



UNESCO Global Report

Opening New Avenues for Empowerment

ICTs to Access Information and Knowledge
for Persons with Disabilities

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February 2013

Published in 2013 by United Nations Educational,
Scientific and Cultural Organization (UNESCO)

7, place de Fontenoy, 75352 Paris 07 SP, Paris, France

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ISBN 978-92-3-001147-5

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Graphic design UNESCO

Printed at UNESCO/CLD - 395.13

Printed in France

PREFACE



Over one billion people – approximately 15 percent of the world's population – live with some form of disability. Facing a wide range of barriers, including access to information, education, health care and a lack of job opportunities, persons living with disabilities struggle every day to be integrated into society.

This is unacceptable, and UNESCO is taking a stand. To tackle these challenges, UNESCO has led a number of initiatives, including the 2013 Global Report, to empower persons with disabilities thanks to information and communication technologies. Our position is clear – information and communication technologies, along with associative technologies, can widen access to information and knowledge, so they must be accessible to all.

Building on the *United Nations Convention on the Rights of Persons with Disabilities*, the Global Report addresses strong recommendations to all stakeholders – from decision-makers to educators, civil society and industry – on how concretely to advance the rights of people living with disabilities. These recommendations draw on extensive research and consultations. Studies launched in five regions have allowed UNESCO to understand more clearly the conditions and challenges faced by persons with disabilities around the world.

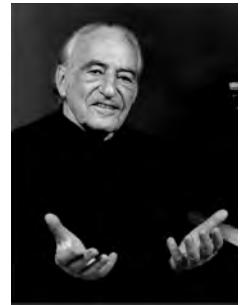
To empower persons with disabilities is to empower societies as a whole – but this calls for the right policies and legislation to make information and knowledge more accessible through information and communication technologies. It calls also for applying accessibility standards to the development of content, product and services. The successful application of such technologies can make classrooms more inclusive, physical environments more accessible, teaching and learning content and techniques more in tune with learners' needs. We need the commitment of all Government and stakeholders to make this a reality for all persons living with disabilities.

To build the inclusive knowledge societies we need for the century ahead, we cannot leave anyone aside. We must do everything to replace exclusion and discrimination with inclusion and empowerment – for this, we must harness the full power of information and communication technologies. This is our shared commitment, and this Global Report will help us move forward.

Irina Bokova

Director-General of UNESCO

FORWARD



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Communication and information are essential for the development of people and societies. It is thanks to the networks of connections which are established freely between individuals that a society is able to advance, as well as the personal development of individuals which makes it possible to increase the collective benefit of all those who form a society.

In light of this, special attention should be paid and necessary products and services should be created for persons with disabilities. The more totalitarian and repressive societies are, the more restricted access to information and knowledge is, as well as the application of rights to self-expression and opinion. In addition, special services and attention for the common good of society are limited. However, when a society is free and respectful of human rights, individuals have more solidarity, are open to work together and share information. As a consequence of this free exchange of information and knowledge, it should be possible to build a more inclusive society which can fully participate in the social, cultural and economic life, intellectually and culturally rich, and where people with different abilities, can take full advantage of Information and Communication Technologies.

Access to information and knowledge allows humans to contribute to social development where he or she can make better choices, and to share the richness with those around them. The conditions, special capacities and abilities of each individual to learn should never be an obstacle or an impediment to their individual development. On the contrary, it is the duty of all authorities to establish an enabling environment and provide special services to those who require them, keeping people with disabilities in mind. Such an inclusive society ensures that each person is valued as an equal human being.

I, therefore, warmly welcome UNESCO's publication titled "*Opening New Avenues for Empowerment: ICTs to Access Information and Knowledge for Persons with Disabilities*" which not only makes a major contribution to our understanding of disability, but also highlights technological advancement and shares good practices that have already changed the lives of people with disabilities. The publication also makes concrete recommendations for action at the local, national and international levels, targeting policy and decision makers, educators, IT&T industry, civil society and certainly persons with disabilities, which, I hope, will receive your deserved attention!

HE Mr Miguel Angel Estrella

UNESCO Goodwill Ambassador

ACKNOWLEDGEMENTS

This Global Report, Opening New Avenues for Empowerment: ICTs to Access Information and Knowledge for Persons with Disabilities, has been commissioned by the UNESCO Communication and Information Sector. It is a result of collaborative action among many researchers, public and private organizations, governmental bodies and civil society, and appreciation is extended to each of them.

The Report is based on the findings of five UNESCO regional studies carried out with the help of the following institutions and coordinating authors:

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UNESCO thanks the GAATES Foundation for its contributions and advice to the preparation of this report, particularly Ms Cynthia Waddell and Ms Betty Dion. Thanks also to Mr Jonathan Avila from SSB Bart Group.

UNESCO wishes to acknowledge the many individual contributors, experts, and advocates, who assisted in the gathering of survey data and in the preparation of the regional studies.

All those contributing their expertise and time to the peer review also deserve recognition. They include: Axel Leblois (G3ict), Luis Gallegos (Ambassador of Ecuador to the United Nations in Geneva, Switzerland), David Andrés Rojas M. and Vanessa Ramirez (The Trust of America, TRUST), Shadi Abou-Zahra (W3C/WAI), Bernhard Heinser (DAISY Consortium), Jan A. Monsbakken and Uma Tuli (Rehabilitation International, RI), Karsten Gerloff (Free Software Foundation Europe), Brian Nitz (Oracle), Kiran Kaja (Adobe), Katim S. Touray (Free Software Foundation for Africa), Sophie Gautier and Charles-H. Schulz (LibreOffice), Luiz M. Alves dos Santos (European Commission, EC), Arnoud van Wijk (Real-Time Task Force), Reinhard Weissinger (International Organization for Standardization, ISO), Kenneth Eklindh (UNESCO), Simon Ball (JISC TechDis).

The global summary report was edited by Ms Alison McKelvey Clayson.

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GLOSSARY

AAC	Augmentative and alternative communication
ADHD	Attention Deficit Hyperactivity Disorder
API	Applications Programming Interface
APPS	Software solutions designed to run on smartphones
AT	Assistive Technologies
ATAG	Authoring Tool Accessibility Guidelines
ATM	Automatic Teller Machines
CAFS	Conflict-affected fragile states
DAISY	Digital Accessible Information System
DRM	Digital Rights Management
EFA	Education for All
EPUB	Electronic Publication
FOSS	Free and Open Source Software
G3ict	Global Initiative for Inclusive Information and Communication Technologies
GPL	General Public License
GPS	Global Positioning System
ICTs	Information and Communication Technologies
IEC	International Electrotechnical Commission
IETF	Internet Engineering Taskforce
IFLA	International Federation of Library Associations
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
ITU	International Telecommunications Union
JAWS	Job Access with Speech
LMS	Learning Management System
MDG	Millennium Development Goals
M-PESA	Mobile-payments system
NGO	Non-Governmental Organization

