formats	https://market.android.com/details?id=bse.multireader&feature=search_result	\$5.08

3.7 School and special education applications

Although mobile phones are not designed primarily for educational use, there is growing evidence that they can be harnessed to maximize learning potential. By providing information at the fingertips of the student, they promote a more active form of learning, allowing learning to happen at a pace chosen by the learner. School and special education applications on mobile phones have similar benefits for disabled or special children, besides the potential to increase their self-esteem and confidence. The University of Tokyo published a good survey of 99 applications for students with disabilities in the classroom³².

Table 6: Examples of Mobile Applications for Students with Disabilities

Application	Platform	Need Addressed/ Problem Solved	Developer/ Download link	Paid/Free approx. Price
AutismClass & AutismAtHome	Android	Application for parents and teachers of autistic children Ideas for creating learning spaces in the home for young children with developmental disabilities and autism	http://www.autismclassroom.com/	Both \$0.99
Autism – Turn Taker	Android	Teaches sharing to children with autism, Down syndrome or other special needs	http://touchautism.com/	\$3.99

³² http://g3ict.org/resource_center/publications_and_reports/p/productCategory_whitepapers/subCat_0/id_170

Autism Letters (DTT)	iPhone/iPad/iPod Touch	Helps autistic children learn the letters of the alphabet (A-Z) and to learn the difference between uppercase and lowercase letters	http://www.zbobbaapps.com/dr-gary-brown/	\$4.99
Conversation Builder	iPhone	Conversation Simulator designed to help elementary aged children learn how to have multi-exchange conversations with their peers – useful in speech therapy sessions too	http://mobile-educationstore.com/iphone-apps	\$5.99
Grace App for Autism	iPhone, iPad	Helps autistic and other special needs children to communicate effectively, by building semantic sequences from relevant images to form sentences. App can be customized by using picture and photo vocabulary chosen by the user.	http://www.graceapp.com/	\$42

3.8 Mainstream services delivered on mobile platforms

There is increased awareness and effort to make public services disabled-friendly; especially in line with the UN CRPD and after attention was shed on the matter by protests³³ like the one in the UK. The UK government has a website that lists all public services available to disabled persons at: <http://www.direct.gov.uk/en/DisabledPeople/index.htm>.

While commercial entities are legally required – in developed countries – to comply with accessibility requirements in matters like building construction, provision of large-print books and magazines and audio books etc., e-accessibility is lagging behind. However, it is an encouraging sign that a number of mobile applications – especially navigation apps – target or take into consideration senior citizens and persons with disabilities. Some of these are listed in the table below.

³³ <http://www.guardian.co.uk/uk/joepublic/gallery/2011/may/11/public-sector-cuts-disability>

Table 7: Mainstream mobile services with accessible or assistive features

Application	Platform	Need Addressed/ Problem Solved	Developer/ Download link	Paid/Free Approx. Price
Handicapped Fraud	iPhone	Helps report parking H-cap parking violations by posting the violators' license plate information, location and time of day of the alleged violation, and make and model of the vehicle	http://www.handicappedfraud.org/	-
Keen Video Guide		Tour guide for cities and college campuses – has choice for open captioning for hearing impaired	http://itunes.apple.com/us/app/keen-guides/id362764676?mt=8	Free
MasterCard ATM Hunter	iPhone/ iPad/ iPod Touch/ Blackberry	ATM locator with filter for accessibility	http://www.mastercard.us/mobile/atm-hunter.html	Free
Parking Mobility	iPhone / Android/ Blackberry	Report disabled parking abuse, portion of ticket revenue directed to user's favorite charity	http://www.parkingmobility.com/	Free
Intersection Explorer	Android	Virtual neighbourhood map for blind users	https://market.android.com/details?id=com.google.android.marvin.intersectionexplorer&hl=en	Free
WalkyTalky	Android	Accessible navigation aid	http://eyes-free.blogspot.com/2010/10/walking-about-with-talking-android.html	Free

3.9 Public and community services for persons with disabilities and senior users delivered on mobile platforms

A number of new mobile applications and services are launched for remote care, community services, public services for persons with disabilities or senior citizens by public, non-profit or private organizations. The table below presents a short selection of navigation services which include an integrated mapping of available accessible services.

Table 8: Examples of mobile navigation services for persons with disabilities and senior citizens

iMetro Multi-city	iPhone/ iPod Touch	Navigation app for European metro lines with optional information for disabled travellers on stops with elevators/lifts	http://itunes.apple.com/app/imetro-multi-city/id307778483?mt=8	\$0.99
iTube Plan	iPhone/ iPad/ iPod Touch	Navigation app for London Tube with access features	http://itunes.apple.com/gb/app/tube-map/id320969612?mt=8	\$2.99
NYC Subway KICKMap Lite	iPhone/ iPad/ iPod Touch	New York city subway navigation with H-cap access features	http://itunes.apple.com/us/app/nyc-subway-kickmap-lite/id310459806?mt=8	Free

3.10 Assistive Technologies for Therapy, Cognitive and Speech Impairments

The possibility of using assistive applications on smartphones or tablets replacing (much costlier) dedicated devices represents a potentially important development for all stakeholders involved. Although some of those mobile applications (such as AAC applications) currently lack the same level of stability and functionality that comes with dedicated solutions, their ability to leverage the economies of scale of tablets and smart phones make them a very attractive alternative from an economic standpoint.

A few mobile assistive technology applications are listed in the table below.

Table 9: Examples of Assistive Technologies Available on Mobile Platforms

Application	Platform	Need Addressed/ Problem Solved	Developer/ Download link	Paid/Free Approx. Price
Physiotherapy Exercises	Android/ iPhone/ Windows Phone	Search for exercises appropriate for people with spinal cord injuries and other neurological conditions	http://www.physiotherapyexercises.com/	Free
Assistive Chat	iPad/ iPhone/ iPod Touch	AAC App, for people with difficulty in speech (available in English and German)	http://www.assistiveapps.com/index.php?option=com_content&view=article&id=3&Itemid=2	\$24.99
Autism Timer	iPad/ iPhone/ iPod Touch	Digital timer for children with autism	http://itunes.apple.com/WebObjects/MZStore.woa/wa/viewSoftware?id=409539780&mt=8&ign-mpt=uo%3D6	\$2.99
Behaviour Assessment Pro	iPad/ iPhone/ iPod Touch	Identifies factors related to problem behaviours for autistic kids	http://web.me.com/jeffersonlu/Vermont_Behavioral_Solutions,_LLC/Behavior_Assessment_Pro.html	
MyTalkTools	iPad/ iPhone/ iPod Touch	AAC app to help people with communication difficulties to express their needs to those around them	http://www.mytalktools.com/dnn/	\$39.99
Autism Xpress	iPad/ iPhone/ iPod Touch/ Blackberry / Android	App to help people with autism recognize and express emotions	http://autismxpress.com/	Free and Pro (\$1.99) editions
Grace	iPad/ iPhone/ iPod Touch	Non-speaking, simple picture exchange system for people with	http://graceappforautismoniphone.blogspot.com/	\$37.99

		Autism to communicate		
My Choice Board	iPad/ iPhone/ iPod Touch	Gives individuals with Autism, communication delays or learning differences the opportunity to be independent and express their own specific needs and wants.	http://www.goodkarmaapplications.com/Good_Karma_Applications/Home_Page.html	\$9.99
LivingSafely	iPad/ iPhone/ iPod Touch	Accessible learning tool specifically designed to be used directly by individuals with autism, learning or other developmental disabilities at their own pace	http://www.ablelinktech.com/index.php?id=41	\$29.99
iCommunicate	iPad/ iPhone/ iPod Touch	Communication app for children with learning disabilities and visual challenges	http://itunes.apple.com/us/app/communicate-for-ipad/id364186415?mt=8	\$49.99
iConverse	iPad/ iPhone/ iPod Touch	AAC app for autistic individuals	http://www.converseapp.com/contact.php	\$9.99
Proloquo2Go	iPad/ iPhone/ iPod Touch	Full-feature communication solution for people who have difficulty speaking.	http://www.proloquo2go.com/	\$189.99

3.11 Social media and social networking

Mobile phones are deemed to be the future of social networking. For many users, especially the youth, social networking overrides even the use of voice/calls on their phones. While twitter and Facebook remain the most popular networks there are any number of specialized social networks

targeting various sections of the population.

While we are yet to see twitter applications for the disabled or senior citizens on mobile phones, many web-based twitter clients are incorporating accessibility features. Most popular among them is **EasyChirp**³⁴ (formerly ‘Accessible Twitter’), which is designed to run on iPhone and Android devices. Another interesting app is **TweetSpeak**³⁵, a speaking twitter tool that allows blind users to do searches on twitter.

Facebook is also working to make the website accessible and has added a help-centre page to aid the disability community and provide instructional tips on using assistive technology with Facebook.

A mobile application for social networking can become accessibility-friendly by leveraging ScreenReader / VoiceOver support available on the particular platform.

3.12 Service Providers and Third-Party applications

Several mobile service providers have begun investing heavily in promoting applications addressing the needs of disabled and aging customers. They may serve as a model for others. Besides incorporating accessibility elements into their product design, offering specific services like text-only plans and relay services, and setting up dedicated call-centres for these communities, they also promote third-party solutions through their own application stores and marketing campaigns. In fact, for some third-party applications the only channel for marketing/sales is through service-provider tie-ups in various countries.

For example, in the United States, AT&T³⁶ offers the Mobile Accessibility Lite suite³⁷ for free and Code Factory’s Mobile Speak and Mobile Magnifier at discount prices on their phones.

³⁴ <http://www.easychirp.com>

³⁵ https://market.android.com/details?id=com.tweet.speak&feature=search_result

³⁶ <http://www.wireless.att.com/learn/articles-resources/disability-resources/mobile-speak-magnifier.jsp>

³⁷ <http://www.codefactory.es/en/products.asp?id=424#sec1> and <http://www.att.com/gen/press-room?pid=21494&cdvn=news&newsarticleid=32969>

Verizon ³⁸ offers TALKS software from Nuance on the HTC Ozone for a discounted price. In Egypt, Etisalat purchases bulk licenses of Code Factory screen readers from Medialog Accessibilities and make them available free of charge to their blind users³⁹. Most service providers list accessibility features and applications available across multiple handsets supported by them, often highlighting accessibility-friendly handsets on their sites. This can be useful input for disabled or aging customers towards selection of a mobile handset.

Table 10: Inside the free AT&T Mobile Accessibility Lite suite of accessible applications

Phone:	Make calls, answer calls, hear the caller ID and manage call log.
Contacts:	Manage contacts, even those from social networks such as Facebook.
SMS:	Compose and read short messages. Manage conversations.
Alarms:	Set alarms.
Web:	Full web browser experience, similar to what is found on a PC. Jump to navigate faster to information of interest. Bookmark of favorite webpages.
Calendar:	Create, edit and delete a calendar entry. View all events per day, week or month.
Email:	Full access to Gmail account.
Where am I? :	GPS application that gives updates on user's current location.
Accessible Music Player:	Accessible music player with intuitive interface that automatically lists all music files installed on the phone and sorts them by Artists and Albums.
Apps:	Access the list of apps installed on the user's Android phone.
Change Sounds:	Configure feedback and notifications (vibration or audio). Configure keyboard echo, punctuation verbosity, speech pitch and rate, etc.
Phone Settings:	Quick access to date and time, phone status information such as battery level and network coverage, number of missed calls, unread messages, etc.

³⁸ <http://aboutus.vzw.com/accessibility/talks.html>

³⁹ http://etisalat.com.eg/etisalat/Etisalat_Portal_En/about/visually_impaired.htm?_pageid=42,1&_dad=portal&_schema=PORTAL&siteAlias=etisalat&sitePath=Etisalat_Portal_En&kpAlias=about&pageAlias=visually_impaired

Chapter 4 Analysis of Challenges and Opportunities for Service Providers to Implement Available Solutions

This chapter highlights the importance of mobile service providers understanding the demographics of the markets they serve. It shows that there are significant business opportunities in providing accessible products and services, since these cater to large groups of persons with disabilities, the elderly and illiterate persons.

4.1 Analyzing demographics and market opportunities

According to the World Health Organization, there are presently one billion persons (15 per cent of the world's total population)⁴⁰ with disabilities living in the world. Population aging is an irreversible global phenomenon. In developing countries, the population of elderly people is expected to grow by 2.8per cent⁴¹ and make up one-fifth of the total population by 2025-2030. In developed countries, the population of the elderly is growing by 2 per cent and will make up one-third of the total population by 2025-2030. By the middle of the 21st century, the elderly will outnumber children for the first time ever.⁴² This presents a fundamental market shift and opportunity for service providers.

