

DIGITAL INCLUSION

Making Mobile Phones and Services
**ACCESSIBLE FOR PERSONS
WITH DISABILITIES**



G3ict

AUGUST 2012
Telecommunication Development Sector



Making mobile phones and services accessible for persons with disabilities

*A joint report of ITU – The International
Telecommunication Union and
G3ict – The global initiative for inclusive ICTs*

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This report is published by the International Telecommunication Union in cooperation with G3ict – The Global Initiative for Inclusive Information and Communication Technologies - whose mission is to promote the ICT accessibility dispositions of the Convention on the Rights of Persons with Disabilities www.g3ict.org. ITU and G3ict also co-produce the e-accessibility Policy Toolkit for Persons with Disabilities www.e-accessibilitytoolkit.org and jointly organize awareness raising and capacity building programmes for policy makers and stakeholders involved in accessibility issues around the world.

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Foreword

Mobile communications have become ubiquitous, reaching out to the most isolated and least served communities in developed and developing countries alike. At the end of 2011, there were more than 5.9 billion mobile-cellular telephone subscriptions. By the same point in 2013 we expect such subscriptions to outnumber the global population. But this will not mean that everyone has access to mobile telephony.

Senior citizens and people with physical or mental disabilities are often unable to access mobile phones because the equipment lacks the necessary accessibility features or because the price of the adapted phones and services remain unaffordable. Considering that 15 per cent of the world's population, or over one billion people, have a disability that affects their access to modern communications, the commercial opportunities for mobile service providers, manufacturers and smart phone application developers are consequently substantial.

It is therefore somewhat surprising that enhanced-accessibility should remain a relatively undeveloped segment of the market. The good news is that the technology to make mobile phones and services accessible is becoming more developed. Screen readers can make mobile phones accessible for the blind, those with low vision and the illiterate. Visual or vibrating alerts, relay services and hearing aid compatibility devices make mobile phones accessible for the deaf and hard of hearing, while features such as voice recognition and auto text are needed by those with physical disabilities. New accessibility applications for smart phones are being developed and launched practically every day. Affordability nevertheless continues to be a major issue, especially for smart phone solutions.

The widespread adoption of the Convention on the Rights of Persons with Disabilities (CRPD), which requires information and communication technology accessibility of all its States Parties, among which most are ITU Member States, has been stimulating a series of reviews of regulatory and policy measures in order to ensure that they adequately take account of accessibility needs. There are many lessons to be shared.

It is my hope that this report which draws on the accumulated expertise in this area will serve a valuable resource for all mobile stakeholders as they strive to implement successful accessibility features, services, business practices, policies and programmes in their countries. Service providers and handset manufacturers will find clear explanations of the accessibility features and special services needed by people with different kinds of disabilities. The chapter on the growing number of accessible mobile applications should serve as inspiration for "apps" developers worldwide. Business managers can use the report to analyze market demographics and opportunities and learn from the real-life accessibility business cases. Policy makers and regulators will gain enhanced awareness of the CRPD's ICT accessibility requirements, the role of government agencies in ensuring accessibility, and find examples of existing national policy approaches and guidelines on developing and implementing accessibility policies.

I invite all stakeholders to use this report to guide them as they implement business practices and policies to promote accessible mobile phones and services at home. It is my goal that affordable, accessible mobile phones and services will be used to "m-power" persons with disabilities and other users around the globe. My sincere appreciation goes to our colleagues at G3ict and CIS with whom we developed this report. I look forward to continuing our joint activities to promote ICT accessibility for persons with disabilities.



Brahima Sanou
Director

Telecommunication Development Bureau

Publishers' note

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

The present study compiles and analyses 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.

The M-Enabling Summit, held in December 2011 in Washington D.C. by G3ict in cooperation with ITU and the U.S. Federal Communications Commission, offered a unique window on the latest innovations and solutions bringing unprecedented benefits to persons with disabilities. We incorporated in the present report some of the latest innovations shared by service providers, technology vendors, application developers or organizations of persons with disabilities during the Summit.

Our sincere appreciation goes to the International Telecommunication Union for facilitating our inquiry during its many international seminars on accessibility, to Brahima Sanou, Director of the ITU Telecommunication Development Bureau (BDT) and his staff, without whom the development of this report would not have been possible, and to Nirmita Narasimhan, Program Manager at the Center for Internet and Society and to the team of contributors who supported her work.

Axel Leblois
Executive Director, G3ict

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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 about accessibility enhancing features is often provided by manufacturers on their websites.¹ Assistive technologies, such as screen readers from a third party, can often provide a better user-experience than the original handset-embedded application or voice synthesizer, although more manufacturers are now embedding high quality applications such as in the iPhone.

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 Global Accessibility Reporting Initiative (GARI) database². The same database has been adopted in the United States by CTIA-The Wireless Association³ as a resource for end-users⁴.

1.1 Hearing – Basic accessibility features and services

Problem: People who are deaf or hard-of-hearing are deprived of social interaction and 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. Moreover, they are unable to access vital emergency services like requesting police or medical assistance.

Solution: There are a variety of accessibility 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 of volume adjustment and speakers to provision of video relay services.

Figure 1.1 illustrates the Emporia Life Mobile Phone which has been designed for elderly users and includes, among various other accessibility features, SMS text messaging, a super loud ringer, a three colour visual alert, hearing aid compatibility, and adjustable volume control.

Figure 1.2 shows that conversations with sign language via peer-to-peer video can work on smart phones with 3G networks.

Accessibility features

Messaging options. The most crucial function that a cell phone serves for the hearing impaired and the deaf 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.

¹ Examples include the websites of Motorola, Nokia, and Samsung

² www.mobileaccessibility.info/

³ www.ctia.org

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

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, etc.

Adjustable volume control Especially useful for those who are hearing impaired as well as for enhancing functionality of hearing aids.

Figure 1.1: The Emporia Life Mobile Phone



Source: AHD (Accessible Handset Distribution) – www.ahdistribution.com/

Call logs. The display of missed or received calls which may have been missed by not feeling the vibrator or seeing the lights.

Visual or tactile indicators for the keypad. Highlighting the buttons pressed on the keypad through either lights or vibration, will confirm actions being taken.

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. The deaf, hard-of-hearing or speech-impaired communicate with 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 pictures or videos using mobile 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. This feature transfers both left and right-channel audio content to both ear buds of headphones and makes listening to music and making calls easier for people with hearing loss affecting one ear.⁵

Video conferencing. This is yet another feature increasingly available on smart phones that has significantly enhanced the means of communicating for the deaf and hard of hearing. Face-to-face calling

⁵ www.apple.com/accessibility/iphone/hearing.html

(video calling) is simpler to use over 3G and WiFi networks. Deaf persons can now communicate instantly and more effectively using video chat via sign language instead of relying on texting.

Figure 1.2: Conversations with sign language via peer-to-peer video works on smart phones with 3G networks



Source: Test and Measurement – www.testandmeasurement.com

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.

Accessibility Services

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

Tailor-made plans for the deaf. Cell phone plans are now tailored for the deaf so that they pay only for messaging and not for voice calls. 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 United States (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

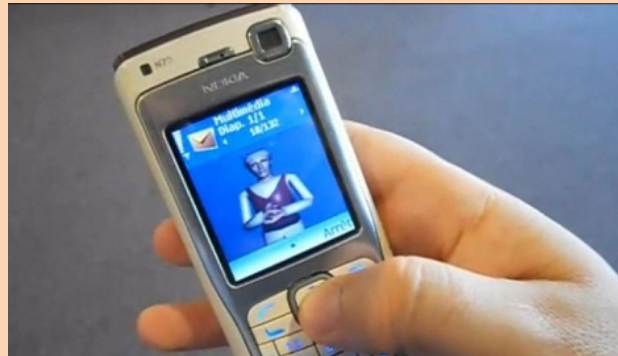
SMS-to-Avatar translation (Tunisia). WebSign is a project of the University of Tunis, based on the technology of avatar (animation in the virtual world). The software converts typed text into real-time, online interpretation in sign language with the help of a dictionary of words and signs. The dictionary has a very simple interface and even allows persons to create their own signs and words.⁸ The service facilitates communication between those who do not know sign language and illiterate deaf users and can also be useful for children learning sign .

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

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

⁸ <http://hebergcck224.rnu.tn/ws/index.php> - The Research Laboratory UTIC, University of Tunis, Tunisia and <http://www.youtube.com/watch?v=9mDkNppWb1M>

Figure 1.3: WebSign SMS to MMS avatar



Source: WebSign

Open Issues

Automated customer services. Systems need to be implemented to ensure that the deaf and hard-of-hearing are able to access automated customer services that require users to listen to several automated options and then select a channel of service using the keypad.

Cost is another issue. 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. This results in technology not being affordable to many persons with disabilities.

1.2 Vision – Basic accessibility features and services

Problem: Persons who are blind or have low vision are unable to see screens and hence cannot use touchscreen keyboards or 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. Newest generations of touchscreen phones come with gesture-based screen-readers. This allows users with visual impairments to hear descriptions of functions on their phones through touch and also allows them to drag and tap to control their activities.

Accessibility features

Table 1 describes a number of mainstream accessibility features available on mobile handsets.