NVDA	Non-visual Desktop Access
OATS	Open source assistive technology software
OCR	Optical character recognition
ODF	Open Document Format
OECD	Organisation for Economic Co-operation and Development
OER	Open Educational Resources
OLPC	One Laptop per Child Initiative
PWD	Persons with Disabilities
SADC	Southern African Development Community
SEN	Special Educational Needs
SMS	Short Message Service
TDD	Telecommunication device for the deaf
TPM	Technological Protection Measures
TVET	Technical Vocational Education and Training
UAAG	User Agent Accessibility Guidelines
UN	United Nations
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
UNDESA	United Nations Department of Economic and Social Affairs
UNDG	United Nations Development Group
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGAI	United Nations Global Alliance for ICT and Development
UNICEF	United Nations Children's Fund
UNIRIN	UN Integrated Regional Information Networks
TVET	Technical and Vocational Educational and Training
W3C	The World Wide Web Consortium
WAI	Web Accessibility Initiative
WCAG	Web Content Accessibility Guidelines
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WSIS	World Summit on the Information Society

EXECUTIVE SUMMARY



Person with disabilities working in SAMU (Emergency Services) in São Paulo, Brazil.

This Report builds on five regional reports commissioned by UNESCO to look at the use of ICTs to access information and knowledge by people with disabilities (PWD).



Section 1 sets the context of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), and the extent to which the Convention has been adopted since 2006 and has stimulated governments around the world to prioritize and mainstream the needs of persons with disabilities (PWD). It also notes the scales at which innovation is now occurring in ICTs for PWD from the local to the multi-national level. The chapter develops the specific contexts of ICTs, of access to information and knowledge, and then addresses the complex challenge of identifying 'disabilities' and producing policy interventions to meet the educational requirements of persons having special needs. The Regional Reports are then introduced with their high-level indications of needs and activities, and following that the ways in which innovative approaches are being developed is documented.



Section 2 looks in more detail at the overall conclusions emerging from the Regional Studies and then builds them into 18 high-level policy recommendations for action. A key feature emerging from these reports is the degree to which the UNCRPD has made an impact across the regions by encouraging governments to 'mainstream' the needs of PWD in their strategies and policies. However, the extent to which governments have mainstreamed needs is uneven, and significant challenges remain. These range from societal prejudice against people with disabilities, to a lack of training and understanding among educators, challenges for these people in securing work in the labour market when they finish their education, and more fundamental ICT issues such as a lack of broadband infrastructure in addition to inadequate capacity, content and tools in local languages. However, there has been significant progress in adopting the Convention, and the rights and needs of PWD have achieved increased visibility. What also emerged was that in many locations where governmental processes were moving gradually, there was significant entrepreneurial action and innovation taking place at local level in the use of ICTs for persons with disabilities. These developments are considered in section 5.



Section 3 takes the high-level outcomes from the previous sections and shows the complex interactions that are needed between information, education, ICTs and the needs of PWD. A good example is the rapid adoption of mobile telephones in both developed and developing economies. Mobile phones (both older technologies and newer 'smartphones') have allowed many communities to 'leapfrog' many of the legacy issues of old and inefficient land-line infrastructures. Section 5 devotes special attention to the business and more local-level innovations that have occurred, showing how they can complement higher-level policy developments stimulated by the Convention, and leading to a partnership approach where civil society and government work together to promote inclusive education for PWD, and particularly in the context of this study, where ICTs are used.



Section 4 details the range of innovative adaptations of ICTs that were used by projects and applications across the regions, in particular those identified in the Regional Studies.



Section 5 summarizes the global outcomes and offers tools for readers to explore further through a structured set of Web links and a detailed bibliography.



Section 6 provides additional structured links to Internet resources that focus on PWD, communication and information, education, and ICTs. These cover many areas of interest, ranging from policy, case studies, ICTs, educational levels, specific applications, such as libraries), and bring together information about the UN organizations that are contributing to the rights of persons with disabilities.



Section 7 contains a detailed bibliography.

1 CONTEXT



© Nevada Center for Excellence in Disabilities (NCED) and Enabled Nevada, University of Nevada, Reno (USA).

1.1 Purpose and Scope of the Report

The overall aims of this report are:

- ▶ To provide governments, civil society, industry, academia and other groups with an insight into the use of Information and Communication Technologies (ICTs) by persons with disabilities to access information and knowledge around the world;
- ▶ To present an overview and critical assessment of existing information policies and strategies as well as challenges and advantages in using ICTs to access information and knowledge for persons with disabilities;
- ▶ To identify practices at local, national and global levels on effective application of ICTs by persons with disabilities to access information and knowledge;
- ▶ To foster future frameworks on the use of ICTs to access information and knowledge of persons with disabilities (PWD); and
- ▶ Based on the best available information and analysis, to make recommendations for strategy formulation, action-oriented initiatives and new synergies at national, regional and international levels.

It is expected that the report and recommendations proposed will guide UNESCO and its Member States in developing better strategies, policies and legislation, as well as raise awareness of the importance of addressing disability. It aims to encourage new action-oriented partnerships among various public and private stakeholders.

The report is targeted specifically towards:

- ▶ Policy and decision makers;
- ▶ Local, regional and national educational institutions;
- ▶ Teachers, education and information professionals;
- ▶ Associations and organizations working with persons with disabilities;
- ▶ ICT professionals and industry; and
- ▶ Others interested in ICTs and social inclusion of persons with disabilities.

Figure 1.1.: Focus

The report uses as its primary resource five regional studies commissioned by UNESCO. It introduces additional material to build an overview and critical understanding of the use of ICTs to access information and knowledge and to inform both in policy and practice with regard to PWD.

There is a particular focus on policy and the ways in which the policy is enabling practice, but there also is a complementary focus on the ways in which ICTs are enabling tools for innovative practice by various stakeholders at the local, national, regional and global levels (Figure 1.1.: Focus).

Attention to policy is important in understanding the extent to which governments and governance processes are addressing the needs of PWDs to access information and knowledge. Policy is a critical enabler, and it can create a legislative, regulatory and inclusive context in which interventions can be made on a widespread basis.

By contrast, innovation at the local level can have significant local impacts, but its benefit is greatest when innovations can be scaled up to national and international levels through policy frameworks:

Legislative environment	Regulatory environment	Inclusive context
A legislative environment can formally acknowledge that a disability exists.	A regulatory environment can create conditions for innovation – for example by enabling content to be provided through electronic channels without additional copyright and licensing negotiations	An inclusive context sends a powerful message that there is a commitment by government, public and private sector and other stakeholders (ideally through resources and finance) to enable a widespread intervention

Without such a context interventions for PWD could be limited to ad-hoc or to local market-led or small-scale initiatives. So, policy interventions at the global level have tremendous significance and are led by the United Nations.