4.2 Reaching out to customers with disabilities and the elderly

Persons living with disabilities and the elderly represent target populations which, in many cases, are not exposed to general marketing campaigns or do not feel that the benefits promoted by such campaign meet their needs. The most successful strategies developed by service providers often rely on processes involving persons with disabilities in the design and marketing of product or services features.⁴³

⁴⁰ http://www.who.int/disabilities/world_report/2011/en/index.html

⁴¹ <http://www.un.org/esa/population/publications/worldageing19502050/pdf/80chapterii.pdf>

⁴² <http://www.globalaging.org/waa2/articles/untimes.htm>

⁴³ AT&T Mobile US has a panel which meets thrice a year to provide recommendations on issues impacting customers and employees: emerging accessible and usable technologies, current products and services, customer service, strategic marketing and employment issues- <http://www.wireless.att.com/learn/articles-resources/disability-resources/advisory-panel.jsp> & http://www.g3ict.org/download/p/fileId_839/productId_159

4.3 Handsets procurement and distribution

In many countries, service providers sell handsets with services that are either subsidized or "locked" to their network. Vendors have to negotiate bulk purchase or "procurement" of those handsets with manufacturers. As part of this process, service providers can negotiate with manufacturers the inclusion of accessibility features and assistive technologies in the handsets. Procurement departments in collaboration with handset manufactures can then develop templates of accessibility features based on user-research.

Further, service providers can use specialized points of distribution for the sale of accessible handsets. These can be accessible physical locations or online sale outlets catering to persons with disabilities.

4.4 Sales and services personnel training

Sales and services are a critical component to serve persons with disabilities. Point of sales or direct marketing channels must be designed for persons with disabilities, including the physical environment, the training of sales personnel, and the use of alternative modes of communications both by phone and in person onsite.⁴⁴

4.5 Accessible sales and services communications and outlets

Persons with disabilities have specific customer care requirements that may not be adequately addressed in regular sales outlets. Service providers and manufacturers can therefore do the following-

- Setting up dedicated customer care centers to assist disabled customers⁴⁵
- Making existing points of sale such as showrooms and kiosks accessible by following universal design principles
- Offering dedicated voice-based and online channels of communication offering support and information in sign, relay and other such mediums

⁴⁴ AT&T National Center for Customers with Disabilities in Los Angeles, California uses specialized channels to offer assistance to persons with disabilities, provides special training to service personnel, offers billing in alternative formats and maintains specific customer knowledge support for each product

⁴⁵ Ibid

4.6 Cost of handsets with accessibility and assistive features and services

While a number of functions described in chapter 1 are standard on most mobile phones, other types of assistive applications only work on high-end smart phones whose cost is prohibitive for many users, especially in developing nations. With the increase of bandwidth available on operators' networks, it is likely that "cloud" based solutions such as voice activated personal directories or high quality server-based synthesized voices will offer functionalities which may be delivered on inexpensive handsets. However, the long term prospect of more powerful, cheaper smart phones will translate into life changing opportunities for persons with disabilities around the world.

Indeed, the emergence of a few standard platforms promoting third party developers makes it possible for users living with disabilities to access a greater choice of accessibility software tools or assistive applications as never before. It also makes it more attractive for application developers to address those groups of users. However, major handset vendors do limit economies of scale to a certain extent by promoting captive "App Stores" which remain specific to their operating systems. With a greater availability of HTML5⁴⁶ on major mobile platforms, it is expected that more applications will be portable across different platforms since application developers can deploy roughly the same code based on all HTML5-ready phones.

4.7 Availability of suitable software

All the assistive software listed in chapter 3 is actually available in major markets. A couple of issues are however limiting their availability and suitability:

- **Unavailability of assistive technology in regional languages:** In many countries, critical solution components such as text-to-speech or voice recognition are not available in local languages. In India, for example, there are 22 official languages, not counting the hundreds of dialects or accents further dividing the linguistic landscape of the country. Whereas applications exist in Hindi⁴⁷, they do not in other languages. The same situation

⁴⁶ HTML5 is the next major revision of the HTML standard, currently under development. Like its immediate predecessors, HTML 4.01 and XHTML 1.1, HTML5 is a standard for structuring and presenting content on the World Wide Web. (Wikipedia- <http://en.wikipedia.org/wiki/HTML5>) HTML5 has the potential to significantly decrease the time and cost of developing applications across devices.

⁴⁷ One of the national languages

limits users' choices in most African countries. Since market dynamics may not suffice to generate private sector investments, one option would be for Universal Services Funds to support the development of text to speech and voice recognition applications by local consortia in local languages⁴⁸.

- **Lack of infrastructural and human support:** While the market for downloadable applications is likely to expand rapidly over the next few years, most users living with disabilities may not be able to access, make online purchases and download solutions and learn how to use them without support. The involvement of disabled persons organizations and community support services is most effective to help disseminate assistive solutions.
- **Cost of broadband connections:** The high costs associated with a high-speed broadband connection can hinder the ability to access Internet and special services like digital libraries, video relay services etc.
- **Absence of accessible services and products:** Lack of availability of accessible handsets in many countries hinder use of mobile phones by these groups; service providers and mobile manufacturers can play a pivotal role in reversing this trend.
- **Lack of awareness about assistive devices/ solutions:** While options and solutions may be offered by various service providers, awareness of those services remains low in most countries.

⁴⁸ See G3ict – CIS report on Universal Services Funds for Persons with Disabilities at http://g3ict.org/resource_center/publications_and_reports

Chapter 5 Examples of Service Providers and Handset Manufacturers Engaged in Serving Persons with Disabilities

This chapter provides a few examples of accessible business practices in the mobile phone and service industry. Amongst service providers, AT&T in the United States, Orange and SFR in Europe and NTT DoCoMo in Japan have over several years developed comprehensive programs for persons with disabilities with significant market success.

5.1 Japan – NTT DoCoMo

This case study validates the business opportunities for service providers while addressing the needs of persons with disabilities and the elderly.

In Japan, the penetration of mobile phones progressed very rapidly during the last decade, reaching rates of over 70 per cent⁴⁹ for the general population between 20 and 50 years of age as early as 2004. With such market penetration, attracting new customers became more difficult. NTT DoCoMo, whose market share is 51.3per cent, identified the potential to attract new customers among elderly populations. While penetration of young adults was over 80 per cent in 2004, it was only 10 per cent for persons aged 70 to 80 and less than 4 per cent for persons 80 years or older.

Based on an in-depth evaluation of the reasons for non-adoption of mobile technologies among elderly persons, NTT DoCoMo identified the lack of accessible and assistive products and services as a key factor.⁵⁰ Based on this finding, the company developed a comprehensive plan to adopt universal design across all activities of its product development and services divisions.

This meant developing accessible handsets for different types of impairments; offering customer service adapted to persons with disabilities and the elderly such as accessible point of sales with trained personnel in various adapted forms of communications; Braille and sign language; tailored services for the elderly and persons with disabilities; and special marketing and rate plans.

⁴⁹ <http://www.mobile-news.com/story/17162.php>

⁵⁰ See <http://www.fujitsu.com/downloads/MAG/vol41-1/paper11.pdf>

The new product line which resulted from this effort, the “Raku-Raku”, was launched in 2002 and has incorporated multiple accessible and assistive services, several of them benefiting from 3G services since 2005. Features included large screen and characters, dedicated auto-dial buttons for pre-recorded numbers, read aloud menus, voice input for text messages and mails, screen reader and access talking e-book repository. One of those phones was also equipped with an optional bone conductor receiver to transmit sound waves directly from bone to nerve.

The business results of this initiative have been stunning: NTT DoCoMo has sold over 15 million units of Raku-Raku phones since its inception in 2002. Penetration of mobile among the elderly has tripled between 2004 and 2008, and NTT DoCoMo has a much higher market share of the elderly market than its national average.

5.2 Europe–SFR, Orange

SFR⁵¹ is a French mobile phone company with a customer base of over 20 million. It is a signatory to France’s Accessibility Charter. (See Chapter 9 ‘e’ for details). As part of its commitment towards accessibility, SFR provides several products and services for persons with disabilities.

The company offers the Gold Pack bundle of assistive technology software for visually impaired users including a screen-reader, screen magnifier, colour recognizer⁵², mobile Daisy player and accessible games.⁵³

The operator has also partnered with other service providers to offer services offered by Jaccede.com, a website that offers accessibility related information regarding various places in Paris. The app ‘Jaccede Mobile’ can be used to find listing on accessible locations for persons with disabilities. SFR also provides access to a free daily news service in sign for hearing impaired users in collaboration with WebSourd⁵⁴, a web based sign-news service.

SFR provides Braille billing and allows hearing impaired users to make enquiries and seek information through a sign-language web cam chat⁵⁵ three days a week.

⁵¹ <http://www.sfr.fr/>

⁵² Tool to identify colors via the phone's camera function

⁵³ <http://www.sfr.fr/handicap/services/index.jsp>

⁵⁴ <http://www.websourd.org/>

⁵⁵ <http://assistance.sfr.fr/accueil/contacter/lcf-webcam/en-2398-70308>

Orange, a subsidiary of France Telecom⁵⁶ has implemented several accessibility initiatives for persons with disabilities and elderly customers. In 2009, Orange France started an accessible distance-selling service for deaf, hearing-impaired or speech-impaired customers.⁵⁷ This service allows customers to contact a customer advisor who is trained in knowledge of telecom products and services for persons with disabilities in real time through internet chat in text or French sign language on a weekly basis. This project, the first of its kind in Europe, was run on an experimental basis and is now live. In the same year, Orange France also partnered with the Paris public transport operator RATP to test BlueEyes, an audio-video tracking system available on mobile phones that makes using the public transport system easier for visually impaired passengers.⁵⁸ The system has been tested successfully and plans are underway to implement it across the Paris Metro system in 2011.⁵⁹

5.3 United States- AT&T

AT&T, one of the largest mobile service and fixed telephony providers in the United States, applies the user-centered design approach to its products.⁶⁰ Its standard project process includes identifying Universal Design requirements through accessibility checklists and an evaluation of how a product might be used by persons with disabilities. This evaluation then becomes part of official documentation of any project.

In addition, AT&T works with handset manufacturers and third-party accessibility, aging, technology and disability organizations on developing accessible products and related services. Further, AT&T has a dedicated “Human Factors Group” to conduct testing of the company’s designs for accessibility.⁶¹

AT&T has set up the AT&T Advisory Panel on Access & Aging (AAPAA) which includes major organizations of persons with disabilities and senior citizens. The AAPAA advises the company on accessibility matters. In 2007, responding to feedback from AAPAA for a handset designed

⁵⁶ http://www.orange.com/en_EN/group/

⁵⁷ http://www.orange.com/en_EN/responsibility/access_for_all/accessibility/distance_selling.jsp

⁵⁸ http://www.orange.com/en_EN/responsibility/access_for_all/accessibility/blueeyes.jsp

⁵⁹ http://www.blueeyes.fr/?page_id=2

⁶⁰ Accessibility, Innovation and Sustainability at AT&T, How culture of inclusion and the adoption of Universal Design at AT&T drive business processes to serve persons with disabilities, Case Study, White Paper Series: G3ict Publications and Reports http://www.g3ict.org/download/p/fileId_839/productId_159

⁶¹ Ibid

specifically for elderly and disabled users, AT&T's User Experience Design Team collaborated with the South Korean company Pantech to develop the Pantech BreZE.⁶²

The Pantech BreZE had several accessible features such as an extra-large colour display, simple user interface, lighted one-touch keys, screen magnifier, hearing aid compatibility and voice dialling. It was well received by customers and in 2010, AT&T launched the BreZE 2. The new phone has many more accessibility features including text-to-speech software that can support content in DAISY format.⁶³

AT&T has also made several efforts to make customer service more accessible for persons with disabilities. It has a dedicated website with information on assistive technologies and other disability resources and has also set up the National Center for Customers with Disabilities (NCCD) in Los Angeles which processes all inquiries regarding AT&T Mobility's products and services.

5.4 Egypt-Etisalat

Egypt- based telecom group Etisalat⁶⁴ has entered into a partnership with Code Factory to distribute the latter's screen reader Mobile Speak for its subscribers. Etisalat offers this service across all of its retail stores in the country. Most importantly, Etisalat offers this service free of charge to all blind and visually impaired users. This step is an important recognition of assistive technology not as a value-added application but as a necessary accommodation that service providers should provide anyway.