Table 1: Mobile handset accessibility features for the visually impaired

Feature	Description
Tactile markers	These markers help orient fingers on the keypad – the raised dot on the number five on telephones and mobile phones helps users to navigate the keypad.
Audible or tactile feedback	Confirms that a button is pressed. For example, provides audio alerts and feedback for functions such as when voice mail is received or phone is turned on.
Adjustable font sizes	This feature enables the user to increase font size when required to suit user needs.
Screen readers	Used extensively by people with visual impairment 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.

Feature	Description
Voice synthesizer feedback for touch screens	Voice feedback allows users of touch screen handsets to hear the description of the icon under their finger tip. When in voice feedback mode (such as Voice Over with iOS), touch screens are typically frozen so that users can explore icons. Special gestures such as three fingers at a time are necessary to trigger the sliding of screen pages when in voice feedback mode.
Audible cues	Noises used to indicate specific services or features, such as: low battery, caller waiting or ending a call, adjusting volume level, etc.
Adjustable brightness / contrast controls	Allows the user to customize the display to meet individual needs. Display colours, for example, can be reversed on BlackBerry smart phones. Depending on the comfort level of a partially sighted user, the foreground and background colours can be changed from light to dark or vice versa. Colours can also be converted to shades of grey.
Changeable size for main display	The size of the displaying area can be changed to suit user needs.
Backlit display	Backlit display facilitates viewing in poor lighting, indoors and outdoors.
Basic text-to-speech functionality	For example, this feature can be useful when checking caller ID and reading text messages.
Scanner and OCR (Optical Character Recognition):	Provides highly accurate print-to-electronic text conversion.
Screen magnifiers	Magnifying screens allow users with low vision to enlarge fonts and images. Essential for those with a limited degree of usable vision. The picture in Figure 1.6 shows an example of the magnifying function.

Figure 1.4: Samsung phone with elevated dots on key #5



Source: G3ict

Figure 1.5: Mobile Speak Features Adjustment – Control Panel



The Mobile Speak screen reader is a software application installed on a mobile phone for users with visual impairments or who are reading challenged. Information displayed on the screen is rendered in synthesized speech output generated using text-to-speech (TTS) technology and routed through the device's speaker or a headset. Screen contents can also be presented in Braille if the mobile phone or PDA is connected to a Braille device with a refreshable Braille display. Speech and Braille output can be used at the same time, or independently, to perform many tasks on the phone, including the following:

- Make and receive calls.
- Read and write SMS messages.
- Manage contacts and call lists.
- Review dialler screen and caller ID.
- Browse the Internet.
- Send and receive emails.
- Manage the calendar with alarms.
- Create text and voice notes.
- Perform calculations.
- Listen to music and podcasts.
- Configure phone settings.

Source: Code Factory

Figure 1.6: Magnifying screens allow users with low vision to enlarge fonts and images.



Source: AFB Access World

In addition, people with low vision can also benefit from a variety of services such as digital libraries (see section 2.1) and GPS enabled path finding applications (see section 2.2).

1.3 Dexterity – Basic accessibility features

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.

Solution: 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 mobile 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.⁹

Other: Sensitive touch screen phones can benefit users with movements limited to their fingers. For people who may have trouble holding mobile 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 mobile phone cameras.

Additional 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; 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

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.

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

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

Accessibility features

Table 1.2 –Useful accessibility features for people with cognitive disabilities

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

Figure 1.7 illustrates a truly simple mobile telephone, easy to use by elderly persons to stay in touch wherever they are. With one press of a button, the user can answer incoming calls and dial any of four programmed numbers with the persons' name featured alongside. The SOS button can be used to place a call to emergency services, or users can activate alert dialling and SMS messages to their four programmed contacts, and it is hearing-aid compatible.

Figure 1.7: Truly simple mobile telephone



Source: Complete Care Shop www.completecareshop.co.uk

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 communities 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 are relevant for illiterate persons as described in Table 1.3.

Table 1.3 –Accessibility features relevant for illiterate persons

Feature	Description
Intuitive UI	An intuitive user interface that is largely understandable based on graphical icons facilitates the use of mobile 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 useful 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 (Tunisia¹⁰).

In addition to such features, innovative use of smart phones can also help people gain literacy skills around the world. For instance, Celedu (Mobile + Education) has started a project in this direction in India

¹⁰ <http://hebergcck224.rnu.tn/ws/index.php> - The Research Laboratory UTIC, University of Tunis, Tunisia

by spreading language skills and other learning content through downloadable games on mobile phones.¹¹

Table 1.4 gives an overview of the accessibility solutions, which are available for some of the devices and platforms in the market today.

Table 1.4 – 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 Back)	Moto Droid, Samsung Galaxy, 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)

¹¹ <http://nextlab.mit.edu/spring2009/celedu/>

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.¹²

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.¹³ Users can download books from special libraries for the visually impaired like Biblio-Net. 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 this system as a personal library on the Internet any time.¹⁴ 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 143 000 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.¹⁵
- **Project Gutenberg:** is a digital library with over 33 000 free eBooks, including DAISY books.¹⁶ These books are usually out of copyright.

Figure 2.1 illustrates Read2Go, a mobile app for Apple iOS products that enables print-disabled readers to download DAISY audiobooks -- notably the growing number of titles available to qualifying members on Bookshare -- so that they can listen to them on their iPad, iPhone, and iPod touch. In addition, Braille readers can output text to a refreshable display connected wirelessly to their device with Bluetooth technology.

¹² <http://edict2010.in/files/2010/09/mobile-phone-and-sped-2010-web-version.pdf>

¹³ Two examples of DAISY players for Nokia's Symbian-based phones are Code Factory's Mobile DAISY player and Nuance's DAISY2Go. www.codefactory.es/en/products.asp?id=314

¹⁴ www.dinf.ne.jp/doc/english/access/0705_IFLA-rightscom/part2/116_japan_special.html

¹⁵ www.bookshare.org

¹⁶ www.gutenberg.org

Figure 2.1: Read2Go mobile app

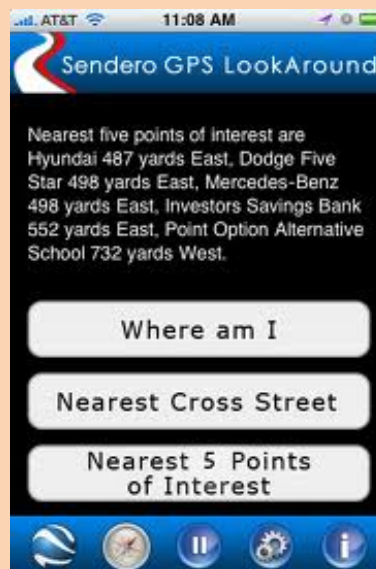


Source: Benetech

2.2 Global Positioning System (GPS)

Lack of information to navigate streets is a major barrier to independent mobility for the visually impaired. Mobile 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. Figure 2.2 shows the Sendero LookAround GPS which announces the nearest points of interest and your current location. Braille readers can also output text to a refreshable display connected wirelessly to their device with Bluetooth technology.

Figure 2.2: Sendero LookAround



Source: Sendero Group

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.

There are numerous examples of accessible GPS applications.¹⁷

2.3 Relay services

Relay services are human operated services for media and mode translation during phone conversations. They are usually given financial support through universal service/access fund mechanisms mandated by governments.

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.

Figure 2.3 shows the Sorenson nTouch VRS application which allows deaf and hard of hearing users to communicate via video relay services on the go. The application runs on iOS and Android devices.

Figure 2.3: Sorenson nTouch VRS application



Source: Sorenson Communications

Text relay services 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.

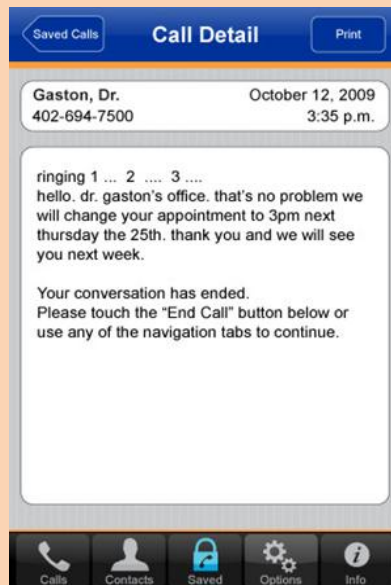
Speech-to-speech relay services support speech calls for users with speech impairments or cognitive disabilities.

¹⁷ 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 www.navigon.com/portal/int/produkte/navigationsoftware/mobile_navigator_iphone_eu.html and www.codefactory.es/en/products.asp?id=336

Captioned speech relay services (captioned telephony or CapTel service) translate 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.

Figure 2.4: Screen of Hamilton CapTel captioning service



Source: Hamilton CapTel

Instant Messaging (IM) 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 hard-of-hearing users, using AOL IM services.

To relay with one-step dialling, users send the phone number they are dialling via instant message to a screen name "AT& T Relay." 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.

This solution is also available on several mobile platforms on which AOL is available. Customers are given a personal 10-digit phone number which people can call via the AT&T IM Relay. Customers can also use an Internet connection and an AIM account on their computers and laptops.

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.¹⁸

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) has been developed for placing emergency calls. REACH112¹⁹ - funded under European Union's ICT Policy Support Programme – allows disabled users to communicate with each other as well as directly with 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.
- The Australian government has initiated an SMS-based emergency service for the hearing impaired and hard of hearing community.²⁰ 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 centres to have a Telecommunications Device for the Deaf (TDD) available for receiving emergency calls from similar devices.²¹ People with a hearing impairment using Video Relay Service (VRS) or IP Relay on their mobile 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 centres.

