e-Accessibility Policy Handbook for Persons with Disabilities

Based upon the ITU-G3ict e-Accessibility Policy Toolkit for Persons with Disabilities

Compiled and Edited by
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Preface

ICT Accessibility: Making the Information Society Barrier Free

Dr. Hamadoun I. Touré
Secretary-General
International
Telecommunication
Union

For the past two decades, the International Telecommunication Union, in partnership with its Member States, private sector members and other United Nations organizations, has led unprecedented efforts to ensure that Information Society infrastructure is universally deployed and promoted as a foundation for human, economic and social development. Standardization, regulatory and development policies promoted by the ITU and the World Summit on the Information Society and implemented by its Member States, combined with market forces, have led to an unprecedented expansion of the adoption of Information and Communication Technologies (ICTs), including in the developing world.

The world counts over 5 billion mobile cellular subscriptions, over 1.2 billion fixed telephone lines, and some two billion Internet users. In addition, virtually all areas are covered by broadcasting services.

Despite these successes, over 650,000,000 persons living

with disabilities are at risk of being excluded from essential services, social interaction and information sources delivered through ICTs. Those include broadcasting, the Internet, personal computers and any digital interface commonly used to deliver commercial or government services or information. Tasks which seem simple to execute for the majority of users such as interacting with a web site, a telephone, an electronic kiosk or simply watching the news or following emergency public announcements can be overwhelmingly difficult or impossible to accomplish for persons living with disabilities.

Yet, with the adoption of the United Nations Convention on the Rights of Persons with Disabilities (CRPD), a new universal legal and policy framework for ICT accessibility has emerged which ITU Administrations — communications policy makers and national regulatory authorities — will need to abide by. Among many new mandates, Member States who ratified the CRPD now need to ensure that their national information infrastructure including telephony, mobile phones, emergency services, the Internet and broadcasting are all accessible. National Regulatory Authorities and Ministries overseeing information and communication technologies will lead those policies and programs in their respective countries. This is not a simple task and global experience sharing among members, disabled persons organizations and the private sector is necessary. The ITU Standardization Sector is committed to improving ICT accessibility through the standardization of relevant technologies. At the same time, it works to promote ICT accessibility awareness with its members and partners, including industry.

Likewise, I am particularly pleased that the ITU Development Sector took the initiative to develop the e-Accessibility Toolkit for Policy Makers in partnership with G3ict – the Global Initiative for Inclusive ICTs. ITU and G3ict launched their joint online e-Accessibility Policy Toolkit for Persons

with Disabilities http://www.e-accessibilitytoolkit.org on 24 February 2010 during the ITU Telecom Development Advisory Group meeting. ITU members greeted enthusiastically this first platform designed for policy makers and regulators to share technical references, policies and good practices on all aspects of ICT accessibility. I encourage our members to take full advantage of it. This print version will help promote this important area of policy-making and serve as an excellent handbook to identify the key steps required to ensure that the Information Society is barrier free and benefits all humankind.

Introduction

The Importance of ICT Accessibility in Bridging the Digital Divide

Sami Al-Basheer
Director, ITU–D

The mandate of the Telecommunication Development Sector (ITU–D) of the ITU is to connect the unconnected. This can only be achieved if the barriers which prevent persons living with disabilities from using ICTs are eliminated. This issue is a challenge for developing and developed nations alike. Statistics from around the world demonstrate that ICT usage among disabled persons is limited and that disability and the lack of accessibility are in fact key drivers of poverty.

Yet, solutions exist today that can transform the lives of millions and make it possible for them to fully participate in all aspects of social and economic activities: accessible mobile phones, assistive features for end-user devices including personal computers, accessible TV programming, relay services for deaf users, accessible electronic kiosks, accessible web sites or accessible emergency services. However, while solutions exist for all those technologies, references have traditionally been scattered among multiple sources of information, and programs and policies to promote their implementation require a diverse set of expertise.

The work of ITU–D is conducted in a collaborative environment open to contributors from many different users' perspectives. Two years ago, we started to work with G3ict on developing the e-Accessibility Policy Toolkit for Policy Makers – http://www.e-accessibilitytoolkit.org. In February of this year, we formally launched the Toolkit during the meeting of the Telecommunication Development Advisory Group (ITU–D). ITU brought a number of references in the field of policy making and standardization, while G3ict - the Global Initiative for Inclusive ICTs - provided contributions from a global network of over 60 ICT accessibility experts from industry, government and Disabled Persons Organizations who all volunteered their time and expertise. We were both very pleased and grateful for such an extraordinary collaborative and voluntary effort, a testimony to ITU's commitment to accessibility and to the leadership that its membership exercises. This print version was also made possible the by additional generous contributions of the Center for Internet and Society and the Hans Foundation. Our colleagues took it upon themselves to offer to further promote our online toolkit by designing and producing this very useful companion handbook. Our sincere appreciation goes to all contributors to this unique collaborative endeavor.

At ITU–D, we are looking towards leveraging this knowledge base and network of experts by expanding our offering of capacity building programs. The next few years will be critical to developing accessible information infrastructure around the world. Our experience in a number of regions shows that policy makers and regulators are aware of those challenges and are very much dedicated to meeting accessibility requirements. The e-Accessibility Policy Toolkit for Persons with Disabilities and its companion handbook will be a valued resource to help share solutions, good practices and policies that work. And for those countries deploying new infrastructure, the time could not be better to make them accessible from the start. I encourage all ITU members to make use of the online e-Accessibility Toolkit and this companion handbook.

Foreword

The e-Accessibility Policy Toolkit for Persons with Disabilities: Global Cooperation for a Global Challenge

Axel Leblois
Executive Director,
G3ict

Since its opening for signature in March 2007, the Convention on the Rights of Persons with Disabilities has enjoyed one of the fastest rates of adoption in the history of Human Rights. With 146 signatures and 91 ratifications as of September 2010, it has established itself in a short period of time as the universal framework which will define the laws, policies and programs which States Parties will need to implement. The Right to accessibility is a cornerstone of the Convention. It conditions the ability of persons with disabilities to "fully enjoy all human rights and fundamental freedoms" as specified by its preamble.

Remarkably, the Ad-hoc Preparatory Committee which developed its text with the input of many disabled persons representatives specified in its Article 9 that accessibility requirements applied equally to the built environment, transportation and Information and Communication Technologies (ICTs). This automatically implies that ICT applications, technologies and services are covered by each

and every disposition of the Convention requiring that States Parties address sector specific accessibility issues.

Back in the fall of 2006, it became clear to a number of key participants to the Ad-hoc Preparatory Committee for the Convention that those ICT accessibility dispositions would have profound and complex implications for States Parties. The suggestion was made that a focused multi-stakeholders effort be launched to promote ICT accessibility and offer solutions via a global exchange of good practices. Ambassador Gallegos, who chaired the Ad-hoc Preparatory Committee for over three years and serves as chair of G3ict, the Secretariat for the Convention at UN DESA, the United Nations Global Alliance for ICT and Development (UN GAID), Disabled Persons Organizations and ICT corporations helped us stage the creation in December 2006 of G3ict – the Global Initiative for Inclusive ICTs – as a multi-stakeholders global advocacy and hub for volunteering experts from around the world.

Naturally, given the central role of Telecom Regulators in implementing many of the ICT accessibility dispositions of the Convention, the International Telecommunication Union (ITU) seemed to be well positioned to help develop outreach activities towards policymakers. In early 2007, at a meeting organized by Craig Barrett, Chairman of Intel and then Chair of UN GAID, we asked Dr. Hamadoun Touré, Secretary-General of the ITU whether ITU may be willing to help G3ict and participate in some of its projects. His response was instantly positive and supportive of our work. Since then, and thanks to the support of Malcolm Johnson, Director of ITU's Telecommunication Standardization Bureau, the cooperation between ITU and G3ict has kept growing, including promoting ICT accessibility standards in cooperation with ITU–T and organizing awareness raising seminars for governments and regulators around the world and rallying multiple stakeholders with ITU–D in multiple countries. Our joint efforts quickly demonstrated the practical needs and expectations that ITU

members had in terms of learning more about ICT accessibility policies and good practices.

In 2008, Asenath Mpatwa, then Head of the Special Initiatives Division, ITU Telecommunication Development Bureau (BDT), came up with a bold idea: given the scarcity of available information on ICT accessibility good practices and policies, could we develop a web based toolkit for policymakers? Could cooperation between ITU and G3ict's many volunteer experts address all the complex technologies, applications and policies supporting ICT accessibility?

With the encouragements of Andrea Saks who has championed the cause of accessibility at ITU for many years, and after a quick poll, we found that prominent experts from around the world were indeed willing to contribute their time and expertise pro-bono so that the e-Accessibility Policy Toolkit for Persons with Disabilities would become a reality. We needed, however, some minimum structure and organization to get this ambitious task accomplished. We sought the advice of Professor Gerard Quinn, a very early G3ict participant and one of the architects of the text of the Convention. Professor Quinn immediately offered to check with Dónal Rice, one of his Ph.D. students at the National University of Ireland Galway, if he would be interested to volunteer as editor to coordinate our contributors. Dónal Rice, who also serves as ICT expert at the Centre for Excellence in Universal Design of the National Disability Authority (CEUD/NDA) of Ireland, expressed his enthusiasm and committed to the project. Gerald Craddock who heads up the CEUD at the NDA generously agreed to let Dónal serve in this capacity, thereby contributing an essential resource to developing the Toolkit. The World Blind Union also volunteered its support of the Toolkit at its 2008 General Assembly in Geneva. IBM, Microsoft and many other companies and large non-profit or governmental organizations such as WGBH, the Wireless RERC, CIS or the City of Chicago agreed to contribute their experts

not only for technical sections, but also to help us review the contents of the Toolkit. Kevin Carey, currently Chair of the Royal National Institute of Blind People (RNIB), came up with the format and structure of our technical sections and greatly contributed to kick-off our editorial process. Cynthia Waddell, Trisha O'Connell, James Thurston, Anne-Rivers Forcke, Nirmita Narasimhan and more than 60 other experts, whose names follow this foreword, contributed considerable content to the Toolkit. There is no proper word to express our gratitude for their invaluable contributions.

To keep the project on track, Susan Schorr, current Head of the Special Initiatives Division, ITU Telecommunication Development Bureau (BDT), with the valuable assistance of Maxim Kushtuev, Project Coordinator, Special Initiatives Division, ITU/BDT, has been a terrific and resourceful partner to make this project happen. Behind the scene, Francesca Cesa Bianchi, Director of External Relations at G3ict and who manages the Toolkit website, competed with Dónal Rice for the number of late nights spent at organizing, proof reading, and uploading the content of the Toolkit. Without Francesca's and Dónal's extraordinary work, attention to details and commitment beyond duty, this project would not have happened.

While we were happy to launch the Toolkit at the ITU Telecommunication Development Advisory Group (TDAG) meeting in February 2010 in Geneva, one of our most dedicated contributors, Nirmita Narasimhan, Program Manager at the Centre for Internet and Society (CIS) in Bangalore, told us that we ought to further promote the Toolkit, that it was such a terrific resource for policymakers that a handbook should be printed and widely distributed. Her enthusiasm was irresistible and we agreed to go ahead: she ended up editing this entire handbook with Rebecca Schild's support and many of our contributors agreed to proof read it. The Hans Foundation generously agreed to cover the production of the first 2, 000

copies of this handbook. Our entire Toolkit team is most grateful for this terrific support of CIS, its Director, Sunil Abraham and The Hans Foundation. We also wish to express our appreciation to Simão Campos and Alexandra Gaspari, at ITU-T, who worked tirelessly to meet the tight deadlines of this print edition. We hope that our readers will enjoy the practical and easy-to-read format of this handbook and appreciate the intent of its many contributors.

For G3ict, this Toolkit and handbook best exemplify the global nature and dynamism of our grassroots network of experts and supporting institutions. The Toolkit and its companion handbook constitute the foundation for an ever more effective global platform to exchange good practices among policymakers involved in ICT accessibility and their constituents. They will also serve to design and deliver multiple capacity building programs over the next few years to facilitate the full implementation of the ICT accessibility dispositions of the Convention on the Rights of Persons with Disabilities. Our very sincere appreciation goes to all our friends and colleagues who have made this project a reality.

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The Accessibility Imperative

Chapter 1

The Accessibility Imperative

This chapter will explore the meaning of Information Communication Technologies (ICT) accessibility while outlining basic accessibility principles, standards and guidelines. It will cover the provisions for ICT accessibility in the Convention on the Rights of Persons with Disabilities (CRPD), discuss how best to assess disability demographics and look at the impact of ICT barriers by identifying ICT accessibility policy and program gaps between the CRPD guidelines and mandates. Finally, it will examine the role of Disabled Persons Organizations (DPOs) and other key stakeholders in policy making.

Full text of the Convention available on the Secretariat website (UN Enable) at http://www.un.org/disabilities/

1.1 What is ICT accessibility?

Accessibility is a measure of the extent to which a product or service can be used by a person with a disability as effectively as it can be used by a person without that disability. The concept of accessibility relates to the diverse needs and abilities of a diverse section of the user population – persons with disabilities – and is expressed in degrees, from "fully accessible", to "partially accessible", to "completely inaccessible" for a specified user group. The more persons

that can use the product and the more tasks they can carry out with it, the more accessible the product is considered to be. Some examples of inaccessibility are given below.

- A bank's Automated Teller Machine (ATM) could be inaccessible in the following ways:
  - Machine positioned too high for a person in a wheelchair to reach some of the controls.
  - Poor quality visual display with low contrast between text and background, or text-only visual display making reading difficult or impossible for persons with vision or reading impairments.
  - Prompts and responses are written in complex language or jargon, making them difficult to understand for persons with some cognitive or learning disabilities.
- Websites which typically contain a mixture of text, images, links, buttons, tables, interactive forms and other content can be inaccessible in the following ways:
  - On-screen buttons are made to respond only to a mouse click, so a person with a physical disability who cannot use a mouse cannot 'click' buttons by pressing the 'Enter' key on their keyboard as another option.
  - On a payment form, the labels of input boxes and controls (e.g. 'name', 'choice of payment method') are displayed in a way that cannot be read by the text-to-speech software used by a blind person, so this person does not know the purpose of each box or control.
  - Visual design and layout are inconsistent from page to page, making the website confusing and difficult to learn for persons with some cognitive or learning disabilities.
  - Online videos have no captions (subtitles), audio description tracks or text transcripts. Therefore, deaf, hard of hearing and blind users do not have access to the full content.

Where legislation, public policy or organizational policies require ICT products and services to be accessible, a recognized accessibility standard is usually referenced. Being 'accessible' then means complying with that standard.

1.1.1 Basic Accessibility principles

For full accessibility, all users must be able to do three things for every control, instruction or output:

- **Perceive it** – Be aware of its existence and able to access its information. For example, a deaf person may be unaware of the existence of an audible alarm signal whereas a blind person will be unaware of a visual signal.
- **Understand it** – Know what it means and how to use it. For instance, a person with a learning disability may be unable to follow complicated or poorly written instructions on an ATM. They may find it difficult to identify where to find things on an inconsistent website.
- **Operate it** – Be able to reach it and physically interact with it in the required way, which may mean pressing, moving, twisting or pulling. For example, a wheelchair user may be unable to reach the card slot on an ATM. A blind person will not be able to click on a map to choose a location.

It may be difficult or even impossible to design a specific product in a way that all persons can use it fully as it is, without requiring any adjustment or add-ons. However, most products can be made accessible to most users using one or more of the following methods:

- **Maximizing the basic accessibility** – For example, using good design principles like well-spaced buttons and providing clear instructions instead of longwinded jargon.
- **Allowing user configuration** – For example, ATMs, websites, mobile phones and PC applications can provide a choice of different text sizes and colour schemes to suit persons with different visual abilities.

- **Allowing a range of interaction methods** – For example, allowing PC users to interact using keyboard input or even voice commands, in addition to using a mouse.
- **Providing outputs in multiple forms** – For example, using both an audible 'beep' and a visible light would make the house alarm accessible to both blind and deaf persons.
- **Ensuring compatibility with assistive technologies** – Many persons with disabilities interact with other technologies through personal 'assistive technologies', ranging from hearing aids to the complex text-to-speech 'screen reader' software used by blind persons to operate a PC etc. The assistive technology provides a standard intermediary interface with interaction methods and output formats suited to different needs. For a product designer, interfacing with assistive technology removes the need to add those interface capabilities into the product itself. For example, a software application or a website does not need to provide spoken output of text if it can interface with assistive technologies like screen readers which provide text-to-speech capability. As far as possible, then, products should be made compatible with these assistive technologies.

Making something accessible doesn't mean making it worse for 'normal' use. In fact, increased accessibility often results in improved usability for all users. The above approaches to accessibility are all additions, allowing added flexibility, additional modes, more choice. The aim is always to allow access to the equivalent functionality, but in an alternative way. This is the true meaning of accessibility.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (e-Accessibility basics): http://www.e-accessibilitytoolkit.org/toolkit/eaccessibility_basics

1.2 What the CRPD says about ICT accessibility

The Convention on the Rights of Persons with Disabilities was adopted by the United Nations General Assembly on December 13, 2006 and has been signed by 146 countries as of September 2010, of which 90 have ratified it, making it an enforceable legal instrument since May 5, 2008 (when the 20th ratification occurred).

The Convention defines disability in the Preamble 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.' This definition discards the medical definition of disability and brings into focus a social definition, recognizing the environmental and attitudinal barriers faced by persons with disabilities, clearly stating that they can enjoy full and free participation only on removal of these barriers. The Convention has Accessibility as one of its eight principles and establishes Accessibility rights including ICT as an integral part of human rights.

'Communication' is defined by the Convention as including all possible means of interaction that may eliminate barriers. Communication 'includes 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 include accessible information and communication technology' (Article 2).

Article 9 of the Convention defines ICT accessibility as an integral part of Accessibility Rights, on par with accessibility to the physical environment and transportation: 'To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to

transportation, to information and communications, including information and communications technologies and systems...' This definition implies that both hardware and software, including the human interface, need to be accessible. Article 21 on freedom of expression and opinion, which includes access to information, also specifically says that 'States Parties shall take all appropriate measures to ensure that persons with disabilities can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others and through all forms of communication of their choice.'

ICT accessibility is included in all sector-specific accessibility accommodation and both Articles 9 and 21 state that even private entities need to take accessibility into account when providing products and services.

The CRPD's accessibility dispositions include general ICT accessibility requirements laid out in Article 9, as well as sector specific accessibility stipulations with direct implications for each sector. Given the rapid evolution of technologies and diverse ICT environments found around the world, the Convention defines obligations in relation to desired outcomes by application areas, rather than in specific technical terms. So, it is the responsibility of States, civil society and industry to define the required solutions in their respective jurisdictions. Some of the obligations in each application area are given below.

- **e-Government** – Provides information in alternative formats and technologies in a timely manner and at no additional cost, accepting and facilitating the use of sign language, Braille, augmentative and alternative communication in official interactions and reasonable accommodation (Article 21 (a), (b)).
- **Media & Internet** – Encouraging mass media providers including providers of information on the Internet to make their services accessible (Article 21 (d)).

- **Education** – Providing inclusive, quality and free primary education and secondary education, as well as the ability to access general tertiary education, vocational training, adult education and lifelong learning without discrimination and on an equal basis as others. Also providing reasonable accommodation and recommendations to training professionals working at all levels of education on disability awareness and the use of appropriate augmentative and alternative modes, means and formats of communication, educational techniques and materials to support persons with disabilities (Article 24).
- **Employment** – Recognize the right to work on an equal basis with others, including the right to the opportunity to make a living through work freely chosen or accepted in a labour market and work environment that is open, inclusive and accessible to persons with disabilities (Article 27.1).
- **Political rights** – Ensure that voting procedures, facilities and materials are appropriate, accessible and easy to understand and use.
- **Emergency services** – Remove obstacles and barriers to accessibility in ICT services including electronic and emergency services.
- **Cultural life** – Recognize the right to take part, on an equal basis with others, in cultural life, and take all appropriate measures to ensure that persons with disabilities have access to cultural materials, television programs, films, theatre and other cultural activities, in accessible formats so that they enjoy access to cultural performances or services in theatres, museums, cinemas, libraries and tourism services, and, as far as possible, enjoy access to monuments and sites of national cultural importance (Article 30).
- **Product Development and Universal Design** – The Convention addresses explicitly the root cause of the

inaccessibility of many products and services by stipulating that States Parties should "Promote the design, development, production and distribution of accessible information and communications technologies and systems at an early stage, so that these technologies and systems become accessible at minimum cost". This disposition naturally applies to all private sector products and services as well as to public services relying on ICT devices, applications or contents interacting with citizens. Furthermore, the Convention includes a guideline for States Parties to "undertake or promote research and development of universally designed goods, services, equipment and facilities … which should require the minimum possible adaptation and the least cost to meet the specific needs of a person with disabilities, to promote their availability and use, and to promote universal design in the development of standards and guidelines".

- **Assistive Technologies** – Although heavily promoted by the Convention, Universal Design "shall not exclude assistive devices for particular groups of persons with disabilities where this is needed." (Art. 2 – Definitions par. 5). In that regard, the Convention also includes important specific dispositions and guidance for States Parties to leverage the significant potential of ICTs in the area of new assistive solutions that benefit persons with disabilities, such as:
  - Mandate to promote R&D for assistive technologies over and above promoting accessible ICTs. Public-private partnerships can be implemented by States for this purpose.
  - Obligation for States to set accessibility standards which directly supports the requirements for interoperability between ICT based contents and services and assistive devices. Article 9 on Accessibility specifies that "States Parties shall also take appropriate measures to develop,

promulgate and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public."

- Intellectual property rights should not constitute an obstacle to implementing digital accessible formats.
- Promoting New Media and the Internet for those with disabilities.
- Reasonable accommodation defined and mandated. States are directed to ensure that reasonable accommodation is provided, specially in specific areas of applicability like liberty and security of the person, education and work and employment. This directly refers to making assistive technologies available to persons with disabilities when available without creating a disproportionate or undue burden.
- Denial of reasonable accommodation is held to be a form of discrimination.