5.5 Others

GreatCall is an American service provider with a focus on ease of use. It offers the Jitterbug⁶⁵, a Samsung handset designed for basic functions for senior citizens and persons with disabilities. The clamshell shaped handset comes with large keys and powerful speaker, one touch customer service dial-in and a menu system based on a question-based interface with keys labeled "YES"

⁶² Ibid

⁶³ Ibid

⁶⁴ <http://www.medialog.ws/en/node/228>

⁶⁵ <http://www.greatcall.com/Phones/JitterbugGraphite/>

and "NO." GreatCall also offers some innovative apps such as Check- in Call (enables automated calls for checking if the user needs any help or support at programmable intervals ⁶⁶), 5 Star Security (activates 24 hour emergency response team by tracking location through phone), LiveNurse (access to registered nurses) and a Medication Reminder.⁶⁷

⁶⁶ <http://www.greatcall.com/Jitterbug/AppStore/GreatSafety/check-in-call.aspx>

⁶⁷ <http://www.greatcall.com/AppStore/>

Chapter 6 Examples of handset manufacturers and operating system organizations engaged in serving persons with disabilities

This chapter provides an over view of the accessibility initiatives of some major international mobile phone manufacturers.

6.1 Nokia

Finnish mobile manufacturer Nokia has set up the Nokia accessibility initiative⁶⁸ an umbrella range of activities which includes development of internal product design standards, initiating research, and training employees for servicing customers with disabilities. Nuance Text-to-speech software is available for Nokia Series 60⁶⁹ and Series 80 phones on Symbian operating systems.

As part of being accessible, several Nokia models offer features such as -

- Dished keys to facilitate use of mouth stick or other device to dial
- Grips for improved stability
- Audio/voice interaction with user interface through voice dialling/response and third party apps
- Voice dialling, voice recorder, and voice commands with integrated hands free speaker
- Push to talk where speaker's voice is automatically played through the phone's loudspeakers
- Dial-out buffer memory that gives more time to complete a process
- Pre-recorded voice command facility for popular functions

⁶⁹ [http://en.wikipedia.org/wiki/S60_\(software_platform\)](http://en.wikipedia.org/wiki/S60_(software_platform))

6.2 Apple

The iPhone is a line of smart phones by Apple, introduced in 2007.⁷⁰ While the accessibility of its touch screen interface was initially received with mixed reviews among online communities, it has since become one of the most popular handsets among persons with disabilities including visually impaired persons. Apple has worked at making the iPhone disabled-user friendly with many accessibility features embedded in all its models.⁷¹

The iPhone 4, Apple's latest model comes built-in with a VoiceOver feature, a gesture-based screen-reader. This allows disabled-end users to hear descriptions of functions on their phones through touch and also allows them to drag and tap in the same way to control their activities. VoiceOver is available in 30 languages and is compatible with all iPhone 4 applications. It comes with a virtual control called the rotor, which allows the user to change the navigation method on a webpage.

Other accessibility features on iPhones include

- Same device video calling with the FaceTime app over Wi-Fi
- Support for wireless Braille displays and international Braille tables
- Touch typing for visually impaired or print impaired users through text to speech
- Magnification and zoom functions
- Optional mono audio for users with hearing limited to one ear
- Support for closed captioning and subtitling

6.3 Samsung

Samsung offers several mobile phones that are hearing aid compatible. The company adheres to technical specification ANSI C63.19⁷² to measure the interference experienced by hearing

⁷⁰ See: <http://atmac.org/iphone-accessibility-by-tim-obrien/> <http://www.timobrienphotos.com/2008/12/accessing-iphone-apps/> <http://www.timobrienphotos.com/large-print-ideas/iphone-access/> <http://accessability.blogspot.com/2009/06/apple-gives-iphone-accessibility-for.html>

⁷¹ <http://www.apple.com/iphone/features/accessibility.html>

⁷² http://www.samsung.com/us/consumer/learningresources/mobile/accessibility/pop_accessibility.html

aid users when using hearing aids with wireless handsets and rates its products accordingly, allowing customers to know which of the company's handsets are optimally suited for use with hearing aids.

Other accessibility features available in most Samsung mobile phones include:

- Tactile keys
- Nibs on or around the "5" key
- Soft keys⁷³
- Bright backlit and LED display
- Voice recognition
- One-and two-touch dialling
- Adjustable volume control
- Icon/graphic menus
- Quick access menus
- Teletypewriter (TTY) capability
- External audio output (via ear bud)

6.4 Motorola

All cell phones of the US-based cell phone company Motorola are engineered so as to create a magnetic field⁷⁴ that can be coupled with a telecoil equipped hearing aid for users with hearing impairments. In addition, the following accessibility features are available on the company's products:⁷⁵

- Speakerphone
- Relay service
- Vibrating Call Alert
- Keypad Depression Feedback

⁷³ Flexible buttons that can be programmed to perform any number of functions

⁷⁴ http://www.motorola.com/Consumers/US-EN/About_Motorola/Corporate_Responsibility/Accessibility/Hearing-Aid-Compatibility

⁷⁵ http://www.motorola.com/Consumers/US-EN/About_Motorola/Corporate_Responsibility/Accessibility/Voice-Recognition

- Audible Alerts/Feedback
- Bright Backlight Displays
- High Contrast
- Ease of opening for Clam Shells or Sliders
- Automatic Answer
- Auto redial when system is busy
- Voice Recorder
- Time-independent User Responses

6.5 Google-Android

Android is a software stack for mobile devices developed by Google which comprises an operating system, middleware⁷⁶ and a range of applications. It is open source and is currently the best-selling platform for smart phones.⁷⁷

Android's open source project for accessible apps is called "Eyes-Free"⁷⁸. Screen readers from Android like Spiel⁷⁹ and Talkback⁸⁰ enable the platform to be accessible to persons with disabilities. Apart from screen readers, there are a few applications which cater to different accessibility needs, like Eyes Free Shell, which provides access to the touch screen without having to look at the screen; Google Voice which is a Speech recognition-based search application; Gesture Search, etc.

The Vilingo app⁸¹ (available for free on the Android market) aims to provide access to all phone services without having to touch the device using voice feedback from both the user and the device itself.

In addition, the Android platform also has accessible GPS applications like WalkyTalky and Intersection Explorer as well as mainstream GPS applications based on Google Maps that are usable with Talkback.⁸²

⁷⁶ Middleware is computer software that acts as a bridge between software components and applications.

⁷⁷ <http://uk.reuters.com/article/2011/01/31/oukin-uk-google-nokia-idUKTRE70U1YT20110131>

⁷⁸ <http://code.google.com/p/eyes-free/>

⁷⁹ <https://market.android.com/details?id=info.spielproject.spiel>

⁸⁰ https://market.android.com/details?id=com.google.android.marvin.talkback&feature=search_result

⁸¹ <http://www.vlingo.com/>

⁸² <http://eyes-free.blogspot.com/2010/10/walking-about-with-talking-android.html>

6.6 Others

Doro is a publicly traded Swedish company specialized in telecommunications and assistive products for the elderly and persons with disabilities. It has developed a comprehensive product line of accessible handsets and peripherals available to persons with disabilities. Its PhoneEasy 410gsm and HandleEasy 330gsm have been popular choices among senior users. Those phones feature large buttons and text, bright displays, and clear, audible sound and include an emergency call button, vibrating ringer, text messaging, phonebook for storing numbers, a two-way speakerphone and are hearing aid compatible: M3/T4.

Austrian manufacturer Emporia Telecom⁸³ has built a successful business practice by targeting a niche market of seniors and persons with disabilities. The Linz- based company sells handsets and mobile accessories suitable for older users who may have visual, hearing or motor impairments, available for various service providers. The mobile phones are equipped with features such as large display with magnifier function, tactile keys, hearing aid compatible speaker and black on orange backlight for visually impaired users or users with cataracts.⁸⁴

Emporia's research and development for handsets is organized around common signs of aging and it collaborates with the Johannes-Kepler University of Linz⁸⁵, the University of Cambridge⁸⁶, the Upper Austria University of Applied Sciences⁸⁷ and the Hagenberg University of Applied Sciences.⁸⁸

The company has a customer base in 28 countries in Central and Northern Europe, Israel, Canada and Cyprus, and in the United States. In Austria it has managed to capture about 16 per cent of the market share for pre-paid mobile phones.⁸⁹

In February 2010, French company, Sagem Wireless unveiled the Cozyphone⁹⁰, a handset device targeted exclusively for persons aged 50 years and above. Designed ergonomically, the device

⁸³ <http://www.emporia.eu/en/home/>

⁸⁴ <http://www.emporia.eu/en/products/overview/>

⁸⁵ www.jku.at/

⁸⁶ www.cam.ac.uk

⁸⁷ www.fh-ooe.at/en/

⁸⁸ www.fh-ooe.at/campus-hagenberg/

⁸⁹ http://de.wikipedia.org/wiki/Emporia_Telecom

⁹⁰ <http://www.nearfieldcommunicationsworld.com/2010/11/09/34938/sagem-nfc-cosy-phone-available-france-uk->

uses contactless NFC technology (near-field communications)⁹¹, which allows users to access the features on their phones without having to scroll through menus. The Cozyphone is equipped to set pre-configured and customized shortcut cards for family or emergency contacts, so users can wave their device over the cards to initiate a call or send a text message. In addition, the phone has a large keypad with raised and separated dialling keys and comes with micro-vibration feedback that confirms if the user has pressed the correct digit. This phone was made available commercially in November 2010 in France, UK and Ireland.⁹²

ireland/

- ⁹¹ Near field communication, or NFC, is a set of short-range wireless technologies, typically requiring a distance of 4 cm or less. NFC always involves an initiator and a target; the initiator actively generates an Radio Frequency field that can power a passive target. This enables NFC targets to take very simple form factors such as tags, stickers, key fobs, or cards that do not require batteries. It can be used for a variety of mobile applications including card emulation, ticketing and credit card transfers. See: http://en.wikipedia.org/wiki/Near_field_communication

Chapter 7 Obligations of States Parties to the Convention on the Rights of Persons with Disabilities (CRPD) in relation to Mobile Phones and Services

The Convention on the Rights of Persons with Disabilities⁹³, which came into force in May 2008, enshrines the principle that persons with all disabilities must be able to enjoy basic human rights and fundamental freedoms. For the first time, one finds an explicit articulation of the right of persons with disabilities to access information and communications technologies and systems on an equal basis with others and without discrimination.

This mandate set out under Article 9 has a far reaching impact since access to ICTs affects the right to access all other basic human rights such as the right to education, employment, access to information, transportation, social and cultural life and entertainment.

With 153 signatories and 106 ratifications as of November 2011, the Convention is the fastest negotiated human rights treaty in the history of the UN⁹⁴. The treaty recognizes the environmental and attitudinal barriers faced by persons with disabilities, and adopts a social definition of disability in the Preamble, which is as follows; “persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments, which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others,”. Hence, it is clear that the removal of these barriers is a necessary precondition to their ability to enjoy full and free participation.

7.1 General obligation to ensure accessibility of information and communication technologies (ICTs)

Accessibility is identified in Article 3(f) as one of its eight principles, and accessibility rights, including ICT, are established as a condition for persons with disabilities to exercise their fundamental freedoms and human rights.

The importance of accessibility is underscored by the fact that the word ‘access’ has been used nine times, and accessibility, 17 times throughout the text of the treaty.

⁹³<http://www.un.org/disabilities/default.asp?id=259>

⁹⁴ As of 30 September 2011, figures likely to change in the future

Article 9 contains the general disposition on ICT accessibility and articulates the obligation for State Parties to ensure that persons with disabilities have access to information and information and communication technologies. Hence article 9 requires all content, communication, hardware, software and interfaces to be accessible. It further calls upon member states to encourage the private sector to deliver accessible products and services.

Article 2 defines ‘communication’ in an inclusive manner to include all possible means of communication- “languages, display of text, Braille, tactile communication, large print, accessible multimedia as well as written, audio, plain-language, human-reader and augmentative and alternative modes, means and formats of communication, including accessible information and communications technologies” which can eliminate barriers.

Since technologies and ICT environments are constantly evolving, the Convention has defined obligations in relation to desired outcomes by application areas, rather than in specific technical terms. Hence, it is for policy makers, civil society and industry to identify and define solutions, which are specifically tailored to their country’s needs.

7.2 Dispositions to promote assistive technologies and alternative formats for persons with disabilities

The convention includes several dispositions to promote assistive technologies across sectors for persons with disabilities. Those dispositions directly support States Parties’ policies and programs promoting mobile assistive technologies.