¹⁸ www.wirelessrerc.org/about-us/background-addressing-a-significant-need.html

¹⁹ www.reach112.eu/view/en/index.html

²⁰ www.deafau.org.au/download/SMSemergencyservicesapril2010.pdf

²¹ www.ada.gov/cguide.htm

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.²²
- **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, mobility, and/or speech disabilities about equipment, accessories, features and calling plans.²³
- **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.²⁴

An additional good resource is the Mobile Industry Good Practice Guide for Service Delivery for Disabled and Elderly Customers in the United Kingdom (UK).²⁵ Endorsed by all major mobile service providers, it covers all aspects of accessible customer service including recommendations for the retail environment.

²² www.iso.org/sites/WSC_Accessibility_2010/presentations/4_Group_3_04_Monique_Mai_Francois-Rene%20Germain_Geneve2010Nov03VD.pdf

²³ www.disabled-world.com/communication/messenger/instant-messaging.php

²⁴ www.g3ict.org/download/p/fileId_813/productId_152

²⁵ 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 an ideal platform for delivering a wide range of applications and services – such as email, music players, navigation, barcode readers and many more.

Developing applications on 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 earning revenue depending on the business model offered by the platform.

Figure 3.1: Main categories of application stores



Source: Distimo web site

Today, there are companies engaged exclusively in the business of making iPhone/Android applications, in addition to the several thousands of hobbyist developers writing code for these applications. 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 Distimo²⁶.

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

²⁶ www.distimo.com/appstores/

on the potential of the smartphone as an ideal assistive technology device – one that can replace multiple devices worth thousands 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 in 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? Apple's recent introduction of a special education section in its application store (Education store area), is a good step to better promote effective mainstream assistive applications.
- Ease with which independent developers are able to incorporate accessibility features into their applications: Does the platform enable incorporation of accessibility features into a generic application? Does it offer accessibility conformance evaluation for developed applications? Do the software development kit (SDK) and developer forums offer support to developers so they can easily weave accessibility features into their application development rather than building them from scratch. Support can be provided through Application Programming Interfaces (APIs) or providing example applications, tutorials and tips on designing for accessibility. Initiatives like Apps4Android's Camstreams ²⁷ are useful resources.
- Identifying phones that support applications on App Stores. While websites like the PhoneFinder ²⁸ can help narrow 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 it economically inaccessible to a large part of the disabled population (among others), especially in developing countries. While there is hope that this might change, with predictions of Android phones costing less than USD 100, there are currently very few smart phones in this price range.

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.

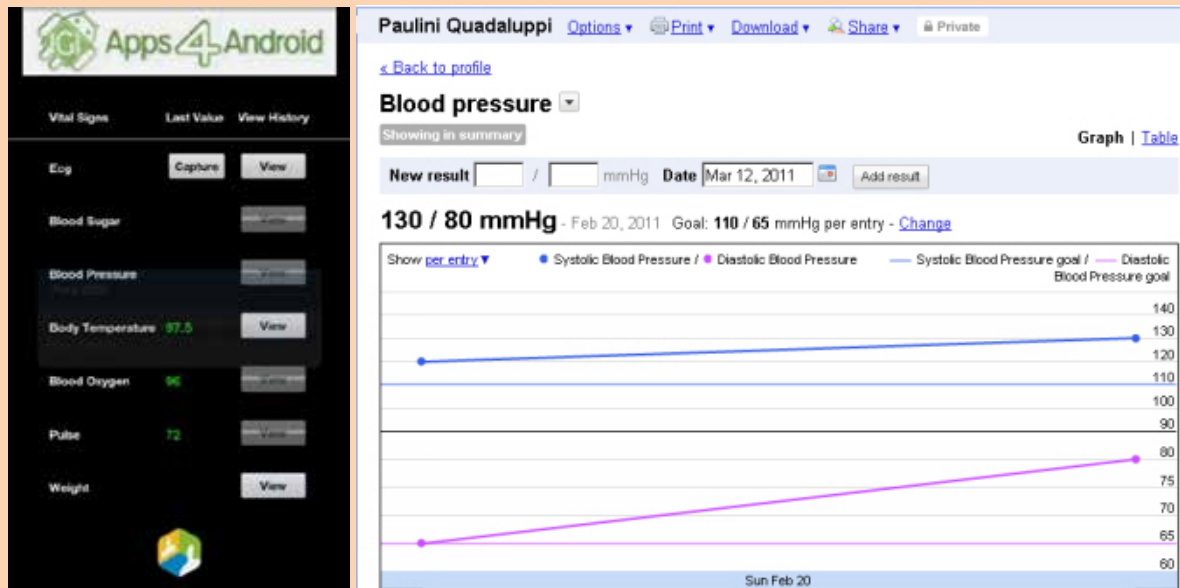
²⁷ www.apps4android.org/?p=2355

²⁸ www.phonescoop.com/phones/finder.php

Table 3.1 – 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.	www.codefactory.es/en/products.asp?id=415	USD 89
Mobile Speak	Symbian and Windows Mobile	Text-to-speech as well as Braille device plugin support	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)	www.codefactory.es/en/products.asp?id=336	
Mobile Magnifier	Symbian and Windows Mobile	Screen Magnifier	www.codefactory.es/en/products.asp?id=312	USD 89
Mobile DAISY	Symbian	DAISY format e-book reader	www.codefactory.es/en/products.asp?id=314	Paid
Oratio	Blackberry	Screen reader	www.humanware.com/en-usa/products/blindness/oratio_for_blackberry_smartphones/_details/id_131/oratio_for_blackberry_smartphones.html	USD 449
Nuance TALKS&ZOOMS	Symbian	Text-to-speech and Large-print for blind/ low-vision users	www.nuance.com/for-individuals/by-solution/talks-zooms/index.htm	USD 295
Color Identifier	iPhone	Color identifier for blind/low-vision users	www.greengar.com/apps/color-identifier/	USD 1.99
Dragon tools	iPad/ iPhone/ iPod Touch/ Blackberry	Voice recognition based applications for people with physical disabilities who have difficulty typing	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	www.looktel.com/	USD 1.99
IDEAL Item Identifier	Android	Open Source Talking Barcode-Reader and Talking Barcode-Maker	www.apps4android.org/?p=1243	Free
Web Access Plugin	Android	Android Browser plugin for blind users	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	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

Figure 3.2: 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, 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.

3.4 Android home automation

Table 3.2 – 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	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/	USD 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	USD 99

Apps4Android projects

Apps4Android²⁹ 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. (www.apps4android.org/?p=1402)
- **Apps4Android DLNA Accessibility Project:** Develop and enhance accessible Android based DLNA control applications. (www.apps4android.org/?p=1381)
- **Apps4Android Near Field Communications Accessibility Project:** Develop and enhance accessible Android based DLNA control applications. (www.apps4android.org/?p=1394)

²⁹ www.apps4android.org/?p=1065

Figure 3.3: Apps4Android web site. More than 6 million installations of accessible and assistive apps in 136 countries.



Source: G3ict

3.5 Home automation applications for Apple iOS

Table 3.3: 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	www.ilovecontrol.com/	USD 3(Lite) / USD 30
iViewer	Controls most systems that support TCP/IP communications (Crestron/AMX/Control4/Global Cache)	www.commandfusion.com/	Free
ROSIE Home Automation	Controls Savant's ROSIE systems	www.savantav.com/savant_and_apple.aspx	USD 50
X10 Commander	Controls X10 devices through Firecracker module (CM11, CM12, CM15, CM17, CM 19) connected to a PC	http://melloware.com/products/x10commander/	USD 10
iDoControl	Controls iDo Automation-based residential and commercial building automation systems	www.idotech.net/iDoTech/iDoControl.html	USD 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 etc.	www.ekeypad.net/eK_Family/Applications.html	Varies
AirRemote	All-in-one remote control for a smart-home on the iPhone	www.airremote.com/	USD 100

Application	Home Automation System supported	Developer/Download link	Paid/Free approx Price
Control4 MyHome	Whole house audio, video, lighting & HVAC control for Control4 house automations from iPhone or iPod Touch.	www.control4.com/myhome/	Free
HM Control	Enables remote monitoring of lighting, temperatures, window shades, thermostats and more for Z-Wave-based Homemanageables systems.	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 ecosystem since multimedia content and services available on mobile platforms are growing exponentially.

Table 3.4: 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 blind and visually impaired persons; as well as their friends, family, caregivers.	http://itunes.apple.com/us/app/iblink-radio/id332027117?mt=8#	Free
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 a wide variety of formats	https://market.android.com/details?id=bse.multireader&feature=search_result	USD 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 a student's fingertips, 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

needs 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 classroom³⁰.

Table 3.5: 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	www.autismclassroom.com/	Both USD 0.99
Autism – Turn Taker	Android	Teaches sharing to children with autism, Down syndrome or other special needs	http://touchautism.com/	USD 3.99
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	www.zbobbapps.com/dr-gary-brown/	USD 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	USD 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.	www.graceapp.com/	USD 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 protests³¹ like the one in the UK. The UK government has a website that lists all public services available to disabled persons at: 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 3.6.