In addition, the Convention identifies specific application areas for which States Parties are directed to establish specific programs to promote assistive technologies, such as mobility, habilitation and rehabilitation, and participation in public and private life.

1.2.1 Public procurement

From a practical standpoint, one of the most important levers which can be used by governments to comply with ICT accessibility obligations is to ensure that appropriate public procurement rules include ICT accessibility considerations.

Although the Convention does not specifically mention public procurement policies, 'Reporting Guidelines' issued by the Secretary-General of the United Nations to States Parties do include them. Such reporting requirement is logical since the Convention establishes general obligations regarding government policies and programs, directing States Parties to take into account '*the protection and promotion of human*

rights of persons with disabilities in all policies and programs', and *'refrain from engaging in any act or practice that is inconsistent with the present Convention and to ensure that public authorities and institutions act in conformity with the present Convention'* (Article 4 (c) and (d)). The purchase of inaccessible ICT product and services by States Parties to the Convention would thus be incompatible with those general obligations and more specifically with ICT accessibility dispositions for communicating with the public or, when those purchases are made for government internal use, incompatible with the obligation to foster an accessible work environment.

1.2.2 Disposition on access to information on specific programs

Ensure that international cooperation, including international development programs, are accessible (Article 32.1); provide text of the Convention in accessible formats, *provide accessible information to persons with disabilities about mobility aids, devices and assistive technologies, including new technologies, as well as other forms of assistance, support services and facilities (*Article 4 (1) (h)), and ensure that any statistics and data collected are made available in accessible formats.

1.2.3 Implementation of the Convention

After a State signs and ratifies the Convention, it must then align its legislation and regulations with the dispositions of the Convention, unless these are already more favorable. This is a long but irreversible process with worldwide pressure from NGOs representing persons with disabilities.

Some of the challenges faced by States Parties to the Convention include:

- Speed of change due to technological developments
- Lack of official statistics in most countries regarding ICT accessibility
- Low awareness of ICT accessibility standards

- Requirement to make accessible and assistive ICT products affordable

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Convention): http://www.e-accessibilitytoolkit.org/toolkit/un_convention

1.3 How to best assess disability demographics and the impact of ICT barriers

Persons with disabilities are often invisible in statistics.[1] The little market data that is available describing the demand for accessible ICT generally reflects the prevalence of specific medical disabilities, each of which are often shown as a small percentage of an overall population. This perpetuates the idea that accessibility is a market 'niche'.

With a niche market label and lack of coordinated commercial focus on accessibility, the supply and availability of accessible ICT and assistive technologies remain limited and fragmented. Finally, with that fragmented availability and limited supply, prices of accessible ICT and AT are correspondingly higher, thus impacting their affordability. Therefore, it is necessary to develop a framework for assessing disability demographics both in order to promote accessibility in the commercial and public sectors and also to determine the current impact of ICT barriers on the disabled. About 89 percent of the global population today lives in countries with a political commitment to ensuring ICT accessibility,[2] but such commitment lacks meaning as long as those requiring accessible ICT remain uncounted or invisible to policymakers and industry.

1. UNESCO Education for All Global Monitoring Report 2006, UNESCO, 2007
2. International Telecommunication Union

1.3.1 The medical model of disability

The 'medical model of disability' – the model most widely understood and interpreted today – considers disability 'a physical, mental, or psychological condition that limits a person's activities', linked to various medical conditions and viewed as a problem by the affected individual. About 10 to 12 percent of the global population is disabled according to the medical model. Considering only the medical model of disability, and factoring in those persons aged 65 years and older and likely to develop a medical disability, there is today an estimated market force of slightly more than one billion persons worldwide requiring accessible ICT.

However, the international community has come to recognize that the medical model is not a sufficiently effective or empowering conceptual framework for promoting the full inclusion of persons with disabilities in society. As a result, the paradigm of disabilities is expanding to include both the medical model as well as the more recently defined 'social model' of disability.

1.3.2 The social model of disability

Unlike the medical model of disability, the social model of disability views disability as 'arising from the interaction of a person's functional status with the physical, cultural, and policy environments'.

According to the social model, disability is the outcome of the interaction of a person with his or her environment and thus is neither person-specific nor environment-specific. Within the social model, then, a disability results when a person attempts to communicate, yet does not understand or speak the national or local language. Similarly, a disability results when someone who has never before operated a phone or computer attempts to use one with no success. In both cases, the person is disabled because of an inability to interact with his or her environment.

The social model of disability inevitably encompasses more of the global population in more situations and under more circumstances than does the medical model, and it has begun to shift the way we view accessibility. Parallel to the social model which describes a disability as occurring at a specific moment within an individual's interaction with some aspect of their environment, Universal Design principals call upon designers to assess the capability demands of their products and minimize the instances where the capability demand of that product exceeds the capabilities of the intended user.

The goal of the social model of disability is to minimize the opportunity for a social disability to occur in the environment by designing barrier-minimal products.

1.3.3 Measuring and responding to changes in human capability

Historically, persons have been viewed as being either able-bodied or disabled but, in fact, human capability varies continuously throughout a lifetime and requires more specific analysis. In general, it is possible to identify seven capabilities which are grouped into three categories:

- **Sensory**, including vision and hearing;
- **Cognitive**, including thinking and communication;
- **Motor**, including locomotion, reach and stretch, and dexterity.

Most persons experience more than one capability loss throughout their lifetime, usually in the form of multiple minor impairments (e.g. decreased in vision, hearing or dexterity) as opposed to a single major capability loss such as blindness, deafness or paraplegia. This pattern of multiple minor impairments over time is typical of the human aging process.

Challenges arising from age variations

The fact that human capability varies continuously throughout a lifetime is responsible for much of the complexity in ICT accessibility. 'Age variation' within a population is as much a consideration for policymakers as it is for product and service designers, especially considering that increased life expectancy in industrial countries will contribute to an increase in the number of persons with disabilities worldwide.

This aging population is significant in both its number and its implications for ICT policy as well as device and software development. Persons are likely to develop new difficulties and impairments as they age, whether sensory, cognitive, or motor. Likewise, persons with existing mild difficulties and impairments may experience an increase in the severity of impairment. Simply put, the increased age of the population creates an immediate 'second tier' of demand for accessible ICT in the form of older persons experiencing diminished sensory, motor, or cognitive capabilities. In particular, the demographics of the developed economies are changing, with longer life expectancies and a reduced birth rate resulting in an increased proportion of persons over 65 in the population.

More so than previous generations, workers currently aged 55-64 are more likely to use computers at work. However, beyond the workplace, there is not only an increase in the use of computers for information and communication, but there is also an overall increase in the average age of computer users in the United States. In the future, then, computer users will demand and expect greater accessibility in computers. More importantly, though, policymakers and stakeholders must consider how accessible ICT might help address the broader, macroeconomic effect of an aging population: the need for increased productivity within the smaller working population on which the growing old-age population will continue to depend.

The need for increased productivity

The less developed regions (not including the least developed countries) are projected to have the steepest growth in their old-age dependency ratios – the number of persons aged 65 or older in the population per every person age 15-64 (working age) in the population – over the next 40 years. These regions are predicted to experience 200 percent increase in the ratio between 2000 and 2050, compared to the slightly more than 100 percent increase predicted for the more developed regions, and slightly less than a 100 percent increase (in the ratio of persons over 65 to those of workforce age) in the least developed countries.

Rising dependency ratios (the number of persons aged 65 or older in the population per every person in the working age range of 15-64 in the population) worldwide require a corresponding increase in workforce productivity.

Firms can increase productivity in a variety of ways, many involving automation and computerization. Recently, however, less obvious accessibility-related techniques are being employed that involve ergonomic design and worker comfort. The theory maintains that a comfortable employee can produce more than a counterpart who struggles through the day. By removing barriers to using automation and computerization (both of which are capital inputs into production) and allowing for a more comfortable workplace, accessible information and communication technologies can help to create a more productive workplace for a more diverse workforce. Increased productivity at the firm level contributes to increased productivity at the national economic level. And this is especially significant in economies where there is an increasing proportion of the population reliant upon the productivity of a decreasing proportion of the population.

1.3.4 Assessing the impact of accessible ICT

Primary and secondary beneficiaries

As we look to the future, we now recognize that there are many kinds of persons who benefit from accessible ICT. As we have already noted, the direct and primary beneficiaries are the more than one billion persons worldwide with disabilities or diminished capabilities for whom accessible ICT contributes to an improvement in overall quality of life. However, it is perhaps equally important for policymakers to recognize and consider that the businesses, communities and economies which depend on the productivity and contributions of these two constituencies represent a second dimension of direct beneficiaries of accessible ICT.

Low-literacy populations

Accessible ICT and assistive technologies also promote literacy, which may not usually be linked to disabilities. By their very nature, though, information and communication technologies depend on communication abilities, including literacy.

Much of the content delivered over ICT, especially Internet-based content, remains text-based and the format and content of web pages often demand skills similar to those of document literacy. Furthermore, the cognitive skills underlying reading and problem solving are also critical to using ICT effectively. Thus there is little doubt that illiteracy or low literacy can present a barrier to a user's interaction with ICT.

Specific assistive technologies can help low-literacy populations by converting text-based content into audible content. These forms of AT are available in screen-readers as well as self-voicing technologies which can be integrated with an application. In both cases the AT is based on 'Text-to-Speech' (TTS) technology and has historically been focused on assisting blind ICT users. However, as the paradigm of disabilities expands to include the broader social model of

disabilities, we can likewise expand the community of beneficiaries by focusing our attention not on the medical disability of the intended user, but rather on the functional objectives of the AT. In this case, the function of the AT is to verbalize non-verbal content: to read the information aloud. The beneficiaries are, then, those populations whose ability to read is impaired and the cause of the impairment is irrelevant.

Additionally, Speech-to-Text (STT) technologies convert spoken communications into text-based communication. These are often used by persons with motor impairments as an alternative method for inputting information into ICT, such as composing an e-mail. This function benefits the breadth of those populations whose ability to write is impaired. Again, the cause of the impairment is irrelevant and, again, the benefit is produced by the enabling function of the AT in the moment that the dysfunction occurs between the information to be communicated and its medium. Thus, the STT technology produces benefits for ICT users with poor or no writing skills, equivalent to the benefit it produces for ICT users with motor impairments.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Who benefits?): http://www.e-accessibilitytoolkit.org/toolkit/who_benefits

1.4 Identifying ICT accessibility legislative, regulatory, policy and programs gaps versus CRPD guidelines and mandates

One fundamental goal of States that have ratified the CRPD is to take ownership of their compliance obligations under the treaty that they have signed. One important tool that can be used for this purpose is the G3ict Accessibility Self-Assessment Framework, which enables ratifying States as well

as States planning to ratify the CRPD to evaluate their own progress toward domestic conformity with the CRPD's (ICT) treaty standards.

The template is designed to encourage government policymakers and citizen leaders to engage their countries in striving for laws, policies, programs and practices that when implemented result in more: (a) accessible ICT infrastructure, (b) affordable ICT and (c) available and effective assistive technology. Self-assessment results and reports can be used to mobilize concerned actors within States to work together to promote the CRPD agenda, especially if various governmental agencies, Disabled Persons Organizations (DPOs) and Non-Governmental Organizations (NGOs) contribute to the assessment and reporting process. When working toward improved compliance with treaty provisions, concerned organizations should be involved in investigating and monitoring domestic situations. Self-assessment may facilitate advocacy and needed improvement on many levels by encouraging cooperation among concerned actors within States.

In collecting data for the Self-assessment, a State may wish to rely on in-country local assessment teams to complete a formal questionnaire review, in most cases with the assistance of a local lawyer or expert with a mastery of the country's laws, or preferably someone with experience working on issues involving persons with disabilities, e.g. representative DPO leaders.

The Self-assessment team should be expected to justify its answers to specific questions during the completion of the questionnaire. Without a proper justification, the assignment of a score is largely meaningless. In some cases, for example, it will be clear from a simple reading of the excerpted language of the law/legislation/policy that a country's compliance with a particular article is poor or exemplary. But this may not always be the case, and in any event, it cannot be assumed

that, based on the text alone, compliance (or non-compliance) will be apparent to a reader with little or no familiarity with a particular country, or to someone from a country with a different legal tradition.

The basic activity for the Self-Assessment Framework includes the following tasks:

- **Identify the country commitments**: This activity requires identifying the political commitments made with respect to the national laws, policies, programs and plans of action that are relevant to the ICT provisions under analysis, and the formal status of the country's government legal and policy regime in relation to those ICT commitments. [Leg #1]
- **Identify the capacity/infrastructure for implementation**: This involves examining the country's capacity to implement the ICT provisions under analysis, including the availability of digital/technological, financial and human resources available, as well as other factors – such as business, social, and cultural – that may limit or expand implementation capacity. [Leg #2]
- **Assess the country's implementation and impact**: This requires the development and application of institutional measures to ensure that legal and policy changes are implemented in actual practice. In particular, it looks at the: (a) availability, accessibility, and affordability of ICTs and Assistive Technologies (ATs); (b) availability, accessibility and quality of information and information services; and (c) the impact of (a) and (b) on the lives of persons with disabilities. [Leg #3]
- **Draw links between commitment and implementation/ impact**: This activity involves comparing the country's commitments to the CRPD with the actual implementation and impact revealed by the self-assessment. The purpose of linking the implementation and impacts to specific legal and policy obligations is to identify the results which the

country should focus on. This also involves linking the country's capacity to implement the CRPD obligations and identifying the main obstacles the country will have in meeting those obligations. What CRPD commitments have not been achieved by the country? What capacity factors are related to those unfulfilled gaps?

- **Generate recommendations and action plan**: This activity involves using the results of the above analysis to work with multiple stakeholders on developing proposals for legal, policy and programme changes. It involves generating strategies and recommendations for preparing a plan of action to work with legislators, regulators and civil society for improvement of its public laws, policies and programs, as well as for necessary private sector changes.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Assessment framework): http://www.e-accessibilitytoolkit.org/toolkit/un_convention/assessment_framework

1.5 Engaging Disabled Persons Organizations and other key stakeholders in policy making

1.5.1 Mainstreaming disability

Mainstreaming disability is the process of assessing the implications for persons with disabilities of any planned action, including legislation, policies and programs, in all areas and at all levels. It is a strategy for making persons with disabilities ' concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programs in all political, economic and societal spheres so that persons with disabilities benefit equally and inequality is not perpetuated. The ultimate goal is to achieve disability equality.

One key factor for mainstreaming success is the engagement of individuals with disabilities that represent cross-disability issues to inform all policy sectors. By actively participating in the development and implementation of policies and strategies for accessible ICT, persons with disabilities can contribute to the determination of the most relevant and appropriate strategies for successful policies. Therefore, policymakers should plan accessible meetings and incorporate effective communication practices so that persons with disabilities can participate.

However, policymakers must engage not only individuals but also a variety of Disabled Persons Organizations, governments and their representatives, commercial actors, and other groups in order to close current and potential accessibility gaps in ICT. The following is a variety of ways in which policymakers considering how best to implement the CRPD might engage stakeholders in the process:

- Hold public consultations with persons with disabilities and Disabled Persons Organizations on developing accessibility policies and regulations.
- Fund the customization of basic assistive technologies tools in local language including text- to-speech, voice recognition and screen readers.
- Design and maintain accessible e-government web sites according to W3C-WAI standards and promotion of accessible private websites.
- Use universal service/access funds to support of ICT accessibility programs, e.g. in schools and vocational training centres.
- Require any public procurement of ICTs to purchase accessible ICT.
- Make publicly available accessible electronic documents across all areas of government.
- Promote the availability of text books in digital format along DAISY standards.

- Develop assistive technologies tools available for education application.
- Train special education teachers to support disabled students in using assistive technologies.

1.5.2 Identifying stakeholders and their roles in implementing accessible services

Policymakers should identify all stakeholders in order to fully understand the context and impact of disparities in accessible ICT and how to address them. The following attempts to identity these stakeholders while suggesting what roles they might play in implementing the CRPD.

Legislators

One of the fundamental obligations of the Convention is that national law should guarantee the enjoyment of rights set forth in the Convention. Legislators should consider the best way to give effect to the rights guaranteed by the Convention in domestic law and this consideration will vary according to the constitutional and legal systems of individual States. In some countries, the ratification of the Convention at the international level may automatically form part of national law; in other countries, the legislature might have to adopt an act of ratification at the national level which would have the effect of incorporating the Convention into domestic law; and in other countries, such as common-law countries, only when specific provisions of the treaty are directly incorporated into national law will there be enforceable rights and duties.

Government regulators

In general, legislators pass laws while government regulators issue regulations in order to carry out or implement laws. It is in the best interest of regulatory authorities to support international standards and good practices since it enables the country to be competitive in the global economy. For

example, in the United States, the Federal Communications Commission (FCC) was established by the Communications Act of 1934 and charged with regulating interstate and international communications by radio, television, wire, satellite and cable. It was not until 1990, when legislators enacted the Americans with Disabilities Act, that persons with hearing and speech disabilities were provided with the ability to use telecommunications services. As the regulatory authority, the FCC was authorized to establish and manage the Telecommunications Relay Services (TRS) programme.

Ministerial departments

Another 'owner' of ICT accessibility and service needs may be a ministerial department responsible for a certain sector. The scope of the Convention addresses a broad range of sectors or application areas, from Employment and Voting to Education and Health, to name a few. The policy maker will look to the appropriate ministerial departments for implementation of these particular Convention Articles. After identifying priorities and evaluating disability policy approaches, the policy maker should engage the ministerial department for the promotion of ICT accessibility. From the legislator to the regulator, to the ministerial department, all three play an important role in impacting ICT accessibility and services.

Public procurement agencies

Another significant player in the availability of ICT accessibility and service needs are public procurement agencies. Government public procurement agencies are on the front lines in the acquisition and deployment of ICT and services. One way to have a systemic impact is to provide ICT public procurement toolkits. There are at least four countries that have implemented this approach: Denmark, Ireland, Canada and the United States.

Local governments

Implementation of the Convention will need to be coordinated with local governments partly because it is at the local level that persons with disabilities can be more readily impacted by ICT accessibility and service needs. It is also at the local level that persons with disabilities and NGOs can serve on advisory bodies in their community for consultations on the Convention implementation. As national laws, policies and regulations are conformed to the requirements of the Convention, local government codes, regulations and ordinances may also need to be conformed. For example, local governments that have an online presence will need to ensure that their website is accessible and that they provide information in an accessible manner. Emergency response plans will also require coordination and review to ensure that citizens with disabilities benefit from emergency response plans. Local governments will need to coordinate their ICT accessibility and service needs as appropriate with national implementation plans for the Convention.

For an extensive review of the methods which local governments can implement to ensure the accessibility of their ICT based services to citizens, refer to http://www.e-accessibilitytoolkit.org/toolkit/local_government

Private sector

Accessible ICT and service needs for persons with disabilities cannot be met if the ICT industry in the private sector does not incorporate accessible design in their product development cycles and has no incentive to do so. It also cannot occur without significant private sector financing. However, governments can assist in correcting accessible ICT market failures and encourage competition. Both the private sector and the government must work together with consumer stakeholders to ensure that there are no barriers to accessible ICT.

As a developer and marketer of ICT products and services, the private sector is directly impacted by government requirements to acquire accessible products and services. Increased efforts towards harmonization of international ICT standards in the accessibility arena are expected. This is due to the global growth of ICT and consumer electronic markets and the universal acknowledgement that innovation is the foundation of the global economy. According to the Japan/U.S./EU Trilateral IT Electronics Associations, compliance with international standards helps to 'promote technology diffusion, production efficiency, product compatibility, interoperability, enhanced competition, consumer choice, and lower costs'.

Collaborative ventures between the private sector and governments, such as Internet infrastructure development in Africa and other regions of the world, will continue. Telecentres and community multimedia centres will be upgraded and built with ICT accessibility in mind. The possibilities for private sector initiatives and collaborations with NGOs are limitless.

Civil society

Civil society organizations played a significant role in drafting the CRPD. Increasingly, such organizations are no longer serving a primary role of service delivery, but are influential in policy making and in performing watchdog functions.

Article 33 of the CRPD specifically designates one or more focal points within government for addressing implementation, and this requires States to consider the establishment or designation of a coordination mechanism within government to facilitate action in different sectors and at different levels. States must establish an independent framework, such as a national human rights institution, to promote and monitor implementation of the CRPD. Article 33 thus sets forth a key role for civil society by providing that persons with disabilities

and their representative organizations must be involved and participate fully in the monitoring process.

Additionally, civil society initiatives provide another vehicle for policy. They can promote outreach, education and training for all aspects of the Convention and serve as one of the many conduits to the community of persons with disabilities for Convention implementation activities occurring in the country. One example of a civil society initiative was the collaboration of two NGOs and a private sector business: The International Center for Disability Resources on the Internet, The Internet Society Disability and Special Needs Chapter, and HiSoftware. A free online web accessibility checker was developed and posted online to aid in the evaluation of whether or not a website is designed according to both U.S. and international technical standards for accessibility.

Supporting voluntary codes of practice or guidelines issued by multi-stakeholders

Finally, policymakers can support and promote the implementation of the code of practice or guidelines issued by multi-stakeholders. As referenced earlier in this chapter, the Web Accessibility Initiative of the World Wide Web Consortium (W3C-WAI) is an example of a voluntary effort by the ICT industry to identify accessibility guidelines and develop tools for implementation. International technical standards for web accessibility have been codified and referenced in country laws, policies, and procurement practices around the globe.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Developing policy): http://www.e-accessibilitytoolkit.org/toolkit/developing_policy

Policies and Programs

Chapter 2

Policies and Programs

This chapter addresses the process of policy formulation, looking at the various facets of policy making by area of government, standard setting, public procurement, promoting assistive technologies, accessible product development and Universal Design, as well as the use of ICT and the Internet by Persons with Disabilities (PWDs) and finally, international cooperation.