First, through the United Nations Convention on the Rights of Persons with Disabilities¹ (UNCRPD), a universal framework reaffirming that all persons with any type of disabilities are entitled to all human rights and fundamental freedoms². By ratifying the UN Convention, the State Parties express their commitment to reasonably accommodate the needs of their citizens with disabilities by making the necessary and appropriate measures, modifications and adjustments in their strategies, policies and practices³. The report is primarily focused on the following UN Convention Articles: Article 9 (Accessibility), Article 21 (Freedom of expression and opinion, and access to information) and 24 (Education); as well as acknowledging Articles 6 (Women with disabilities), 8 (Awareness-raising), and 32 (International cooperation).

Second, through collaborative activities across its member countries, UNESCO is able to share good practice and technological advances, provide a benchmarking process to see how the UN Convention is being adapted and implemented at country level by public and private partners, understand how the landscapes of intervention are emerging in countries, and synthesize overall trends.

The combined focus on governance and civil society development is complementary to the goals of the UN Convention. As this report will emphasize, PWD are seen as passive members of society, but as active contributors and creators of knowledge and users of ICTs in all spheres of life⁴. There is real value for the economy and society in maximizing the inclusion of persons with disabilities⁵. Furthermore, on-going developments in ICTs increasingly bring the innovation landscape closer to persons with disabilities than before, particularly through the ICT channel of mobile phones⁶. The potential for technological development opens new avenues for social inclusion, learning, employment and participation of PWDs in society, particularly where ICT interventions are holistic – for example by involving

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1. UN. (2006). *Convention on the Rights of Persons with Disabilities*. United Nations, December 6, [accessed 9 October, 2012]. <http://www.un.org/esa/socdev/enable/rights/convtexte.htm>
 2. G3ict. (2007). *The Accessibility Imperative: Implications of the Convention on the Rights of Persons with Disabilities for Information and Communication Technologies*. Global Initiative for Inclusive Information and Communication Technologies, [accessed 15 November 2012]. http://g3ict.com/resource_center/publications_and_reports/p/productCategory_books/id_118
 3. UNCRPD also interacts with other international normative instruments such as Charter of the United Nations, Universal Declaration of Human Rights and in the International Covenants on Human Rights, International Covenant on Economic, Social and Cultural Rights, the International Covenant on Civil and Political Rights, the International Convention on the Elimination of All Forms of Racial Discrimination, the Convention on the Elimination of All Forms of Discrimination against Women, the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment, the Convention on the Rights of the Child, and the International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families.
 4. NEF. (2012). *Local innovations for disabled people*. New Economics Foundation, October 11, [accessed 4 November 2012]. <http://neweconomics.org/publications/doing-services-differently>
 5. Ashington, Nicola. (2010). *Accessible Information and Communication Technologies Benefits to Business and Society*. OneVoice for Accessible ICT, [accessed 15 September, 2012]. <http://www.onevoiceict.org/sites/default/files/Accessible%20ICT%20-%20Benefits%20to%20Business%20and%20Society.pdf>
 6. G3ict. (2012g). *Making Mobile Phones and services accessible for Persons with disabilities*. Global Initiative for Inclusive Information and Communication Technologies, August, [accessed 26 September 2012]. http://www.itu.int/ITU-D/sis/PwDs/Documents/Mobile_Report.pdf

families and communities in the education process⁷. Certain trends, such as reduced costs to access mobile phones and mobile internet, have significantly empowered individual people including those with disabilities, along with businesses, and NGOs to develop new types of services and products in countries where previously governments were the main providers, or where governments had limited resources and capacities.

For example, in Kenya a group of students developed the eHealth information and resources initiative:

“... that will let thousands of Kenyan health workers use mobile phones to report and track the spread of diseases in real time—and they'd done it for a tiny fraction of what the government had been on the verge of paying for such an application.”⁸

Many other African countries have seen mobile phone and mobile internet usage expand dramatically as costs have decreased and governments have de-regulated access. Other developments include a mobile-payments system (M-PESA), where funds can be transferred securely and at low cost, local virtual innovation hubs⁹, and ‘crowd-sourcing’ approaches that can include mass micropayments in support of causes such as crisis relief¹⁰. That development not only improves the life of all citizens, but also facilitates access for persons with disabilities to enter the workplace and benefit from those services and products if they are accessible.

Governments play an important role in enabling local developments by creating a favourable regulatory environment within which the ‘infrastructure’ to encourage innovation is widely accessible and made affordable through competition. For example, in Botswana:

The government has embarked on a public-private partnership with the country's biggest mobile phone company, Mascom, to bring advanced data, web and voice services to 42 villages. It's part of a wider programme to connect 197 villages to communication services.”¹¹

The centres are known as ‘Kitsong Centres’, and are usually operated by local entrepreneurs who know local demands and have a direct interest in encouraging the development of local services. They can

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7. ITU. (2011a). *Connect a School, Connect a Community Toolkit Module 4: Using ICTs to promote education and job training for persons with disabilities*. International Telecommunications Union [accessed 1 September 2012]. http://www.itu.int/ITU-D/sis/Connect_a_school/Modules/ES/ES04.pdf
- , ITU. (2012a). *Connect a School, Connect a Community*. International Telecommunications Union, [accessed 2 September 2012]. <http://connectaschool.org/>
8. Talbot, David. (2012c). *Kenya's Startup Boom*. Technology Review, March, [accessed 23 February 2012]. <http://www.technologyreview.com/communications/39673/>
9. ECONOMIST. (2012). *Innovation in Africa: Upwardly mobile*. Economist, August 25, [accessed 2 August 2012]. <http://www.economist.com/node/21560912>
- , Talbot, David. (2012a). *African Social Networks Thrive in a Mobile Culture*. Technology Review, April 19, [accessed 20 April 2012]. <http://www.technologyreview.com/computing/40250/>
10. Anon. (2012j). *Rwanda: Mobile Phone Cash Transfer Assists Rebuild Haiti*. The New Times (Rwanda), March 3, [accessed 9 March 2012]. <http://allafrica.com/stories/201203040122.html>
11. Cossou, Egan. (2011). *Botswana bets on technology to save rural economies*. BBC, August 2, [accessed 25 August 2011]. <http://www.bbc.co.uk/news/business-14328157>

be considered as an extra community education resource that also supplement Botswana's specific initiatives in ICTs for education¹².

However, local-level innovation cannot realistically replace the efficient implementation of policy at the national level. Education and information for all need to be delivered country-wide, not just selectively to those who can afford to pay for a service or product. So the UNESCO focus, where rights to a service necessarily drive the need for policy frameworks that provide access to information and knowledge for all, remain a priority consideration for this report.

But, while acknowledging the centrality of policy the report also acknowledges that the situation is very fluid, with new alliances (such as the public-private partnership noted above in Botswana), new locally-led innovations, and a much more open information landscape where social networks and related communication channels enable local actors to communicate directly with others without the mediation of national government or even international organizations.

The UN Convention of the Rights of Persons with Disabilities provides a global reference point for governments to enable access to information and knowledge using ICTs for PWDs.

1.2 Terms and Context - ICTs

This report addresses the current status of access to information and knowledge through Information Communication Technologies (ICTs) of persons with disabilities (PWD). It therefore deals with the intersection of three major policy themes where the definitions of each are seldom clear-cut.