Article 4, relating to general obligations, states that state parties must provide accessible information to persons with disabilities on assistive technologies and new developments.⁹⁵ The article also urges signatories to undertake or promote research in the area, promote the availability of such technologies, those in particular which are affordable. Mobile based solutions are prone to benefit from such programs since they benefit from unprecedented economies of scale.

⁹⁵<http://www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#obligations>

Article 9 makes provisions for promoting assistive technologies and information in alternative formats. Art.9.2 (f) states that signatories must promote forms of assistance and support to persons with disabilities to ensure their access to information. In Art.9.2(g), the Convention outlines the mandate to ensure access to “new information and communications technologies and systems, including the Internet”. Further, as per Art.9.2 (h), state parties must promote design and development of accessible information and communications technologies and systems from an early stage in order to make them accessible at minimum cost. Article 21 ' Freedom of expression and opinion, and access to information' requires state parties to take steps to ensure that persons with disabilities can receive and impart information and ideas on an equal basis with others and through the communication of their choice. Art.21 (a) states that general information for the public must be made available in accessible formats and technologies for persons with disabilities at no extra cost.⁹⁶

Article 30 requires state parties to ensure access to cultural materials in accessible formats in order to ensure participation of persons with disabilities in cultural life, recreation, leisure and sport.

Apart from these, there are articles which cover assistive technologies for specific application areas, which may be relevant to mobile phones. For instance, article 20(b) on mobility, which requires states parties to facilitate access by persons with disabilities to “quality mobility aids, devices, assistive technologies and forms of live assistance and intermediaries, including by making them available at affordable cost” would also extend to navigation software and services on mobile phones. Similarly, article 26.3 requires states parties to promote “the availability, knowledge and use of assistive devices and technologies” relating to habilitation and rehabilitation. Article 32 (d) talks about international cooperation through the provision of technical and economic assistance and transfer of technologies in relation to assistive and accessible technologies.

⁹⁶ <http://www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#expression>

7.3 Reasonable accommodation to meet nondiscrimination criteria

Article 5 of the convention deals with equality and non-discrimination.⁹⁷ Clause 3 of the article requires state parties to adopt necessary measures to ensure that reasonable accommodation is provided, which includes facilitating access through accessible and assistive technologies and communication. The Convention also provides for reasonable accommodation in three specific areas, namely, liberty and security of the person (article 14), education (art.24) and work and employment (art.27). Provision of reasonable accommodation as detailed in these articles necessitates the use of ICTs. For instance, article 24 talks about “Facilitating the learning of Braille, alternative script, augmentative and alternative modes, means and formats of communication and orientation and mobility skills, and facilitating peer support and mentoring”.

7.4 Minimum national accessibility standards

Article 9.2 (a) of the convention states that state parties take steps to develop, promote and monitor the “implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public.”

This disposition would apply to the development of accessibility and assistive technologies standards for mobile phone products and services. Those may ensure greater interoperability among systems and services, and through increased market competition, increase the availability of cheaper assistive and accessible technologies, products and services.

Article 9 (b) of the convention also mandates signatories to ensure that private entities offering any kind of facilities and services for the general public keep in mind, the different accessibility needs for persons with disabilities. Art. 21 (c) obliges states parties to encourage private entities to provide information about their services in accessible formats.

7.5 Accessibility of emergency services

Accessible emergency services are essential for persons with disabilities. The convention creates a disposition for the provision of such services. Article 9 specifically extends the obligation to provide accessible information and communication services to include emergency services.

⁹⁷ <http://www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#Equality>

7.6 Promotion of assistive technologies for independent living

The convention, in its Article 19, recognizes the right of persons with disabilities to live independently and enjoy full and active participation in society.⁹⁸ It mandates that state parties take measures to facilitate independent living. Persons with disabilities who live independently must be able to confidently rely on any and every support service available to them, including mobile services and other ICTs. This mandate is clearly articulated in Article 9, which also recognizes the right to live independently.

7.7 Other sector specific ICT accessibility requirements

The internet and new media are increasingly being used as the preferred medium of communication and service delivery across all sectors including education, e-governance, banking, telecom, mass media, and employment. Services are being accessed through computers, mobile phones and other emerging technologies and platforms. The UN CRPD n recognizes the potential of ICTs to enable access and participation for persons with disabilities. Given the universal adoption of mobile communications around the world, there is a clear imperative and advantage for States Parties to promote the accessibility of mobile communication and services, including to the Internet, especially in developing countries.

⁹⁸ <http://www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#Living>

Chapter 8 Government agencies involved with accessible and assistive mobile phones and services

This chapter provides an overview of the role of various government agencies in ensuring delivery of information and services to persons with disabilities through accessible and assistive mobile phone solutions.

8.1 Telecom Regulatory authority

Regulators can play an important role in ensuring accessibility of mobile services. Subject to their extent of power and authority, regulators can -

- Integrate accessibility into mainstream telecom policies and industry codes of practice⁹⁹ as well as through recommendations to relevant government bodies
- Include accessible service delivery as part of the license terms of operators.
- Establish systems for assessing and benchmarking accessibility
- Hold consultations with persons with disabilities and their organizations to seek inputs on policy formulation and business practices
- Provide basic mobile phones and services accessibility through the universal service fund
- Promote website accessibility with industry and telecom authorities and ensure that its own website is accessible
- Promote availability of assistive technologies for mobile devices at affordable rates and in local languages
- Incentivize service providers to design special tariff schemes and packages to encourage mobile use amongst persons with disabilities.
- Undertake periodic surveys to gather data on mobile adoption and use by persons with disabilities
- Encourage international cooperation in this area

⁹⁹ Example- UK's Ofcom has brought out policy documents with accessibility provisions

8.2 Ministry of Telecommunications/Communications/Technology

Ministries of information and communication¹⁰⁰ play an important role in governing telecom in many countries. In some cases it even doubles up as a regulator. Ministries can do the following to make mobile phone services more accessible-

- Formulate or/and amend laws and policies to promote accessibility of mobile phones and services
- Organize public consultations with persons with disabilities and organizations working on accessibility to develop inclusive policies
- Encourage the private sector to develop mobile phone related assistive technologies and related ICT equipment for persons with disabilities at affordable prices and in local languages.
- Fund research and development of low cost accessible mobile phones and assistive mobile technologies
- Engage with other ministries and departments to ensure that their schemes and programmes include delivery of accessible content and services through mobile phones, for example, work with the ministry of education for delivering educational content through mobile phones in an accessible manner
- Maintain an accessible web site and promote web site accessibility with the telecom industry and other government departments
- Identify and adopt accessibility standards for mobile phones which have been formulated by international standards setting organizations such as the International Telecommunication Union (ITU) and the International Standards Organisation (ISO) and develop accessibility guidelines for mobile equipment manufacturers and service delivery standards for service providers.
- Engage in awareness raising activities for service providers and equipment manufacturers
- Ensure that mobile penetration amongst persons with disabilities is a part of the national plan for telecommunications and is also included in the universal service policy of the

100 This portfolio may be referred to by other names such as ministry of communication, ministry of telecommunication and so on.

country

- Specify accessible mobile infrastructure as part of procurement guidelines wherever applicable.

8.3 National Council on Disability or inter-governmental agencies overseeing disability policies

Most countries which have ratified the Convention have created a national body to oversee disability policies with the participation of organizations of persons with disabilities. Such council can take the following initiatives to further the accessibility of mobile communications and services:

- Organize public debates and raise the awareness in the public opinion of mobile accessibility benefits
- Work with governments and industry on policy formulation and provision of inclusive mobile products and services
- Help to monitor implementation of policies
- Work with the private sector to facilitate the development of appropriate and necessary software and hardware
- Facilitate international cooperation and sharing of knowledge

8.4 Universal service funds

Countries can use their Universal service funds to promote mobile accessibility in the following ways¹⁰¹:

- Identify accessibility of telecommunication and mobile services for persons with disabilities as a specific mandate of the universal service obligation.
- Implement programmes and projects to provide standard and special services for persons with disabilities through mobile phones. These could cover a range of activities such as subsidizing the cost of handsets or assistive technologies, launching special service packages, providing incentives for R&D or localization of assistive solutions and any other form of incentive consistent with local market conditions.

¹⁰¹ See report on Universal Service for Persons with Disabilities G3ict and CIS 2011 at: http://www.g3ict.org/resource_center/publications_and_reports

- Require service providers to provide equal levels of access to persons with disabilities as part of universal service agreements

8.5 Other government agencies involved in implementing assistive and accessible mobile phones and services

Apart from the key government bodies identified above which are responsible for promoting telecommunications accessibility, there are various other agencies which can play a role in making mobile phones and services accessible for persons with disabilities.

- **Technical Standards organizations** can identify and adopt standards for accessible mobile equipment and services which have been formulated by international standards setting organizations like the International Telecommunication Union (ITU).
- **Research organisations** can engage in development and localization of low cost assistive and accessible solutions for mobile phones in local languages
- **Agencies in charge of/involved in public procurement** such as administrative divisions of public services and consumer welfare organizations can include accessibility as a condition for public procurement.
- **Educational institutions** can focus on creation and dissemination of content in accessible format, such as DAISY and encourage innovative uses of cell phones in classrooms for students with disabilities.¹⁰²
- **Agencies involved in dissemination of public information** such as government press offices and website maintenance departments can take steps to ensure that all public information and documents are easily available in accessible mobile ready formats

8.6 Ministries with e-government services

Increasingly, many persons prefer accessing services through the mobile interface and in many countries, mobile devices are far more widespread than computers. Ministries which offer e-governance services should therefore ensure that these services are accessible to persons with disabilities as well. In addition, they could -

¹⁰² http://www.g3ict.org/resource_center/publications_and_reports

- Hold consultations with persons with disabilities and their organisations to develop accessible, easy to use e-governance applications.
- Provide accessible phone services such as relay services, talking directory services etc
- Ensure that all e-governance web sites are in conformance with the W3C/WAI guidelines on accessible websites and encourage private organizations also to maintain accessible web sites.
- Ensure that all electronic documents are accessible and in mobile friendly formats
- Provide toll free help-lines to provide assistance to disabled end-users
- Make information about mobile e-governance services available in accessible formats¹⁰³

8.7 Education ministries overseeing web based educational resources

Education ministries can take steps to make available mobile based educational resources and services in accessible formats in the following ways-

- Hold consultations with persons with disabilities and their organizations to formulate policies that facilitate their right to education
- Provide educational materials in accessible formats like Daisy which can be accessed on mobile phones.
- Formulate policies to promote creation of educational materials in accessible electronic formats at all levels of education
- Fund research and development of assistive technologies and learning aids for mobile phones especially in local languages
- Build capacity among teachers to support disabled children in using mobile phones to work with study materials

8.8 Ministries of Health and Human Services overseeing rehabilitation and elderly care services

Ministries which handle portfolios such as social welfare, rehabilitation or health can leverage and promote accessible mobile technology in many ways such as -

- Hold consultations with persons with disabilities and their organisations to formulate m-

¹⁰³ http://www.e-accessibilitytoolkit.org/toolkit/technology_areas/access_to_published_works

Health sector specific accessibility policies and guidelines

- Provide mobile phones and assistive technologies to economically disadvantaged persons with disabilities through government schemes and subsidies
- Support and fund accessible m-health and social welfare services, such as providing information on common diseases like Aids, polio and malaria, disaster preparedness and early warning systems, toll free health help lines, job vacancy updates etc.
- Maintain accessible web sites in accordance with the W3C/WAI guidelines and ensure that all information is provided electronically and in accessible mobile friendly formats

Chapter 9 Overview of national initiatives and policy developments

This chapter gives an overview of the measures implemented by different countries to facilitate accessibility in telecommunications for persons with disabilities. Data was collected based on desk-research and confirmed, where possible with the ITU Administration.

9.1 Australia

Australia¹⁰⁴ has made telecommunications accessible for persons with disabilities through a combination of universal service obligations, consumer protection laws, industry codes and guidelines, telecommunications standards, and through its ratification of the United Nations Convention on the Rights of Persons with Disabilities on 17 July 2008.

The Department of Broadband, Communications and the Digital Economy has policy oversight for access to telecommunications. The Australian Communication and Media Authority is the regulator for the communication sector in Australia.

The Telecommunications (Consumer Protection and Service Standards) Act 1999 (the TCPSS Act), guarantees Standard Telephone Service (STS) as part of the Universal Service Obligation (USO). The USO requires that persons with disabilities have reasonable access to voice telephony including payphones or an equivalent form of communication if voice telephony is not practical. This is in consonance with the Disability Discrimination Act, 1992, which makes it unlawful to discriminate against persons with disabilities in the provision of goods and services.