As countries move forward to ratify and implement the Convention on Rights of Persons with Disabilities, policymakers grapple with the task of reflecting the obligations of the Convention in the State's national legal framework, including policies, development planning and budgeting. Policy formulation has three facets – identifying priorities, reviewing disability policy approaches and developing policy. Each of these is summarized below.

Identifying priorities

The first step for policy makers is to perform a country assessment by identifying priorities for policy making.

1. Analysis of in-country installed bases of ICT devices and usage

The first step in identifying priorities is to perform an analysis of the in-country installed bases of ICT devices and

usage. Statistics play an important role in providing the basis for analysis and confronting the 'digital divide' a problem described as having several gaps in one involving socio-economic issues including:

- A technological divide in ICT infrastructure between the wealthiest countries and the poorest countries.
- A content divide where almost 70 percent of the world's websites are in English and 'at times crowding out local voices and views'.
- A gender divide where women and girls worldwide enjoy less access to ICT than men and boys.
- A commercial divide where electronic commerce links certain countries and companies more closely together.

2. Inventory of existing laws, regulations or voluntary guidelines adopted by civil society to promote ICT accessibility and assistive technologies

The second step in identifying priorities for policy making is to map or take inventory of all existing laws, regulations or voluntary guidelines adopted by civil society to promote ICT accessibility and assistive technologies. Conducting a country inventory will assist in determining the gaps in policy making for establishing the constitutional, legal and administrative framework for the implementation of the Convention with respect to e-Accessibility and service needs for persons with disabilities.

3. Inventory of existing in-country organizations and programs promoting ICT accessibility and assistive technologies

The next step in identifying priorities for policy making is to inventory existing in-country case studies and good practices that promote ICT accessibility and assistive technologies. This step informs the policymaker of lessons learned in case studies as well as best practices. It also enables current best practices to be leveraged and supported.

4. Development of consultations with representatives of persons with disabilities and possible surveys to be conducted

An important step in identifying priorities for policy making is the development of consultations with organizations representing persons with disabilities. Hitherto, disability policy making has been fatally flawed by the failure to consult the community of persons with disabilities, despite their being in the best position to evaluate appropriate solutions to accessibility barriers. In fact, representatives of persons with disabilities can facilitate the administration of surveys needed to obtain data about accessible ICT and assistive technology needs.

Developing consultations with representatives of persons with disabilities requires the policymaker to be informed about effective communication and accessibility so that persons with disabilities can provide consultations. This means that accessible meetings, documents in alternate formats and teleconferences must be accessible for participation.

If surveys are used, then the survey design and deployment must meet ICT accessibility requirements, so that persons with disabilities can participate in the survey. Frequently, persons with disabilities are not represented in data collection. For example, a telephone survey may not reach persons with hearing or speech disabilities, unless calls are made to those using text telephones, Telecommunication Devices for the Deaf (TDDs) or 'Total Conversation'.

Likewise, a survey posted on the World Wide Web may be inaccessible because it fails to meet the W3C Web Content Accessibility Guidelines 2.0. As a result, persons with visual disabilities and specific learning disabilities may not be able to access the survey with a screen reader, and those with mobility disabilities may not be able to access the survey by keyboard with assistive technologies. This would also be inaccessible to those with hearing loss, if the survey included a video or multimedia component without captioning.

5. Establishing a ranking of technologies and application areas to be addressed

The final step in identifying priorities for policy making is to rank technologies and application areas to be addressed while keeping in mind the gaps in e-accessibility and service needs for persons with disabilities. One hallmark for successful policies and strategies is the implementation of ICT barrier removal action plans. A successful plan is informed by steps for identifying priorities and budgets accordingly.

Disability policies approaches

Disability policy approaches may fall into one of three categories:

1. Accessibility policies (both horizontal and sector-specific policies) – A complete and effective approach to e-accessibility should include:

a. A combination of 'top-down' and 'bottom-up' legislation
b. An approach that first establishes the basic legislation, followed by detailed rule-making
c. A combination of vertical and horizontal approaches
d. Effective use of public procurement
e. Appropriate usage of soft law, with linkage to hard law
f. Establishment of points of reference (including standards and codes of practice)
g. A range of other public measures (public assistive technology services, financial supports for users/ consumers, tax-breaks or other incentives for industry).

2. Mainstreaming ICT policies – Mainstreaming disability is the process of assessing the implications for persons with disabilities of any planned action, including legislation, policies and programs, in all areas and at all levels. It is a strategy for making the concerns and experiences of persons with disabilities an integral dimension of the design, implementation, monitoring and evaluation of policies and programs in

all political, economic and societal spheres so that persons with disabilities benefit equally and inequality is not perpetuated.

3. Policies in support of civil society or non-government organizations – The role of civil society has been significant in the elaboration of the first human rights Convention of the millennium. The Convention on the Rights of Persons with Disabilities established two implementation mechanisms: The Committee on the Rights of Persons with Disabilities, tasked to monitor implementation, and the Conference of States Parties, tasked to consider matters regarding implementation. With respect to national implementation and monitoring, Article 33 of the Convention requires States to consider the establishment or designation of a coordination mechanism within government to facilitate action in different sectors and at different levels. States must establish an independent framework, such as a national human rights institution, to promote and monitor implementation of the Convention. Article 33 sets forth a key role for civil society by providing that persons with disabilities and their representative organizations must be involved and participate fully in the monitoring process.

2.1 Policy development by area

From a policymaker's perspective, the core ICT areas that need consideration may differ according to each government department or ministry sector, even though there are some ICT service needs that are common to all government sectors. Both the key common considerations as well as the government sector considerations by area are outlined below.

2.1.1 Common core ICT areas

Core ICT areas that are common to all government sectors are listed below.

- Design Accessible e-government websites as per W3C-WAI standards and promote accessible private websites.
- Require all public procurement of ICTs to purchase accessible ICT.
- Ensure accessible electronic documents across all areas of government.
- Allow provisions for reasonable accommodation for the workplace.
- Benchmark, measure and report progress on actions taken, as this is an essential tool for policymakers to assess the effectiveness of country policies and programs.

2.1.2 Telecom/ICT regulator, broadcasting authority/Ministry of Telecommunications/communications/technology

- Hold public consultations with persons with disabilities and their representative organizations concerning the development of accessibility policies and regulations.
- Promote availability of accessible cell phones.
- Promote accessible print information.
- Provide relay services for the deaf or "Total Conversation".
- Install accessible public phones.
- Implement TV closed captioning for the deaf and/or sign language interpretation.
- Fund the customization of basic assistive technology tools in local language including text-to-speech, voice recognition and screen readers (with or instead of ministry of education).

In coordination with other sectors of government:

- Provide accessible emergency communications for disaster management (in coordination with ministry of interior, homeland department).
- Utilize universal service/access funds to support ICT accessibility programs, e.g. in schools and vocational training centres.

- Collect disaggregated data on ICT use by disability and type of ICT.

2.1.3 Ministry of Education

- Hold public consultations with persons with disabilities and their representative organizations concerning the development of accessibility policies and regulations.
- Fund the customization of basic assistive technologies tools in local language including text-to-speech, voice recognition and screen readers.
- Promote the availability of text books in digital format along DAISY standards.
- Select and make assistive technologies tools available for education application.
- Train special education teachers to support students with disabilities in using assistive technologies.
- Ensure that e-learning or long distance learning is conducted on accessible websites.

2.1.4 Ministry of Labour/Social Affairs

- Hold public consultations with persons with disabilities and their representative concerning the development of accessibility policies and regulations.
- Request all sectors to work on the integration of persons with disabilities in the labour force (e.g. encourage applications of persons with disabilities and create tele-working where possible).
- Select and promote assistive technology tools for persons with disabilities.
- Support employers and programs offering accommodation with assistive technologies in the workplace.
- Provide incentives for the private sector to hire persons with disabilities (e.g. provide tax incentives for employers or fund assistive technology tools for use as reasonable accommodations).

2.1.5 Ministry of Interior, Homeland Department

- Hold public consultations with persons with disabilities and their representative organizations concerning the development of accessibility policies and regulations.
- Provide accessible electronic voting machines.
- Encourage and promote industry or private sector efforts for the development and production of assistive technologies and related ICT equipment for persons with disabilities.

In coordination with other sectors of government:

- Provide accessible emergency communications for disaster management (in coordination with Ministry of Telecommunication).

2.1.6 Ministry of Health

- Hold public consultations with persons with disabilities and their representative organizations concerning the development of accessibility policies and regulations.
- Encourage and promote industry or private sector efforts for the development and production of develop or produce assistive technologies and related ICT equipment for persons with disabilities.

In coordination with other sectors of government:

- Fund the customization of basic assistive technologies tools in local language including text-to-speech, voice recognition and screen readers (in coordination with Ministry of Education).
- Foster R&D programs in cooperation with rehabilitation centres and invest for assistive technologies.
- Seek international cooperation in promoting the usage of assistive technologies.
- Implement policy and programs to help persons with disabilities acquire and use assistive technologies.

2.1.7 Ministry of Transportation

- Hold public consultations with persons with disabilities and their representative organizations concerning the development of accessibility policies and regulations.
- Provide accessible digital signage in public transportation in addition to accessible transportation such as buses equipped with lifts for persons using wheelchairs and accessible paths of travel.

2.1.8 e-Government services

In all government areas, e-service accessibility guidelines should be developed for providing:

- Public consultations with persons with disabilities and their representative organizations concerning the development of accessibility policies and regulations.
- Accessible e-government websites as per W3C-WAI standards and promotion of accessible private websites.
- Accessible phone services.
- Accessible electronic kiosks.
- Accessible electronic documents across all areas of government.
- Accessible digital signage.
- Provisions for reasonable accommodation for the workplace.
- Public procurement of accessible ICTs.
- Benchmarking, measuring and reporting progress on actions taken, as this is an essential tool for policymakers to assess the effectiveness of country policies and programs.

2.1.9 Local government

- Collaborate with local governments.
- Ensure secure commitment to accessibility from the executive office.

- Involve the local disability community in programme efforts.
- Identify and adopt comprehensive ICT accessibility standards.
- Integrate accessibility into IT governance, project management, and procurement processes.
- Train employees on adopted ICT accessibility standards.
- Utilize tools that facilitate adherence to accessibility standards.
- Test products using common assistive technologies.
- Audit and report on progress regularly to ensure compliance.
- Upgrade assistive technology tools and adapt accessibility standards regularly.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Developing policy): http://www.e-accessibilitytoolkit.org/toolkit/developing_policy

2.2 Setting standards

Accessibility for pervasive Information and Communication Technologies (ICT) requires coordination between many independent societal components including education, employment, economic factors, civil rights, and research and development. ICT international technical standards provide a common platform for technological development worldwide.

One of the important benefits of standards for persons with disabilities is to ensure a greater level of interoperability between systems, communication protocols and applications. In addition, from an ICT industry standpoint, the development of accessibility and assistive technology standards can greatly enhance market dynamics. Standards foster competition, enabling industry to deliver mass produced (and therefore cheaper) accessible and assistive solutions based on greater

economies of scale and competition. Standardization encourages organizations to address the needs of persons with disabilities and persons with limitations due to age; it triggers development of ICT products and services with built-in accessibility.

International Standards Development Organizations (SDOs) play an important role in promoting e-accessibility for ICT product and services. Policymakers can in most cases rely on their local standards organizations which belong to international SDOs for access to their e-accessibility programs and standards. Standards developed by organizations such as International Telecommunication Union (ITU-T), International Organization for Standardization (ISO), World Wide Web Consortium (W3C) and International Electrotechnical Commission (IEC) can influence changes on a global scale, as they are not bound by a specific jurisdiction, unlike regulatory instruments. This characteristic of international standards especially compliments the objective of the CRPD with regard to developing minimum standards and guidelines for accessibility, promoting Universal Design, and facilitating international cooperation (Articles 9(a), 4(f) and 32). Additionally, as international standard organizations work on a diverse range of topics, they can deploy highly specialized expertise in areas such as encoding of languages or specifications for media formats which may have direct or indirect impact on the accessibility of ICT. Improving accessibility awareness in the work of standard development would have far-reaching impact on technologies that are not easily affected by regulatory instruments.

2.2.1 ISO/IEC JTC1

ISO/IEC JTC1 is a joint technical committee created by the International Standardization Organization (ISO) and the International Electrotechnical Committee (IEC) to provide a single, comprehensive standardization committee to address

ICT standardization. JTC 1 standards are globally recognized and provide interoperability capabilities in order to promote sustained development and retention of investment.

In October 2004, JTC 1 established a Special Working Group on Accessibility and the first meeting was held in April 2005. Referred to as JTC1 SWG-A, the Special Working Group on Accessibility has a wide membership open to all standards development organizations, consortia, consumer organizations and user representatives.

Special working group on accessibility

Understanding the potential positive impact standards can make towards a more accessible digital society, ISO/IEC Joint Technical Committee 1 (JTC 1) approved the formation of a Special Working Group on Accessibility (SWG-A) at its Berlin meeting. The objectives of SWG-A are to:

- Determine an approach and implement the gathering of user requirements.
- Gather and publish an inventory of all known accessibility standards efforts.
- Identify areas / technologies where voluntary standards are not being addressed and suggest an appropriate body to consider the new work.
- Track public laws, policies/measures and guidelines to ensure the necessary standards are available.
- Encourage, through wide dissemination of the SWG materials, the use of globally relevant voluntary standards.
- Assist consortia / fora, if desired, in submitting their specifications to the formal standards process.

SWG-A has provided three significant deliverables:

- User Needs Summary – to facilitate Standard Development Organizations to consider barriers faced by persons with disabilities during standard planning and development.
- Standards Inventory – to itemize all known standards and public policies related to accessibility.

- Guidance on mapping user needs – provides guidance for Standard Development Organizations to map a standard against user needs.

2.2.2 International Telecommunication Union (ITU)

The International Telecommunication Union (ITU) works extensively in the fields of Radio Communications (ITU-R), Standardization (ITU-T) and Development (ITU-D) The activities of various ITU sectors, departments and divisions in the field of e-Accessibility are described below.

ITU-T has seen the work on accessibility increase over recent years. It should be noted that the ITU-T has been promoting accessibility with the concept of Total Communication and the principle of "Design for all" since 2000 – with its Recommendation ITU-T F.703. These two elements promoted the concept of Universal Design enshrined in the Convention, eight years before its adoption by the United Nations. Since then, many other standards – which are called "Recommendations" in ITU parlance – have been written for accessibility and for mainstreaming accessibility within telecommunication/ICT systems. In 2008, the World Standardization Telecommunication Assembly (WTSA 08) built on the momentum for mainstreaming accessibility and addressed for the first time in a Resolution the need for advancement on standards for accessibility and on the need to include persons with disabilities in the standards making process. WTSA-08 Resolution 70 will also assist ITU-T in the task of complying to the provisions of Article 9 of the United Nations Convention on the Rights of Persons with Disabilities.

Though the ITU-T Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF) was created before Resolution 70's approval, it was designated in the latter to officially assist in this task by helping to increase awareness on accessibility and human factors. It was given the mandate to assist ITU-T Study Groups on how to provide accessibility

for persons with disabilities in its standards. It also was mandated to communicate, coordinate and assist not only ITU-T but also the other two ITU Sectors, ITU-D and ITU-R. The JCA-AHF invites recognized outside groups and non members with experience in accessibility and human factors to share best practices by joining the JCA-AHF. Details on how to participate can be found easily on the ITU-T website under the link on accessibility http://www.itu.int/ITU-T/accessibility/index.html

The technical work on accessibility is covered within various technical committees (called study groups in ITU's parlance), in coordination with the JCA-AHF.

In ITU-T, the work on accessibility is being encouraged by the use of the Telecommunications Accessibility Checklist, which enables standards writers – who are manufacturers, network providers, operating agencies, regulators, along with Member States – to include accessibility and universal design principles during the early stages of the standards development process, instead of having to do – often expensive – retrofits into existing systems and services.

There are two specific Study Groups that have specific Accessibility and Human Factors responsibilities.

ITU-T Study Group 2 (*Operational aspects of service provision and telecommunications management*) is the parent study group of the JCA-AHF. Study Group 2 has a specific Human Factors group, namely Question 4/2, *Human factors related issues for improvement of the quality of life through international telecommunications*. Q4/2 covers more than just the needs of persons with disabilities: *usability for all* covers the needs of children, the elderly and persons who may or may not have a disability. For example, one of the most famous Recommendations produced by SG2 human factors is the one that puts a raised dot or indicator on the number 5 on keypads that allows blind persons to navigate the key pad of any telephone. More details can be found on its website at http://itu.int/ITU-T/go/sg2.

ITU-T Study Group 16 (*Multimedia coding, systems and applications*) is the lead study group on telecommunication/ICT accessibility for persons with disabilities. Question 26/16 is the group specifically designated to deal with Accessibility to Multimedia Systems and Services for persons with disabilities. Q26/16 is responsible for developing (or assisting in the development of) multimedia technical standards addressing accessibility needs of persons with disabilities. It also reviews accessibility features included in telecom standards developed in other Study groups. Examples cover interoperability for text telephone terminals, real-time text in fixed and mobile networks, and accessibility in Next Generation Networks (NGN) and Internet Protocol Television (IPTV). New work will address networked cars and home networking scenarios, and the development of standards for relay services for deaf and speech-impaired persons.

Question 26/16 is where the ITU-T Telecommunications Accessibility Checklist was created along with Recommendation ITU-T F.790, which gives guidance on understanding the topic of accessibility and the ways that accessibility may be incorporated in ICT products and services for older persons and persons with disabilities.

More details can be found at the ITU-T website at http://itu.int/ITU-T/go/sg16.

All of the documents mentioned above and listed below can be downloaded without charge from the ITU-T website.

Here are some examples of the standards developed by ITU–T that address accessibility and usability needs of persons with disabilities, older persons, and children.

The following ITU-T Recommendations on accessibility are a result of SG 2's work:

- **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".

The following ITU-T Recommendations on accessibility are a result of SG 16's work:

- 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

Most recently, some other ITU-T study groups' standards work on accessibility has been achieved:

- ITU-T Recommendation Y.1901 "Requirements for the support of IPTV services". The text produced by ITU-T Study Group 13 includes some key terms and definitions on accessibility, such as "Accessibility feature"[3], "Universal

3. "Accessibility feature: An additional content component that is intended to assist people hindered in their ability to perceive an

design"[4] and "Captions"[5]. Accessibility features are included in the main architecture for IPTV services and describe functionality expected from IPTV terminal devices. One example is the electronic programme guides where the associated metadata to be provided to users must include elements that facilitate access and usability by the widest possible range of users Albeit particularly relevant for the end user in terms of accessibility and persons with disabilities, these are not just accessibility features but mainstream features useful to all.

The Telecommunication Development Sector (ITU-D) plays a leading role in sharing best practices that its members – ICT Ministries, National Regulatory Authorities and ICT industry players – can take to ensure the goals of Article 9 of the CRPD are implemented at the national level.

One of the major activities ITU has undertaken is to team up with G3ict to develop the online e-Accessibility Policy

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aspect of the main content. Examples: captions for the hard of hearing, subtitles in various languages, sign-language interpretation video and descriptive audio" (para 3.2, page 8 of the text).

4. Universal design: It is the design of the products and environments to be useable by all people, to the greatest extent possible by including accessibility features in the original design to prevent the need for adaptation after deployment.
   Note: The intent of universal design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal design benefits people of all ages and abilities."
5. "Captions: Captions provide a real-time on-screen transcript of the dialogue as well as any sound effects. Note: This service can be provided by means of either textual or graphical supplementary content. The captions and the dialogue are usually in the same language. The service is primarily to assist users having difficulty hearing the sound. Ideally, users may have some control over the position and size of the presentation. Different speakers are distinguished, usually by different colours."

Toolkit for Persons with Disabilities and this print version of the Toolkit. ITU-D also organizes awareness-raising and capacity-building workshops for its members on accessible ICTs, assistive technologies, the CRPD and the resources available in the e-Accessibility toolkit. ITU members also explore these issues through ITU-D Study Group Question 20/1. More information on this work can be found at http://www.itu.int/ITU-D/sis/PwDs/index.html

In addition, ITU-D is implementing a variety of projects in developing countries, including establishing community ICT centres equipped with assistive technologies so that persons with disabilities can partake in ICT literacy training as well as ICT-enabled job training, and projects targeted at the development of text-to-speech in local languages. ITU-D is also identifying best practices in incorporating assistive ICTs to ensure the education of children with disabilities and to enable vocational and educational training to adult persons with disabilities. These best practices will be shared in the Connect a School, Connect a Community toolkit at http://www.connectaschool.org in the fourth quarter of 2010.

The ITU-D Study Group 1 covers "Access to telecommunication/ICT services by persons with disabilities and with special needs". Two emerging technology groups that have important considerations for accessibility are Focus group on IPTV and the Joint Coordination Activity on RFID. Other ITU activities related to accessibility include BDT/Special Initiatives and ITU-R Sector contribution to Bridging the Digital Disabilities Divide.

2.2.3 Other organizations involved in e-accessibility

International SDOs involved in e-accessibility include:

- Inter National Committee for Information Technology Standards (INCITS)
- International Standards organization (ISO)
- World Wide Web Consortium Web Accessibility Initiative (W3C-WAI)

- DAISY Consortium (leads the worldwide transition from analogue to Digital Talking Books)

European standards development organizations include:
- European Committee for Standardization (CEN)
- European Committee for Electrotechnical Standardization (CENELEC)
- European Telecommunications Standards Institute (ETSI)
- ICT Standards Board (ICTSB), an initiative from the three recognized European standards organizations to co-ordinate specification activities in the field of Information and Communications Technologies

U.S. SDOs involved in e-Accessibility include:
- American National Standards Institute (ANSI)
- Institute of Electrical and Electronics Engineers (IEEE)
- Telecommunications Industry Association (TIA)

Japanese organizations have also been involved in e-accessibility work since 1995, with the Japan Industrial Standards Committee (JISC) and the Japanese Standards Association Information Technology Research and Standardization Center taking the lead in defining accessibility standards in Japan.