First, while there is a large literature on the use of ICTs more generally in accessing information and knowledge in various areas such education (for example regional studies in their use¹³, the value of mobile learning¹⁴, open source educational content¹⁵, and collaborative learning¹⁶) how do we identify which ICTs are being used for educational interventions for PWDs? In many definitions of ICTs there is now an emphasis on convergence¹⁷ of hardware (phones, screens, keyboards, cameras, and

12. Kgokwe, Bore P. (2012). *ICT for Education: Botswana, Malawi, Namibia*. Ministry of Education & Skills Development, Botswana, January, [accessed 2 September 2012]. <http://africanbrains.net/edusa/wp-content/uploads/2012/01/Botswana-Presentation.pdf>

13. INFODEV, 2009 #39988]

14. UNESCO. (2012k). *Mobile Learning and Policies: Key Issues to Consider*. UNESCO, September 27, [accessed 9 October 2012]. http://www.unesco.org/new/en/unesco/themes/ict/single-view/news/mobile_learning_and_policies_key_issues_to_consider/

15. UNESCO. (2012l). *Open Educational Resources in Non-English-Speaking Countries*. UNESCO, [accessed 9 October 2012]. <http://iite.unesco.org/publications/3214703/>

16. UNESCO. (2012e). *Crowdsourcing for education*. UNESCO, October 8, [accessed 9 October 2012]. http://www.unesco.org/new/en/unesco/themes/ict/single-view/news/crowdsourcing_for_education/

17. Singh, Rajendra, and Siddhartha Raja. (2010). *Convergence in information and communication technology: strategic and regulatory considerations*. World Bank, [accessed 4 September 2012]. http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/Convergence_in_ICT.pdf

computational power), and increasing access to networks. As the International Telecommunications Union (ITU) notes: "New information and communication technologies (ICTs) continue to penetrate countries in all regions of the world, as more and more people are getting connected"¹⁸.

It its 2012 Global Review the ITU emphasizes the rapid technological development in mobile phones and smartphones, the expansion of broadband (fixed and mobile) availability and pricing strategies, and the resulting wider uptake of Internet usage and the innovative services and products that can be developed. Indeed, modern mobile phones have more computing power in them than many main-frame computers of the past. They have cameras, keyboards, high-definition screens, can connect to GPS satellite signals to monitor location, and are increasingly robust, which allows them to be used easily in environments that previously were 'hostile' to computers.

Entrepreneurs are even finding innovative ways to make older-generation phones function like smart phones in India, for example, to provide "*location data to phones without access to GPS via a little-known feature of mobile networks known as the Cell Broadcast Service (CBS)*"¹⁹. Even the problem of re-charging a phone from a source of electricity could be overcome through innovations where "*taking a stroll may soon be enough to re-charge your mobile phone, after American researchers developed a way to generate electricity from human motion. Placed in a shoe, the device captures the energy of moving micro droplets and converts it into electrical current.*"²⁰

Such ICT innovations show that features that hitherto have required infrastructure investment (electricity production and distribution equipment) in the future may become more trivial challenges. The same is happening with disability and ICTs, for example through advances with bionics and 'exoskeletons'²¹ that enable paralyzed people to 'walk' through environments that would otherwise have been inaccessible to them. Such developments may mean that adapting some building for persons with disabilities may become easier with the help of ICTs that increase mobility.

So, any fixed definition of ICTs is not particularly helpful in this context, because the rapid rate of innovation and the convergence of devices will render a definition obsolete. Instead there is more sense in focusing on the **inclusive** emphasis of the ITU and UNESCO Broadband Commission for Digital Development²² and in the 2011 Report 'Broadband, a platform for progress' there were specific benefits identified when using ICT for PWD:

*"Moreover, universal access to broadband will increase the development of **local content**, and contribute to the burgeoning of **local ICT economies and enterprises**. Continuously expand-*

18. ITU. (2012e). *Measuring the Information Society 2012*. International Telecommunications Union, [accessed 14 September 2012].

http://www.itu.int/ITU-D/ict/publications/idi/material/2012/MIS2012_without_Annex_4.pdf

19. Aron, Jacob. (2012). *GPS workaround helps make dumb phones smart*. New Scientist, September 27, [accessed 4 October 2012]. <http://www.newscientist.com/article/mg21528844.600-gps-workaround-helps-make-dumb-phones-smart.html>

20. Moskitch, Katia. (2011). *Mobile phones could soon be 'powered by walking'*. BBC, August 24, [accessed 24 August 2011]. <http://www.bbc.co.uk/news/technology-14647639>

21. Chen, Brian X. (2012). *New Breed of Robotics Aims to Help People Walk Again*. New York Times, September 11, [accessed 12 September 2012]. <http://www.nytimes.com/2012/09/12/technology/wearable-robots-that-can-help-people-walk-again.html>

22. <http://www.broadbandcommission.org/>

ding networks — based on broadband Internet and other ICT advances — will stimulate **new forms of human association** of unprecedented scale and flexibility, spanning cities, nations and cultures. Very importantly, broadband connectivity can significantly **increase the independence of women and men with disabilities**, so their needs should be taken into account in designing and implementing Internet infrastructure at all levels (backbone, distribution, user facilities and access devices)²³.

Figure 1.2.: Context



This is important, because it takes the emphasis away from ‘what are the technologies?’ to the more important question of **‘how are current and emerging technologies being made more accessible, affordable and relevant’** for particular target groups? A significant recent change has been the shift in the design of mainstream ICTs to incorporate accessibility (a shift away from design for those without disabilities to cover those with disabilities – Assistive Technologies) and user functionalities for the widest number of users while at the same time focusing also on **personalization of the technologies** to address the particular disability characteristics of individuals (Figure 1.2.: Context). The UNESCO/Microsoft Report specifically recommended “enabling students to ‘self-accommodate’ by learning the computer features that best suit their needs: The ability to personalize technology to suit one’s preferences and needs is a life-skill that will benefit students as they progress through the educational system”²⁴.