The TCPSS Act also provides for the National Relay Service which allows people who are deaf, hearing and/or speech impaired to access to a standard telephone service on terms and in circumstances that are comparable to the access other Australians have to a standard telephone service, including access to emergency services. The NRS is funded through a levy on eligible telecommunications carriers.

Australia's Telecommunications (Equipment for the Disabled) Regulations, 1998, outline features and equipment that must be available for use with standard telephone services. They include one-touch dial memory, hands-free capability (a speaker and/or a handset cradle), built-

¹⁰⁴ Text provided by ITU Member State Australia.

in hearing aid coupler, cochlear implant, telephone adaptor, volume control – to amplify either the incoming or outgoing caller’s voice, alternative alerts to indicate that the telephone is ringing (either an additional ringing device with adjustable volume tone and pitch, or a visual alert),

provision of lightweight handsets and the facility to connect a second piece of equipment in parallel with the existing telephone. The regulations also specify the types of equipment that allow a person with a disability to have access to the National Relay Service.

The Telecommunications Disability Standard AS/ACIF S040:2001 requires that standard customer equipment used in connection with the STS must include:

- a raised ‘pip’ on the ‘five’ digit key to assist people who are vision impaired to locate number keys on the keypad, and
- a limit on interference between handsets and hearing aids.

The Australian Communications Industry Forum Code—C625:2009 Information Accessibility Features for Telephone Equipment , specifies the obligations on suppliers to provide product information on the functional characteristics of customer equipment that uses a telephone handset that is manufactured in, or imported to Australia. The purpose of the code is to ensure that the information provided by equipment suppliers clearly and comprehensively assists carriage service providers. It also helps consumers to identify equipment features that meet individual communication needs.

The Code works in conjunction with the ACIF - G627:2095 Operational Matrices for Reporting on Accessibility Features for Telephone Equipment Guideline .which provides matrices for the reporting on accessibility features of fixed and mobile customer equipment against four settings: handset/hardware information; mobility/dexterity features; vision features; and hearing features.

The guideline G586:2006 Disability Matters: Access to Communication Technologies for People with Disabilities and Older Australians outlines considerations to ensure that the needs of people with disability and older Australians are taken into account in activities undertaken by industry participants and the industry body, Communications Alliance.

9.2 Argentina

Argentina has enacted a few overarching laws to ensure the accessibility of telecommunication services.

National legislation of relevance to ICT accessibility dates back to the Latin American Convention for the Elimination of all Forms of Discrimination against Persons with Disabilities (2000) that was promulgated by Congress in Ley 25.280. Article 3, Section 1, point (a) stipulates the introduction of “... measures to progressively eliminate discrimination and to promote integration on the part of government bodies and/or private bodies in the provision or offering of goods, services, installations, programs and activities such as employment, transport, communication, housing...”¹⁰⁵.

In the most recent change to the regulation of the public telephone service for the hard of hearing and persons with speech impairments (Ministerial Order S.C. N° 2151/97¹⁰⁶), the text mentions that “the current regulations for terminal equipment for the hard of hearing and/or the speech impaired in Argentina is similar to that used in the United States”. Section 3 of the 1997 regulations therefore required that “all models of handsets for ‘Hard of Hearing and Speech Impaired Category 3’, as defined in Article 10 of the Regulations approved by Resolution SC No. 26878/96 – both public and private – duly certified and approved by the communications regulatory body of the United States, the Federal Communications Commission (FCC), are approved in (Argentina), provided they have Spanish keyboard language and (a minimum) speed of 50 baud¹⁰⁷.” On 12 November 2010, Congress passed a bill (4521-D-08) featuring additional legislation governing the accessibility of information on websites which refers to Web browsers. Because the legislation does not stipulate the type of device running Web browsers, it would also appear to apply to smart phones.

¹⁰⁵ This is an informal translation.

¹⁰⁶ SC Res 2151/97 http://www.atedis.gov.ar/hipo_normativa6.php

¹⁰⁷ This is an informal translation.

9.3 Brazil

Brazil¹⁰⁸, which is a signatory to the Convention on the Rights of Persons with Disabilities and its Optional Protocol, has proposed public policies aimed at achieving full accessibility for persons with disabilities.

In the communication sphere, and specifically the area of telecommunication services, a number of actions are being pursued in order to break down the existing barriers. For example:

- A programme, established under Decree 6039 of 7 February 2007, to support institutions providing assistance to persons with hearing disabilities, with implementation of an individual fixed access point and telecommunication terminal for hearing-impaired persons, coupled with payment of the basic fixed telephony service subscription, using resources from the Fund for the Universalization of Telecommunication Services.
- On 7 August 2007, Anatel approved Resolution 477 approving the Short-Message Service (SMS) Plan for persons with hearing difficulties in the low-income bracket, and calling for a certain volume of messages at reduced cost. All personal mobile service authorities approved the plan while the regulations were still in the process of being revised. The revision also specified a maximum message response time to enable hearing-impaired persons to converse using such messages.
- On 20 April 2011, Anatel approved Resolution 564, whereby, upon request by the heads of public emergency services (police, fire service, ambulance service, etc.), providers are required, subject to the prevailing technological limitations, to route text messages from their subscribers to the respective public emergency services, without any type of remuneration for the providers handling such calls or messages to the emergency services.
- All fixed and mobile telephone service providers are required to have an intermediate communication facility to assist persons with hearing or speech disabilities.
- It is a requirement that at least two per cent of all public telephones, upon request, be adapted to accommodate people with mobility, hearing or speech impairments, and that 100 per cent of public telephones be adapted for visually-impaired persons.

¹⁰⁸ Text provided by ITU Administration Brazil.

- Installation in all ministries of the Federal Government of public telephones adapted to accommodate hearing-impaired persons.
- Meetings with institutions representing persons with disabilities for the purpose of improving the regulatory process with respect to accessibility.

Another important advance in the provision of telecommunication services in Brazil was the expansion of the networks of the Personal Mobile Service and Multimedia Communication Service, commonly used to provide broadband access.

Until 2007, only 2 125 of Brazil's 5 565 municipalities had fixed telephone network infrastructure capable of broadband connectivity. In 2008, and in response to that situation, the General Plan of Goals for Universalization of the Fixed Telephony Service was amended with a view to expanding the infrastructure, and by 31 December 2010 all of the country's municipalities were covered.

In late 2007, an auction was held for the frequency bands for the 3G component of the Personal Mobile Service, coupled with an obligation to provide the mobile telephony service to all seats (head towns) of Brazilian municipalities.

The expansion of telecommunication service networks brings with it an expansion of the opportunities for, and means of, communication by persons with disabilities, with the coverage rate in the seats of Brazilian municipalities now having reached 100 per cent.

However, much remains to be done, including popularizing use of the 3G mobile service, which would enable people with speech or hearing disabilities to communicate by means of sign language; implementing an intermediate communication facility based on sign language; and, first and foremost, formulating policies specifically aimed at assisting persons in the low income bracket.

9.4 Canada

In Canada, accessibility of telecommunication services is part of the broader regulatory policy governing the sector. The Canadian Radio-television and Telecommunications Commission (CRTC) is the regulatory body overseeing electronic and telecommunications industry practices and legislation.

In 2008, the CRTC initiated a Telecom Public Notice (2008-8), where it held a converged telecommunications and broadcasting proceeding to address residual issues related to the accessibility of the same to persons with disabilities. Based on the submissions made in the g71 proceeding, CRTC outlined several measures under the Broadcasting and Telecom Regulatory Policy 2009-430.¹⁰⁹

These include extension of relay services to include IP relay service and making it obligatory for service providers to provide at least one type of wireless mobile handset which accommodates the needs of persons with disabilities, provide alternative billing formats and include accessible disability-specific information on websites.

9.5 France

In France¹¹⁰, accessibility of telecommunications was achieved through the signing of a voluntary charter by service providers and disability organizations, which was facilitated by the French regulator, the Autorité de Régulation des Communications Électroniques et des Postes – ARCEP¹¹¹. In 2005, the French government and the ARCEP, along with operators and disability organizations signed a voluntary charter for improving access to mobile telephony for disabled end users¹¹² which laid down priorities such as the introduction of necessary and comfort features, innovation of new features and provision of analysis and market accessibility features for the service providers to work on .

In 2008, changes and improvements to the charter were made which included increasing usability, wider dissemination of information, targeted product development and setting up an information website to aid persons with disabilities to choose handsets. The charter further added objectives such as training for information vendors, eventual adoption of the charter at European level and using innovation to increase accessibility.¹¹³

The charter has had a noticeable impact on the mobile telephony industry. By 2009, every operator in France was offering 10 to 20 accessible handsets, and operators provided bills in Braille or large print for the visually impaired as well as special text and multimedia message packages for the deaf. In addition,

¹⁰⁹ http://www.crtc.gc.ca/eng/info_sht/t1036.htm

¹¹⁰ Text provided by ITU Member State France

¹¹¹ <http://www.arcep.fr/index.php?id=1&L=1>

¹¹² <http://www.afom.fr/eclairages/laces-des-personnes-handicapees-la-telephonie-mobile>

¹¹³ <http://www.gouvernement.fr/gouvernement/l-acces-des-personnes-handicapees-a-la-telephonie-mobile>

new services were launched with accessibility features such as sign language news, accessible information websites, etc.

On 9 June 2011, sector players sought to renew their involvement in this area by extending the charter to include all electronic communication services. The charter henceforth requires professionals to offer products and services that are accessible to disabled people, to inform the general public concerning offers accessible to disabled people, and to provide customer follow-up adapted to the requirements of disabled people.

Note should also be taken of the adoption, within the framework of the European Union's new 2009 telecoms package, of Directive 2009/136/EC, which requires Member States to ensure that disabled people have access to electronic communication services equivalent to that of other end-users. France is to transpose this directive into national legislation by guaranteeing in the national texts that disabled people have access equivalent to other end-users, at affordable rates, to electronic communication services and by improving disabled people's access to customer services.

9.6 Japan

Mobile phone accessibility in Japan is ensured through a mix of legislative provisions and accessibility guidelines and standards. The Ministry of Internal Affairs and Communications is responsible for Japan's telecommunication sector.

The Info-communication Access Council (IAC) in Japan plays an active role as a facilitator in promoting easy access to telecommunications equipment and services, or in other words, assuring and improving telecommunications accessibility.¹¹⁴ IAC has come out with a guideline for disabled telecom accessibility. The guideline, JIS X8341-4, applies to telecommunication equipment (which includes fixed telephones, facsimiles, mobile telephones and video phones).

Section 19 of the Basic Law for Persons with Disabilities Act, 1970, amended in 2004, deals with accessible communication and states that the (state) government and the local governments shall take necessary measures through disseminating accessible computers and accessible information technology devices, facilitating accessible telecommunications and making

¹¹⁴ Mitsuji MATSUMOTO, 'Accessibility in Telecommunications - Significance of Global Standardization' - ITU-T Workshop The impact of the United Nations Convention on the Rights of Persons with Disabilities on the work of the ITU-T" Geneva, 2 November 2009

adjustments of facilities that provide information for persons with disabilities so that they can make use of accessible communication and express their own will. The Government and the local governments shall especially take into account accessibility for persons with disabilities in providing public information and promoting utilization of information technology.

Service providers for telecommunication, broadcasting, information, computer and other information technology devices are also directed to make efforts to take into account accessibility for persons with disabilities in providing services or manufacturing devices on the basis of social solidarity”.¹¹⁵

It is also important to note that the Law for Promoting Businesses that Facilitate the Use of Communications and Broadcast Services by Physically Disabled Persons (1993, Law No. 54), promotes services to make media such as telecommunications and broadcast accessible to persons with disabilities so that they can take advantage of the growing availability of information.¹¹⁶

9.7 Malaysia

In Malaysia, access for persons with disabilities is part of the universal service obligation. The Malaysian Communications and Multimedia Commission (MCMC) is the regulator for communications and multimedia industry in the country.