In addition to SDOs, international civil society organizations like TDI (formally known as Telecommunications for the Deaf and Hard of Hearing, Inc.), International Center for Disability Resources on the Internet (ICDRI), Global Partnership for Disability and Development (GPDD), Royal National Institute of Blind People (RNIB) and others are also involved in e-accessibility work. Industry associations involved in ICT accessibility include World Broadcasting Unions (WBU), Usability Professionals' Association (UPA),

Information Technology Industry Council (ITI) and CTIA - The Wireless Association.

Useful links

- ITU-G3ict Toolkit - Additional information on standards development and links (http://www.e-accessibilitytoolkit.org/toolkit/policy_guides/cooperation)

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Standards and guidelines):

http://www.e-accessibilitytoolkit.org/toolkit/eaccessibility_basics/standards_and_guidelines

2.3 Public procurement

Public procurement generally concerns the purchase of goods and services from private sector contractors and vendors in a transparent and competitive bidding process. Governments have used public procurement policies to achieve socio-economic goals in at least six ways, including 1) stimulating national economic activity, 2) protecting against foreign competition, 3) improving competition in certain economic sectors, 4) driving innovation in a particular area of technology, 5) remedying regional disparities and 6) achieving specific social policy goals. This section discusses how public procurement can be used to advance equality and non-discrimination for persons with disabilities.

Government can be seen both as 1) a purchaser of information and communication technology (ICT) and 2) as a regulator in using the 'power of the purse' to advance equality. The CRPD's Universal Design mandate can impact ICT procurement and the development of technical standards for accessible design of ICT products and services. This section reviews the rationale for public procurement policies that incorporate ICT accessibility mandates and discusses critical issues in creating effective procurement policies while providing some case studies.

2.3.1 Rationale for public procurement policies incorporating ICT accessibility mandates

- **Accessibility and non-discrimination** – The rationale for public procurement policies that incorporate ICT accessibility mandates is grounded in the principles of accessibility and non-discrimination. From a public policy point of view, a paradigm shift is underway from viewing a person with a disability from the medical model perspective of diagnosis and inability to a focus on ability, integration and the problem of incompatibility between persons and the environment. Disability is viewed as the result of the interaction between a non-inclusive society and individuals.
- **Reconciling social and economic approaches to public procurement** – The extent to which governments should use their spending power in buying goods and services to bring about social change can be debated. Public procurement has historically been used as a tool to address important social policies in North America and Europe and even modern procurement practices have considered fair wages, unemployment and workers with disabilities. Although some believe that a robust and efficient marketplace determines consumer needs, others point to the gap in accessible ICT products and services and the barriers created by inaccessible ICT. The CRPD seeks to narrow this gap and remove barriers to citizen participation. This includes the promotion of ICT Universal Design and the Article 9 obligation to identify and remove ICT barriers, including barriers found in electronic and emergency services.
- **Leveraging the market power of public authorities as an incentive to create critical mass of accessible ICTs by competent producers** – There are at least nine alternative mechanisms that public authorities can use to promote critical mass as they leverage the power of the purse, namely:

- Specify the accessible ICT requirements for the product and/or service to be purchased;
- Specify the processes by which the contract must be delivered;
- Regulate who can tender for the contract;
- Influence the supply chain by including provisions on sub-contractors;
- Deny the ability to tender as a sanction for breach of social law;
- Include social and ethical issues as considerations to be taken into account at the award stage, such as providing more 'points' for accessibility features;
- Grant price preferences to selected tenderers;
- Enable selected tenderers to match lowest offers; and
- Impose conditions to regulate post-award delivery of the contract.

By requiring specific accessible ICT technical design standards of functionality, a procurement policy can create a marketplace incentive to design accessibly, and also enables the procurement authority to evaluate the accessibility features of the products and services being tendered.

- **Supporting technical innovations and service capabilities for accessible ICT product and service vendors** – In developing public procurement policies, attention should be paid to the support of technical innovations for accessibility that might not readily fall into current ICT specifications. ICT industry participation in the development of accessible design standards and procurement policies is necessary for a successful outcome. The same is true for consumers with disabilities since a key factor for success is stakeholder engagement and the mainstreaming of the disability perspective.

2.3.2 Core issues in creating effective public procurement policies

The main issues in creating effective public procurement policies are described briefly below:

- **Technical standards for accessibility in products and services** – One best practice is to mandate by law the procurement of accessible ICT and at the same time tie the procurement to concrete accessible ICT technical design standards of functionality for product conformance. The international standards community has become increasingly active in developing technical standards for accessible ICT. Organizations involved in this effort include the World Wide Web Consortium (W3C) Web Accessibility Initiative, European Telecommunications Standards Institute (ETSI), the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the Japanese Standards Association's Japanese Industrial Standards (JIS). ISO/IEC JTC1 Special Working Group on Accessibility (SWG-A) is also working on mapping global accessibility standards.
- **Training and guidelines for procurers and suppliers** – Procurers and suppliers can be required to show their support for accessibility in various ways:
  - *Accessibility statements* – Require procurers to provide accessibility requirements statements in their 'requests for proposals', with the accessible design requirements for ICT deliverables and preferably pointing to an international or industry standard
  - *Training on accessible ICT as prequalification for bid* – Require suppliers or vendors to satisfy accessibility training on ICT accessible design requirements in order to qualify or be eligible to bid on a procurement contract. The training requirement approach is best suited to contracts for custom services such as a website

or application to be developed specifically for the government customer.

- *Conformance claims* – A Supplier's Declaration of Conformance (SDoC) is a way for vendors to report on the level of conformance of an ICT product or service that is offered. Vendors can submit proposals for ICT products or services that may not meet 100% of the accessibility requirements as long as the vendor accurately states the level of accessibility support provided. One example of this practice is the Section 508 Voluntary Product Accessibility Template that was developed jointly by the ICT industry and the U.S. government.. Conformance claims are suitable where commercial off-the-shelf products are being procured.
- *Procurement evaluation of bid* – Some considerations in the decision-making process could include steps to verify the claims of the vendor about the product or service, the award criteria to be used in the event no products meet all of the accessibility standards and/or the use of accessibility declarations of conformance. The procurement evaluation approach is suitable where commercial off the shelf products that will be widely deployed in an organization are being procured.
- *Acceptance testing* – This is especially suitable for large scale procurements where many products may be integrated into a solution. Testing should validate the solution against the accessibility standards specified in the contract. Validation of the total solution's accessibility is crucial and end-users with disabilities should be included in these tests.
- *Accessible ICT Public Procurement Toolkit* –There are at least four countries that have implemented this approach: Denmark, Ireland, Canada and the United States. All four toolkits are web-based applications and have been evaluated by eInclusion@EU.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Public procurement):

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

2.4 Promoting assistive technologies

The term 'Assistive Technology' (AT) is closely related to 'enabling technology', that is technology that enables access to information, communication or the environment. In this section we will focus on those technologies that enable access to other forms of technology, whether they be computers, phones, digital TV, or home or office control systems. We will look at how assistive technologies enable and support Independent living, personal mobility, working and communication, and finally examine how assistive technology can be implemented whilst considering the importance of procurement.

2.4.1 Understanding needs

Before discussing assistive technologies in further detail, we need to understand the potential barriers that technology presents.

- **Seeing the screen** – Many persons experience problems with seeing the display used by various forms of technology ranging from small inconveniences to a total barrier.
- **Physical access to the technology** – Similarly, physical access to technology can present more or less severe challenges. Completely new forms of interface may be required from alternative pointing devices and keyboards to touch screen, voice recognition or alternative systems related to movements and gestures other than with our hands and arms, such as eyes, tongue or head.
- **Reading and communication** – For many, traditional forms

of text are in themselves a barrier. For some users it may be that careful selection of the shape and size of text will have an impact upon ease of reading and legibility, for others, blocks of text may be entirely impossible to read, and the ability to translate text into other formats such as audio or graphical symbols may be the only way to ensure that key messages and concepts are communicated and understood.

In addition, there are other needs that can impact upon the ability of a user to access all the features of technology and digital content. Other factors to take into account in this area include attention disorders, memory deficit, and difficulty in generalizing information.

2.4.2 Solutions to meet needs

Vision

Almost all technologies offer a degree of ability to customize the presentation of visual information according to personal preferences, usually either by making information larger on screen (magnification) or by replacing visual output with audio or tactile forms (screen-reading or Braille). Solutions may also be offered within the OS and there are a number of free and open source technologies which could enhance the operating system. Examples of these include NVDA for Windows and Orca for Linux.

Commercial solutions can offer a specific solution such as magnification or screen reading, but increasingly they combine these features to allow users to mix and match features to meet their personal needs, e.g. Jaws, Supernova.

Physical

Meeting the physical needs of users will often require a combination of hardware, in the form of alternatives to the standard keyboard or mouse, and software to adjust the way

the keyboard / mouse or alternative device responds to an action. Solutions within the operating system may also be provided, with further customizations to the platform being available through a range of free and open source solutions, e.g. Dasher, FXC Software, Click N Type.

There are a wide range of commercial and third party solutions designed to assist with ease of access. Persons with physical impairments may need to utilize a range of solutions. Some of these include touchscreens, switching, voice recognition, on-screen keyboards.

Reading and communication

There are a number of stand-alone devices that are available to assist persons with difficulties in reading and writing. These would include Voice Output Communication Aids (VOCA) suitable for persons with little and no speech and reading aids such as e-book readers, or spelling aids for persons with reading difficulties such as dyslexia. Tools to amend the style of text include RapidSet, Washer and ssOverlay. Solutions that add extra computer tools to support reading include VuBar, ReadPlease, Natural Reader and BookReader. There are, in addition, a number of commercial and proprietary tools that enhance the computer with specialized features. These include both hardware and software tools such as:

- Hardware: BookCourier, Daisy Readers, Kurzweil Reading machines, Ebook readers;
- Software: TextHelp Read and write ClaroSoftware Dragon Naturally speaking.

2.4.3 How AT supports independent living

The various ways in which AT supports independent living are outlined below:

- **Telecare** – Increasingly, social care is seeking to ensure that persons with disabilities and older persons are able to live independently within their own communities.

Telecare is made up of a number of features; some are passive systems that monitor the health and well being of individuals without their active involvement, and others are more highly interactive and require the introduction of assistive technologies to allow individuals to be an active partner in their own care packages.

- **Passive monitoring** – Tele-health monitoring is the collection and review of patient data for the purpose of health supervision and management. Monitoring of health status, activities and symptoms takes place through an interactive monitor placed in the patient's home and remotely connected to a computer in the agency office, reducing unnecessary visits to the physician, emergency care and hospital readmissions, all of which allow better health, greater patient satisfaction and improved quality of life.
- **Active care** – Interactive tele-medicine services provide real-time interactions between patient and provider, to include phone conversations, online communication and home visits. Many activities such as history review, physical examination, psychiatric evaluations and ophthalmology assessments can be conducted comparably to those done in traditional face-to-face visits. In addition, 'clinician-interactive' tele-medicine services may be less costly than in-person clinical visits.
- **Environmental control** – Alongside solutions that meet health and social needs, effective independent living may be dependent upon the ability of the individual to have control over their immediate environment. Such systems can be utilized to open doors, switch on televisions, open and close curtains, and in fact give total control over the local area. Solutions in users' homes, or even in the workplace, can be installed to ensure that maximum independence is achieved without the need for ongoing personal support from a carer.

- **Internet usage** – For many persons with disabilities, the ability to engage with all of the above will be dependent upon their ability to interact fully through the internet. The full range of applications and activities that persons with disabilities have identified as being of personal benefit are: e-commerce, messaging, voice and video over IP, virtual reality, collaboration and communication, community activity and online gaming.
- **Leisure and entertainment** – Assistive Technologies open up new opportunities for leisure and entertainment for persons with disabilities, and hence contribute significantly to quality of life. The following are examples:
  - **Broadcast Media** – BBC iPlayer provides access to a full range of BBC broadcasts through an Internet connection, allowing users who use assistive technologies to control their viewing through the use of alternative keyboards or pointing devices. Slingbox is a system for transmitting and viewing your digital TV or your home player remotely, from anywhere in the world.
  - **Gaming** – There are accessible controllers for computers and game consoles, ranging from modified controllers for the Xbox 360 or PS3 to switch accessible guitars for Guitar Hero.
  - **Arts and culture** – There are many online art galleries and museums that can be browsed online. Examples include the Tate Collection in London, Louvre online from Paris and the New York Metropolitan Museum of Art.
  - **Music** – Many music collections can be listened to online, including a huge collection through tools such as iTunes or Napster and Internet radio. Specialist technology can help make mp3 players accessible, or can offer opportunities to perform and compose using an instrument such as the Soundbeam.

2.4.4 How AT supports personal mobility

Technology is enabling a much wider variety of users to maximize their personal safety. Examples of such technologies include GPS systems such as those on mobile phones, and local use of RFID tags to communicate location-based information to users on a single street or corner. Systems such as Wayfinder allow blind users to follow routes while out walking in towns by directing them to a destination by voice prompts. Persons with disabilities have shown high demand for access to features of a modern mobile phone. Software such as 'talks', coupled with Symbian phones, are giving users access to talking menus, texts and even mobile web browsing. RFID tags are being used to communicate information locally to and from persons with disabilities to offer very local access. RFID tags are being used to identify locations by being embedded in the pavement and a user with a receiver is given constant information about location that can be communicated to a location device.

New technologies place an augmented reality system onto low cost devices such as mobile phones. The technology locates the user in space, and then by use of an internal compass knows the direction faced, which can then overlay the image from a camera with data. Early examples include location information, such as where to find the nearest underground train station.

2.4.5 How AT supports working

How AT supports the ability to work can best be illustrated through a case study from http://www.abilitynet.org.uk/. Barbara Howard, Director of Leicester-based charity, Mosaic, was left with photosensitive epilepsy after a minor stroke. Working in a digital world of Flash and Flickr, adverts, logos and icons, Barbara found using a PC was virtually impossible. This was a huge obstacle. Following an assessment on the phone, Barbara was convinced that a remote assessment at

home would help. The assessment recommended many changes to how she used her computer, like changing the screen colour, removing all images (no photos, no flash photography and no flashing cursor), making her computer much faster and enabling her to carry out her work activities, like sending e-mail, tendering for funding bids etc.

2.4.6 Remote and home working

New technologies are enabling users to take part in employment whilst remaining at home. For example, Susan is a technological advisor for persons with disabilities. She finds it difficult to leave her home, but through the use of voice over IP, screen sharing and collaboration tools, she is able to work effectively and efficiently from her own home. Her ability to work as part of a team is enhanced through a web-based CRM system that allows her to enter live data and share that with other members of her team.

2.4.7 How AT supports communication

Communication has been properly defined in the Convention on the Rights of Persons with Disabilities as a basic human right. For many persons technology (notably assistive technology) is critical in implementing this human right.

Communication takes a variety of forms, but most notably we have challenges posed by barriers to text and to speech. Persons with conditions like dyslexia can make use of tools like voice recognition software or software like Proloquo2go installed on a device like the Apple iTouch, which enables users to create sentences by touching sequences of symbols available on the screen. For many users with intellectual or cognitive disabilities, classic e-mail clients such as Outlook are simply too complex. To counter this, e-mail software from RJ Cooper has been designed for persons with cognitive challenges, visual impairments and physical disabilities. For

the user, it operates in a sequential manner with prompts such as 'Who would you like to send this to?' or 'If you'd like to speak your message, you can do that here'. Reading requirements are small as the software has voice output to support use. The e-mail 'partner' (the recipient or sender) sends and receives mail without any special software at all.

2.4.8 Implementing assistive technologies

The different aspects that need to be considered while implementing AT are outlined below.

Procurement

Key issues to consider in procuring assistive technologies can broadly be divided into two considerations:

- Is the assistive technology appropriate to the needs of the user(s)?
- Does the platform / infrastructure provided support assistive technologies?

An effective procurement model can be based upon some simple questions:

- Does the proposal meet recognized standards?
- Does it pass your testing?
- Will the vendor commit to compliance?
- Is there an acceptable interim position?

Assessment models

Traditionally, assessment has been conducted either through an intervention by an individual through a personal visit and assessment of needs, or by an intervention from a multidisciplinary team including AT professional, speech therapist, physiotherapist, ergonomist etc. Increasingly, however, a more structured escalating model has evolved which utilizes collaboration technologies to lead to an agreed solution. This has included telephone review, online self-assessment and remote assessment using a loan bank of

technologies and communication tools, including voice and video over IP.

Training solutions

Similarly, it is possible to explore an escalating model of training for assistive technology users. There have been a number of low cost solutions for this need including the work of organizations such as UcandoIT in the United Kingdom, Digital Unite, Telecentres.org and Telecentres-Europe. Forms of training delivery that have been developed to address needs include:

- **Online learning – For example,** the U.K. NGO AbilityNet has established a portal to a range of training resources that are available on demand at http://www.abilitynet training.org.
- **Webinars – For example,** the Australian AT company, Spectronics, has been regularly running webinars introducing and training persons on specific assistive technologies over the past two years. A number of the webinars have been recorded and can be viewed on demand at http://www.spectronicsinoz.com/online training.

Joint working across sectors

Public, private and voluntary sectors need to work together, offering niche expertise and experience to produce a seamless service to users with individual needs. For example, the U.K. government department Defra worked with IBM and Microsoft as well as the NGO AbilityNet to ensure that it fully complied with best practices for disabled team members when renewing corporate technology. The NGO reviewed the combined hardware and Vista platform to confirm that it provided a sound basis for reasonable adjustments for disabled employees and it reviewed the list of assistive technologies that Defra had to provide a benchmark of solutions that could

be recommended and supported across the department in the future.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Promoting assistive technologies): http://www.e-accessibilitytoolkit.org/toolkit/promoting assistive_technologies

2.5 Promoting accessible product development & Universal Design

This section describes how policy and legislation that promotes and incentivizes the Universal Design (UD) of products can help to fulfil a country's accessibility obligations within the CRPD. In the context of this convention, accessibility refers to the extent to which persons in a society can live independently and participate fully in all aspects of life. Developing legislation for products that successfully improves accessibility first requires a holistic understanding of the interaction between accessibility, business economics, technical standards, and user uptake. An accessible product has the following characteristics:

- **Utility** is the extent to which the product provides functionality that meets real user needs, such as those associated with independent living and participation in society.
- **Usability** is the extent to which the product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction, in a specified context of use.
- **Accessibility** is the extent to which the product is usable by persons with the widest range of capabilities.
- **Desirability** is the extent to which ownership and use of the product leads to pleasure and satisfaction.
- **Affordability** is the extent to which the perceived value of

the product is greater than its perceived cost to the users, given their available income.

- **Viability** is the extent to which the sale and maintenance of the product achieves success for the corresponding company.
- **Compatibility** is the extent to which the product works together with other devices, and conforms to current technical standards, guidelines and laws.

Careful consideration should be taken regarding the impact of any legislation on the existing balance between these characteristics. For example, mandatory legislation that compromises the price of a product will reduce its production volume, which reduces its viability for the business and therefore limits the potential real-world uptake.

Universal Design

In Article 2 of the CRPD, Universal Design is defined as: 'the design of products, environments, programs and services to be usable by all persons, to the greatest extent possible, without the need for adaptation or specialized design. Universal Design shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.'

Within Article 4(f), States Parties are obliged to promote the research and development of universally designed goods, services, equipment and facilities. Universal Design has been included in policy and legislation in many countries such as Ireland, Norway, Spain and Japan and has been adopted by the Council of Europe in its Disability Action Plan.

More closely associated with product development, the Trace Research and Development Centre provides a particularly useful description for the Universal Design of products, which includes two major components:

- Designing products so that they are flexible enough to be

directly used (without requiring any assistive technologies or modifications) by persons with the widest range of abilities and circumstances as is commercially practical given current materials, technologies, and knowledge.
- Designing products so that they are compatible with the assistive technologies that might be used by those who cannot efficiently access and use the products directly.

Universal Design process

Successful Universal Design requires getting it right at the concept stage, because changes made later in the development process may be prohibitively difficult and expensive. The specific focus for Universal Design is on understanding the true diversity of user needs, and applying this knowledge to better inform design decisions taken throughout the development process. The development process is briefly described below.

- **Explore: what are the needs?** Exploratory activities aim to discover the requirements for a product that will meet the targets of utility, usability, accessibility, desirability, affordability, viability and compatibility. The needs of the stakeholders, activities related to the use of the product and relevant issues associated with different usage environments are captured at this stage. The requirements associated with developing a solution that is feasible to manufacture and deliver form part of the business needs.
- **Create: how can needs be met?** Creative activities generate conceptual solutions that satisfy the needs of users and of the business. Creativity can be stimulated by setting up a culture where ideas can flow freely. Having generated large numbers of ideas, these can be grouped, combined, and worked up into a smaller number of concepts. Physical or virtual prototypes of these concepts can investigate their feasibility, while also enabling further evaluation and refinement.

- **Evaluate: how well are needs being met?** Evaluative activities provide evidence on how well the concepts meet the needs of the users and the business, and help to plan the next steps. The criteria for evaluating concepts should reflect a summarized version of the needs list, or requirements specification. These criteria will likely include cost, performance, feasibility etc. Typical evaluation activities include expert appraisal, role-playing, simulation and user involvement. The next steps might be to plan more exploration, more creativity, more evaluation, or move to detailed design.
- **Where does it all go wrong?** Common pitfalls for Universal Design are:
  - User needs not sufficiently explored, understood, or communicated.
  - Fixation with existing solutions inhibits creativity.
  - Evaluation occurs after all the important decisions have been made.
  - Communication difficulties that occur due to the diverse range of backgrounds amongst members of the design team.

2.5.1 Considerations for specifying, incentivizing and implementing Universal Design

Many governments attempt to improve levels of accessibility for persons with disabilities by regulating and/or incentivizing aspects of the design process, or aspects of the end product. The so-called 'carrot' or 'stick' approaches are briefly examined below.

- **Regulation –** Government obligations to establish and enforce accessibility requirements can be found in building and e-accessibility regulations, anti-discriminations laws and public procurement policies. The 'stick' approach has in many instances effectively worked to enforce compliance with minimum accessibility requirements.