³⁰ http://g3ict.org/resource_center/publications_and_reports/p/productCategory_whitepapers/subCat_0/id_170

³¹ www.guardian.co.uk/uk/joe/public/gallery/2011/may/11/public-sector-cuts-disability

Table 3.6: Mainstream mobile services with accessible or assistive features

Application	Platform	Need Addressed/Problem Solved	Developer/ Download link	Paid/Free Approx. Price
HandicappedFraud	iPhone	Helps report "Handicapped 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	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	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	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. Table 3.7 presents a short selection of navigation services which include an integrated mapping of available accessible services.

Table 3.7: 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	USD 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	USD 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. Although some mobile applications (such as AAC applications) currently lack the same level of stability and functionality offered by 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 Table 3.8.

Table 3.8: 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	www.physiotherapyexercises.com/	Free
Assistive Chat	iPad/ iPhone/ iPod Touch	AAC App, for people with difficulty in speech (available in English and German)	www.assistiveapps.com/index.php?option=com_content&view=article&id=3&Itemid=2	USD 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	USD 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	www.mytalktools.com/dnn/	USD 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 (USD 1.99) editions
Grace	iPad/ iPhone/ iPod Touch	Non-speaking, simple picture exchange system for people with Autism to communicate	http://graceappforautismoniphone.blogspot.com/	USD 37.99
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.	www.goodkarmaapplications.com/Good_Karma_Applications/Home_Page.html	USD 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	www.ablelinktech.com/index.php?id=41	USD 29.99
iCommunicate	iPad/ iPhone/ iPod Touch	Communication app for children with learning disabilities and visual challenges	http://itunes.apple.com/us/app/ico-mmunicate-for-ipad/id364186415?mt=8	USD 49.99

Application	Platform	Need Addressed/ Problem Solved	Developer/ Download link	Paid/Free Approx. Price
iConverse	iPad/ iPhone/ iPod Touch	AAC app for autistic individuals	www.converseapp.com/contact.php	USD 9.99
Proloquo2Go	iPad/ iPhone/ iPod Touch	Full-feature communication solution for people who have difficulty speaking.	www.proloquo2go.com/	USD 189.99

3.11 Social media and social networking

Mobile phones are deemed to be the future of social networking. For many users, especially young people, 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**³² (formerly 'Accessible Twitter'), which is designed to run on iPhone and Android devices. Another interesting app is **TweetSpeak**³³, a speaking twitter tool that allows blind users to do searches on twitter.

Facebook is also working to make its 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.

³² www.easychirp.com

³³ https://market.android.com/details?id=com.tweet.speak&feature=search_result

For example, in the United States, AT&T ³⁴ offers the Mobile Accessibility Lite suite³⁵ for free and Code Factory's Mobile Speak and Mobile Magnifier at discount prices on their phones. Verizon ³⁶ 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 users³⁷. 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 in the process of selecting a mobile handset.

Table 3.9: 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 favourite 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.

³⁴ www.wireless.att.com/learn/articles-resources/disability-resources/mobile-speak-magnifier.jsp

³⁵ www.codefactory.es/en/products.asp?id=424#sec1 and
www.att.com/gen/press-room?pid=21494&cdvn=news&newsarticleid=32969

³⁶ <http://aboutus.vzw.com/accessibility/talks.html>

³⁷ 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 in implementing 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 Analysing demographics and market opportunities

According to the World Health Organization, there are presently over one billion persons (15 per cent of the world's total population)³⁸ 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 2.8 per cent³⁹ and make up one-fifth of the total population by 2025-2030. In developed countries, the elderly population 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.⁴⁰ 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 campaigns 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.⁴¹

4.3 Handset 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 manufacturers 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 sales 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. Points of sale or direct marketing channels must be designed for persons with disabilities, including the physical environment,

³⁸ www.who.int/disabilities/world_report/2011/en/index.html

³⁹ www.un.org/esa/population/publications/worldageing19502050/pdf/80chapterii.pdf

⁴⁰ www.globalaging.org/waa2/articles/untimes.htm

⁴¹ 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 www.wireless.att.com/learn/articles-resources/disability-resources/advisory-panel.jsp & www.g3ict.org/download/p/fileId_839/productId_159

the training of sales personnel, and the use of alternative modes of communications both by phone and in person.⁴²

4.5 Accessible sales and services communication 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:

- set up dedicated customer care centres to assist disabled customers⁴³;
- make existing points of sale such as showrooms and kiosks accessible by following universal design principles;
- offer dedicated voice-based and online channels of communication providing support and information in sign, relay and other such mediums.

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 than ever before. It also makes it more attractive for application developers to address these 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 greater availability of HTML5⁴⁴ 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 few issues however limit 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. While applications exist in

⁴² 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

⁴³ Ibid.

⁴⁴ 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.

Hindi⁴⁵, they do not exist in the other languages. The same situation limits users' choices in most African countries. Since market dynamics may not suffice to generate private sector investments, one option would be for Universal Service/Access Funds to support the development of text-to-speech and voice recognition applications by local consortia in local languages⁴⁶.

- **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 necessary to help disseminate assistive solutions.
- **Cost of broadband connections.** The high cost associated with broadband connections in many developing countries can hinder the ability to access Internet and special services like digital libraries, video relay services etc.
- **Absence of accessible services and products.** The 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.

⁴⁵ One of the national languages

⁴⁶ 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 programmes 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 cent⁴⁷ 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 was 51.3 per cent, identified the potential to attract new customers among the elderly. 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.⁴⁸ 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 personnel trained 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.

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 readers and access to a talking e-book repository. One of the 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 17.8 million units of the Raku-Raku phone since its inception. Penetration of mobile phones among the elderly tripled between 2004 and 2008, and NTT DoCoMo has a much higher market share of the elderly market than its national average.

Figure 5.1 illustrates the DoCoMo Raku-Raku 7 phone manufactured by Fujitsu. Since inception of the product line in 2001, 17.8 million units were sold in Japan as of June 30, 2010.

⁴⁷ www.mobile-news.com/story/17162.php

⁴⁸ See www.fujitsu.com/downloads/MAG/vol41-1/paper11.pdf

Figure 5.1: DoCoMo Raku-Raku 7



Source: Fujitsu

5.2 Europe – SFR and Orange

SFR⁴⁹ is a French mobile phone company with a customer base of over 20 million. It is a signatory to the voluntary accessibility charter in France. (See Chapter 9.5 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 recognizer⁵⁰, mobile Daisy player and accessible games.⁵¹ SFR provides Braille billing and allows hearing impaired users to make enquiries and seek information through a sign-language web cam chat⁵² three days a week.

The operator has also partnered with other service providers to offer the services of Jaccede.com, a website that offers accessibility related information regarding various places in Paris. The app 'Jaccede Mobile' can be used to find listings on accessible locations for persons with disabilities. SFR also provides access to a free daily news service in sign language for hearing impaired users in collaboration with WebSourd⁵³, a web-based sign language news service.

Orange, a subsidiary of France Telecom⁵⁴ has implemented several accessibility initiatives for persons with disabilities and elderly customers. It serves 160 million individual customers in 35 countries. Orange's strategy is to embed as many accessibility features in its mainstream products so that they can be

⁴⁹ www.sfr.fr/

⁵⁰ Tool to identify colours via the phone's camera function

⁵¹ www.sfr.fr/handicap/services/index.jsp

⁵² <http://assistance.sfr.fr/accueil/contacter/lsf-webcam/en-2398-70308>

⁵³ www.websourd.org/

⁵⁴ www.orange.com/en_EN/group/

activated at no incremental cost by users and products do not need to be retrofitted after they are launched. Its stated strategy is to leverage accessibility features designed for persons with disabilities to benefit all customers.

In addition to this Universal Design approach to product development, Orange created several services for customers with disabilities requiring special services. For example, in 2009, Orange France started an accessible distance-selling service for deaf, hearing-impaired or speech-impaired customers.⁵⁵ 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.⁵⁶

5.3 United States - AT&T

AT&T, one of the largest mobile service providers in the United States, applies the user-centred design approach to its products.⁵⁷ 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. AT&T offers guidelines for Universal Design to its technology providers.

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.⁵⁸

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 specifically for elderly and disabled users, AT&T's User Experience Design Team collaborated with the South Korean company Pantech to develop the Pantech BreEZe.⁵⁹

The Pantech BreEZe had several accessibility 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 BreEZe 2. The new phone has many more accessibility features including text-to-speech software that can support content in DAISY format.⁶⁰

AT&T offers phones with screen readers, voice activation and control, compatibility with Braille displays, front facing cameras, closed captioning, audible, visible and vibrating alerts and hearing aid compatibility. Through a partnership with Code Factory, AT&T offers "mobility accessibility lite", a suite of accessible apps for Android, designed for customers who are blind or have low vision. A voice synthesizer reads aloud the text under each app, either in English or Spanish. The service is free of charge for AT&T customers and is available on a wide range of handsets.

⁵⁵ www.orange.com/en_EN/responsibility/access_for_all/accessibility/distance_selling.jsp

⁵⁶ www.orange.com/en_EN/responsibility/access_for_all/accessibility/blueeyes.jsp

⁵⁷ 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 www.g3ict.org/download/p/fileId_839/productId_159

⁵⁸ Ibid.

⁵⁹ Ibid.

⁶⁰ Ibid.