Malaysia’s Universal Service Provision¹¹⁷ is established through Section 202¹¹⁸ of the Communication and Multimedia Act, 1998.¹¹⁹ The provision identifies persons with disability as an “underserved community/group” defined by MCMC as “being groups of people in served areas that do not have collective and/or individual access to basic communications services”. Section 192 of the Act also states that the Required Application Service¹²⁰ i.e. specific services that service providers are mandated to offer includes services for disabled consumers.¹²¹

¹¹⁵ <http://www8.cao.go.jp/shougai/english/law/no84.html#04>

¹¹⁶ <http://www.dinf.ne.jp/doc/english/law/japan/selected38/chapter7.html>

¹¹⁷ http://www.skmm.gov.my/index.php?c=public&v=art_view&art_id=98

¹¹⁸ http://www.skmm.gov.my/index.php?c=public&v=art_view&art_id=251

¹¹⁹ http://www.msc.com.my/cyberlaws/act_communications.asp

¹²⁰ [http://www.skmm.gov.my/link_file/the_law/NewAct/Actper cent 20588/Actper cent 20588/a0588s0193.htm](http://www.skmm.gov.my/link_file/the_law/NewAct/Actper%20cent%2020588/Actper%20cent%2020588/a0588s0193.htm)

¹²¹ http://www.msc.com.my/cyberlaws/act_communications.asp

9.8 South Africa

South Africa has a strong legislative framework for telecommunication accessibility in the form of a code with detailed recommendations on accessible services. The Independent Communication Authority of South Africa¹²² (ICASA) is the electronic and telecommunications regulator for South Africa.

Section 2(h) of the Telecommunications Act, 1996¹²³ includes ensuring the needs of persons with disabilities in the provision of telecommunication services as one of its objectives.

South Africa has also enacted the Promotion of Equality and Prevention of Unfair Discrimination Act, 2000¹²⁴ which prohibits unfair discrimination on the grounds of disability. These include;

- Denying or removing from any person with disability, any supporting or enabling facility necessary for their functioning in society
- Failing to eliminate obstacles that unfairly limit or restrict persons with disabilities from enjoying equal opportunities or failing to take steps to reasonably accommodate the needs of such persons.¹²⁵

Section 70 of the Electronic Communications Act, 2005¹²⁶ states that ICASA is obligated to prescribe regulations in the form of a code for people with disabilities that will be applicable across all categories of licenses, including telecom.”¹²⁷ Consequently, ICASA established the Code on People with Disabilities¹²⁸ in August 2009, which set out guidelines for license holders when they are dealing with or providing services to disabled end-users.

Some of the recommendations of the code include provision of inclusive products and services by manufacturers and operators, design of accessible products and services by service providers,

¹²² <http://www.icasa.org.za/tabid/38/Default.aspx>

¹²³ <http://www.info.gov.za/acts/1996/a103-96.pdf>

¹²⁴ [http://www.iwraw-ap.org/resources/pdf/Southper cent 20Africa_GE1.pdf](http://www.iwraw-ap.org/resources/pdf/Southper%20Africa_GE1.pdf)

¹²⁵ Section 9 of the Promotion of Equality and Prevention of Unfair Discrimination Act, 2000. See: [http://www.iwraw-ap.org/resources/pdf/Southper cent 20Africa_GE1.pdf](http://www.iwraw-ap.org/resources/pdf/Southper%20Africa_GE1.pdf)

¹²⁶ <http://www.info.gov.za/view/DownloadFileAction?id=67890>

¹²⁷ Electronic Communications Act, 2005 accessible at [http://www.icasa.org.za/LinkClick.aspx?fileticket=hVMvwf2qmj0per cent 3d&tabid=86&mid=649&forcedownload=true](http://www.icasa.org.za/LinkClick.aspx?fileticket=hVMvwf2qmj0per%20cent%203d&tabid=86&mid=649&forcedownload=true)

¹²⁸ <http://old.ispa.org.za/regcom/advisories/advisory26.shtml>

provision of emergency, relay, directory and call progress information services, operator assistance at all call centers, billing in alternative formats, accessible advertisements etc.

9.9 Sweden

Sweden¹²⁹ has an overarching disability policy with specific provisions for telecommunications accessibility. The [Swedish Post and Telecom Agency \(PTS\)](#)¹³⁰ is the country's regulatory authority for electronic communications and postal activity. Programs and operational initiatives under the PTS for people with disabilities are funded annually. For the year 2011 the funding from within the national budget of Sweden was approximately 149 million SEK for 2011. The funding is used for procurement of services and projects as well as for promotion of an accessible and usable society with the use of electronic communication. In Sweden relay services for instance are secured by procurement instead of by regulation.

The PTS has been assigned by the Swedish Government to ensure that important services within electronic communications and the postal sector are available for people with disabilities. PTS also initiates and funds development projects in order to improve existing services and develop new ones. The aim is to improve the potential of people with disabilities to use electronic communication and to be fully included in society.

The PTS is one of 14 agencies that are mandated to enforce and realize the objectives of Sweden's [Disability Policy](#)¹³¹, i.e. to enhance and assure accessibility and usability of electronic communication and postal services for disabled users.

As part of this, the PTS funds a number of services¹³²: Relay service for text telephony [Texttelsoni.se](#)¹³³, relay service for speech to speech [Teletal](#)¹³⁴, relay service for video telephony [Bildtelefoni.net](#)¹³⁵, flexible text telephony service [Flexitext](#)¹³⁶, Free directory enquiry service 118 400, Communication via databases for people who are deaf-blind, Freepost conveyance of

129 Text provided by ITU Member State Sweden

¹³⁰ <http://www.pts.se/en-gb/>

¹³¹ <http://www.sweden.gov.se/sb/d/2197/a/15254>

¹³² <http://www.pts.se/en-gb/People-with-disabilities/Services/>

¹³³ <http://www.texttelefoni.se/start.asp?sida=5008>

¹³⁴ <http://www.teletal.se/in-english>

¹³⁵ <http://www.bildtelefoni.net/en>

¹³⁶ <http://www.flexitext.net/en/start>

dispatch of literature for the blind, and Extended rural post and counter service for elderly people and people with disabilities in sparsely populated areas.

The PTS also initiates and funds a number of developing projects, such as: IT-support direct¹³⁷, E-adept¹³⁸ and Ippi¹³⁹ for people with disabilities and elderly users.

9.10 Thailand

Thailand has adopted several legislative and policy measures to ensure accessibility in telecommunications for all. The National Broadcasting and Telecommunications Commission (NTBC)¹⁴⁰ is the telecom regulator in Thailand. The universal service obligation is clearly defined to include special services for the impaired or elderly.¹⁴¹ Section 17 of the Telecommunication Act, 2001 identifies provision of access to public telecommunications for persons with disabilities, children, elderly and disadvantaged persons as part of the universal service obligation.¹⁴²

Further, Section 20 of the Persons with Disabilities Empowerment Act, 2007 (B.E. 2550) deals with the right of persons with disabilities to access facilities, including welfare assistance provided by the state. Section 20(6) of this Act specifically talks about telecommunication and other information and communication accessibility.¹⁴³

The Telecommunication Master Plan (second issue) for 2008-2010 deals with accessibility for all disadvantaged people and introduces the telecommunication relay service.¹⁴⁴ In 2009, the then National Telecommunications Commission (NTC) granted 2.5 million baht (approximately USD 70,000) of research and development funds in collaboration with National Electronics and Computer Technology Center (NECTEC) to set up the Telecommunication Relay Service Centre

¹³⁷ A call-in service for problem solving and assistance for people with disabilities and elderly users of electronic communication and media.

¹³⁸ A developing project which has established ways in which people with disabilities can independently navigate their way in urban environments with the help of digital maps and GPS.

¹³⁹ A developing project which will allow people with disabilities and elderly users who lack computers or smart phones to use digital services. The focus in the project is to allow people to pay invoices via the television set.

¹⁴⁰ <http://eng.ntc.or.th/>

¹⁴¹ http://www.itu.int/ITD/icteye/Reporting/ShowReportFrame.aspx?ReportName=/TREG/UniversalServiceProfile&ReportFormat=HTML4.0&RP_intCountryID=229&RP_intLanguageID=1

¹⁴² Supra n.2

¹⁴³ http://thailaws.com/law/t_laws/tlaw0385.pdf

¹⁴⁴ <http://eng.ntc.or.th/images/stories/pdf/masterplanad2008-2010.pdf>

for fixed line and mobile communication, or TRS, to act as a middleman, providing relay or translation services for people with hearing or speech disabilities.¹⁴⁵

Apart from these legislative and policy measures, Thailand has also taken practical steps for reaching out to people using innovative ideas such as an outreach exhibition bus that provides information and training in using wired and wireless telecommunication devices for persons with disabilities.¹⁴⁶

The Thailand Association of the Blind, in collaboration with NECTEC Ratchasuda Foundation under HRH Princess Mahachakri Sirindhorn, has introduced the on-demand ‘Digital Talking Book’¹⁴⁷ delivery system over fixed and mobile telephones.

9.11 United Kingdom

The mandate for accessible telecommunications in UK flows from an overarching disability legislation and specific regulations and policies. The Office of Communications¹⁴⁸¹⁴⁹ (Ofcom) is the communications regulator in-charge of overseeing telecommunications and media practices in the United Kingdom. Under Section 3 (4i) of the Communications Act, Ofcom is required to pay heed to the needs of elderly and the disabled and those with low incomes. Further, under Section 21, Ofcom established an advisory committee for matters relating to elderly and disabled persons.

Ofcom issued the Telecommunications (Services for Disabled Persons) Regulations 2000 (SI 2000 No. 2410)¹⁵⁰. These rules along with the EU Directive of 98/10/EC¹⁵¹ require telephone

¹⁴⁵http://mis-asia.com/news/articles/thailand-plans-technology-to-help-connect-people-with-disabilities?SQ_DESIGN_NAME=print

¹⁴⁶ Supra n.2

¹⁴⁷ A Digital Talking Book (DTB) is a multimedia representation of a print publication. A collection of digital files that provides an accessible representation of the printed book for individuals who are visually or print-impaired. These files may contain digital audio recordings of human or synthetic speech, marked-up text, and a range of machine-readable files. See: <http://www.daisy.org/daisy-technology>

¹⁴⁸ [Text provided by ITU Member State, United Kingdom](#)

¹⁴⁹ <http://www.ofcom.org.uk/about/>

¹⁵⁰ <http://www.ofcom.org.uk/static/archive/oftel/publications/consumer/text0801.htm>

¹⁵¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31998L0010:en:NOT>

companies (fixed and mobile) providing voice telephone services to enable a number of services for customers with disabilities.¹⁵²

These obligations, also covered under General Condition 15¹⁵³ include access to text relay and directory enquiry services, provision of onward connection for blind users with dexterity problems, provision of priority repair services at standard rates and a protected service scheme to reduce disconnections, support for billing in alternative formats and nominated persons to manage billing on behalf of the customer with disability¹⁵⁴. With regards to priority fault repair it is worth noting that this applies to fixed rather than mobile providers (because of the nature of fixed communications where a repair can often be expedited for a particular vulnerable customer).

Ofcom also has an obligation under the UK Disability Discrimination Act 2005¹⁵⁵ (DDA) to take measures to ensure that people with disabilities can use the services as easily as everyone else. The Disability Discrimination Act is now consolidated as part of the UK Equality Act 2010.

Ofcom's [Single Equality Scheme](#)¹⁵⁶ aims at promoting quality and diversity through its functions and policies across sectors.

Ofcom has also developed the Mobile Industry Good Practice Guide for Service Delivery for Disabled and Elderly Customers in the UK available at:

http://consumers.ofcom.org.uk/files/2010/06/gp_guide_eld_dis.pdf.

In January 2011 the Communications Consumer Panel published a report about mobile handset usability

<http://www.communicationsconsumerpanel.org.uk/smartweb/telecommunications/mobile-usability>

Since May 2011, mobile providers must offer access to emergency SMS for deaf and speech-impaired people.

¹⁵² <http://www.legislation.gov.uk/ukxi/2000/2410/made>

¹⁵³ <http://stakeholders.ofcom.org.uk/binaries/telecoms/ga/cvoge300710.pdf>

¹⁵⁴ For further details see: http://consumers.ofcom.org.uk/files/2010/06/gp_guide_eld_dis.pdf

¹⁵⁵ <http://www.legislation.gov.uk/ukpga/2005/13>

¹⁵⁶ <http://www.ofcom.org.uk/about/policies-and-guidelines/equality-and-diversity/single-equality-scheme-ses/>

9.12 United States

The United States ¹⁵⁷ has a range of general and specific laws mandating telecommunication access for persons with disabilities. The Federal Communications Commission ¹⁵⁸ (FCC) is the regulatory body in charge of media and communication practices and policies in the US.

As part of the Telecommunications Act of 1996 that mandated the FCC to establish a Universal Service Fund¹⁵⁹, Section 255¹⁶⁰ and Section 251(a) (2)¹⁶¹ of this act requires manufacturers of telecommunications equipment and service providers to ensure that their products and services are accessible to and usable by persons with disabilities, if such access is readily achievable. This covers telephones, cell phones, pagers, call-waiting, and operator services.