There are certain drawbacks, however, such as fostering a culture of minimum compliance. E.g., it is difficult to decide a lawsuit based on whether the corresponding user experience is sufficiently desirable. Also, it is quite difficult to regulate commercial products where the natural and appropriate strategy is to target individual products towards specific market segments, inevitably excluding others. Many initiatives now try to promote the Seven Principles of Universal Design as a holistic approach to extend beyond accessibility compliance. In 2009 the Council of Europe published Achieving Full Participation Through Universal Design as a guide for Member States to promote participation in society for all individuals.

- **Incentivization –** An alternative 'carrot' approach promotes the business case and market potential for designing products than are accessible and usable to a wider range of persons, based on global trends associated with ageing and disability, and changing cultural perspectives. Many companies (like British Telecom) that have prioritized Universal Design in their work are reporting improved customer satisfaction, lower support costs and improved profitability. In addition to promoting the benefits of Universal Design, government bodies can further incentivize the design of more accessible products through their own procurement strategies. Yet another strategy for increasing the uptake of Universal Design promotes incentive strategies within commercial organizations that reward Universal Design principles, in contrast to the popular approach of measuring employee's performance solely according to project costs prior to launch.

2.5.2 Activities of standards bodies relevant to Universal Design

Considering a wider remit of ensuring safety, compatibility of systems, standard interfaces and consumer protection,

representatives from industry, and national and international standards bodies, have worked to establish accessibility and usability requirements for products and services. Furthermore, standards organizations have developed and promoted guidelines for including and representing the needs of older persons and persons with disabilities in standards development (e.g. ISO/IEC Guide 71). From a universal or accessible design basis these guides layout an ergonomic method for aligning human data, abilities and limitations with the associated design factors, thereby addressing the negative consequences experienced from design exclusion

2.5.3 Higher education engineering curricula

Universal Design should be included in the ICT engineering curricula because without awareness of the issues, and the corresponding education in methods and techniques of Universal Design, future engineers will unknowingly incorporate impediments in existing and coming technologies. Furthermore, it must be borne in mind that existing engineers also have a demand for Universal Design training, thus they can cope with the needs of those users in their professional environments.

Curriculum design is also becoming a key issue because of the harmonization efforts occurring in some parts of the world, like the Bologna agreement in the European Union. The IDCnet project[6] classified the necessary knowledge and skill sets necessary to design Universal Design curricula, after thorough research on existing initiatives and interaction with interested parties like higher education institutions and the industry. The key sets identified were:

1. Universal Design awareness
2. Why Universal Design? Ethical, legal and commercial considerations;

6. Inclusive Design Curriculum Network: http://idcnet.info/

3. Interpersonal skills for teamwork;
4. Accessible content: knowledge about documents and multimedia;
5. Accessible interaction: input and output;
6. New paradigms of interaction;
7. User-centered design;
8. Application domains and research.

As mentioned earlier, there is not only a need to train future professionals, but to provide training to active engineers in different aspects of Universal Design. The training must be tailored to different types of users typically found in the industry, and with different levels of granularity. The taxonomy of topics listed for higher education institutions is being adapted to the industry needs under the scope of the DfA@eInclusion project[7] and will be standardized in a CEN Workshop Agreement.[8]

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Product development and design): http://www.e-accessibilitytoolkit.org/toolkit/product_development and_design

2.6 International cooperation

International cooperation is an important component of national e-Accessibility policies and programs. Technology products and services are developed and marketed on a global basis and a number of international institutions, industry associations, and Standard Development Organizations are involved in the process of defining accessibility standards,

7. http://www.dfaei.org/
8. CEN Workshop on 'Curriculum for training professionals in Universal Design' (WS/UD-PROF): http://www.cen.eu/CEN/sectors/sectors/isss/workshops/Pages/ws-ud-prof-curriculum.aspx

promoting research and development and technical exchanges for accessible and assistive technologies.

This section will first outline the CRPD dispensations on international cooperation and then describe various ongoing international cooperation activities, specifically with reference to the European Union, other regional cooperations and the United States.

2.6.1 Convention dispositions

Two references in the text of the Convention on the Rights of Persons with Disabilities address international cooperation and standardization. The Convention in its preamble recognizes 'the importance of international cooperation for improving the living conditions of persons with disabilities in every country, particularly in developing countries...' It also establishes the grounds, in its Article 32 on International Cooperation, for proactive exchanges 'facilitating cooperation in research and access to scientific and technical knowledge.'

The second reference, in Article 9 on Accessibility, specifies that 'States Parties shall also take appropriate measures to develop, promulgate and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public' Article 9.2 (a).

Given the global nature of ICT markets and the international scope of most ICT vendors' activities, promoting international standards are an essential success factor for States Parties implementing ICT accessibility and assistive technology programs and policies. Standard setting has already been discussed earlier in this chapter; international cooperation is described below.

2.6.2 European Union

Given the strong convergence of objectives between the

overall EU Disability Strategy and the Convention, the Commission considers that issues relating to the implementation of the Convention at EU level should be tackled in the framework of the rolling EU Action Plan on mainstreaming disability. All the EU Member States and the community have signed the Convention and 17 Member States signed the Optional Protocol. Austria, Hungary, Spain, Germany, Sweden, and Slovenia have already ratified both the Convention and the Optional Protocol. The process of concluding the Convention by the European Union is underway.

The European Union has specific e-Accessibility programs and policies in matters of information society and e-inclusion, employment and public procurement. Especially in the case of the latter, the EU issues Mandate 376 to European Standards Organizations to provide the foundation for a European Public Procurement policy and practice for accessible Information and Communication Technologies.

2.6.3 Other regional co-operations

Some regional cooperation details are described briefly in this section.

- **National Information Society Agency (NIA)** – Its role is to continue in advancing and activating world-class knowledge, information and infrastructure to a higher level, bridging any digital divide and preventing adverse effects which may occur during the process, while improving information culture.
- **United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)** is the regional development arm of the United Nations for the Asia-Pacific region. UN ESCAP established in 2002 the **Biwako Framework** on 'Promoting an inclusive, barrier-free and rights-based society for persons with disabilities in the Asian and Pacific region in the twenty-first century' which includes specific guidelines for ICT accessibility (Article 6). It also extended

the Asian and Pacific Decade of Disabled Persons, 1993-2002, for another decade, 2003-2012.

- **Dynamic Coalition on Accessibility and Disability (DCAD)** was established by the International Telecommunication Union's Telecommunication Standardization Sector (ITU-T) to facilitate interaction between relevant bodies and ensure that Information and Communications Technologies (ICT) accessibility and tools to facilitate it are included in the key debates around Internet governance.
- **G3ict, Global Initiative for Inclusive Information and Communication Technologies** is a flagship advocacy initiative of UNGAID, the United Nations Global Alliance for ICT and Development and is a non-profit organization exclusively dedicated to facilitating the implementation around the world of the Digital Accessibility provisions of the Convention on the Rights of Persons with Disabilities. It is supported by industry, Disabled Persons Organizations, academia, international standards development organizations and public sector entities in charge of promoting e-Accessibility in their respective regions or countries.
- **POETA – Partnership in Opportunities for Employment through Technology in the Americas** – Operating across Argentina, Colombia, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Peru and Venezuela, POETA is a joint venture between Microsoft and the Organization of American States (OAS), providing technological job retraining and job placement assistance to youth and adults with disabilities.

2.6.4 U.S. TEITAC

The U.S. Access Board is responsible for overseeing the implementation of U.S. legislation on accessibility. The Board has an advisory committee, Telecommunications and Electronic and Information Technology Advisory Committee

(TEITAC) which reviews its standards and guidelines and recommends changes. The committee's membership includes representatives from industry, disability groups, standard-setting bodies in the United States and abroad, and government agencies, among others. In the spirit of international cooperation, the Access Board also includes representatives from the European Commission, Japan, Canada, and Australia. Participation of representatives from International organizations in TEITAC deliberations contributed to fostering a dialogue on e-Accessibility standards for public procurement as well as a global approach to policy making and public procurement as it relates to e-Accessibility standards.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (International cooperation): http://www.e-accessibilitytoolkit.org/toolkit/international_cooperation

Solutions that Work

Chapter 3

Solutions that Work

This chapter will explore existing barriers to e-accessibility, along with a survey of present strategies and solutions employed in each respective technological area. Accessibility solutions covered will include all relevant sectoral and governmental technical standards and guidelines, as well as legal regulations. Technology areas covered include wireless phones, radios, televisions, remote consoles, websites, personal computers, software, electronic kiosks, broadband services, and published works.

3.1 Wireless phones

With over four billion subscribers worldwide, wireless phones have become the most ubiquitous ICT platform around the world with substantial penetration in both developed and emerging markets. This rapid development of wireless telephony (and wireless-enabled computing) has provided persons with disabilities with a substantial improvement in their functional capacity; no longer do blind and visually impaired persons need to locate a public telephone kiosk while wheelchair users no longer need to struggle with inaccessible kiosks. Deaf persons have embraced text messaging all over the world, opening an entirely new way to communicate with others. Elderly and persons with disabilities

can access simple emergency call procedures. Wireless (cell or mobile) phones are portable, personalised and always on for work, leisure and emergencies.

While critical accessibility issues affected the early generations of handsets, three factors have driven substantial progress in handset accessibility:

- The increasing availability of enhanced processing power for handsets along with innovative software has improved the user interface with features such as voice recognition or text to speech.
- Pressure from user groups and regulators to solve issues like hearing aid compatibility and visually inaccessible handsets.
- Wireless operators in saturated markets have realized that persons with disabilities and elderly persons represent a large untapped market.

Accessible hardware and software is available today which can address the needs of users with various types of impairments: visual, cognitive, hearing, speech and physical. Some examples are given below:

- Adjustable display settings such as font size or colour contrast for visually impaired persons.
- Pictorial address books (containing an image of the person beside their name and phone number) for persons with cognitive disabilities to use cell phones.
- A range of services including SMS text messages and sign language via video calls (on 3G networks) for deaf persons.

As technology continues to evolve, mobile phones and high end Personal Digital Assistants (PDAs) become a prime platform for assistive technology by providing additional functionalities not traditionally available on phones, such as easy to use emergency keys, integrated GPS for geo-positioning, text scanning capabilities with optical character

recognition to read documents aloud with text to speech software, or a mini Daisy reader to read downloaded books aloud. For specific conditions such as hard of hearing users, bone conduction to transmit sounds to the inner ear is available. Furthermore, by using 3G connectivity, along with Wi-Fi and Bluetooth technologies, smart phones will likely become platforms of choice to enhance proximity and mobility services for persons with disabilities.

Customers with disabilities, however, require dedicated customer support services with trained personnel to take full advantage of those new features. Currently this is available only in parts of Europe and Japan. Also, only a few operators like NTT DoCoMo, Orange or AT&T Wireless have accessible services such as Braille invoices or dedicated remote phone support.

3.2 Radios

The equipment a person uses to listen to radio depends on the transmission medium. For terrestrial radio broadcasts, it may be an integrated radio set or a separate radio tuner attached to an audio system with a remote control. For radio accessed through cable, satellite or terrestrial television, the equipment consists of a television and sometimes a separate receiver in the form of a 'set-top box'. For Internet or mobile radio, it is a PC or handheld device running a software application or accessing a website.

Whatever the type of radio, the listener has to use a mix of hardware (displays, buttons, dials, cables, etc.) and software (menus, schedule guides, pause/rewind/record functions, etc.). This equipment can sometimes be very difficult to use for persons with visual or physical disabilities and may need adjustments to make it accessible. Some examples follow.

- Persons with visual impairments may require equipment with clearly labelled buttons that can be distinguished by touch, adjustable display settings to increase the size,

brightness or contrast of displayed text or have it spoken out in a synthetic voice.

- Persons who have poor grip or dexterity may need larger well-spaced controls that are easy to locate and operate with minimal strength and movement, such as a remote control that can be laid on a flat surface and operated using one hand.
- Persons with cognitive impairments need equipment that is easy to unpack and set up and easy to learn and use.
- For Internet or mobile radio, persons with disabilities will need the applications or websites to be compatible with the assistive hardware and software they use to operate their PC or mobile device.

According to the consumer test conducted by the UK Research Institute for Consumer Affairs (RICA), the radio model 'Roberts RD-8BW Duet' has been recognized as easy to use by blind and partially sighted persons, and also those with limited dexterity or strength. It is considered to have good reception, is easy to tune as it has a distinctive rotary dial, five large illuminated presser buttons, a large display and allows users to tune in automatically to stations as they are scrolled through.

3.3 Television

There are two aspects of television where accessibility considerations arise for viewers with disabilities – the equipment and the programme content. First, the equipment a person uses to watch television depends on the transmission medium. For cable, satellite or terrestrial television, the equipment consists of a television, sometimes a separate receiver in the form of a 'set-top box', and a remote control. For Internet or mobile television, the equipment is a PC or handheld device running a software application or accessing a website.

Whatever the type of television, the viewer has to use a mix of hardware (screens, buttons, cables, etc.) and software (menus, programme guides, pause/rewind/record functions, etc.). This equipment can sometimes be very difficult to use for persons with sensory and physical disabilities and the difficulties / solutions faced by persons with visual or physical disabilities are similar to those outlined in the earlier section on radio. In addition, persons with sensory impairments will need equipment and software that is able to access and pass on captions, subtitles, audio description and sign language tracks whenever they are included with television programs.

Secondly, accessible equipment is still of no use if you can't perceive the programme content due to vision or hearing loss. Television programs can be made accessible in the following ways:

- Captions (or subtitles) provide a written text transcript of the dialogue and other important sounds contained in the program and are specifically designed for viewers who are deaf and hard of hearing (unlike subtitles which are more general). Captions are carefully placed to identify speakers, on- and off-screen sound effects, music, and laughter.
- Audio description (or video description) provides a spoken narration during pauses in the dialogue, describing important visual content such as moving objects, actions and facial expressions.
- Sign language is less common, but also vital for members of the Deaf community, for whom sign language may be their first language.

3.4 Remote consoles

Anything from a television to a ticket machine to a flashlight has what is called a user interface. As the name implies the "user interface" is the interface between the user and the device functionality. A user interface is bi-directional passing commands and input data to the device functionality and

providing feedback and output back to the user. A user interface may include button, levers, latches, knobs, gesture recognizers, biometric sensors, handwriting or drawing capture technologies, speech recognition, visual displays and indicators, auditory output, tactile displays, to provide just some of the components that may make up an user interface. Different products use different user interface elements and the design of the elements can vary quite substantially, so a person may find one device easy to use but another one difficult or even impossible.

Accessibility issues

Different persons will require the use of different interfaces approaches or techniques. Persons who cannot see may need auditory outputs; persons who cannot hear may need visual and/or tactile outputs; and persons with limited dexterity may need larger, wider spaced controls than others. Sometimes, these needs are mutually exclusive. For example, some users need a feature-rich interface to deal with complexity while others need something simple. In order to meet the needs of all users, a user interface will therefore have to allow multiple interaction methods.. A certain amount of this can be build-in as interface options. However there is a limit at some point and users need to turn to alternate input devices.

Solutions

One approach is to separate the user interface from the product function. It could then be possible to provide a "user interface socket" to the product functionality that would allow a user to attach a different interface – one that was tuned to their abilities. An alternate interface that provide a full alternate interface called a *remote console*. By defining a standard communication protocol, it is possible to create Universal Remote Consoles (URCs) that can be used to interact

with many different products. Individual users can then choose URCs that meet their own unique interaction needs and operate many products using whichever input and output mechanisms are most suited. A deaf person can use a console that displays text on a visual display, whereas a blind person can use one that outputs the same text as speech.

A URC can come in many forms. It could be a purpose built device built to function only as an alternate interface to a single product or system. Or it could be a general purpose URC that is built into a wheelchair or mobile phone and can control a wide variety of devices.

If all mainstream products supported URCs, then users with special needs could carry a personal interface device with them, perhaps built into their phone or assistive technology, and use it to operate any product they encounter. The technology underlying URCs is based on the concept of user interface sockets and pluggable user interfaces that allow an alternate interface to be used instead of the default one on a product. Researchers have proposed a number of different approaches to achieving this. Currently the most widely supported one is the Universal Control Hub (UCH) middleware architecture, which is based on ISO/IEC 24752:2008. A UCH reference implementation is available as open-source software at http://myurc.org/tools/UCH.

3.5 Landline phones

Landline telephony - which refers to phones which are meant for stationary use - provides users with several functionalities, namely the ability to:

- Conduct real-time conversations at a distance with other persons around the world.
- Carry out limited data collection, data retrieval and remote control
- Reach important and essential services, such as emergency services.

- Conduct multi-party conferences by connecting a number of landline phones and other phones.

To make landline phones accessible requires that the range of services provided through landline phones also provide equivalent functionality for persons with disabilities. In order to have a telephone conversation, a person with one or more disabilities may need to have a suitable terminal, like a voice handset or textphone, videophone or a total conversation terminal, combining the opportunity to use all three media in the same terminal. In addition, a person with disabilities should also be able to use the controls of the terminal. For persons with motor disabilities, this may require the use of assistive technology to either control the phone, or in some cases to both control and talk on the phone. The audio level must also be loud enough for persons with mild to moderate hearing loss to hear. It must also be provided in specific ways so that it can be coupled with hearing aids including cochlear implants. Video must be of a quality suitable for the use of sign language, lip reading, and other visual communication. Text must be readable and it must also be possible to produce.

Accessibility features that are most desired by persons with disabilities include:

- Large print capability
- Clear audio
- Text messaging
- Connection to hearing aids
- Audio amplification
- Pip on figure 5
- Large figure keys with good contrast
- Good quality video, suitable for sign language, lip reading and person recognition
- Interoperable between IP and 3G networks
- Real time text together with voice
- Total conversation ability (voice, text, video)

- Flashing light on incoming call
- Vibration on incoming call
- Text relay service
- Video relay for sign language
- Captioned telephony relay service
- Automatic voice to text (and sign) conversion (as soon as possible)
- Own phone number in the national number plan leading through a relay service
- SMS on fixed phones

Many initiatives have been taken to make experiences via telephones more accessible. For example, the text direct system by BT in the U.K. provides a connection via direct dialing to the end destination number and still provides both inclusion of relay services when needed in the call and call progress information (normally tones and spoken messages which are inaccessible to persons with hearing disabilities) in text mode.

Furthermore, the requirement to have a tactile indicator on the figure 5 on telephones to support keypad navigation has become very widespread, and makes it possible to dial numbers without seeing the keypad. However, the positioning of keys other than number keys are not standardized on telephones, so this feature is not sufficient for switching from one telephone to another (for persons with low vision).

Relay services

Relay services are usually human operated services for media and mode translation (voice, text, video) during phone conversations and are normally provided as community supported services. The provision of relay services which are well integrated in the phone system is an important backbone capability for accessible phone services. Existing types of relay services include:

- **V**ideo relay services, translating between sign language in video and speech in a voice phone.
- Text relay services, translating between real-time text in the text part of a phone and speech in a voice phone, usually for persons with speech impairments, hearing impairments, deafness or deaf-blindness.
- Speech-to-speech relay services, supporting speech calls for persons with speech impairments or cognitive disabilities.
- Captioned speech relay services (Captioned Telephony), which add real-time text captions to a voice call, for persons with hearing impairments or deafness.

In all these cases, the other media (voice, video, text) may be handled as well in the call, ideally connected in two or three-party call mode between the parties in the call (who have terminals that can handle the media). Integration of relay services in the phone system implies that a user with disabilities should be able to invoke a chosen relay service when either making or receiving calls, if required. Calls in-between two users who can and want to use the same modes and media in the call should be possible without invoking any relay service.

Relay services should work with all commonly used handsets and terminals as users need to be able to use the same terminal for calls directly in the modes they handle, as is used for calls through relay services and with emergency services.

Emergency phone and relay services

Emergency phone and relay services are also important components of an accessible telephony experience. Article 9 (b) of the Convention on the Rights of Persons with Disabilities requires that persons with disabilities are able to communicate with emergency services. This, therefore,

stipulates that individuals must have the opportunity to access emergency services through a common regional emergency number, to be able to use the same conversational terminal for the emergency call that they use for everyday call, receive calls back from the emergency services in the same media and modes, and have relay services included in the call if the user wants or needs to have such services in the emergency call.

In order to provide the best opportunity to survive an emergency, a person with a disability must be able to communicate in the modes and media that are effective for them. Relay services play an important role in facilitating such conversions and also enable emergency service personnel to directly communicate with, hear and see (wherever possible) the user and their environment. Because relay and emergency services can only feasibly support a limited number of connection types or protocols, it is important to coordinate the specifications of access to relay services, to emergency services, and for terminals used by persons with disabilities so that maximum interoperability in all available media is achieved for the occurring call combinations.

Future development

Currently the most active area of development for landline telephony is in IP networks, which provide an opportunity to include more good quality media in calls - a very positive development for the reasons cited above. It is likely that developments will proceed towards the production of more and more wireless devices, even when intended for stationary use (because of the ability to eliminate costly wiring). The move to wireless technologies is, in principle, mostly positive in terms of accessibility though accessibility is still not automatically included in all mainstream developments. Progress towards the inclusion of accessibility from the beginning of the development cycle is still urgently needed,

and policy related actions including adoption of Universal Design principles may be required.

As the telecom industry moves from analogue networks to Next Generation Network technology, landline networks will switch to IP based technology over a transition phase of many years. This will introduce many ways in which accessibility will be improved or lost in this domain, depending on how these new opportunities and challenges are met. Some examples of positive changes include:

- U.S. regulation to introduce the ability to call directly from numbers in the North American Number Plan in order to reach videophone users and IP text conversation users through their registered video or text relay services in the United States. This is an important regulation that results in increasing functional equivalence in the accessibility of landline phones.
- Section 255 of the U.S. Telecommunications act regulation changes, as recommended by TEITAC.
- Improved access to communication in Sweden resulting from the procurement of Total Conversation phones on behalf of users with communication disabilities.