Then, the issue of ‘what are ICTs’ becomes more important in evaluating, benchmarking and developing indicators, where there needs to be a clear ‘harmonised’ acceptance of what is being measured. For example, the Organisation of Economic Cooperation and Development (OECD) has a broad definition that covers 10 broad categories and 99 products within them. The 10 broad categories in the 2009 OECD definition are:

“Computers and peripheral equipment; Communication equipment; Consumer electronic equipment; Miscellaneous ICT components and goods; Manufacturing services for ICT equipment;

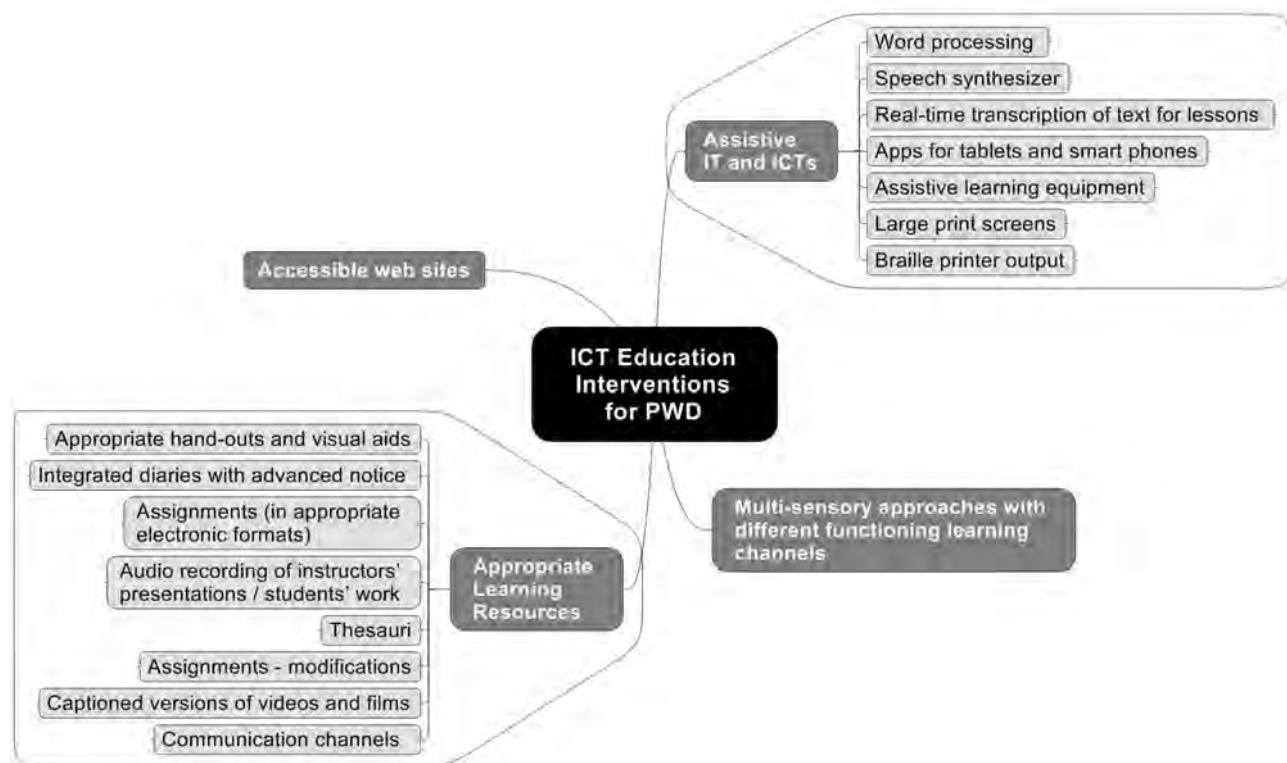
23. ITU. (2011c). *Report 2 - Broadband, a Platform for Progress*. International Telecommunications Union, June, [accessed 7 July 2011]. <http://www.broadbandcommission.org/#outcomes>

24. UNESCO. (2012p). *UNESCO launches meeting report on accessible ICTs for students with disabilities*. UNESCO, March 1, [accessed 15 August 2012]. http://www.unesco.org/new/en/communication-and-information/resources/news-and-in-focus-articles/all-news/news/unesco_launches_report_on_accessible_icts_for_students_with_disabilities/

Business and productivity software and licensing services; Information technology consultancy and services; Telecommunications services; Leasing or rental services for ICT equipment; and, Other ICT services²⁵.

The extent to which ICTs can enable and accelerate inclusion is therefore highlighted in this report. Figure 3.1 offers an example of the **diversity of potential ICTs** included in the range of educational strategies used at Johns Hopkins University in the USA²⁶:

Figure 1.3.: ICT Education Interventions for PWD*



Adapted by M. Blakemore from Johns Hopkins University, USA

- * 1. Assistive IT and ICTs: (i) Word processing (spell-checker, word prediction, keyboard/mouse modification), (ii) Speech synthesizer, (iii) Real-time transcription of text for lessons with an instructor using a microphone, (iv) Apps for tablets and smart phones, (v) Assistive learning equipment, (vi) Large print screens, (vii) Braille printer output. 2. Accessible web sites. 3. Multi-sensory approaches with different functioning learning channels. 4. Appropriate Learning Resources: (i) Appropriate hand-outs and visual aids, (ii) Integrated diaries with advanced notice of class schedule and/or room changes, (iii) Assignments available in appropriate electronic formats, (iv) Audio recording of instructors' presentations and of students' work, (v) Thesauri, (vi) Assignments - modifications (use of a computer with voice synthesizer), (vii) Captioned versions of videos and films, (viii) Communication channels (e-mail, fax, word processor for discussions with the instructor).

25. OECD. (2009). *Information Economy Product Definitions Based on the Central Product Classification (Version 2)*. OECD, June, [accessed 2 September 2012]. <http://www.oecd.org/science/scienceandtechnologypolicy/42978297.pdf>

26. <http://web.jhu.edu/disabilities/faculty/guidelines.html>

And this is by no means an exhaustive list. Such ICT interventions also need to fit into the other contexts of the learning environment, including the role of the teacher. In this context the critical factor will be **the ability of the teachers to utilize ICTs to engage effectively with people having a wide range of disabilities, assuming** they have been able to recognize that the disabilities require particular educational interventions. Training of teachers, other educators (for example support staff) or librarians is a frequently cited need by countries in Africa. Are teachers trained to use different communication forms, do they know sign language, can they vary teaching styles to meet the needs of PWDs, is the physical layout of the teaching environment suitable, or can different learning strategies and environments be used?

In summary, for successful benchmarking and evaluation it is important to have a clear idea of what ICTs are. However, even in an evaluation context the link between ICTs, PWDs, and access to information and knowledge is on the **outcomes**. In this Report the 'definition' of ICTs emphasizes inclusiveness, but it also covers ICT policies and regulations insofar as these affect the development of ICT-led interventions for persons with disabilities.

ICTs must be considered in the broadest sense, from regulation and competition, to inclusive policies, and to devices and applications that are of relevance to PWDs.