Where access is not readily achievable, Section 255 requires manufacturers and service providers to make their devices and services compatible with peripheral devices and specialized customer premises equipment that are commonly used by people with disabilities, if such compatibility is readily achievable. The “readily achievable” standard requires companies to incorporate access features that can easily be provided without much difficulty or expense. Title IV of the Americans with Disabilities Act, 1990 (ADA) which took effect on July 26, 1992 requires all telephone companies across the United States to provide telecommunications relay services (TRS). Pursuant to this statute, the FCC has also made regulations for the provision of TRS. ¹⁶²

TRS allows people who are deaf, hard of hearing, or speech impaired to communicate through a communications assistant (CA) with people who use a standard telephone. A CA relays the TTY (text telephone or telecommunications device for deaf and hard of hearing people) input to the telephone user and types that person’s response back to the TTY user.

Since 2000, the FCC authorized several forms of TRS designed to meet the needs of certain users, and allows greater access to telecommunications via Internet. For example, Speech-to-

¹⁵⁷ [Text provided by ITU Member State, United States](#)

¹⁵⁸ <http://www.fcc.gov/>

¹⁵⁹ <http://www.usac.org/default.aspx>

¹⁶⁰ <http://www.access-board.gov/about/laws/telecomm.htm>

¹⁶¹ http://www.dleg.state.mi.us/mpsc/comm/broadband/unbundling/section_251.htm

¹⁶² <http://www.fcc.gov/cgb/dro/trs.html>

Speech relay service for persons with speech disabilities, Internet-Protocol relay service and video relay service for persons with hearing disability who communicate in sign language.

The costs of intrastate TRS services are recovered by the states, either through rate adjustments or surcharges on local telephone bills. Costs for interstate TRS are recovered through a shared-funding mechanism (TRS Fund) set forth in the Commission's rules. All providers of interstate telecommunications services contribute to the TRS Fund, and TRS providers recover the costs of providing interstate TRS from the TRS Fund on a minutes-of-use basis.

As per the Hearing Aid Compatibility Act of 1988 (HAC Act), the FCC ensures that all telephones manufactured or imported for use in the United States and all ‘essential telephones’¹⁶³ are hearing aid-compatible. FCC also has extended this requirement to wireless/mobile telephones.¹⁶⁴

In October 2010, the US Congress passed the Twenty-First Century Communications and Video Accessibility Act of 2010 (CVAA),¹⁶⁵ the aim of which is to improve access to “advanced communications” (including interconnected and non-interconnected voice over Internet protocol (VoIP), electronic messaging, and interoperable video conferencing services) and “consumer-generated media” for persons with disabilities. Section 102¹⁶⁶ of this Act requires that telephones which are used with the Internet need to accommodate hearing aids. Section 104, outlines access to advanced communications services and equipment which is an expansion of Section 255’s accessibility mandates to advanced communications services and equipment. This section has a modified standard which defines “achievable” as reasonable effort or expense, as determined by the FCC.

¹⁶³ ‘Essential’ telephones are defined as “coin-operated telephones, telephones provided for emergency use, and other telephones frequently needed for use by persons using such hearing aids.” Essential phones might include workplace phones, phones in confined settings (like hospitals and nursing homes), and phones in hotel and motel rooms.

¹⁶⁴ <http://www.fcc.gov/cgb/dro/hearing.html>

¹⁶⁵ <http://www.govtrack.us/congress/bill.xpd?bill=s111-3304>

¹⁶⁶ <http://www.coataccess.org/node/9776>

CVAA follows and complements a string of laws, passed in the 1980s and 1990s, that were designed to ensure that telephone and television services would be accessible to all Americans with disabilities.¹⁶⁷ The followings are the key requirements:

- Access to Internet browsers on mobile phones
- Improved accountability and enforcement
- Expansion of relay services definition and contributors
- Equipment for low-income deaf-blind individuals
- Expansion of hearing aid compatibility (HAC) rules
- Ensuring access to next generation 9-1-1 services.

Section 508¹⁶⁸, a provision in the Rehabilitation Act,¹⁶⁹ mandates that electronic and information technology funded, developed or used by the US federal government or US federal agencies should be accessible to persons with disabilities who may be employees or general members of the public, “unless an undue burden would be imposed on the department or agency”.¹⁷⁰

The provision further requires that levels of access be on par with those for able-bodied people. Section 508 concerns federal agencies, but has created a marketplace incentive for the development of accessible information and communications technology.¹⁷¹

9.13 European Union

The European Commission Universal Service Directive (Directive 2002/22/EC),¹⁷² lays down rules relating to the needs of disabled end users and people with special needs with regard to telecommunications. These cover fixed, wireless and broadband telephony.

¹⁶⁷ <https://www.fcc.gov/encyclopedia/twenty-first-century-communications-and-video-accessibility-act>

¹⁶⁸ <http://www.section508.gov/>

¹⁶⁹ http://en.wikipedia.org/wiki/Rehabilitation_Act_of_1973

¹⁷⁰ <http://www.afb.org/afbpress/pub.asp?DocID=aw110402>

¹⁷¹ http://www.e-accessibilitytoolkit.org/toolkit/public_procurement

¹⁷² http://ec.europa.eu/information_society/policy/ecommm/todays_framework/universal_service/index_en.htm

The directive states that National Regulatory Authorities (NRA) of member states can adopt measures depending upon the specific circumstances in their nations to ensure adequate choice of telecommunication services to disabled users.

Some of the measures taken by NRAs in different European member states which build upon the EU Directive are outlined below. Countries may have implemented these measures in a variety of ways. For example, some provide state subsidies for connections facilitating alternative forms of communication for disabled end users while others require service providers to offer such accommodations.

- **Billing in accessible formats:** Czech Republic, France, Greece, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Slovenia, Sweden, Switzerland, and UK
- **Information about accessible services covered by the universal service obligation:** Czech Republic, France, Greece, Ireland, Italy, Lithuania, Malta, Norway, Portugal, Slovakia, Slovenia, Sweden, Switzerland, and UK.
- **Special measures of access for emergency situations such as the sms112 project:** Czech Republic, France, Greece, Ireland, Italy, Malta, Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, Sweden, Switzerland, and UK.
- **Text Relay Services:** Czech Republic, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Portugal, Slovakia, Sweden, Switzerland, and UK.
- **Video Relay Service:** Germany, Sweden
- **Speech to Speech Relay Services :** Sweden
- **Quick dial and speed dial keys for mobile telephony** Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Sweden, Switzerland, and UK.
- **Volume adjustment in handsets** - Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Sweden, Switzerland, and UK.

Chapter 10 Good practices for policy development and implementation

10.1 Awareness raising activities among key stakeholders

Creating awareness about the need for integrating accessibility solutions on mobile products and services for persons with disabilities amongst various stakeholders such as policy makers, handset manufacturers, service providers, developers and standards setting organisations will help to encourage proactive initiatives and mainstream accessibility. The following measures can be taken by governments and disability organisations to raise more awareness amongst stakeholders:

- Engaging in public outreach activities such as information kiosks, travelling exhibits, etc –e.g.- Thailand’s outreach exhibition bus.
- Conducting media outreach activities in the form of advertisements and public service announcements that speak about accessible mobile products and services and educate consumers on their rights
- Working with universities and research laboratories to develop universally designed products
- Publishing data and survey results relating to mobile use by persons with disabilities
- The M-Enabling Summit organized in 2011 by G3ict in cooperation with the ITU and FCC with major organizations of persons with disabilities and leading mobile industry participants aims at establishing such a dialogue on a global scale ¹⁷³

10.2 Consensus building and policy making including persons with disabilities

Consensus building on the need for accessibility in mobile phones and services can be brought about by engaging key stakeholders – disabled consumers, manufacturers, network operators, regulators, governments, developers and accessibility experts in fruitful interaction and galvanizing them towards action. This can be done by:

- Encouraging national debate and discourse around accessibility through conferences and meetings showcasing innovative trends and developments, best practices and working

¹⁷³ <http://www.m-enabling.com/>

models.

- Consulting with field experts including disability organizations, NGOs working in accessibility, experts in universal design etc.
- Adopting large scale initiatives for accessibility such as the voluntary charter for mobile accessibility signed by the French Government, service operators and disability organizations

10.3 Adoption of level playing field alternatives for service providers

Smaller network operators and manufacturers may not be able to undertake accessibility initiatives. Governments can therefore encourage smaller players to include accessibility in their business practices in the following ways-

- Monetary incentives for adopting accessibility in products and services in the form of subsidies and tax breaks
- Building partnerships for research and development
- Subsidizing implementation of mandatory compliance with accessibility norms through the universal service fund and other special schemes and programmes
- Facilitating technology transfer and sharing

10.4 Pilot programs

Pilot programmes are a good way to experiment with innovative ideas and work out feasibility issues. Pilot programmes are also optimal for implementing small-scale localized solutions for specific regions and sometimes to fund projects where no precedence or policy mandate exists. Governments can support pilot programmes in several ways either through funding, or through partnerships, or through the universal service fund.

10.5 Expanding charters of universal service funds to include persons with disabilities

Universal service funds represent a prime opportunity for governments to fund the creation of specialized schemes and programmes for persons with disabilities. This can be done in the following ways:-

- Including persons with disabilities explicitly as a beneficiary group in universal service

policies and legislation

- Outlining accessibility initiatives and programmes benefitting persons with disabilities
- Defining universal service/access to include service to persons with disabilities

10.6 Other public funding initiatives for sector specific mobile applications

Accessible mobile phones provide the means for governments to extend their range of services relating to health, business, education, insurance and banking, e-governance etc. to persons with disabilities either directly or by supporting private ventures. These can include -

- Actionable information services (weather/farming/market prices/navigation assistance/public information etc.) via accessible text/voice messages
- Dial in access to DAISY content via mobile phones
- Accessible e-governance services and gateways on mobile platforms

10.7 Milestones, measurement of progress and reporting

Evaluation and monitoring is essential for identifying gaps in policy implementation. Progress reports and data collected through surveys can give really useful feedback for deciding future course of action.

- Using the G3ict ICT accessibility self-assessment framework for UNCRPD signatories to assess current policy framework and build upon it.¹⁷⁴
- Commissioning market research and survey to assess the telecom market. Ex- Ofcom commissioned a Disabilities Mystery Shopping exercise¹⁷⁵ to look into what information was being provided by fixed and mobile telecom providers to consumers with disabilities about products and services.
- Reviewing laws, guidelines and compliance standards periodically to keep them updated and relevant to current technological developments.
- Including questions to measure levels of access to ICTs and mobile phone services with regard to persons with disabilities in census and other surveys.

¹⁷⁴ http://www.g3ict.org/download/p/fileId_807/productId_147

¹⁷⁵ <http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/783922/DisabilitiesMysteryShoppin.pdf>

Chapter 11 Resources on accessible and assistive mobile technologies and solutions for persons with disabilities

This chapter provides an overview of resource and resource centres on accessible and assistive mobile technologies and solutions for persons with disabilities. It lists institutions and bodies at the national level as well as provides information on larger international bodies involved in accessible mobile phone services. The list given here is merely indicative of the kinds of organizations and bodies that a citizen in any country may approach for telecom accessibility and is not intended to be an exhaustive list of resources.

11.1 Standards and Standards Development Organizations resources

- **ITU-T** - The Standardization Sector of the International Telecommunication Union - (ITU-T)¹⁷⁶ has been working at improving accessibility standards in accordance with UNCRPD guidelines on Universal Design. Some of its recommendations are as follows:

ITU-T Standardization recommendations

The Standardization Sector of the International Telecommunication Union - (ITU-T)¹⁷⁷ has been working at improving accessibility standards in accordance with UNCRPD guidelines on Universal Design. Some important recommendations are given below¹⁷⁸ –

- E.121: “Pictograms, symbols and icons to assist users of the telephone service” (Easy-to-understand symbols)
- E.135: “Human factor aspects of public telecommunication terminals for people with disabilities”
- E.136: “Specification of a tactile identifier for use with telecommunication cards”
- E.138: “Human factor aspects of public telephones to improve their usability for older people”.