3.6 Websites

Persons with various disabilities use a variety of different technologies and assistive technologies to access information on the Internet. For instance, blind persons use screen readers, persons with low vision use glasses, screen magnifiers or CC TV cameras, persons with motor impairments may use speech recognition programs, one-handed key boards etc. Deaf persons use cochlear implants, persons with cognitive impairments may use software like word prediction software and persons with multiple disabilities may use a combination of all these to successfully use computers. These persons also encounter different kinds of obstacles while trying to access the Internet depending upon the nature of their disability

and kind of assistive technologies they use.

The Web Accessibility Initiative (WAI), which is a wing of the World Wide Web Consortium (W3C) has come out with a set of guidelines called the Web Content Accessibility Guidelines (WCAG) 2.0 which sets out the criteria for creating web sites which will be accessible to persons with different kinds of disabilities.

Making websites accessible is not only useful for persons with disabilities, older persons and persons with low literacy levels, but also for persons accessing the Internet from remote locations through alternate platforms like mobile phones, or those using very low bandwidth, persons using older and less advanced technologies and those who are not practiced users. Accessible websites build good customer relations, help organizations fulfil their corporate social responsibility, increase clientele, reduce legal suits for inaccessibility and increase Search Engine Optimization (SEO). In addition to this, web accessibility also has certain technical advantages since it facilitates interoperability, enhances the quality of the website, reduces the time taken for developing and maintaining the website, enables easy configuration on different systems, reduces the load on the server, and can be adapted easily to meet the requirements of future technologies. It also addresses the requirements under existing legal provisions on accessibility as well as helping to streamline an organization's costs by taking present and future costs into account. Unfortunately, awareness of the benefits of accessible websites still tends to be quite low amongst web developers.

Internet usage is now shifting to a paradigm where more and more devices other than computers are being used to access the web. Web applications of the future will therefore need to encompass a much wider range of appliances. The ubiquitous web seeks to broaden the capabilities of browsers to enable new kinds of web applications, particularly those

involving coordination with other devices. For example, connecting a camera phone to a nearby printer, or using a cell phone to give a business presentation with a wireless projector. As the ubiquitous web increases in scope and reach, accessibility standards will need to be extended to encompass all devices and uses.

Currently, apart from computers, mobile phones are the most widely used device for accessing Internet. In developing countries especially, the number of persons using mobile phones is far greater than the number of persons using Internet. Increasingly, even persons with disabilities around the world use mobile phones to communicate and access information. It is important to understand the overlap between web accessibility standards and best mobile practices in order to maximize returns on creating accessible websites. Some problems which are common for persons using mobiles and persons having disabilities are: when communication of content is reliant solely on colour, use of large pages or large images; multimedia with no captions or text alternatives; audio only prompts; non text objects with no text alternatives; large requirement of text inputs etc. Given this, the WAI has provided guidelines for making websites usable from a mobile device. The Mobile Web Best Practices (MWBP) is a guide for making websites usable from a mobile device. There are several overlapping principles in MWBP and WCAG. For instance, the MWBP best practice, '*Label all form controls appropriately and explicitly associate labels with form controls*' corresponds with the WCAG 2.0 technique, *'H44: Using label elements to associate text labels with form controls'*. If developers design their websites following both these sets of principles, then their websites would be accessible to persons in different circumstances.

3.7 Personal computers

A Personal Computer (PC) is a computer whose size,

capabilities and price make it useful for individuals, and which is intended to be operated directly by an end user. A PC may be a desktop computer (used in a fixed location), a laptop (a mobile device), a TabletPC (laptop without keyboard and used with a Stylus pen or touch screen) or a handheld PC (also called palmtop).

The physical part of the computer including the digital circuitry is typically not visible to the end user and is called the hardware. Hardware is typically comprised of a motherboard, power supply, storage and video display controllers, removable media devices, internal storage, a soundcard and networking devices. In addition, hardware may also consist of additional peripheral devices broadly classified into two categories:

- **Input peripherals** – Devices used to input data into the computer such as text input devices like keyboard, pointing devices like a mouse, gaming devices like joysticks, image and video input devices like scanners and webcams and audio input devices such as microphones.
- **Output peripherals** – Devices that take information from the computer and display or provide information to other devices. These include text/image output devices like monitors and printers, audio output devices like speakers or headsets and assistive technology devices like Switches, Joysticks, Tracking devices (Gesture, Head Movements, Eye-Trackers), Special Keyboards and Braille embossers(Braille equivalent of a printer) for persons with disabilities.

Though hardware can be adapted in many ways to make it accessible to persons with disabilities, there are also many accessibility features that can be incorporated during the design and development stages. Accessibility of PCs, which are the most important tools to access ICT and content, is a critical factor that needs to be addressed for achieving full e-inclusion. Personal Computer accessibility is directly linked to

and dependent on the Operating System (OS) accessibility, because the hardware is controlled and managed by the OS. However in this section, only the hardware related aspects will be considered. The following is a list of some of the hardware considerations that will improve access to and use of the PC by persons with a disability:

- **Documentation** – **User Manual** – should have Assistive Technology (AT) specific information such as a list of AT products that have been tested with the product, all documentation such as manufacturer's guide, user guide etc. should be available in accessible formats and in clear, concise language.
- **Hardware Drivers (video and sound**) – Video and sound drivers should conform precisely to the OS specifications.
- **Hardware Guidelines** – AT products rely on standard hardware interfaces and assume they conform to a given standard. PC manufacturers should follow precisely the specifications defined by the OS manufacturer and standards organizations when building standard hardware interfaces such as USB ports, PC card interfaces, etc, thus ensuring that AT products are also compatible with the hardware.
- **Ergonomic Designs** – The physical design of the PC is a very important factor and is often not considered for most persons with disabilities. Alternatives to the often restrictive design of the conventional desktop computer are TabletPCs, notebooks and all-in-one PCs, each of which give to the user a choice of movements as well as a different capabilities to position it in the best location as per the user's needs and requirements.
- **Keyboard & Keyboard Layout** – Wireless keyboard enable the user to better position the keyboard according to their needs. In addition, considerations such as consistent keyboard layout, easily distinguishable and well spaced keys etc. make them easier to use for persons with

disabilities. Factors to keep in mind while designing accessible keyboards include basic ergonomic features, such as wireless features or ability to detach the keyboard, localization of keys (e.g. grouping related keys together and making them distinguishable), Identification of keys (e.g. enabling easy key identification through use of contrast etc.) and activating keys (e.g. enabling keyboard customization).

- **Drives and removable media** – Mechanisms for inserting and removal of drives and removable media should require a minimum of muscular strength, range of motion, reach and movement precision; user should be notified of incorrect insertion.
- **Mouse / Pointing devices** – Size, shape and click execution are very important to many computer users with a disability, thus making mouse features like size, large click button etc. important; additionally other pointing devices such as touchscreen, touchpads, light pen, eye tracking systems etc. can be used.
- **Displays (Screen)** – Screens should reduce the reflective glare and allow adjustment of position like turning left, right up, down etc.
- **USB Ports** – PCs should have a sufficient number of USB ports to allow a number of peripheral devices including AT's to be attached, with some USB ports in the frontal area to allow ease of access.
- **WebCams** – Increasingly important for features like video calls, some ATs also use real-time images captured by the webcam to control on screen the mouse cursor (face tracking) and execute commands (gesture mode). Therefore, the webcam device will need in many instances to have drivers that are fully compatible with all AT tracking devices for persons with a disability.
- **Audio Input and Output** – It is important that the computer speakers are high-quality, providing clear sound and power.

In addition to good-quality speakers, it is also important to have a good quality and directional microphone, with advanced drivers able to apply filters, amplification and remove background noise. This is also important for all users using Voice Commands and Automatic Speech Recognition technologies.

- **External connections** – These should conform to common industry standards. Some design considerations include providing tactile indication on any plug or insert and its corresponding connection point, providing a bevel around the slot or connection point.
- **Peripheral devices** – A system purchased with the expectation that it will now or in the future be used by a user who needs an assistive device should have the maximum number of USBs, one external VGA port and expansion slots.
- **Wireless Systems** – Personal Computers should have built-in technology for wireless control (short distance), for example technologies like Infrared, Bluetooth or Zigbee. This technology should also be available in order to control remotely the Turn-on function for people in a wheel chair or not able to press the Power-On button of the device.
- **Hard Disk, RAM Memory and CPU Speed** – The latest PCs should include a sufficiently powerful CPU, high-capacity Hard Disks and enough memory (RAM) to efficiently run the required commercial software and AT solutions.
- **Sleep Awareness – Power off features** – Some programs do not recover from a situation where the PC enters sleep mode and lock up Assistive Technologies, or crash the computer altogether. Users with severe disability may need a long time between one action and the next; therefore a PC's initial configuration should not automatically enable Hard Disk and Display sleep/power-off functions.
- **General Recommendations** – Some general considerations include: the surface of the controls should not contain any

material which may cause an allergy; controls should be operable with one hand and well spaced, tactilely discernible etc.

There are many standards on hardware accessibility published by organizations such as ITU, ISO, JIS etc. which provide guidelines on accessibility, ergonomics and AT related requirements.

3.8 Software

Personal computers, mobile phones, personal digital assistants (PDAs) and other general purpose computing devices all consist of two aspects – the hardware and the software. The hardware is the physical parts such as screens, keypads and headphones. The rest is software – web browsers, text editors, address books, applications for organizing photographs, industrial process control systems, etc.

The design of a piece of software determines how persons can interact with it and what abilities they will need. This includes what hardware can be used for inputs (e.g. a mouse, keyboard, touch screen or eye-tracker), how these inputs should be made (e.g. by clicking, dragging, typing or physical gestures), how the outputs are presented to the user (e.g. on a visual display or through audio) and which other devices and applications the software can interact with, including assistive hardware and software.

Assistive hardware and software is used by persons with disabilities to enable them to interact with software applications through an alternative to the standard methods that they cannot use.

- A blind person may use screen reading software which converts text to speech so that they can listen to what is usually displayed on the screen. Any software application that can display text on a visual display should also be able to pass that same text to a screen reader for conversion to speech.

- Persons with a physical disability may be unable to use a keyboard and may use a single switch together with an application that enables them to select individual letters, words or phrases, inputting them as text as if they were using a keyboard. Any software that can take text input from the keyboard should also be able to take input from this switch-based application.

Barriers arise when software is designed in a way that is incompatible with assistive technologies so that persons with disabilities cannot make the required inputs or receive outputs.

An important factor for accessibility is the extent to which the software integrates with the computer's 'operating system' which runs the computer, handles the display of windows, menus, buttons and other interactive elements and provides the filing system for storing documents and applications. Examples include the personal computer operating systems Microsoft Windows, Linux and Mac OSX, and the mobile phone operating systems Symbian and Android. Generally speaking, these operating systems can interact with assistive technologies, so that standard elements such as windows, menus, text panes, buttons and dialogue boxes are all accessible. The problems arise when a software application doesn't use the standard interactive elements provided by the operating system, but creates its own, or interacts directly with the screen or keyboard, bypassing the operating system completely. In this case, the assistive technologies may not be able to detect the outputs or mimic the inputs. A further problem is that whatever accessibility adjustments the user has made at the operating system level, such as changing the default text size and colour or reducing the input sensitivity, may then be ignored by that software application.

In addition to considering how information output occurs, software applications also need to consider what the output

is. For example, it is important to ensure that displayed colours have sufficient contrast for persons with vision impairments, and that the information contained within images and graphs is also available as text, that audible information is also available visually and that complexity is kept to a minimum. Beyond the software itself, the packaging, installation and configuration tools should also be accessible, as well as any documentation, training and support materials.

Enterprise level software, encountered by many persons with disabilities within employment, often presents far greater accessibility barriers than the more widely used office, personal or mobile software applications. This software, which may be used for a wide range of tasks such as industrial process control, systems monitoring, project management and data storage, often either creates its own interface environment or uses that provided by the application environment (e.g. Lotus Notes). Lack of accessibility in this kind of software can seriously reduce the opportunities for employment or career advancement for persons with disabilities.

Today, more software is being made accessible on a commercial basis. Companies, such as IBM and Microsoft have made great strides in ensuring that software is made accessible and interoperable with assistive technologies. Windows Vista, for example comes with many accessibility features built into the OS. For persons with physical impairments, speech recognition allows interaction with the OS simply on the basis of voice inputs. Magnifiers also enable users with visual impairments to enlarge parts of the screen. A text-to-speech program also reads aloud on-screen text and describes events (such as error messages) that happen while using the computer. Other features include captions, sticky keys and visual notifications, among others.

3.9 Electronic kiosks

Electronic kiosks generally include outlets such as Automated Teller Machines, information kiosks, electronic voting machines, and information displays (e.g. flight information), points of sale, customer card payment systems, among others.

Accessibility considerations for kiosks include:

- Path to kiosk must be free from obstacles such as steps, bins or signage that would obstruct the progress of users who are either walking or using a mobility aid such as a wheelchair, a motorized buggy, crutches or a cane. This includes the path into any room or area containing the kiosk. The user should be able to operate the kiosk from a clear, flat area large enough to manoeuvre mobility aids
- There should be adequate lighting.
- The operable parts of an electronic kiosk including such things as buttons and keypads, input slots for cards or money and dispensers for tickets, receipts or returned money should be accessible to users from any position and orientation while using the terminal. Preferably, this should be a single position which does not require the person to re-orientate themselves during the operation.
- Using the terminal for physical operations like pressing buttons or keys, turning knobs or other moving parts, inputting or retrieving cards or other items, should be possible with minimal grip, pushing and pulling strength or twisting of the wrist.
- The user interface may consist of a number of discrete components, each with their own accessibility issues such as labels and instructions, Smart Cards, displays, keypads, and touch screens.

Certain product-wide accessibility solutions exist. Some examples follow.

- EZ Access is a set of interface enhancements which can be applied to electronic products and devices so that they

can be used by more persons including those with disabilities and cover a wide range of interactive electronic systems, from public information and transaction machines such as kiosks to personal handheld devices like cellular phones.

- Talking kiosks that use sounds, video, spoken and tactile instructions to help direct blind and low-vision passengers have been implemented by the New York City Department of Transportation at the Whitehall Ferry Terminal in Lower Manhattan.
- Banks are now making Automated Teller Machines (ATMs) accessible to persons with visual impairments, by providing them with a pair of earphones along with a training kit on CD.

3.10 Broadband services

Access to broadband services today is an essential component for ensuring success for persons with disabilities in the information economy. To date, many efforts have been made to ensure that broadband services are made accessible for persons with disabilities. Video Relay Service, for example, allows a deaf or hard of hearing person to use sign language to converse with a person who does not. The Internet, in conjunction with accessible software and assistive technologies, has opened up new opportunities to access information and processes which were once inaccessible. An internet connection with higher bandwidth makes important affordances for persons with disabilities. For example, a quicker connection can enable education and communication methods that slower connection speeds cannot facilitate.

It is important that governments and service providers, in cooperation with disability organizations make efforts to ensure that issues of broadband and disability receive adequate attention in the policy-making arena. In the United States, for example, workshops on broadband and accessibility

have played an important role in promoting dialogue between the Federal Communications Commission, persons with disabilities, advocates for persons with disabilities and service providers. Stemming from such workshops, appropriate policy recommendations on accessibility and broadband have also been put forth to the FCC for consideration.

3.11 Access to published works

The fundamental right to read should be enjoyed by all persons in the Information age. The ability to seek, receive and impart information and ideas is vital to ensuring that all persons are able to participate productively in the cultural, scientific and economic life of the country. However, there are several groups of persons who are unable to access materials in the printed form due to a physical, sensory or cognitive disability (print impaired persons). These may be persons who are blind or have low vision, those who are dyslexic, have a learning disability or a physical or motor disability which prevents them from holding or turning the pages of a book. There are two specific areas affecting access to information for persons with print impairments, namely legal and technical aspects.

3.11.1 Legal challenges

Published works are the subject matter of national copyright laws, which vary from nation to nation. The copyright laws of countries are responsible for determining whether conversions for the benefit of print impaired persons are possible without seeking permissions from copyright holders.

According to a study by the World Intellectual Property Organization (WIPO) on exceptions and limitations for the visually impaired (a report by Judith Sullivan), only 57 countries have specific provisions to make copyrighted works accessible to print for impaired persons. Some of the countries cited as

having systems in place for the production and national dissemination of accessible copies are Kenya, the United Kingdom, Brazil, Canada and the United States. Similarly, some countries that have infrastructure in place for the production and international dissemination of accessible copies include the Netherlands, Russia and France. Persons with disabilities, in such countries, can get accessible content from libraries like Bookshare, RNIB, Tiflolibros etc.

On the other hand, there are nearly 127 countries which do not make any special provisions for print for impaired persons to convert and read books. Consequently, persons in these countries have very few books in accessible formats. The World Blind Union estimates that this may be as low as 5 per cent in developed countries and 0.5 per cent in developing countries. Blind persons in these countries are also unable to borrow accessible materials from libraries in other countries.

The stringency of copyright legislation and its consequent restriction of public access to cultural and scientific works combined with rapidly changing methods of cultural production and collaboration are driving the rise of new and alternative models to traditional copyrights. Recent trends have witnessed a shift towards open and flexible models of licensing such as the open content and creative commons licenses which are used for software, music and artwork. These alternative licenses can be classified into different categories, taking into account the medium they address, nature of the license and the validity of the license.

Creative Commons (CC) is a non-profit organization that was set up in 2001 and works to increase the level of cultural, scientific and education content available in the public domain i.e. the body of work available in the public domain for persons to use, share, repurpose and remix in a free and legal manner. Inspired in part by the GNU GPL, Creative Commons has come up with an array of free licenses that can be used by persons

to license their works freely for certain uses, on certain conditions, or dedicate their works to the public domain. The widespread use of these licenses can go a long way in securing access to knowledge for print impaired persons. It is estimated that over 130 million works were licensed under CC licenses in 2008.

3.11.2 Technological challenges

Print impaired persons can access information in a variety of formats, ranging from mainstream electronic formats like accessible HTML, MS Word, Text, PDF, etc., to specialised formats such as Braille, large print, audio and so on. In the case of electronic formats, there are several assistive technologies such as screen readers, refreshable Braille displays etc., which enable access to electronic information. Of key importance to users of assistive technologies when accessing content in electronic format is whether the content contains a structure which can be interpreted by these assistive technologies. For example, in an accessible HTML, content in data tables can be 'marked up' in order to provide information on the layout of the table to the screen reader user. Similarly, formats such as accessible PDFs can be 'tagged' to provide a correct reading order of the text as well as to provide information on the flow and structure of the content including chapter headings and sub-section headings. Without such an embedded structure, content in electronic formats can be difficult or even impossible for print impaired persons to access. However, although electronic books have ushered in a revolution for print impaired persons by enabling access to content at the same time and in the same format as for everyone else, the lack of adherence to accessible standards while creating electronic documents frustrates the possibility of instant and easy access for persons using assistive technologies. Creators of electronic documents should make an effort to ensure that their documents are created in an

accessible manner. Some of the international standards that enable the creation of accessible electronic documents are DAISY, EPUB and PDF.

Another significant barrier to access works can be found in the form of DRMs (Digital Rights Management) and TPMs (Technological Protection Measures). Articles 11 and 12 of the WIPO Copyright Treaty (WCT) and articles 18 and 19 of the WPPT (WIPO Performances and Phonograms Treaty) have made it possible for Member States to oblige the setting in place of a digital rights management regime. DRM systems are undesirable because they grant copyright owners digital rights which go far beyond property rights which are the subject matter of copyright. The copyright owners get the power to decide whether or not to give access to works, irrespective of whether the works are copyrighted. They also extend control to ideas and works in the public domain. Furthermore, since DRMs are used to trace users, they raise serious concerns of data protection and privacy. Today, one increasingly finds that DRMs are exercised by intermediaries and not necessarily the authors of works. Hence, many times, authors are unable to access their own works in different formats or using different devices due to the DRMs placed by the distributor.

Recently, Amazon released the Kindle book reader, which also has the potential to make many books accessible due to its text to speech feature. However, copyright holders and publishers protested and forced the restricted availability of this feature, thus denying print impaired persons access to many books. At present, Amazon is working on improving the accessibility of Kindle's menus and other features and has a workaround for users with disabilities, where persons with disabilities can get access to the text to speech feature for certified print.

Access to knowledge for persons with disabilities can be facilitated to a significant extent by conformance with certain technological standards and sharing platforms, namely open

standards and open access / content. Open standards are very important for ensuring interoperability between different software technologies. Since most pieces of government information and transactions are now carried out over the Internet, governments have to recognize the need for promoting open standards through interoperability frameworks to ensure enhanced transparency and efficiency in government actions, promote informed decision making and better public services. This will open up the entire world of public information which is available on government websites but unavailable for persons with assistive technologies because of technological incompatibility. In countries like the United States, Germany, Korea, the United Kingdom and so on, accessibility of public information services is mandated under legislation and policies and hence, it is easy to ensure that even private service providers deliver information in an accessible manner.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Technology areas): http://www.e-accessibilitytoolkit.org/toolkit/technology_areas

Accessibility Policy Making: An International Perspective

Chapter 4

Accessibility Policy Making: An International Perspective

This chapter provides a brief summary of some of the initiatives and best practices which have been adopted by countries around the globe as a first step towards policy formulation for countries. Many of the countries included are developed nations since the aim is to look at a wide gamut of regimes where the principle of accessibility has taken shape in different forms – ranging from legislations and policies to directives and ordinances – and observe the efficacy of these forms. The chapter covers 15 countries and the European Union. The countries include the United States and Canada from the Americas; the United Kingdom, Germany, Italy, Portugal, Ireland, and Sweden in Europe; and Australia, New Zealand, Japan, the Philippines, Korea and Thailand from the Asia Pacific.