Figure 5.2 illustrates how AT&T markets and promotes products to specific categories of customers using videos on YouTube. The sign language interpreter explains for deaf customers how the AT&T Video Relay Service works. The video is silent and captioned.

Figure 5.2: AT&T Video Relay Service explained on YouTube



In addition, AT&T offers a data only plan, national directory assistance exemption, and Braille and large print bills. AT&T also has a dedicated website for persons with disabilities with information on assistive technologies and other disability resources and has established the National Center for Customers with Disabilities (NCCD) in Los Angeles which processes all inquiries regarding AT&T Mobility products and services.

5.4 Egypt-Etisalat and Vodafone

Egypt-based telecom group Etisalat⁶¹ 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.

⁶¹ www.medialog.ws/en/node/228

Vodafone Egypt approaches services to persons with disabilities from a Corporate Social Responsibility standpoint. Among several initiatives for persons with disabilities, it pioneered special services for speech impaired and hard of hearing customers in Egypt with a prepaid rate plan, "Bedoun Kalam," that offers cheaper SMS and video calls for sign language⁶². It successfully deployed dedicated marketing campaigns and partners with disabled persons organizations to reach out to those customer segments.

5.5 Others: GreatCall

GreatCall is an American service provider with a focus on ease of use. It offers the Jitterbug⁶³, a Samsung handset designed with basic functions for senior citizens and persons with disabilities. The clamshell shaped handset comes with large keys and a powerful speaker, one touch customer service dial-in and a menu system which uses a question-based interface with keys labelled "YES" and "NO." GreatCall also offers some innovative apps such as Check-in Call (which enables automated calls for checking if the user needs any help or support at programmable intervals⁶⁴), 5 Star Security (activates a 24 hour emergency response team by tracking the user's location through the phone), LiveNurse (with access to registered nurses) and a Medication Reminder.⁶⁵

⁶² www.vodafone.com.eg/vodafoneportalWeb/en/P600878041288685208951

⁶³ www.greatcall.com/Phones/JitterbugGraphite/

⁶⁴ www.greatcall.com/Jitterbug/AppStore/GreatSafety/check-in-call.aspx

⁶⁵ 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 initiative⁶⁶ an umbrella range of activities which includes development of internal product design standards, initiating research, and training employees to provide services to customers with disabilities. Nuance Text-to-speech software is available for Nokia Series 60⁶⁷ and Series 80 phones on Symbian operating systems.

Several Nokia models offer accessibility features such as –

- dished keys to facilitate the use of a mouth stick or other devices 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 an 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.

6.2 Apple

The iPhone is a line of smart phones by Apple, introduced in 2007.⁶⁸ While the accessibility of its touch screen interface was initially perceived as a potential challenge among online communities covering accessibility, 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.⁶⁹ Its design philosophy for handsets and tablets is built upon the design philosophy of the MacIntosh computer which has included free embedded accessibility features, such as a screen reader, since 2004. Apple seeks to maintain the consistency of its user experience across different product lines: an iPod Touch user will find the same Voice Over commands on an iPhone or iPad. A significant breakthrough with Voice Over is that it is the world's first fully accessible touch screen technology. It lets users know via speech synthesis what's under their fingers and what the various menus and operating system functions are doing.

The iPhone 4, Apple's latest model comes built-in with VoiceOver. It is a gesture-based screen-reader. Gestures are made easy for a broad range of people, from small children all the way through individuals in the aging community. This allows disabled users to hear descriptions of functions on their phones through

⁶⁶ <http://www.nokiaaccessibility.com/>

⁶⁷ [http://en.wikipedia.org/wiki/S60_\(software_platform\)](http://en.wikipedia.org/wiki/S60_(software_platform))

⁶⁸ See: <http://atmac.org/iphone-accessibility-by-tim-obrien/>, www.timobrienphotos.com/2008/12/accessing-iphone-apps/, www.timobrienphotos.com/large-print-ideas/iphone-access/, <http://accessability.blogspot.com/2009/06/apple-gives-iphone-accessibility-for.html>

⁶⁹ www.apple.com/iphone/features/accessibility.html

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 Bluetooth Braille displays and 30 international Braille tables;
- touch typing for visually impaired or print impaired users through text-to-speech;
- magnification and zoom functions up to 500 per cent;
- option to display text with larger font sizes instead of Zoom;
- option to use white on black and other contrast inversions for colour blind users;
- optional mono audio for users with hearing limited to one ear;
- support for closed captioning and subtitling, built in to iTunes, for content searches.

With iOS 5, Apple introduced additional accessibility features⁷⁰:

- A “lite” version of Voice Over which allows users to read aloud only the text they select in a given application. This can be most helpful for situations when users want help to read content for a variety of reasons ranging from situational (driving for example) to vision challenges, dyslexia, or for auditory learners.
- “Assistive Touch” provides more functionality for someone with minimum mobility. Assistive Touch adds several functionalities, the first of which is hardware-based. It allows for the connection of assistive devices to the iOS 5 touch screen technology. It can be a switch or a joy stick, allowing a person to use the iOS touch screen interface with minimal motor skills. The other elements are software-based. One allows users to control the few physical switches and buttons of the device with a touch screen command. Another important functionality of Assistive Touch allows users to program single-finger gestures where the default setting requires two or more fingers (such as pinching a photo).
- Voice Over support for the camera tells the user how many persons are in the picture.
- Option to label unlabelled apps buttons.

6.3 Samsung

Samsung offers several mobile phones that are hearing aid compatible. The company adheres to technical specification ANSI C63.19⁷¹ to measure the interference experienced by hearing aid users when using hearing aids with wireless handsets. It 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 are:

- tactile keys;
- nibs on or around the “5” key;
- soft keys⁷²;

⁷⁰ www.macworld.com/article/1163058/up_close_with_ios_5_accessibility_features.html

⁷¹ www.samsung.com/us/consumer/learningresources/mobile/accessibility/pop_accessibility.html

⁷² Flexible buttons that can be programmed to perform any number of functions

- 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 mobile phones of the US-based mobile phone company Motorola are engineered to create a magnetic field⁷³ 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:⁷⁴

- speakerphone;
- relay service;
- vibrating call alert;
- keypad depression feedback;
- 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.

6.4 Google - Android

Android is a software stack for mobile devices developed by Google which comprises an operating system, middleware⁷⁵ and a range of applications. It is open source and is currently the best-selling platform for smart phones.⁷⁶

⁷³ www.motorola.com/Consumers/US-EN/About_Motorola/Corporate_Responsibility/Accessibility/Hearing-Aid-Compatibility

⁷⁴ www.motorola.com/Consumers/US-EN/About_Motorola/Corporate_Responsibility/Accessibility/Voice-Recognition

⁷⁵ Middleware is computer software that acts as a bridge between software components and applications.

⁷⁶ <http://uk.reuters.com/article/2011/01/31/oukin-uk-google-nokia-idUKTRE70U1YT20110131>

Android's open source project for accessible apps is called "Eyes-Free"⁷⁷. Screen readers from Android like Spiel⁷⁸ and Talkback⁷⁹ 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 app⁸⁰ (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.⁸¹

An important decision taken by Google with Android 4.0 and above will be to ask handset manufacturers to take into account the accessibility component of its CDD – Compatibility Definition Documents – or to offer alternatives of their choice. This will likely promote the accessibility features for a number of mobile handsets and tablets operating with Android, a very positive move given Android's increasing market share of the global mobile market.

6.5 Doro

Doro is a publicly traded Swedish company specialized in telecommunications and assistive products for the elderly and persons with disabilities. Its design processes incorporate detailed input and testing by elderly persons with a focus on ease of use and safety at home or on the go. 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. These phones, which are hearing aid compatible, feature large buttons and text, bright displays, clear, audible sound and include an emergency call button, vibrating ringer, text messaging, a phonebook for storing numbers and a two-way speakerphone.

Doro relies on a detailed market segmentation of the elderly population which includes attitudes towards technology and impairments. This approach allows Doro and its distributors, including mobile service providers, to better address users' needs.

⁷⁷ <http://code.google.com/p/eyes-free/>

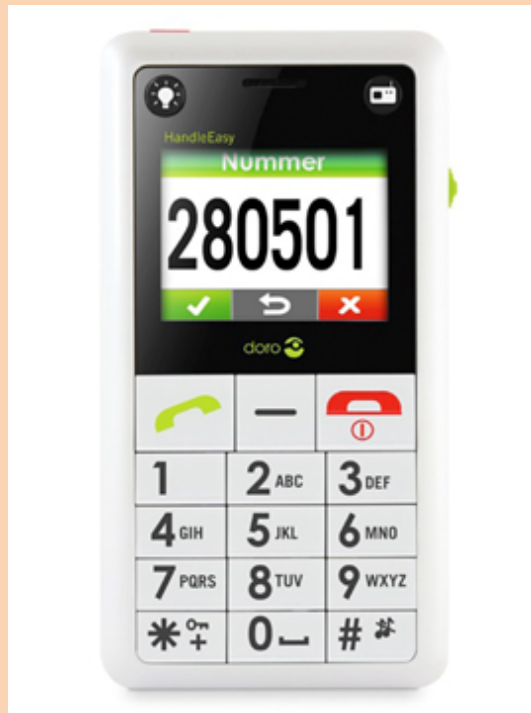
⁷⁸ <https://market.android.com/details?id=info.spielproject.spiel>

⁷⁹ https://market.android.com/details?id=com.google.android.marvin.talkback&feature=search_result

⁸⁰ www.vlingo.com/

⁸¹ <http://eyes-free.blogspot.com/2010/10/walking-about-with-talking-android.html>

Figure 6.1: Doro HandleEasy 330gsm.