1.3 Terms and Context – Access to information and knowledge

Access to **information and knowledge** is taken in the broadest sense in this report to mean: accessing, evaluating and maintaining information for the creation and diffusion of knowledge using appropriate technologies to build **inclusive, pluralistic, equitable, open and participatory Knowledge Societies**²⁷. In its 'Knowledge Society Report' of 2005 UNESCO identified information and knowledge as the primary resources for individual development, social engagement and economic growth addressing existing challenges such as inequity and exclusion²⁸. Indeed, it is difficult to build inclusive knowledge societies (as envisioned by the WSIS, MDGs and other relevant international commitments) if society's policies and programmes, as well as products and services, do not meet the needs of persons with disabilities. Relevant information and knowledge are core elements for being able to deliver the **Education for All** goals with its three thematic pillars: *i) every child in school, ii) quality education and iii) global citizenship*²⁹, about whether basic education should be free and compulsory, and importantly looking broadly at:

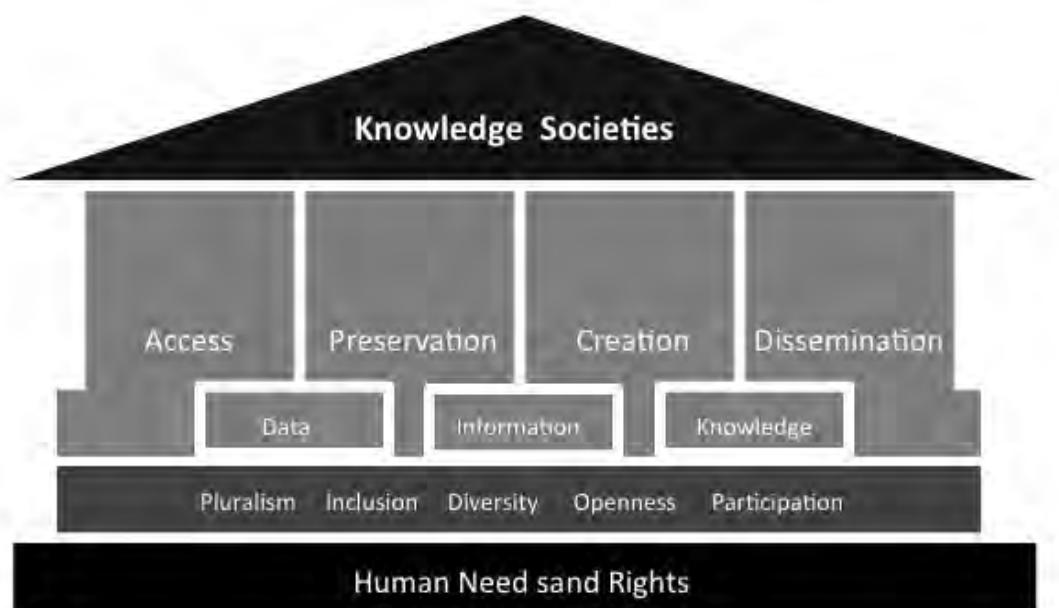
27. <http://www.unesco.org/new/en/communication-and-information/>

28. UNESCO. (2005a). *Towards Knowledge Societies*. UNESCO, [accessed 2 September 2012]. <http://unesdoc.unesco.org/images/0014/001418/141843e.pdf>

29. Narayan, Swati. (2012). *Education for All: Beyond 2015. Mapping Current International Actions to Define the Post-2015 Education and Development Agendas*. UNESCO, June, [accessed 12 September 2012]. <http://unesdoc.unesco.org/images/0021/002179/217935e.pdf>

- Forms of education and basic education: formal as well as non-formal education, and literacy and adult education as an essential component of basic education. The concept of education throughout life is crucial³⁰.

Figure 1.4.: Knowledge societies*



* 1 level: human needs and rights; 2 level: pluralism, inclusion, diversity, openness, participation; level 3: data, information, knowledge; level 4: access, preservation, creation, dissemination; level 5: knowledge societies.

A crucial factor then is that information and knowledge are gained at all stages of life through '**life-long learning**', which the UNESCO Institute for Lifelong Learning (UIL) emphasizes "*is to see to that all forms of education and learning – formal, non-formal and informal – are recognized, valued and available for meeting the demands of individuals and communities throughout the world*"³¹. In other words, persons with disabilities are not just children with disabilities in the education context, but **learners at any stage of life**. It also acknowledges that learning is not something that is exclusively undertaken in formal educational settings, but can occur in any context. As this report will show, ICTs can assist education at all stages of life and in all contexts.

UNESCO also promotes inclusive education in its broadest sense, arguing from the position of fundamental rights where an "*inclusive system benefits all learners without any discrimination towards any individual or group. It is founded on values of democracy, tolerance and respect for difference*"³².

30. UNESCO. (2007). *Operational Definition of Basic Education*. UNESCO, [accessed 25 September 2012]. <http://www.unesco.org/education/framework.pdf>

31. <http://uil.unesco.org/about-us/news-target/mission/9eab8155976eb1c9613a0c56a4d22e99/>

32. UNESCO. (2012m). *Ten questions on inclusive education*. UNESCO, October, [accessed 9 October 2012]. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/10-questions-on-inclusive-quality-education/>

The **complexity of the education contexts** required to deliver inclusiveness was detailed in a study of educational programmes for PWD in South Africa, where the overall conclusion was:

*"The study has revealed some of the **complexities** involved in the **relationship between disability, education and participation in society** through meaningful employment. In order to achieve the intentions of the CRPD it is however necessary that interventions into the education system to improve the quality and the relevance goes hand in hand with research that can generate further **knowledge on barriers and facilitators** for disabled youth to participate fully"³³.*

The final emphasis on barriers is crucial to better understanding the education context, for there are barriers to inclusive education, the business and public sectors and others which pertain specifically to PWD. A study of education and skills of PWDs in Sri Lanka, Kenya, Sierra Leone, and China recommended that a greater effort was needed to:

1. **Create mechanisms for cross ministry coordination;**
2. **Build stronger links between education providers, TVET providers and business/employment sector, including incentives for apprenticeships that lead to employment and stronger links between TVET and local labour market requirements;**
3. **Better understand the needs of youth with disabilities within education and TVET institutions**"³⁴.

The picture so far suggests a complex and multi-themed landscape when the education of PWDs is addressed, quite independently of how ICTs can enhance the process. Despite the fact noted in the next section that people with disabilities are the largest group of citizens most at risk of social and labour market exclusion, there are few countries that have a dedicated ministry. Those that do include: the UK, which has a Minister for Disabled People³⁵, India which has its Office of The Chief Commissioner for Persons with Disabilities³⁶, South Africa has a Department for Women, Children and People with Disabilities³⁷, and New Zealand, which has a Minister for Disability Issues within the Ministry of Social Development³⁸.

In most cases, therefore, **interventions for disabled people happen across multiple agencies/ministries of government**. The fact that interventions are multi-agency, and that different governments have different structures of ministries etc., means that there is even more value in global organizations such as UNESCO providing structured access to information, knowledge and good practice – there is no single organizational model that can be applied to all countries, but the need for holistic interventions is clearly applicable in all contexts.