4.1 Country analysis

4.1.1 United States of America

The United States has enacted extensive legislation to cover various aspects of accessibility. The U.S. web accessibility regime is well-established and well functioning for the public sector. Section 508 is an effective, direct, and targeted

legislation which provides for a systemised process of complaint registration in cases of non-compliance. Though it originally applied only to the federal government, most States have now adopted it as state law and many companies have adopted it for their official policies. Section 508 also provides for the setting up of an Access Board to periodically review and amend the standards. Yet, it remains unclear whether U.S. anti-discrimination law applicable to the private sector also applies to the Internet. Current case law suggests that the private providers of goods and services may not discriminate against persons with disabilities on the Internet, and many companies are pre-empting future lawsuits by adopting accessibility policies of their own.

4.1.2 United Kingdom

The United Kingdom's regime takes a different form: it does not have legislation directly addressing web accessibility. Rather, its keystone is the Disability Discrimination Act, a general law prohibiting discrimination against persons with disabilities in the provision of goods, facilities and services. Though the Act contains no direct reference to websites or web accessibility, it is not designed to mention any goods or services specifically, and focuses instead on the responsibility of the service provider to ensure equitable access. The practical meaning of the Act is instead outlined in the Code of Practice for the Act which explicitly mentions websites. Additionally, a document called the PAS78 provides guidance to organizations in how to commission an accessible website from a design agency. The enforcement of these legal provisions depends primarily on users with disabilities filing complaints, culminating in legal action. The unequivocal application of the United Kingdom's web accessibility law to the private sector is a key source of its strength.

4.1.3 Australia

The Australian web accessibility regulations are also rooted in the Australian Disability Discrimination Act (DDA). All governments in Australia have policies and guidelines that deal with accessible public websites. The Worldwide Web Access Advisory Notes to the DDA, which contain specific guidelines for 'authors and designers to make their worldwide web documents accessible to the broadest possible audience' buttress the general antidiscrimination regime, ensure its applicability to the Internet, and enhance enforceability and compliance. The Human Rights and Equal Opportunity Commission (HREOC) has responsibility for promoting the objectives of the Disability Discrimination Act (DDA) and provides advice about the implications and monitoring of the Act for website operators. The pioneering case of Maguire v. SOCOG, where a blind man successfully sued an organization, is highly relevant, as the outcome of the case was influenced heavily by the WCAG. This case will likely be a point of reference for other courts, in Australia and abroad, dealing with website accessibility suits.

4.1.4 Germany

Germany has many regulations covering accessibility for persons with disabilities and is one of the most advanced nations in this regard. Its regulations cover accessibility of both web and other electronic infrastructure. It has generic disability legislation in the form of an equal opportunities act for persons with disabilities and covers web and electronic accessibility through regulation in the form of a federal ordinance. Its broad Barrier-free Information Technology Ordinance (http://www.einfach-fuer-alle.de/artikel/bitv_english/) covers web accessibility and contains provisions for regular evaluation and review of the Ordinance. The Ordinance is applicable to authorities, health insurances and

other bodies, foundations and public institutions and to the private sector in a more limited way.

4.1.5 Portugal

Portugal has put in place web accessibility guidelines for public websites. While there is no specific legislation that has been enacted, the Portuguese web accessibility regime is distinct for its robust monitoring component. The Resolution of the Council of Ministers on the Accessibility of Public Administration Websites for Citizens with Special Needs states that information layout and presentation in public administration websites (central and local) should allow or facilitate access by persons with special needs. The Resolution also provides for a Minister to be appointed to monitor and evaluate the enforcement of this piece of legislation and requires a report to be presented on its implementation.

4.1.6 New Zealand

New Zealand's web accessibility regime primarily comprised by its set of 'New Zealand Government Web Standards and Recommendations', exemplifies those regimes based largely on the WCAG. This is an important reminder that countries seeking to adopt web accessibility regimes need not necessarily engage in extensive processes of policy development: the WCAG provide a ready reference for the development of effective web accessibility law and policy. The legislation and guidelines covering web accessibility mandate compliance by public sector agencies.

4.1.7 Canada

Canada's Internet standards, the 'Common Look and Feel Standards for the Internet' are, like those of the United Kingdom, largely dependent on the private filing of complaints. Persons who are unjustly discriminated against

may file a confidential complaint with the Canadian Human Rights Commission. The applicability of the guidelines is to all Government Departments and Ministries and agencies but not to any private organizations. Other than these standards, Canada has many kinds of human rights legislation which advocate accessibility, and other offices and reports which deal with the issue.

4.1.8 Ireland

While Ireland has formulated several policies and programs dealing with web accessibility for persons with disabilities, there is no specific legislation that directly covers this area. Ireland has national guidelines on accessibility of IT products and services, which in the specific case of web accessibility essentially adopt or incorporate W3C WCAG 1.0 without substantive change. Applicability of guidelines is primarily to the public sector and is again not mandatory. The National Disability Authority has also published the national guidelines on accessibility of IT products and services in the public sector, which have sections on web accessibility. While these guidelines are advisory rather than compulsory, there is evidence that they have been adhered to by national and sub-national governments.

4.1.9 Italy

Italy provides an example of a country responding to the evolution of international norms by implementing domestic web accessibility initiatives. It is not coincidental that the umbrella law concerning access for persons with disabilities to ICT, Law 4/2004, was drafted in 2003, the European Year of Persons with Disabilities. The requirements of the Law include web accessibility and place upon government agencies the obligation of making public sector websites accessible and to ensure accessibility while purchasing ICT goods and services

and signing contracts for their maintenance. This law is supported by two decrees, one of which specifies the enforcement regulations and one of which lays down the technical requirements for web accessibility to be adhered to. The guidelines apply to national and local public bodies and to private subjects, if they are concessionaries of public information or services, and to public transport and telecommunications companies. The case of Italy stands as testament to the influence of evolving international norms.

4.1.10 Sweden

Sweden has a very detailed set of non-mandatory guidelines on web accessibility, as well as stipulating that government products and services are accessible to persons with disabilities; it lacks legislation to fortify these guidelines with the force of law. Sweden has passed laws requiring that IT products and services should be accessible to and usable by everyone as far as this is at all possible, including persons with disabilities and this is applicable to all in Sweden. It does have a comprehensive disability policy with other legislation relating to non-discrimination etc. And fascinatingly, studies show that over 80% of public sector websites are following these guidelines to some extent. It is dangerous, however to extract any general lesson from the Swedish example since similar levels of voluntary compliance cannot be expected from countries whose conditions vary drastically from those of Sweden. However, the Swedish example serves as testament to the fact that web accessibility guidelines need not be so difficult to comply with: they can be adopted quite easily in many cases.

4.1.11 European Union

The European Union has adopted a charter of fundamental rights and an action plan designed to protect the rights of

Persons with Disabilities and extend accessibility of IT products and services including web accessibility. The EU has also issued communications and adopted resolutions as well as action plans with the aim of providing increased accessibility to public websites and content as well as increased availability of IT products and services to persons in the EU. While guidelines comply with WCAG, the implementation of the same is still in progress. Further applicability is still restricted to public sector agencies, products and services.

The European Union has a 'Council Resolution on the accessibility of public websites and their content' which deals with web accessibility. The Action Plans of the EU are unique. They are direct and they set clear goals. There is a clear-cut deadline prescribed for making changes to regarding website accessibility. However, the extent to which different countries in the EU follow EU guidelines varies. The EU has commissioned studies over the past few years to measure web accessibility and has been dissatisfied with its own progress. In 2006 the 'Measuring progress of e-Accessibility in Europe' (MeAC) study found that only a very small proportion of key government websites in the Member States meet the accepted minimum international standards on accessibility (12.5% passed automated testing and only 5.3% passed both automatic and manual examination), and found that the share of key commercial / sectoral websites (e.g. railways, TV, newspapers, retail banking) providing this minimum level of accessibility is even lower (only 3.9% passed automated testing while not a single site passed both automatic and manual testing).[9] While such results are nowhere near enough to overcome the digital divide, the study found that such results compared very unfavourably with those pertaining to

9. MeAC - Measuring Progress of e-Accessibility in Europe, Assessment of the Status of e-Accessibility in Europe, Executive Summary, available at: http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=4280.

Australia, Canada, and the United States – such self-assessment and self-regulation is essential to the functioning of any effective regime.

4.1.12 Japan

Japan does not have any legislation covering accessibility, but the guidelines for accessibility have been laid down in the form of an Industrial Standard by the Japanese Standards Association. In 2004, building on ISO/IEC GUIDE 71 and JIS Z 8071, the Japanese Industrial Standard for web accessibility was released, called 'JIS X 8341: Guidelines for Older Persons and Persons with Disabilities—Information and Communications Equipment, Software and Services'.

The JIS X 8341-3, a component of JIS X 8431, was expected to function as a basis to ensure the web accessibility of government websites in the central and local governments in Japan. However, the Ministry of Internal Affairs and Communications found a widespread lack of understanding of and respect for the JIS X 8341-3 among the local governments in Japan, and in December 2005 further proposed 'Operational Models to Improve Accessibility of Public Websites' in order to supplement the JIS X 8341-3.

The guidelines and standards are mandatory for national and local government agencies and can be followed on a voluntary basis by private companies.

4.1.13 Korea

Korea has a robust combination of legislation, such as the 2007 Korea Disability Discrimination Act, the National Informatization Act, and overarching policy with mandatory compliance required by public and private sectors in a phased manner. The government has established a process of surveys to measure the degree of compliance and awareness of the guidelines and see how far they have reached in the roadmap.

The web accessibility obligations laid down in the Korea Disability Discrimination Act, 2009 are intended to apply to both the private and public sectors gradually by 2015, as per the current roadmap, starting with government agencies and subsidiaries in 2009.

4.1.14 Developing countries

Of the developing countries studied, both Thailand and the Philippines lack enforceable law about web accessibility. Both countries have, however, demonstrated that promoting web accessibility is a priority with their signing and ratifying of the CRPD and their various policy initiatives. Both countries feel that developing indigenous versions of the WCAG is essential in their steps towards a complete web accessibility regime.

Whereas Thailand has already developed its own version of the WCAG, the Philippines has established a working group currently in the process of doing the same. As these are both relatively recent initiatives, their actual efficacy remains to be seen. These countries will, in the future, be critical test cases for whether modified WCAG standards can in fact result in significantly increased web accessibility, or whether they are empty efforts designed to affect the appearance of conformance with international norms.

India has generic legislation on disability in the form of the Persons with Disabilities (Equal Opportunities, Protection of Rights & Full Participation) Act which was enacted in 1995 with the objective of ensuring equal opportunities for persons with disabilities and their full participation in nation building. Work on creating an overarching accessibility policy for the country was initiated in January 2009 by the Department of Information Technology and is soon likely to come into effect.

4.2 Summary

Common themes — developed countries

All the countries studied have put in place measures to ensure web accessibility. Some have specific enforceable legislation while others have recommendations and guidelines. All countries have some form of a disability discrimination act, which covers the issue of accessibility more broadly defined. Six of the countries studied have regulations on web accessibility in the form of legislations, while two countries have their own standards on web accessibility.

While most of the countries have specific legislation pertaining only to web accessibility, countries like Korea, Japan, Germany and Ireland have included accessibility policies on other electronic infrastructure along with their web accessibility policy.

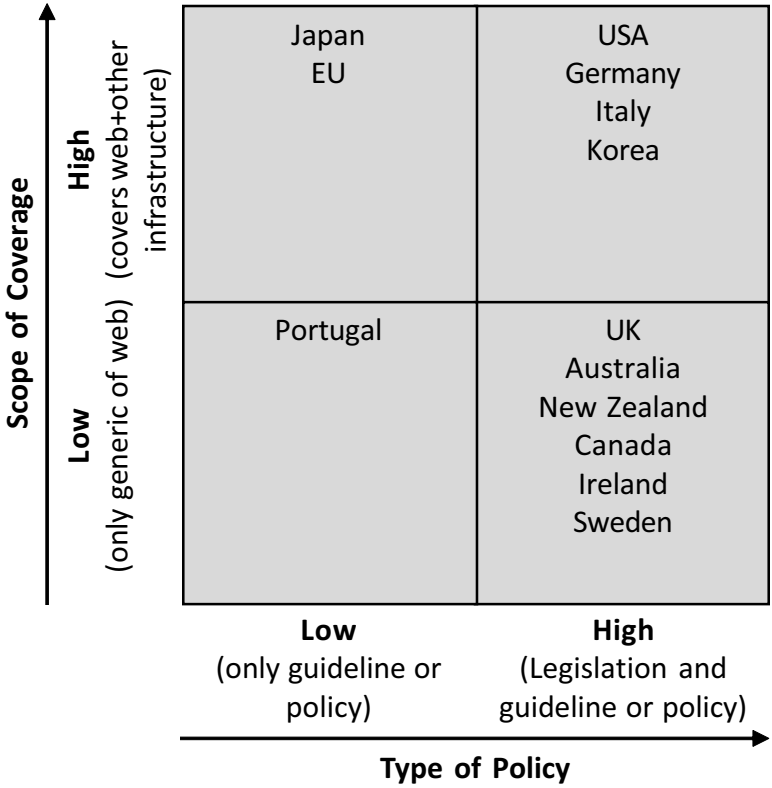
As many as ten of the countries studied have their legislations, policies and standards based on the WCAG. However, countries like Japan whose national language uses a different script and a phonetic alphabet, have found that the WCAG is better suited to languages utilizing Latin script and have moved to augment it with language specific accessibility considerations.

Most countries have focussed on having legislations which makes it mandatory only for the government and related public sector departments to maintain accessible websites. In Australia and the United Kingdom however, any service provider or individual or organization creating a web page must ensure that it is accessible. And in the United States it is likely the case, but remains to be seen, whether the Americans with Disabilities Act applies to private websites.

There is much case law in such countries deriving from successful suits against organizations not maintaining accessible websites.

Differences — developed countries

Two fundamental ways in which countries' web accessibility regimes vary are: 1) in terms of their scope, that is, to what sectors of society they apply, and 2) in terms of their strength, that is, whether or not they have the force of law. The following grid maps a few of the countries included in this study according to these variables.



Portugal inhabits the lower left quadrant of the grid, as its regime has both a weak policy-type and a low scope. Japan and the EU inhabit the top left quadrant, as they have comprehensive regimes that are not backed by the force of law. The United States, Korea, Germany, Italy land in the top-

right quadrant of the grid, as they exhibit both highly comprehensive and legally enforceable web accessibility regimes.

For a full list of citations, references and useful resources related to this topic, please visit the e-Accessibility Policy Toolkit website (Developing policy): http://www.e-accessibilitytoolkit.org/toolkit/developing_policy

Appendix A: Accessibility Policy Comparison Grid

CRITERIA	AUSTRALIA	CANADA	GERMANY	INDIA	IRELAND	ITALY	JAPAN	KOREA	NEW ZEALAND
Type of Policy	Legislation +Advisory Notes	Standards	Ordinance	Generic Legislation	Legislation+ Policy Document	Legislation +Decrees +Directives	Industrial Standard	Legislation	Guidelines+ Legislation
Effective from	1992, 2002	2007	2002	1995	2005, 2002	2004,2005, 2006	2004	2007	2002, 1988
Scope of Coverage: (only web or other electronic infra-structure)	General legislation with web specific advisory notes	Only web	Includes regulations for web as well as other electronic infra-structure	General legislation	Includes other electronic infra-structure	Includes other electronic infra-structure	Includes guidelines for web and other electronic infra-structure	Covers web and other infra-structure as well	Only web
Compliance with WCAG	Yes	Yes, Standards based on WCAG 1.0	Yes, Ordinance based on WCAG	N/A	Yes	Yes,	Borrowed some guidelines from WCAG	Yes, Guidelines based on WCAG	Yes, wholly compliant

CRITERIA	AUSTRALIA	CANADA	GERMANY	INDIA	IRELAND	ITALY	JAPAN	KOREA	NEW ZEALAND
Applicability (govt websites/ all)	Any individual/ organization creating a web page. (Includes Government + Private)	Only Government Department, Ministries and Agencies	Authorities of Federal Administration	N/A	Only Public Sector Websites	Public sector agencies as well as private subjects if they are beneficiaries of public information or services	National and Local Government Agencies	Both private and public sector gradually by 2015 as per the current roadmap, starting with government agencies and subsidiaries in 2009.	Public Sector Websites & Public Agencies
Signatory to CRPD	Yes	Yes	Yes, also signed and ratified Optional protocol	Yes	Yes	Yes, also signed and ratified - Optional protocol	Yes	Yes, also signed and ratified - Optional protocol	Yes

CRITERIA	PHILIPPINES	PORTUGAL	SWEDEN	THAILAND	U.K.	U.S.A.	EU
Type of Policy	Working group currently formulating policy	Parliamentary Resolution	Legislation + National Guidelines +Ordinances	Policy + Guidelines	Legislation +Guidelines	Legislation	Council Resolution + Action Plan
Effective from	N/A	1999	1999, 2001, 2002, 2004	Not available	1995, 2006	1998	2002
Scope of Coverage: (only web or other electronic infra-structure)	N/A	Only web	Covers websites as well as broad term 'Information Technology'	Web accessibility guidelines	General overarching legislation, with specific guidelines for web accessibility	Covers web and other infrastructure as well	Includes other electronic infrastructure
Compliance with WCAG	N/A	Partly, broadly based on same principles	Yes, guidelines based on WCAG	Th-WCAG, Partially compliant with WCAG 1.0s	Yes, guidelines based on WCAG	Partly	Yes

CRITERIA	PHILIPPINES	PORTUGAL	SWEDEN	THAILAND	U.K.	U.S.A.	EU
Appli-cability (govt websites/ all)	N/A	General Directorates, State Corporations and Agencies	Public sector is main subject, but private sector is also covered by the policies.	Guidelines targeted at both the public and private sectors	Any Service Provider (Includes Government + Private)	Only Federal Department and related agencies	Public Sector Websites of the Member States
Signatory to CRPD	Yes, signed and ratified convention	Yes, also signed Optional protocol	Yes	Yes, signed and ratified convention	Yes, also signed Optional protocol	Yes	Yes

Appendix B: Online Toolkit Site Map

***Convention on the Rights of Persons with Disabilities: dispositions covering ICT accessibility**

- Overview of the Convention on the Rights of Persons with Disabilities and its dispositions on ICT accessibility – *Edited by Axel Leblois, Executive Director, G3ict. Contributor: Susan Schorr, Head, Special Initiatives Division, ITU Telecommunication Development Bureau (BDT)*
- Definitions – *Edited by Axel Leblois, Executive Director, G3ict. Contributor: Susan Schorr, Head, Special Initiatives Division, ITU Telecommunication Development Bureau (BDT)*
- Accessibility provisions for States Parties to the Convention – *Edited by Axel Leblois, Executive Director, G3ict. Contributor: Susan Schorr, Head, Special Initiatives Division, ITU Telecommunication Development Bureau (BDT)*
- Assessment framework – *Edited by Martin Gould, National Council on Disability*

Who benefits? Global demographics and the imperative for accessible *ICTs – *Edited by K. Anne-Rivers Forcke, IBM Human Ability and Accessibility Center. Contributors: James Thurston, Microsoft Trustworthy Computing Group; Martin Gould, National Council on Disability; Andi Snow-Weaver, IBM Human Ability and Accessibility Center; Susan Schorr, Head, Special Initiatives Division, ITU Telecommunication Development Bureau (BDT)*

- Introduction
- Establishing Metrics for Digital Inclusion
- Changing Views on Disability
- Global Demographics – Capability variations and age variations
- Beneficiary populations of accessible ICT

e-Accessibility basics

- Introduction to e-accessibility basics – *Edited by Dr. Mark Magennis, National Council for the Blind of Ireland – NCBI Centre for Inclusive Technologies (CFIT)*
- Accessibility and the purposes of ICTs – *Edited by Dr. Mark Magennis, National Council for the Blind of Ireland – NCBI Centre for Inclusive Technologies (CFIT)*
- Basic accessibility principles – *Edited by Dr. Mark Magennis, National Council for the Blind of Ireland – NCBI Centre for Inclusive Technologies (CFIT)*
- Standards and guidelines – *Edited by Alex Li, International Organization for Standardization (ISO)/ International Electrotechnical Commission (IEC) Joint Technical Committee 1 (JTC1) Special Working Group–Accessibility Convener*

Technology Areas

- Wireless phones – *Original by Kevin Carey, humanITy, RNIB/ World Blind Union. Edited by Axel Leblois, Executive Director, G3ict. Resources selected by Ben Lippincott, Industry Relations, Wireless RERC/Georgia Institute of Technology and Axel Leblois, G3ict*
- Radios – *Edited by Dr. Jonathan Freeman, MD i2 media research ltd; Senior Lecturer, Department of Psychology Goldsmiths, University of London New Cross. Introduction edited by Dr. Mark Magennis, National Council for the Blind of Ireland - NCBI Centre for Inclusive Technologies (CFIT)*
- Television – *Resources collated by Trisha O'Connell, WGBH-Shapiro National Center for Accessible Media (NCAM);*

WGBH Educational Foundation, Boston, MA. Introduction edited by Dr. Mark Magennis, National Council for the Blind of Ireland - NCBI Centre for Inclusive Technologies (CFIT)

- Remote consoles – *Gregg Vanderheiden, TRACE Centre, University of Winsconsin-Madison, Kevin Carey, humanITy, RNIB/World Blind Union and Dr. Mark Magennis, National Council for the Blind of Ireland - NCBI Centre for Inclusive Technologies (CFIT)*
- Landline phones – *Edited by Gunnar Hellström, Omnitor*
- Websites – *Edited by Nirmita Narasimhan, Centre for Internet and Society, Bangalore, India. Contributor: Rich Schwerdtfeger, Distinguished Engineer, SWG Accessibility Architect/Strategist, IBM*
- Personal computers – *Edited by Claudio Giugliemma, President, Dominic Foundation*
- Software – *Resources collated by David Sloan, University of Dundee and edited by Kevin Carey, humanITy, RNIB/World Blind Union. Introduction by Dr. Mark Magennis, National Council for the Blind of Ireland - NCBI Centre for Inclusive Technologies (CFIT)*
- Electronic kiosks – *Edited by Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland*
- Broadband services – *Edited by Kevin Carey, humanITy, RNIB/World Blind Union*
- Access to published works – *Edited by Nirmita Narasimhan, Centre for Internet and Society, Bangalore, India*