Source: Doro

6.6 Emporia Telecom

Austrian manufacturer Emporia Telecom⁸² has built a successful business practice by targeting a niche market of seniors and persons with disabilities. The Linz- based company sells, to various service providers, handsets and mobile accessories suitable for older users who may have visual, hearing or motor impairments. The mobile phones are equipped with features such as large display with a magnifier function, tactile keys, a hearing aid compatible speaker and black on orange backlight for visually impaired users or users with cataracts.⁸³

Emporia's research and development for handsets is organized around common signs of aging and it collaborates with the Johannes-Kepler University of Linz⁸⁴, the University of Cambridge⁸⁵, the Upper Austria University of Applied Sciences⁸⁶ and the Hagenberg University of Applied Sciences.⁸⁷

The company has a customer base in 28 countries in Central and Northern Europe, Canada, Cyprus, Israel and the United States. It has managed to capture about 16 per cent of the Austrian market share for pre-paid mobile phones.⁸⁸

⁸² www.emporia.eu/en/home/

⁸³ www.emporia.eu/en/products/overview/

⁸⁴ www.jku.at/

⁸⁵ www.cam.ac.uk

⁸⁶ www.fh-ooe.at/en/

⁸⁷ www.fh-ooe.at/campus-hagenberg/

⁸⁸ http://de.wikipedia.org/wiki/Emporia_Telecom

6.7 Sagem

In February 2010, French company Sagem Wireless unveiled the Cosyphone⁸⁹, a handset device targeted exclusively for persons aged 50 years and above. Designed ergonomically, the device uses contactless NFC technology (near-field communications)⁹⁰, which allows users to access the features on their phones without having to scroll through menus. The Cosyphone 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, Ireland and the UK.

⁸⁹ www.nearfieldcommunicationsworld.com/2010/11/09/34938/sagem-nfc-cosy-phone-available-france-uk-ireland/

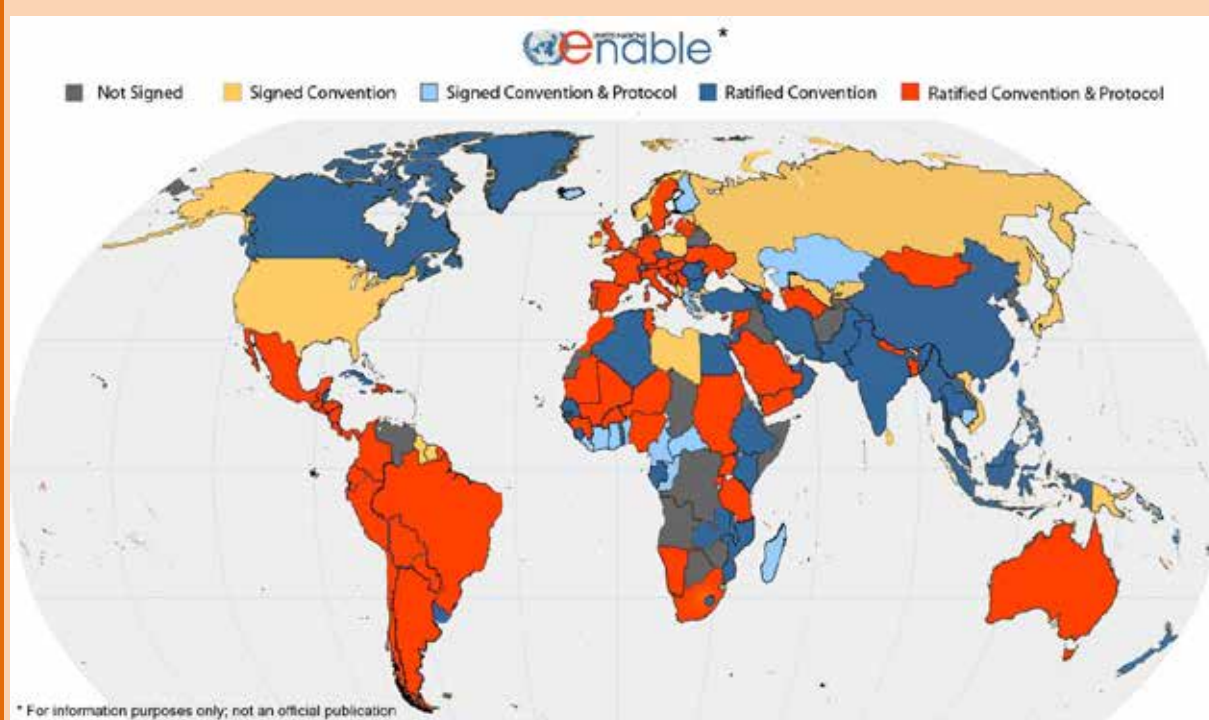
⁹⁰ Near field communication, or NFC, is a set of short-range wireless technologies, typically requiring a distance of 4 cm or less. NFC always involves an initiator and a target; the initiator actively generates a Radio Frequency field that can power a passive target. This enables NFC targets to be used in simple objects 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 Disabilities⁹¹, 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, an international human rights agreement includes 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.

Figure 7.1: Map of CRPD Signatures and Ratifications



Source: UN Enable - www.un.org/disabilities/index.asp

With 153 signatories and 117 ratifications as of July 2012, the Convention is the fastest negotiated human rights treaty in the history of the UN⁹². 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.

⁹¹ www.un.org/disabilities/countries.asp?navid=12&pid=166

⁹² Figures likely to change in the future

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.

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 States Parties 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. These dispositions directly support States Parties' policies and programmes promoting mobile assistive technologies.

Article 4, relating to general obligations, indicates that States Parties must provide accessible information to persons with disabilities on assistive technologies and new developments.⁹³ The article also urges signatories to undertake or promote research in the area, promote the availability of such technologies, in particular those which are affordable. Mobile-based solutions are likely attractive to States Parties in implementing Article 4 given their unprecedented economies of scale.

Article 9 makes provisions for promoting assistive technologies and information in alternative formats. Article 9.2 (f) states that signatories must promote forms of assistance and support to persons with disabilities to ensure their access to information. In Article 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 Article 9.2 (h), States 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 States 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. Article 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.⁹⁴

⁹³ www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#obligations

⁹⁴ www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#expression

Article 30 requires States 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.

7.3 Reasonable accommodation to meet non-discrimination criteria

Article 5 of the Convention deals with equality and non-discrimination.⁹⁵ Clause 3 of this article requires States 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 (Article 24) and work and employment (Article 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 requires that States 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. Such standards 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. Article 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.

⁹⁵ www.e-accessibilitytoolkit.org/toolkit/annexes/Textper cent 20ofper cent 20theper cent 20Convention#Equality

7.6 Promotion of assistive technologies for independent living

Article 19 of the Convention recognizes the right of persons with disabilities to live independently and enjoy full and active participation in society.⁹⁶ 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, telecommunications, mass media, and employment. Services are being accessed through computers, mobile phones and other emerging technologies and platforms. The CRPD 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.

⁹⁶ www.e-accessibilitytoolkit.org/toolkit/annexes/Textpercent20ofpercent20thepercent20Convention#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. Additional information on policy development and implementation, including a checklist for policy makers, is found in Chapter 10.

8.1 Telecommunication or ICT 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 telecommunication/ICT policies and industry codes of practice⁹⁷ as well as through recommendations to relevant government bodies.
- Include accessible service delivery as part of the terms of operators' license agreements or introduce other measures to ensure that affordable and accessible handsets and services are provided by operators to persons with disabilities.
- Establish systems for assessing and benchmarking accessibility.
- 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 accessible mobile phones and services through funding from the universal service/access fund.
- Promote website accessibility with industry and government authorities and ensure that the regulator's 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 among persons with disabilities.
- Undertake periodic surveys to gather data on mobile adoption and use by persons with disabilities.
- Encourage international cooperation in this area.

8.2 Ministry of Telecommunications/ICT

Ministries of telecommunication/ICT play an important role in governing telecommunications/ICT in many countries. 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.

⁹⁷ The UK's Ofcom, for example, has published policy documents with accessibility provisions.

- 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 telecommunication/ICT 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/access policy of the country.
- Specify accessible mobile infrastructure as part of public 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 councils can take the following initiatives to further the accessibility of mobile communications and services:

- Organize public debates and raise the awareness among the public of mobile accessibility benefits and the many people who benefit from mobile accessibility.
- 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/access funds

Countries can use their universal service/access funds to promote mobile accessibility in the following ways⁹⁸:

- Identify accessibility of telecommunication and mobile services for persons with disabilities as a specific mandate of the universal service obligation.

⁹⁸ See report on Universal Service for Persons with Disabilities G3ict and CIS 2011 at: www.g3ict.org/resource_center/publications_and_reports

- 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, special monthly service packages, relay services and assistive technologies, or providing incentives for R&D or localization of assistive solutions (such as development of speech-to-text engines in local languages) and any other form of incentive consistent with local market conditions.
- Require service providers to provide equal levels of access to persons with disabilities as part of universal service/access 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 mobile phones in classrooms for students with disabilities.⁹⁹
- **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 people prefer to access services through their mobile phones especially since, in many countries, mobile devices are far more widespread than computers. Ministries which offer e-governance services will therefore seek to ensure that these services are accessible to persons with disabilities. In addition, these government agencies could:

- Hold consultations with persons with disabilities and their organizations 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 formats¹⁰⁰.