33. Elde, Arne H. (2012). *Education, employment and barriers for young people with disabilities in southern Africa*. UNESCO, [accessed 25 September 2012]. http://www.unesco.org/ulis/cgi-bin/ulis.pl?catno=217877&set=508FDC44_3_49&gp=1&lin=1&ll=1

34. Kett, Maria. (2012b). *Skills development for youth living with disabilities in four developing countries*. UNESCO, August, [accessed 25 September 2012]. http://www.unesco.org/ulis/cgi-bin/ulis.pl?catno=217882&set=508FE00C_2_35&gp=1&lin=1&ll=1

35. <http://odi.dwp.gov.uk/about-the-odi/the-minister-for-disabled-people.php>

36. <http://www.ccdisabilities.nic.in/>

37. <http://www.dwcpd.gov.za/>

38. <http://www.odi.govt.nz/>

Providing relevant and effective access to information and knowledge for PWDs does not just include ICTs, although ICTs are the core consideration of this report. Other aspects include the capacities of teachers to use Assistive Technologies (AT) and ICTs, and to supply students with adapted textbooks in their local language. In that context UNICEF emphasizes wider issues of **classroom inclusion, accessibility to buildings, and teaching and learning techniques**.³⁹ It asks the following specific questions about information access for children with disabilities:

- ▶ Are students with disabilities included in regular education classes?
- ▶ Are books provided in Braille or on tape to students that need them?
- ▶ Are audio or visual devices equipped with captions for students with hearing impairments?
- ▶ Are books with large text provided for students with visual difficulties?
- ▶ Is information provided in a format that is easy to understand?
- ▶ Are supports and services provided to students with disabilities as needed?
- ▶ If information is not available in Braille, are peer supports available to read/describe materials?
- ▶ Is digital/computer equipment accessible (physical facilities, hardware, software, Internet)?⁴⁰

At that point the wider educational challenges are being linked to the ICT processes, and they now interact with the most complex of the three themes being considered in this report, that of **who is disabled, and what ICT and interventions do they need in order to access information and knowledge?** That is the particular focus of UNESCO through activities such as research through the UNESCO Institute for Information Technologies in Education (IITE) which promotes "*a broader view of the concept of inclusive education, {and} provides support to the policy dialogue and initiates the development of national e-inclusive strategies.*"⁴¹

The interventions are needed more than just **policy frameworks** (which enable actions and provide them with an organizing framework) and **technologies** (from Internet access to assistive and relevant technologies), but importantly include **content** (curricula, software etc.) and capacity building. **The most sophisticated ICT infrastructure is of little utility unless the relevant content is delivered inclusively to the users (PWDs) and through channels and in formats that are most suited to them** (Figure 1.5.: Interventions). In that context ICT developments move to the availability of content

39. UNICEF. (2009). *It's About Ability: Learning Guide on the Convention on the Rights of Persons with Disabilities*. UNICEF, May, [accessed 15 September 2012]. http://www.unicef.org/publications/files/its_AboutAbility_Learning_Guide_EN.pdf

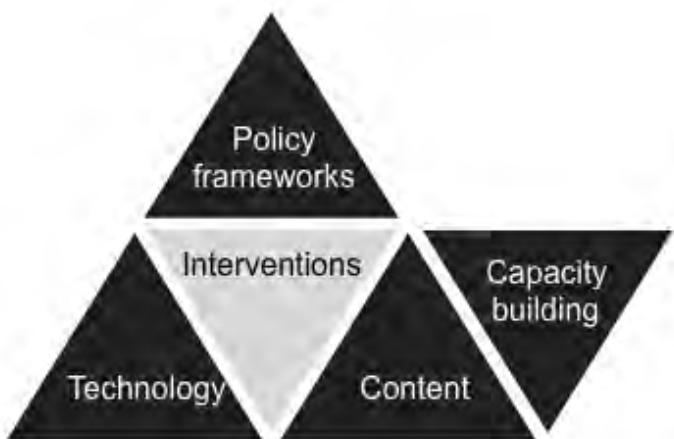
40. Ibid.
, ibid.

41. UNESCO. (2012o). *UNESCO IITE Policy and Research ICT in education for people with disabilities*. UNESCO, [accessed 9 October 2012]. http://iite.unesco.org/policy_and_research/icts_in_special_needs/

and curriculum, for example through FOSS⁴², Free and Open Source Software (programmes and applications – apps, and collaborative building of content and applications through the process of crowdsourcing⁴³.

From a policy viewpoint education encounters a fundamental inclusion dilemma. Should people with disabilities be educated within the mainstream education system, or do they need specialized education programmes?

Figure 1.5: Interventions*



* Interventions: (i) policy frameworks, (ii) technology, (iii) content, and (iv) capacity building.

Article 24 of the UNCRPD states simply that:

"States Parties recognize the right of persons with disabilities to education. With a view to realizing this right without discrimination and on the basis of equal opportunity, States Parties shall ensure an inclusive education system at all levels and lifelong learning"⁴⁴.

Article 9 of the UNCRPD indicates 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".

Within these Articles there are clear expectations that PWD will have access to information and knowledge, that teachers should be trained in educating PWD and AT will be used (and this will be identi-

42. UNESCO. (2012i). *Free and Open Source Software (FOSS)*. UNESCO, October, [accessed 9 October 2012]. <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/free-and-open-source-software-foss/>, UNESCO. (2012l). *Open Educational Resources in Non-English-Speaking Countries*. UNESCO, [accessed 9 October 2012]. <http://iite.unesco.org/publications/3214703/>

43. UNESCO. (2012e). *Crowdsourcing for education*. UNESCO, October 8, [accessed 9 October 2012]. http://www.unesco.org/new/en/unesco/themes/ict/single-view/news/crowdsourcing_for_education/

44. UN. (2006). *Convention on the Rights of Persons with Disabilities*. United Nations, December 6, [accessed 9 October 2012]. <http://www.un.org/esa/socdev/enable/rights/convtexte.htm>

fied later as a major concern in the regional studies), and overall that "States Parties shall ensure that reasonable accommodation is provided to persons with disabilities".⁴⁵

Rather than specify particular locations for education the Convention sets important broad goals within Article 24:

- ▶ *The full development of human potential and sense of dignity and self-worth, and the strengthening of respect for human rights, fundamental freedoms and human diversity;*
- ▶ *The development by persons with disabilities of their personality, talents and creativity, as well as their mental and physical abilities, to their fullest potential; and*
- ▶ *Enabling persons with disabilities to participate effectively in a free society.*⁴⁶

With those goals as key targets it becomes clear that if PWD are included, if they are educated, their needs respected and accommodated across sectors, the higher is their chance of inclusion. The more the **education systems and environments are 'designed for all'**, rather than segregating PWD, the higher the chance that 'design for all' will become the expected standard by all. And, the more that good practices and learning experiences become shared experiences, the greater the chance of inter-cultural sharing of the rights and values of living in an inclusive society.

ICTs in the context of education for PWD are important in their ability to enable innovative inclusion, innovative education content, and to encourage the open sharing of applications and content.

And, should educational programmes be in the 'traditional' style where teachers 'teach' learners without any specific application of AT or ICTs? Some recent experiences in Ethiopia indicate that the potential for collaborative learning (quite independent of teachers and formal schools) among children is significant. Most education systems are based on the premise that teachers pass on skills, knowledge and competencies to children. Yet in Ethiopia the 'One Laptop per Child' project:

*"Is trying something new in two remote Ethiopian villages—simply dropping off tablet computers with preloaded programs and seeing what happens. The goal: to see if illiterate kids with no previous exposure to written words can learn how to read all by themselves, by experimenting with the tablet and its preloaded alphabet-training games, e-books, movies, cartoons, paintings, and other programs"*⁴⁷.