Product development and design

- Introduction to product development and Universal Design – *Authors: Dr. Sam Waller, University of Cambridge, Engineering Design Centre and Prof. P John Clarkson, University of Cambridge, Engineering Design Centre. Edited by James Hubbard, Senior Design Advisor, Products and Services, Centre for Excellence in Universal Design, NDA;*

Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland

- What is an accessible product? – *Authors: Dr. Sam Waller, University of Cambridge, Engineering Design Centre and Prof. P John Clarkson, University of Cambridge, Engineering Design Centre. Edited by James Hubbard, Senior Design Advisor, Products and Services, Centre for Excellence in Universal Design, NDA; Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland*
- Using Universal Design to improve product accessibility – *Authors: Dr. Sam Waller, University of Cambridge, Engineering Design Centre and Prof. P John Clarkson, University of Cambridge, Engineering Design Centre. Edited by James Hubbard, Senior Design Advisor, Products and Services, Centre for Excellence in Universal Design, NDA; Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland*
- Considerations for specifying, incentivising and implementing Universal Design – *Authors: James Hubbard, Senior Design Advisor, Products and Services, Centre for Excellence in Universal Design, NDA and Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland. Edited by Dr. Sam Waller, University of Cambridge, Engineering Design Centre and Prof. P John Clarkson, University of Cambridge, Engineering Design Centre*
- Activities of standards bodies relevant to Universal Design – *Authors: James Hubbard, Senior Design Advisor, Products and Services, Centre for Excellence in Universal Design, NDA and Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland. Edited by Dr. Sam Waller, University of Cambridge, Engineering Design Centre and Prof. P John Clarkson, University of Cambridge, Engineering Design Centre*

- Higher education engineering curricula – *Edited by Dr. Carlos A. Velasco, Fraunhofer Institute for Applied Information Technology FIT Web Compliance Center*

***Public procurement –** *Edited by Cynthia D. Waddell, Juris Doctor, International Center for Disability Resources on the Internet (ICDRI)*

- Introduction to public procurement
- Rationale for public procurement policies incorporating ICT accessibility mandates
- Core issues in creating effective public procurement policies
- Case studies
- Public Procurement of Accessible ICTs –Training Workshop Presentation – *Compiled by Cynthia D. Waddell, ITU Senior Accessibility Consultant, Executive Director, International Center for Disability Resources on the Internet, this training workshop presentation was delivered at the "Asia-Pacific Regional Forum on Mainstreaming ICT Accessibility for Persons with Disabilities, " organized by ITU and ESCAP in Bangkok, Thailand (25-27 August 2009)*

***Promoting assistive technologies for persons with disabilities**

- Introduction to assistive technologies – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- Understanding needs – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- Solutions to meet needs – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- How AT supports education – *(content under development)*
- How AT supports independent living – *Author: David Banes,*

Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group

- How AT supports personal mobility – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- How AT supports working – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- How AT supports communication – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- Implementing assistive technologies – *Author: David Banes, Deputy Director, Mada – Qatar Assistive Technology Center. Edited by James Thurston, Microsoft Trustworthy Computing Group*
- Policies and programs promoting assistive technologies – *(content under development)*
- Open Source Software-Based Assistive Technologies – *Contributor: Fernando Botelho, Literacy Bridge & Mais Diferenças, Brazil*

***International cooperation -** *Edited by Axel Leblois, Executive Director, G3ict*

- Overview
- Convention dispositions
- European Union
- Other regional cooperations
- U.S. TEITAC
- International standards development
- International civil society organizations involved in ICT accessibility issues

- International industry associations involved in ICT accessibility issues
- International research programs

***Local government –** *Edited by Hardik Bhatt, Chief Information Officer, Department of Innovation and Technology; Karen Tamley, Commissioner, Mayor's Office for People with Disabilities, City of Chicago. Contributors: Danielle DuMerer and Matthew Guilford, Department of Innovation & Technology; Laurie Dittman and Joseph Russo, Mayor's Office for People with Disabilities, City of Chicago*

- Introduction to local governments
- Secure commitment to accessibility from the executive office
- Involve the local disability community in program efforts
- Identify and adopt comprehensive ICT accessibility standards
- Integrate accessibility into IT governance, project management, and procurement processes
- Train employees on adopted ICT accessibility standards
- Utilize tools that facilitate adherence to accessibility standards
- Test products using common assistive technologies
- Upgrade assistive technology tools and adapt accessibility standards regularly
- Audit and report on progress regularly to ensure compliance

***Developing policy –** *Author: Cynthia D. Waddell, Juris Doctor, International Center for Disability Resources on the Internet (ICDRI). Contributors: J. E. Baker, L. McArthur, J. Silva, J. Treviranus, Adaptive Technology Resource Centre, University of Toronto; Susan Schorr, Head, Special Initiatives Division, ITU Telecommunication Development Bureau (BDT)*

- Introduction to developing policy

- Step 1: Identifying priorities – *Edited by Dónal Rice, Centre for Excellence in Universal Design, NDA. Centre for Disability Law and Policy, NUI-Galway, Ireland*
- Step 2: Disability policies approaches
- Step 3: Policy development
- Step 4: Policy examples from around the world – *Collated from referenced resources by Rebecca Schild, Centre for Internet and Society, Bangalore, India*

***Guides by Policy Area**

- Telecom/broadcasting
- Education
- Labor/social affairs
- Interior/homeland
- Health
- Transportation
- e-Government services
- Local government
- International cooperation
- Public procurement

***Annexes**

- Convention on the Rights of Persons with Disabilities
- Convention cont'd
- Why a Toolkit?
- Editorial team and contributors
- Tips on conducting accessible meetings and conferences
- Privacy policy and terms of service
- Accessibility

Useful Links

Additional information on the CRPD - http://www.un.org/disabilities/default.asp?navid=14&pid=150

Accessibility to ICT Products and Services by Disabled and Elderly People at http://ec.europa.eu/information_society/activities/einclusion/docs/access/comm_2008/framework.doc

Mainstreaming Disability in the Development Agenda at http://www.un.org/disabilities/documents/reports/e-cn5-2008-6.doc

eInclusion@EU Learning Examples: Accessible Procurement Toolkits Denmark, Canada and USA: Description and Synopsis at http://www.einclusion-eu.org/ShowAnalysisReport.asp?IDFocusAnalysis1-17

Information Communication Aids: http://www.ace-centre.org.uk/index.cfm?pageid=DB6B5FE3-3048-7290-FE18A6FAEAF27C9B

Information on accessibility of OS and content: http://www.bbc.co.uk/accessibility/accessibility_beta/

AT case studies: http://www.abilitynet.org.uk/

ISO/IEC Guide 71:2001 - Guidelines for standards developers that focus on addressing the requirements of older and disabled persons in the development of standards: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=33987

ISO/TR 22411:2008 Ergonomic data and ergonomic guidelines for the application of ISO/IEC Guide 71 to products and services: http://www.iso.org/iso/catalogue_detail?csnumber=40933

ISO/PAS 18152 (2003) Ergonomics of human-system interaction – Specification for the process assessment of human-system issues: http://www.iso.org/iso/catalogue_detail.htm?csnumber=38596

'Structuring Development Processes to Achieve Global Accessibility Compliance'(2008) (http://g3ict.com/images/user/files/765.pdf) by Roman Longoria, Ph.D., CPE Vice President, CA (requires registration on the G3ict website)

'ISO 9000 Quality Management System and Accessibility'(2008) (http://g3ict.com/images/user/files/763.pdf) Sean MacCurtain ISO/CASCO Secretary ISO International Organization for Standardization

e-Accessibility Toolkit article on accessibility and international standards development: http://www.e-accessibilitytoolkit.org/toolkit/eaccessibility_basics/standards_and_guidelines)

Information Society and e-Inclusion - European Commission Information Society Thematic Portal, includes section on e-Accessibility: (http://ec.europa.eu/information_society/activities/einclusion/index_en.htm)

Employment - European Commission Employment, Social Affairs and Equal Opportunities: (http://ec.europa.eu/social/main.jsp?catId=429&langId=en)

Public procurement - Mandate 376:
(http://ec.europa.eu/information_society/activities/einclusion/archive/deploy/pubproc/eso-m376/index_en.htm,
http://www.econformance.eu/euconformancereport.html)

ETSI Human Factors (HF); European accessibility requirements for public procurement of products and services in the ICT domain (European Commission Mandate M 376, Phase 1):
(http://portal.etsi.org/stfs/STF_HomePages/STF333/STF333.asp)

Biwako Framework: (http://www.worldenable.net/bangkok2003/biwako0.htm)

NIA: (http://old.nia.or.kr/special_content/eng/)

The United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)(http://www.unescap.org/about/index.asp)

Recommendation for Information and Communication Technology (ICT) Accessibility Guideline for Persons with Disabilities: http://www.itu.int/themes/accessibility/dc/

DCAD: http://www.itu.int/themes/accessibility/dc/

G3ict - The Accessibility Imperative (http://g3ict.com/resource_center/g3ict_book_-_the_accessibility_imperative), Digital Accessibility World Report: http://g3ict.org/resource_center/newsletterarchive) and Country profiles of CRPD signatories (http://dev.g3ict.com/resource_center/country_profiles)

POETA: http://www.trustfortheamericas.org/poeta.html

FCC Order on Section 255 (USA): http://www.fcc.gov/Bureaus/Common_Carrier/Orders/1999/fcc99181.pdf

FCC rules on hearing aid compatibility (USA): http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-68A1.doc

Voluntary charter signed by French operators, Disabled Persons Organizations, government and Regulatory Authority (in French): http://www.afom.fr/v4/STATIC/accesphandicapees/Handicapes.htm#charte

ITI VPAT, Voluntary Product Accessibility Template: http://www.itic.org/index.php?submenu=Resources&submenu=Resources&src=gendocs&ref=vpat&category=resources

UK Mobile Industry Good Practice Guide for Service Delivery for Disabled and Elderly Customers: http://g3ict.org/resource_center/publications_and_reports/p/productCategory_whitepapers/subCat_0/id_153

Apple: http://www.apple.com/iphone/iphone-3gs/accessibility.html

Motorola: http://direct.motorola.com/ens/accessibility/default.html

Nokia: http://www.nokiaaccessibility.com/

BlackBerry: http://na.blackberry.com/eng/support/devices/blackberryaccessibility/

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

Accesswireless.org: http://www.accesswireless.org/

Global Accessibility Reporting Initiative—Mobile Accessibility: http://www.mobileaccessibility.info/

User Requirements specified by persons with disabilities for access to digital radio: http://www.culture.gov.uk/reference_library/publications/5731.aspx

Accessible alerting recommendations: http://ncam.wgbh.org/invent_build/analog/alerts/

Design recommendations for accessible radio equipment needs for blind and partially sighted consumers: http://www.goldsmiths.ac.uk/i2/i2_RNIB_AreYouReallyListening.pdf

National Centre for Accessible Media: http://ncam.wgbh.org/

Ricability, Research and Information for Older and Persons with Disabilities: http://www.ricability.org.uk

Closed Captioning of Video Programming (U.S. Federal Communications Commission): http://www.fcc.gov/cgb/dro/caption.html

Access to TV for persons with hearing impairments, Broadcasting Public Notice CRTC 2007-54 (Radio and Television Commission Canada): http://www.crtc.gc.ca/eng/archive/2007/pb2007-54.htm

21st Century Communications and Video Accessibility Act 2008 - Proposed U.S. legislation mandating accessible IPTV and internet content (captions, descriptions), and accessible menu guides and user interfaces: http://www.coataccess.org/node/32

Prototype DTV solutions for TV stations emergency alerts: http://ncam.wgbh.org/onscreen/

Guidelines for creation and provision of broadcast captions, audio description and sign language: http://www1.bsc.org.uk/tv/ifi/guidance/tv_access_serv/guidelines/

A guide to Audio Description services and technology (Ofcom, U.K.): http://www.ofcom.org.uk/tv/ifi/tech/audiodescription/

Guidelines for the Description of Educational Media—American Foundation for the Blind (AFB) & Described and Captioned Media Program (DCMP): http://www.afb.org/Section.asp?SectionID=44&TopicID=338

EIA/CEA-608 (line-21 captions): closed-captioning standard for US NTSC (analog) broadcasts: http://www.ce.org/Standards/browseByCommittee_2523.asp

CEA-708-D: standard for DTV Closed Captioning (DTVCC) in the United States: http://www.ce.org/Standards/browseByCommittee_2525.asp

ATSC standard for U.S. TV and interactive services to be broadcast directly to handheld devices: http://www.atsc.org/cms/index.php/standards

Digital Video Broadcasting (DVB), international broadcast standards for transmission of digital television signals in the EU: http://www.dvb.org/technology/standards/. Handheld broadcast standards: http://www.dvb-h.org/technology.htm

Web Accessibility Initiative (WAI): WAI Timed Text Working Group, a non-proprietary text-display format for digital video transmissions: http://www.w3.org/TR/2006/CR-ttaf1-dfxp-20061116/

DTV / IPTV equipment, interface and controls - Accessible Television Guidelines: http://www.tiresias.org/research/guidelines/television/index.htm , http://www.tiresias.org/research/guidelines/remote.htm

Open IPTV Forum: Release 1 Specification, Volume 2 – Media Formats V1.0, 2009: http://www.openiptvforum.org/docs/Release1/OIPF-T1-R1-Specification-Volume-2-Media-Formats-V1_0-2009-01-06.pdf

Royal National Institute of Blind People (RNIB): Submission to Think Tank on Convergence and Accessibility: http://www.culture.gov.uk/Convergence/submissions/seminar5/RNIB-CTT-Convergence-and-accessibility.rtf

ITU Study Group 13: IPTV- Global Standards Initiative (GSI), ITU, 2007: http://www.itu.int/ITU-T/gsi/iptv/

ISO/IEC 24752 – a 5 part international standard on 'Universal Remote Console': http://www.iso.org/iso/catalogue_detail.htm?csnumber=42311

Vanderheiden, G. C., "Standards and Guidelines." In C. Stephanidis, (ed.) The Universal Access Handbook, (in press) CRC Press: http://bit.ly/9N9J1y

Section 508 of the Rehabilitation Act, 2000 - Electronic and Information Technology Accessibility Standards (Section 508): http://www.access-board.gov/sec508/standards.htm

Section 255 of the Telecommunications Act, 1998 - Accessibility Guidelines. (for telecommunications products and services): http://www.access-board.gov/telecomm/rule.htm

ITU-T Recommendation F.790 (01/2007): 'Telecommunications Accessibility Guidelines for Older Personas and Persons with Disabilities': http://www.itu.int/rec/T-REC-F.790-200701-I/en

ITU-T Recommendation P.370 (08/1996): 'Coupling Hearing Aids to Telephone sets': http://eu.sabotage.org/www/ITU/P/P0370e.pdf

ITU-T Recommendation E.161: 'Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network': http://electronics.ihs.com/document/abstract/IZOVWAAAAAAAAAAA

ETSI TR 102 974: 'Human Factors (HF); Telecommunications Relay Services, Background Information to ES 202 975'.

ETSI ES 202 975: Human Factors (HF); Harmonized Relay Services'.

IETF RFC 5194 (June 2008): 'Framework for Real-Time Text over IP Using the Session Initiation Protocol (SIP)': http://www.ietf.org/rfc/rfc5194.txt

'Telecommunications and Electronic and Information Technology Advisory Committee (TEITAC) Report to the Access Board: Refreshed Accessibility Standards and Guidelines in Telecommunications and Electronic and Information Technology', TEITAC (April 2008) http://www.access-board.gov/sec508/refresh/report/

W3C Web Content Accessibility Guidelines: http://www.w3.org/WAI/intro/wcag.php

W3C guidelines on developing websites for mobile users as well as persons with disabilities: http://www.w3.org/WAI/mobile

Mobile Web Best Practices (MWBP): http://www.w3.org/TR/mobile-bp/ ; http://www.w3.org/TR/mwbp-wcag/#contents

Accessible rich internet applications guidelines overview**:** http://www.w3.org/WAI/intro/aria

Canada: Common Look and Feel Standards for the Internet (CLF 2.0), mandatory for all institutions represented in Schedule I, I.1 and II of the Financial Administration Act: http://www.canadiansocialresearch.net/fed_clf.htm

Germany: the Barrier-Free Information Technology Ordinance (BITV). It mandates that all Federal government web pages and websites which are publicly accessible must be in conformity with its Priority Standards: http://www.einfach-fuer-alle.de/artikel/bitv_english/

New Zealand Government Web Standards 2.0 are mandatory for many public websites: http://www.webstandards.govt.nz/new-zealand-government-web-standards-2/

IT Accessibility Guidelines: Application Software (Centre for Excellence in Universal Design, Ireland: http://universaldesign.ie/useandapply/ict/itaccessibilityguidelines/applicationsoftware/guidelines

GNOME Desktop Accessibility Guide - Accessibility features of GNOME, the Linux-based operating system: http://library.gnome.org/users/gnome-access-guide/nightly/

ISO 9241-171 Ergonomics of human-system interaction Part 171: Guidance on software accessibility. Covers general design requirements, plus data input, data output (visual, audio, tactile) and documentation: http://www.iso.org/iso/catalogue_detail.htm?csnumber=39080

U.S. Rehabilitation Act Section 508 - Software Applications and Operating Systems (1194.21) - defines accessible software. It covers keyboard access, input focus, display (text, graphics, animation, colour), forms and accessibility features including user preferences: http://www.section508.gov/

IBM Software Accessibility Checklist - Version 3.5.1.: http://www-03.ibm.com/able/guidelines/software/accesssoftware.html

Microsoft Accessibility Developer Centre: http://msdn.microsoft.com/en-gb/accessibility/default.aspx

Adobe Acrobat Accessibility Centre: http://www.adobe.com/accessibility/products/acrobat/

KDE: Accessibility Project: http://accessibility.kde.org/

Freedom Scientific is one of the world's major developers and manufacturers of assistive software and hardware for those with visual impairments or learning difficulties: http://www.freedomscientific.com/default.asp

Public Access Terminal Guidelines, complied by the Centre for Excellence in Universal Design at the National Disability Authority, Ireland: http://www.universaldesign.ie/useandapply/ict/itaccessibilityguidelines/publicaccessterminals

Smart Card Accessibility Guidelines by the Centre for Excellence in Universal Design at the National Disability Authority, Ireland: http://www.universaldesign.ie/useandapply/ict/itaccessibilityguidelines/smartcards/guidelinesforsmartcardaccessibility/smartcardguidelines

Accessibility to ICT Products and services by Disabled and Elderly People Towards a framework for further development of EU legislation or other co-ordination measures on e-Accessibility: http://ec.europa.eu/information_society/activities/einclusion/docs/access/comm_2008/framework.doc

Simpson, Jenifer: Factors promoting broadband use by people with disabilities: http://www.dmd-aapd.org/TTPI/Broadband_Policies_and PWDs_by_Jenifer_Simpson.doc

Carey, Kevin: Broadband & Disability: BT 2006: http://www.btplc.com/Societyandenvironment/Ourapproach/CSRresources/Reports/Broadbandanddisability.pdf

Bowe, Frank G. and Schloss, Dr. Mervin Livingston: Universal Service and the Disability Community: The Need for Ubiquitous Broadband Deployment: http://www.benton.org/benton_files/Bowe.doc

LINDSTROM, JAN-INGVAR: Broadband use relevant to disabled and elderly people: A Scandinavian Perspective: http://www.tiresias.org/phoneability/broadband_for_all_proceedings/7.htm

Comreg, Eire, Phones and Broadband – A guide for people with disabilities and older people: http://www.o2online.ie/wps/wcm/resources/file/ebb9384ad124d6f/ComReg%20guide.pdf

TEDICORE: Submission to the ACMA Discussion Paper on the Strategies for Wireless Access: http://www.tedicore.org.au/documents/was.rtf

Digital Accessible Information System (DAISY) - a standard for digital talking books: http://www.niso.org/workrooms/daisy/

The International Digital Publishing Forum (IDPF) has developed standards for text based digital reflowable books and publications ("EPUB"): http://www.idpf.org/

Adobe's portable document format (PDF): http://www.adobe.com/accessibility/resources.html

Creative Commons provide for a more flexible licensing regime: http://creativecommons.org/

WIPO website on the issue of access to information and cultural content by reading-disabled persons: http://www.visionip.org

Brief summary of implications of the WBU proposal for a WIPO treaty for the reading disabled: http://www.cis-india.org/advocacy/ipr/blog/wbu-proposal-for-a-wipo-treaty-for-the-visually-impaired-and-reading-disabled

A Guide to Open Content Licences, Lawrence Liang: http://pzwart.wdka.hro.nl/mdr/research/olliang/open_content_guide/

American Foundation for the Blind site with information on accessible formats: http://www.afb.org/Section.asp?SectionID=4&TopicID=222&DocumentID=1224

Book Sharing Networks

- Bookshare.org. This online library converts books into alternate formats such as Braille, audio and electronic formats and distributes them to their members: http://bookshare.org

- Royal National Institute of Blind People (RNIB) (U.K.): http://rnib.org
- Tiflolibros is a Spanish language digital library for the blind: http://www.tiflolibros.com.ar
- Accessible features in Google Books: http://www.daisy.org/news/news_item.php?NewsId=322
- The Open Library Project: http://www.openlibrary.org

Examples of Accessible Websites:

- **Government websites**: U.S. Government Sec 508 website: http://www.section508.gov/
- U.K. Govt public services portal (WCAG 1.0 compliant): http://www.direct.gov.uk/en/index.htm
- **Private sector websites**: IBM - http://www-03.ibm.com/able/access_ibm/index.html
- **Banking**: Wells Fargo http://www.wellsfargo.com
- **Media websites:** BBC - http://www.bbc.co.uk
- **Education websites**: Harvard (WCAG 1.0 Priority 1 compliant): http://www.harvard.edu
- **Social networking sites**: LinkedIn - http://www.linkedin.com