⁹⁹ www.g3ict.org/resource_center/publications_and_reports

8.7 Education ministries overseeing web-based educational resources

Education ministries can take steps to make mobile-based educational resources and services available 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 the 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 access their 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 organizations to formulate m-Health 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 HIV/AIDSs, 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.

¹⁰⁰ www.e-accessibilitytoolkit.org/toolkit/technology_areas/access_to_published_works

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

Australia¹⁰¹ 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.¹⁰²

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 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-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 Equipment¹⁰³ – 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

¹⁰¹ Text provided by ITU Member State Australia.

¹⁰² ACMA Access to disability services webpage: www.acma.gov.au/scripts/nc.dll?WEB/STANDARD/1001/pc=PC_2022

¹⁰³ www.acma.gov.au/webwr/telcomm/industry_codes/codes/acif_code_c625_2009_section_2.pdf.pdf

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 Guideline¹⁰⁴ – 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 G586:2006¹⁰⁵ 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..."¹⁰⁶.

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° 2151/97¹⁰⁷), 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 baud"¹⁰⁸. 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.

9.3 Brazil

Brazil¹⁰⁹, 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:

¹⁰⁴ www.acma.gov.au/webwr/telcomm/industry_codes/codes/acif_guideline_g627_2009_section_2.pdf.pdf

¹⁰⁵ www.commsalliance.com.au/Documents/all/guidelines/g586

¹⁰⁶ This is an informal translation.

¹⁰⁷ SC Res 2151/97 www.atedis.gov.ar/hipo_normativa6.php

¹⁰⁸ This is an informal translation.

¹⁰⁹ Text provided by ITU Administration Brazil.

- 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.
- 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 2009-430.¹¹⁰

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 France¹¹¹, 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 – ARCEP¹¹². In 2005, the French government and ARCEP, along with operators and disability organizations signed a voluntary charter for improving access to mobile telephony for disabled end users¹¹³ 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 the European level and using innovation to increase accessibility.

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

On 9 June 2011¹¹⁴, 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.

¹¹⁰ www.crtc.gc.ca/eng/info_sht/t1036.htm

¹¹¹ Text provided by ITU Member State France

¹¹² www.arcep.fr/index.php?id=1&L=1

¹¹³ www.fftelecoms.org/articles/la-charte-dengagement-des-operateurs-pour-laces-des-personnes-handicapees-aux-technologies (French language version only)

¹¹⁴ www.arcep.fr/fileadmin/reprise/communiqués/communiqués/2011/dossier-presse-charte-acces-handicap-090611.pdf

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.¹¹⁵ IAC developed a guideline for disabled telecommunication 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 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".¹¹⁶

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.¹¹⁷

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 Provision¹¹⁸ is established through Section 202¹¹⁹ of the Communication and Multimedia Act, 1998.¹²⁰ 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 Service¹²¹ i.e. specific services that service providers are mandated to offer includes services for disabled consumers.¹²²

¹¹⁵ 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

¹¹⁶ www8.cao.go.jp/shougai/english/law/no84.html#04

¹¹⁷ www.dinf.ne.jp/doc/english/law/japan/selected38/chapter7.html

¹¹⁸ www.skmm.gov.my/index.php?c=public&v=art_view&art_id=98

¹¹⁹ www.skmm.gov.my/index.php?c=public&v=art_view&art_id=251

¹²⁰ www.msc.com.my/cyberlaws/act_communications.asp

¹²¹ www.skmm.gov.my/link_file/the_law/NewAct/Actper cent 20588/Actper cent 20588/a0588s0193.htm

¹²² 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 Africa¹²³ (ICASA) is the electronic and telecommunications regulator for South Africa.

Section 2(h) of the Telecommunications Act, 1996¹²⁴ 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, 2000¹²⁵ 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.¹²⁶

Section 70 of the Electronic Communications Act, 2005¹²⁷ 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 telecommunication.¹²⁸ Consequently, in August 2009, ICASA established the Code on People with Disabilities¹²⁹ 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, provision of emergency, relay, directory and call progress information services, operator assistance at all call centres, billing in alternative formats and accessible advertisements.

9.9 Sweden

Sweden¹³⁰ has an overarching disability policy with specific provisions for telecommunications accessibility. The [Swedish Post and Telecom Agency \(PTS\)](http://www.pts.se)¹³¹ 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 SEK 149 million 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.

¹²³ www.icasa.org.za/tabid/38/Default.aspx

¹²⁴ www.info.gov.za/acts/1996/a103-96.pdf

¹²⁵ www.iwraw-ap.org/resources/pdf/Southper cent 20Africa_GE1.pdf

¹²⁶ Section 9 of the Promotion of Equality and Prevention of Unfair Discrimination Act, 2000. See: www.iwraw-ap.org/resources/pdf/Southper cent 20Africa_GE1.pdf

¹²⁷ www.info.gov.za/view/DownloadFileAction?id=67890

¹²⁸ Electronic Communications Act, 2005 accessible at www.icasa.org.za/LinkClick.aspx?fileticket=hVMvwf2qmi0per cent 3d&tabid=86&mid=649&forcedownload=true

¹²⁹ <http://old.ispa.org.za/regcom/advisories/advisory26.shtml>

¹³⁰ Text provided by ITU Member State Sweden

¹³¹ www.pts.se/en-gb/

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](#)¹³², 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 services¹³³: Relay service for text telephony, Texttelsoni.se¹³⁴, relay service for speech-to-speech, Teletal¹³⁵, relay service for video telephony, Bildtelefoni.net¹³⁶, flexible text telephony service, Flexitext¹³⁷, Free directory enquiry service 118 400, communication via databases for people who are deaf-blind, free post conveyance of 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 direct¹³⁸, E-adept¹³⁹ and Ippi¹⁴⁰ 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)¹⁴¹ is the telecom regulator in Thailand. The universal service obligation is clearly defined to include special services for the impaired or elderly.¹⁴² 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.¹⁴³

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.¹⁴⁴

¹³² www.sweden.gov.se/sb/d/2197/a/15254

¹³³ www.pts.se/en-gb/People-with-disabilities/Services/

¹³⁴ www.texttelefoni.se/start.asp?sida=5008

¹³⁵ www.teletal.se/in-english

¹³⁶ www.bildtelefoni.net/en

¹³⁷ www.flexitext.net/en/start

¹³⁸ A call-in service for problem solving and assistance for people with disabilities and elderly users of electronic communication and media.

¹³⁹ 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.

¹⁴⁰ 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.

¹⁴¹ <http://eng.ntc.or.th/>

¹⁴² www.itu.int/ITD/icteye/Reporting/ShowReportFrame.aspx?ReportName=/TREG/UniversalServiceProfile&ReportFormat=HTML4.0&RP_intCountryID=229&RP_intLanguageID=1

¹⁴³ Supra n.2

¹⁴⁴ http://thailaws.com/law/t_laws/tlaw0385.pdf

The Telecommunication Master Plan (second issue) for 2008-2010 deals with accessibility for all disadvantaged people and introduces the telecommunication relay service.¹⁴⁵ 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 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.¹⁴⁶

In addition, 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.¹⁴⁷

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'¹⁴⁸ 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 Communications¹⁴⁹ (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 the elderly and 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)¹⁵¹. These rules along with the EU Directive of 98/10/EC¹⁵² require telephone companies (fixed and mobile) providing voice telephone services to enable a number of services for customers with disabilities.¹⁵³

These obligations, also covered under General Condition 15¹⁵⁴ 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 disability¹⁵⁵. With regards to priority fault repair it is worth noting that this applies to fixed

¹⁴⁵ <http://eng.ntc.or.th/images/stories/pdf/masterplanad2008-2010.pdf>

¹⁴⁶ http://mis-asia.com/news/articles/thailand-plans-technology-to-help-connect-people-with-disabilities?SQ_DESIGN_NAME=print

¹⁴⁷ Supra n.2

¹⁴⁸ 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: www.daisy.org/daisy-technology

¹⁴⁹ Text provided by ITU Member State, United Kingdom

¹⁵⁰ www.ofcom.org.uk/about/

¹⁵¹ www.ofcom.org.uk/static/archive/oftel/publications/consumer/text0801.htm

¹⁵² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31998L0010:en:NOT>

¹⁵³ www.legislation.gov.uk/uksi/2000/2410/made

¹⁵⁴ <http://stakeholders.ofcom.org.uk/binaries/telecoms/ga/cvogg300710.pdf>

¹⁵⁵ For further details see: http://consumers.ofcom.org.uk/files/2010/06/gp_guide_eld_dis.pdf

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 2005¹⁵⁶ (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](#)¹⁵⁷ 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 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.