¹⁷⁶ http://www.e-accessibilitytoolkit.org/toolkit/international_cooperation/international_standards_development

¹⁷⁷ http://www.e-accessibilitytoolkit.org/toolkit/international_cooperation/international_standards_development

¹⁷⁸ http://www.e-accessibilitytoolkit.org/toolkit/international_cooperation/international_standards_development

- V.18 provides for harmonization of text telephony
- V.151 Procedures for the end-to-end connection of analogue PSTN text telephones over an IP network utilizing text relay
- T.140 specifies the general presentation protocol for text conversation
- T.134 details how to use text conversation in the T.120 data conferencing environment
- H.323 Annex G defines text conversation in H.323's packet multimedia environment
- H.248.2 allows gateway procedures between Text Telephony in PSTN and real-time text in IP and other networks
- H Series Supplement 1 gives users the requirements on video communication for sign language and lip reading
- Telecommunication Accessibility Checklist for standards writers
- F.790 provides telecommunications accessibility guidelines for older persons and persons with disabilities
- ITU-T Recommendation Y.1901 “Requirements for the support of IPTV services”
- **JISC-** The Japanese Industrial Standards Committee¹⁷⁹ has developed JIS X8341-4, which is applicable to telecommunications equipment.
- **ETSI-** The European Telecommunication Standards Institute¹⁸⁰ is the telecommunications' standards setting organization for the European Union. The ETSI technical committee Human Factors¹⁸¹ develops standards and guidelines for ease of use and access to ICT. The following accessibility standards have been developed by ETSI¹⁸² -
 - EG 202 116- Guidelines for ICT products and services; 'Design for All'
 - ES 202 975- Harmonized Relay Service

¹⁷⁹ <http://www.jisc.go.jp/eng/>

¹⁸⁰ <http://www.etsi.org/WebSite/AboutETSI/AboutEtsi.aspx>

¹⁸¹ <http://www.etsi.org/website/Technologies/Accessibility.aspx>

¹⁸² <http://www.etsi.org/website/Technologies/Accessibility.aspx>

- TR 102 974- Telecommunication relay services
- ES 202 076- User Interfaces; Generic spoken command vocabulary for ICT devices and services
- TR 102 612- European accessibility requirements for public procurement of products and services in the ICT domain (European Commission Mandate M 376, Phase 1)
- **Unicode Consortium**¹⁸³ - The Unicode Standard¹⁸⁴ is the internationally accepted standard for the representation of digital text on various platforms. It assigns a unique code for every character irrespective of platform, program, font or language. Standardizing digital text content in compliance with Unicode allows for greater interoperability, assures greater accessibility and eliminates error in processing and ensure lossless transmission of data and better interoperability.
- **W3C Consortium**¹⁸⁵- Web Content Accessibility Guidelines (WCAG)¹⁸⁶ are the internationally recognized standards for Web accessibility published by the W3C's Web Accessibility Initiative¹⁸⁷. They consist of a set of guidelines on making web content accessible for persons with disabilities and for user agents such as mobile phones. The current version is 2.0.
- **DAISY Consortium** - The DAISY Consortium develops, maintains and promotes the international DAISY (Digital Accessible Information System) Standards.

11.2 Professional organizations

- **Internet and Wireless Service Providers Associations** - Cellular Operators Association of India (COAI), Internet Service Providers Association of United Kingdom (ISPA), The Wireless Association (CTIA) , European association of Internet Services Providers (EuroISPA), Canadian Independent Telephone Association, African Internet Service Providers Association, the GSM Association, CDMA development group.
- **Mobile manufacturer associations** - the Global mobile Suppliers Association, the Mobile Manufacturers Forum (MMF) which has launched the Global Accessibility Reporting

¹⁸³ <http://www.unicode.org/consortium/consort.html>

¹⁸⁴ <http://unicode.org/>

¹⁸⁵ <http://www.w3.org/>

¹⁸⁶ <http://www.w3.org/TR/WCAG20/>

¹⁸⁷ <http://www.w3.org/WAI/>

Initiative (GARI) - a project aimed at helping consumers with disabilities find information about the various accessibility features. Its database of handsets and web site has been adopted in 2011 by the CTIA in the United States which added features and content relevant to North American mobile users.

- **Chambers of commerce/ trade Councils and other business and industry lobby groups-** Bodies such as the Federation of Indian Chambers of Commerce and Industry (FICCI), British Confederation of Industry (BCI), US Chamber of Commerce, the Telecommunications Industry Association etc.

11.3 Users organizations

- **Statutory and independent consumer welfare bodies and watchdogs-** Consumers International, Consumers' Federation of Australia, *Proteste* in Brazil, *Union Fédérale des Consommateurs of France*, Consumers Union of Japan, National Consumer Agency of Ireland etc.
- **Disabled Persons Organizations with a focus on technology and accessibility** such as TDI, Telecommunication for the Deaf and Hard of Hearing, the American Foundation for the Blind, the Royal National Institute for the Blind in the U.K. or the American Association of People with Disabilities – AAPD.
- **Statutory and independent disability councils -** National Disability councils of United States and United Kingdom, Rehabilitation Council of India, The National Council for Persons with Physical Disabilities in South Africa, The Swedish Disability Federation, Physical Disability Council of Australia (PDCA) etc.

11.4 Academic and research institutions

- **University based research initiatives** – Major universities around the world are pursuing research projects on mobile accessibility. One excellent resource is the recently published report by the Ontario College for Arts and Design (OCAD) at the University of Toronto for the Canadian regulatory authority on mobile phone accessibility: http://www.thewirereport.ca/reports/content/12541-crtc_releases_report_on_mobile_handset_accessibility. The Rehabilitation Engineering

Research Center for Wireless Technologies (RERC), a jointly run by the Shepherd Center and the Georgia Institute of Technology specializes on wireless technologies research for persons with disabilities. The University of Tokyo has contributed to several research projects including the use of mobile in the classroom for students with disabilities.

- **Corporate funded research** – For example IBM has partnered with the National Institute of Design of India and Research Center for Advanced Science and Technology, The University of Tokyo (RCAST) for a collaborative research initiative to develop an open, accessible common user interface platform for mobile devices,
- **Others-** R&D divisions of service providers/mobile manufacturers, state- backed telecommunication research centres and institutes etc.

11.5 Others

Official information channels of service providers and mobile manufacturers, government bodies and regulators, technology review websites and blogs and online support forums and bulletin boards can also act as access points of information and interaction for persons with disabilities.

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<http://www.eastersealstech.com/content.aspx?pId=554>

<http://atcoalition.org/category/mobile-phones-including-smartphones>

<http://www.mywirelessreview.com/accessible-apps-corner>

http://www.androidzoom.com/android_applications/deaf

<http://www.apparelyzed.com/forums/forum/62-accessible-computing-adaptive-technology-and-home-automation/>

<http://a4cwsn.com/>

Windows Mobile Device Accessibility

<http://www.microsoft.com/windowsphone/en-us/howto/wp6/setup/set-up-windows-phone-6-5.aspx>

Windows Phone 7 Devices Accessibility

<http://www.microsoft.com/windowsphone/en-us/howto/wp7/start/windows-live-id.aspx>

IPhone Accessibility

<http://www.apple.com/accessibility/iphone/vision.html>

<http://www.eastersealstech.com/content.aspx?pId=554>

Android Official Accessibility project, Eyes-Free

<http://code.google.com/p/eyes-free/>

Blackberry

http://us.blackberry.com/support/devices/blackberry_accessibility/

Code Factory – Leading Accessibility application provider (Third Party)

<http://codefactory.es/en/>

Nuance – Screen Reader and Magnifier fro S60 and S80 Phones)

<http://www.nuance.com/for-individuals/by-solution/talks-zooms/index.htm>

Nokia Accessibility Features

<http://www.nokiaaccessibility.com/>

Samsung

http://www.samsung.com/us/consumer/learningresources/mobile/accessibility/pop_accessibility.html

Exhaustive List of Mobile Device Manufacturer

<http://www.phonedog.com/cell-phone-research/companies/manufacturers.aspx>

Android Market

<http://www.phonedog.com/cell-phone-research/companies/manufacturers.aspx>

IPhone App Store

<http://www.apple.com/iphone/apps-for-iphone/>

Windows Mobile Market Place

<http://marketplace.windowsphone.com/>

Glossary

3G - Third Generation; International Mobile Telecommunications-2000 (IMT — 2000), a generation of standards for mobile phones and mobile telecommunications services including wide-area wireless voice telephone, mobile Internet access, video calls and mobile TV

AAC - Augmentative and Alternative Communication, methods of communication for those with impairments or restrictions on the production or comprehension of spoken or written language

ADA: Americans with Disabilities Act

Android – mobile operating system developed by Android Inc, owned by Google

Android Market – online software store for Android applications

API: Application Programming Interface

AT or Assistive Technology - an umbrella term that includes assistive, adaptive and rehabilitative devices for people with disabilities

Avatar – graphical representation of an online member

Biblio-Net - digital library serving the print impaired in Japan

Bluetooth – wireless technology standard for exchanging data over distances between devices

Bone conductor – refers to the conduction of sound to the inner ear through the bones of the skull

Bookshare - international digital library for persons with print impairments

Celedu: Mobile Education

Cloud computing - location independent computing

Code Factory - manufacturer of screen readers for mobile phones

DAISY - Digital Accessible Information System

Digital library - library resource comprising reading materials in digital and electronic formats

DLNA – Digital Living Network Alliance, compatibility and interoperability standards for consumer digital devices

Dyslexia - a form of learning disability

eReader - electronic reader, could refer to hardware device or software

Google Talk - Instant messaging software

GPRS - Global Packet Radio Service, packet oriented mobile data service.

GPS – Global Positioning System

Handsfree – devices to circumvent handheld phone communication

IM Relay- Instant Messaging Relay

IP Relay – Internet Protocol Relay

ITU - International Telecommunications Union

MMS – Multimedia Messaging Service

Mono audio - single channel monophonic sound reproduction

Motor disability - any disability that affects movements of limbs

MSN - the Microsoft Network

NCCD- National Centre for Customers with Disabilities, a resource center set up by AT&T

NFC- Near Field Communication

Nuance - manufacturer of screen readers for mobile phones

OS – Operating System

Ovi Maps – brand of Applications for Nokia cell phones

PDA – Personal Digital Assistant

Pocket PC - a hardware specification for a handheld-sized computer (Personal digital assistant) that runs the Microsoft 'Windows Mobile Classic' operating system.

Predictive text – input technology commonly used in cell phones, which allows some common words to be entered by a single keypress for each letter, as opposed to multiple key press

Project Gutenberg - founded in 1971 by Michael S. Hart, it is the oldest digital library

Quadriplegics - persons paralysed from neck down

QWERTY keypad – mobile keypad with 26-alphabet character layout

RERC - Rehabilitation Engineering Research Center for Wireless Technologies, founded in 2001 and headquartered at the Shepherd Center in Atlanta, in partnership with the Georgia Institute of Technology

Sagem – A French communication systems and consumer electronics company

Screen magnifier - application that allows user to magnify font or zoom into portion of screen

Screen reader - software application that attempts to identify and interpret the display on the screen

SDK – Software Development Kit, interface and tools provided by a company to open up their platform to developers who wish to write applications for it

Smart phone – a mobile phone with advanced computing abilities and features

SMS – Short Messaging Service

SRT - Subrip subtitle format, takes its origin from the program of the same name. Subrip is a program to rip and convert DVD subtitles in a text format through an OCR process. As a text based format, it can be opened and edited it with any text editor.

Symbian - operating system for mobile phones develop by Nokia

TTY or Tele Typewriter - device that lets people use the telephone to communicate, by allowing them to type messages back and forth between user and receiver, instead of talking and listening

Tele-density - the number of landline telephones in use for every 100 individuals living within an area

Telematic- any integrated use of telecommunications and informatics

Third party applications – software applications developed by persons and companies which are not brand-bound

UNCRPD/CRPD - United Nations Convention on the Rights of Persons with Disabilities

USOF/USF - Universal Service (Obligation) Fund

User Interface /UI - the space where interaction between humans and machines occurs

Voice Dial - connecting to a phone number by using voice commands to dial numbers

VoiceOver - screen reader, which comes with the Apple Operating System

WCAG - Web Content Accessibility Guidelines, WCAG) is part of a series of Web accessibility guidelines published by the W3C's Web Accessibility Initiative.

Wi-Fi: Wireless Fidelity

Zigbee – Suite of protocols to enable low-rate wireless communication between home appliances and devices

Z-Wave - a new generation wireless ecosystem that lets all home electronics talk to each other, allow for their remote control. It uses low-power radio waves that easily travel through walls, floors and cabinets. Z-Wave control can be added to almost any electronic device in a house, even devices that wouldn't ordinarily be qualified as "intelligent," such as appliances, window shades, thermostats and home lighting.