9.12 United States

The United States¹⁵⁸ has a range of general and specific laws mandating telecommunication access for persons with disabilities. The Federal Communications Commission¹⁵⁹ (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 Fund¹⁶⁰, Section 255¹⁶¹ and Section 251(a) (2)¹⁶² 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, mobile 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.¹⁶³

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

¹⁵⁶ www.legislation.gov.uk/ukpga/2005/13

¹⁵⁷ www.ofcom.org.uk/about/policies-and-guidelines/equality-and-diversity/single-equality-scheme-ses/

¹⁵⁸ Text provided by ITU Member State, United States.

¹⁵⁹ www.fcc.gov/

¹⁶⁰ www.usac.org/default.aspx

¹⁶¹ www.access-board.gov/about/laws/telecomm.htm

¹⁶² www.dleg.state.mi.us/mpsc/comm/broadband/unbundling/section_251.htm

¹⁶³ www.fcc.gov/cgb/dro/trs.html

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-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'¹⁶⁴ are hearing aid-compatible. FCC also has extended this requirement to wireless/mobile telephones.¹⁶⁵

In October 2010, the US Congress passed the Twenty-First Century Communications and Video Accessibility Act of 2010 (CVAA)¹⁶⁶, 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 102¹⁶⁷ 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.

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.¹⁶⁸ 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 508¹⁶⁹, a provision in the Rehabilitation Act,¹⁷⁰ mandates that electronic and information technology funded, developed or used by the US federal government or US federal agencies should be

¹⁶⁴ '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.

¹⁶⁵ www.fcc.gov/cgb/dro/hearing.html

¹⁶⁶ www.govtrack.us/congress/bill.xpd?bill=s111-3304

¹⁶⁷ www.coataccess.org/node/9776

¹⁶⁸ <https://www.fcc.gov/encyclopedia/twenty-first-century-communications-and-video-accessibility-act>

¹⁶⁹ www.section508.gov/

¹⁷⁰ http://en.wikipedia.org/wiki/Rehabilitation_Act_of_1973

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”.¹⁷¹

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.¹⁷²

9.13 European Union

The European Commission Universal Service Directive (Directive 2002/22/EC),¹⁷³ 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.

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 (as well as Norway and Switzerland) 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.

¹⁷¹ www.afb.org/afbpress/pub.asp?DocID=aw110402

¹⁷² www.e-accessibilitytoolkit.org/toolkit/public_procurement

¹⁷³ http://ec.europa.eu/information_society/policy/ecomm/todays_framework/universal_service/index_en.htm

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 into mobile products and services for persons with disabilities among 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 organizations 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 highlight 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 ¹⁷⁴.

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 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;

¹⁷⁴ www.m-enabling.com/

- subsidizing implementation of mandatory compliance with accessibility norms through the universal service/access fund and other special schemes and programmes;
- facilitating technology transfer and sharing.

10.4 Pilot programmes

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/access fund.

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

Universal service/access 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/access 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:

- 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 useful feedback for deciding future course of action.

- Using the G3ict ICT accessibility self-assessment framework for CRPD signatories to assess the current policy framework and build upon it.¹⁷⁵
- Commissioning market research and survey to assess the telecom market. Ex- Ofcom commissioned a Disabilities Mystery Shopping exercise¹⁷⁶ to look into what information was being provided by fixed and mobile telecom providers to consumers with disabilities about products and services.

¹⁷⁵ www.g3ict.org/download/p/fileId_807/productId_147

¹⁷⁶ <http://stakeholders.ofcom.org.uk/binaries/research/telecoms-research/783922/DisabilitiesMysteryShoppin.pdf>

- 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.

10.8 Checklist for policy makers

The following check list is meant to integrate some of the best practises and success factors observed around the world and covered in the previous sections and chapters.

- Assign one lead government executive to oversee the process of promoting mobile accessibility. Most countries assign such responsibility to the consumer affairs division of their regulatory authority.
- Conduct a survey of existing accessible handsets and services offered by mobile operators.
- Publicize among operators and organizations of persons with disabilities the ICT accessibility obligations included in the Convention on the Rights of Persons with Disabilities which the majority of countries have signed and ratified (list of States Parties available at www.unenable.org).
- Check existing regulatory frameworks applicable to mobile accessibility.
- Set up a process involving organizations representing persons with different types of disabilities, operators and regulatory authorities to provide feedback and recommendations on potential mobile accessibility gaps, and monitor progress made in closing these gaps.
- Use lists available in Chapter 1 of the present report “Available accessibility features for mobile phones and services” to assist stakeholders in reviewing available accessible mobile products and services.
- Develop a roadmap with operators, supported by organizations of persons with disabilities, to fill mobile accessibility gaps and determine an on-going process to monitor progress.
- Encourage leading handset manufacturers to offer existing accessible products already marketed around the world.
- Facilitate or hold capacity building programs with mobile operators on disability awareness and ways to reach out and serve persons with disabilities.
- Encourage the development of alternative sales and support channels leveraging non-profit organizations and local communities serving persons with disabilities.
- Identify areas for which Universal Service/Access Funds may intervene to equalize access for users with disabilities.
- Explore opportunities to accelerate the localization of voice recognition and text-to-speech interfaces if not available in local languages.
- Use regulatory means when consensus building is not producing results or to establish a level playing field among competitors when investments to implement solutions are necessary.

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 organization resources

ITU-T – The Standardization Sector of the International Telecommunication Union – (ITU-T)¹⁷⁷ has been working at improving accessibility standards in accordance with CRPD guidelines on Universal Design. Some of its recommendations are as follows:

- 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”.
- 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
- Y.1901 “Requirements for the support of IPTV services”.

JISC- The Japanese Industrial Standards Committee¹⁷⁸ has developed JIS X8341-4, which is applicable to telecommunications equipment.

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

¹⁷⁸ www.jisc.go.jp/eng/

ETSI- The European Telecommunication Standards Institute¹⁷⁹ is the telecommunications' standards setting organization for the European Union. The ETSI technical committee Human Factors¹⁸⁰ develops standards and guidelines for ease of use and access to ICT. The following accessibility standards have been developed by ETSI¹⁸¹:

- EG 202 116- Guidelines for ICT products and services; 'Design for All'.
- ES 202 975- Harmonized Relay Service.
- 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 Consortium¹⁸² – The Unicode Standard¹⁸³ 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 Consortium¹⁸⁴ - Web Content Accessibility Guidelines (WCAG)¹⁸⁵ are the internationally recognized standards for Web accessibility published by the W3C's Web Accessibility Initiative¹⁸⁶. 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 and the Mobile Manufacturers Forum (MMF) which launched the Global Accessibility Reporting Initiative (GARI), a project aimed at helping consumers with disabilities find information about various accessibility features. In 2011, this database of handsets and website was adopted by CTIA in the United States which added features and content relevant to North American mobile users.

¹⁷⁹ www.etsi.org/WebSite/AboutETSI/AboutEtsi.aspx

¹⁸⁰ www.etsi.org/website/Technologies/Accessibility.aspx

¹⁸¹ www.etsi.org/website/Technologies/Accessibility.aspx

¹⁸² www.unicode.org/consortium/consort.html

¹⁸³ <http://unicode.org/>

¹⁸⁴ www.w3.org/

¹⁸⁵ www.w3.org/TR/WCAG20/

¹⁸⁶ www.w3.org/WAI/

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 UK or the American Association of People with Disabilities – AAPD.

Statutory and independent disability councils – National Disability councils of the 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 on mobile phone accessibility developed for the Canadian regulatory authority by the Ontario College for Arts and Design (OCAD) at the University of Toronto: www.thewirereport.ca/reports/content/12541-crtc_releases_report_on_mobile_handset_accessibility. The Rehabilitation Engineering Research Center for Wireless Technologies (RERC), jointly run by the Shepherd Center and the Georgia Institute of Technology, specializes in wireless technology 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 – IBM has partnered with the National Institute of Design of India and the Research Center for Advanced Science and Technology at 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.

Bibliography

Applications

www.mywirelessreview.com/

<http://ulanoff.com/blogs/automation/iphone-apps/>

www.eastersealstech.com/content.aspx?pld=554

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

www.mywirelessreview.com/accessible-apps-corner

www.androidzoom.com/android_applications/deaf

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

<http://a4cwsn.com/>

Windows Mobile Device Accessibility

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

Windows Phone 7 Devices Accessibility

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

iPhone Accessibility

www.apple.com/accessibility/iphone/vision.html

www.eastersealstech.com/content.aspx?pld=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 for S60 and S80 Phones)

www.nuance.com/for-individuals/by-solution/talks-zooms/index.htm

Nokia Accessibility Features

www.nokiaaccessibility.com/

Samsung

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

Exhaustive List of Mobile Device Manufacturers

www.phonedog.com/cell-phone-research/companies/manufacturers.aspx

Android Market

www.phonedog.com/cell-phone-research/companies/manufacturers.aspx

iPhone App Store

www.apple.com/iphone/apps-for-iphone/

Windows Mobile Market Place

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

Glossary

3G	Third Generation; International Mobile Telecommunications-2000 (IMT2000), 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 Telecommunication 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
OCR	Optical Character Recognition, the mechanical or electronic conversion of scanned images of handwritten, typewritten or printed text into machine-encoded text
OS	Operating System
Ovi Maps	brand of Applications for Nokia mobile 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 mobile 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 paralyzed from the 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 users to magnify font or zoom into portions of the 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 Optical Character Recognition (OCR) process. As a text based format, it can be opened and edited 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
USF/USAF	Universal Service Fund/Universal Service Access 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), 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, allowing 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.

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