45. ibid

46. ibid

47. Talbot, David. (2012b). *Given Tablets but No Teachers, Ethiopian Children Teach Themselves*. Technology Review, October 29, [accessed 29 October 2012]. <http://www.technologyreview.com/news/506466/given-tablets-but-no-teachers-ethiopian-children-teach-themselves/>

The project leaders have described significant early outcomes of the project⁴⁸, which starts with no intervention from adults. The closed boxes which contain the tablets, (Low-cost and solar powered) were simply left for the children to open, and included no instructions. The radical results are even prompting some questioning of “traditional” educational approaches and suggesting that some of the innovations in developing countries are relevant for both excluded groups and general learning in more developed countries⁴⁹.

Lastly, returning to the life-long education theme, there is little to be gained in providing sophisticated ICTs and education for PWD if the people concerned do not go on to be productive and engaged members of the labour force and society. For OECD this means ‘**transforming disability into ability**’:

“One goal is to ensure that disabled citizens are not excluded from society: that they are encouraged and empowered to participate as fully as possible in economic and social life, and in particular to engage in gainful employment, and that they are not ousted from the labour market too easily and too early. The other goal is to ensure that those who are disabled or who become disabled have income security: that they are not denied the means to live decently because of disabilities which restrict their earning potential”⁵⁰.

Research by OECD shows that students with disabilities find it more challenging than others to make the transition from secondary to tertiary education, and that this then impacts negatively on their labour market prospects⁵¹. That finding concurs with the recent UNESCO study on southern Africa which observed the “complexities involved in the relationship between disability, education and participation in society through meaningful employment”⁵².

ICTs also have an important role in helping PWD to make the transition from education to work, for example through the acquisition of soft skills and in preparing them for the ICTs they will find in the workplace.

48. Ananian, C. Scott, Chris J Ball, and Michael Stone. (2012). *Growing Up With Nell: A Narrative Interface for Literacy*. ACM International Conference Proceeding Series, June, [accessed 31 October 2012]. <http://cscott.net/Publications/OLPC/idc2012.pdf>

49. Tett, Gillian. (2012). *When tablet turns teacher*. Financial Times (London), October 5, [accessed 31 October 2012]. <http://www.ft.com/cms/s/2/6a071e00-0db6-11e2-97a1-00144feabdc0.html#axzz2ArQsWOnj>

50. <http://www.oecd.org/els/employmentpoliciesanddata/transformingdisabilityintoability.htm>

51. OECD. (2011). *Inclusion of Students with Disabilities in Tertiary Education and Employment*. OECD, May 27, [accessed 30 May 2011]. <http://www.oecdbookshop.org/oecd/display.asp?K=5KGH3ZTK1KB&CID=&LANG=EN>

52. Elde, Arne H. (2012). *Education, employment and barriers for young people with disabilities in southern Africa*. UNESCO, [accessed 25 September 2012]. http://www.unesco.org/ulis/cgi-bin/ulis.pl?catno=217877&set=508FDC44_3_49&gp=1&lin=1&ll=1

1.4 Terms and Context – Persons with Disabilities

Taken as a generalized community, people with disabilities are a significant proportion of global citizens, and “they are **the world’s largest minority**; some 80 % of them live in developing countries”⁵³. A recent WHO Report notes:

“About 15% of the world’s population lives with some form of disability, of whom 2-4% experience significant difficulties in functioning. The global disability prevalence is higher than previous WHO estimates, which date from the 1970s and suggested a figure of around 10%.”⁵⁴

Globally PWD make up some 15% of the World’s population.

And that:

“The number of people with disabilities is growing. There is a higher risk of disability at older ages, and national populations are growing older at unprecedented rates. There is also a global increase in chronic health conditions, such as diabetes, cardiovascular diseases, and mental disorders, which will influence the nature and prevalence of disability. Patterns of disability in a particular country are influenced by trends in health conditions and trends in environmental and other factors – such as road traffic crashes, natural disasters, conflict, diet, and substance abuse”⁵⁵

UNICEF, in a study on Africa, focuses on causes:

*“Country-specific information suggests that between **5 and 10 per cent of all children in Africa grow up with disabilities**. The leading causes of disability – in addition to genetic disorders and complications during birth – include poliomyelitis, measles, meningitis and cerebral malaria, as well as inadequate prenatal and neonatal health care services and inadequate diet leading to stunting”⁵⁶*

80% of PWD are in developing countries which are least able to provide comprehensive policy responses.

It is the very heterogeneity of this ‘minority’ that presents so many challenges, but there is a worrying homogeneity in the negative outcomes that result in the exclusion of persons with disabilities from mainstream services. Their distribution is uneven across the globe, with the largest proportion being

53. UN. (2012c). *Persons with Disabilities*. United Nations, [accessed 9 October 2012]. <http://www.un.org/en/globalissues/disabilities/index.shtml>

54. WHO. (2012c). *World report on disability*. World Health Organisation and the World Bank, [accessed 15 October 2012]. http://www.who.int/disabilities/world_report/2011/en/index.html

55. Ibid.

56. UNICEF. (2012). *Africa: UNICEF Calls for Social Inclusion of Children With Disabilities in Africa*. United Nations Children’s Fund, June 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201206180384.html>

in the countries that have been least able to address their needs. In the context of this report the associated challenge therefore is to provide innovative solutions using ICTs that are affordable, efficient and effective.

The most marginalized among marginalized PWD are girls and women with disabilities. Women with disabilities face significantly more difficulties - in both public and private spheres - in attaining access to adequate housing, health, education, vocational training and employment, and are more likely to be institutionalized⁵⁷. The World Bank reports that every minute "*more than 30 women are seriously injured or disabled during labour*" and that the complications and disabilities arising are not well recognised⁵⁸.

Another challenge concerns the uneven recognition of what is a 'disability'. The UNCRPD provides a **formal definition**:

*"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."*⁵⁹

However, the Convention explicitly acknowledges that the definition depends on place, culture, politics and context:

*"**Disability is an evolving concept** and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others"*⁶⁰

The UNESCO definition concurs with the definition from the World Health Organisation:

*"**Disabilities is an umbrella term, covering impairments, activity limitations, and participation restrictions.** An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Thus **disability is a complex phenomenon, reflecting an interaction between features of a person's body and features of the society** in which he or she lives"*⁶¹

It is the social, medical and political context which introduces particular challenges, because the interface between disability and education first **depends on whether a disability is formally recognized and therefore entitles the PWD to receive an intervention or service**. A disability is a condition that is independent of citizenship, but as upcoming examples will show the acceptance that a condition is a disability is unevenly distributed across governments, cultures and educational systems. Figure

57. Kothari, Miloon. (2005). *Women and adequate housing*. United Nations Economic and Social Council, February 23, [accessed 24 October 2012]. <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G05/112/98/PDF/G0511298.pdf?OpenElement>

58. <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTPRH/0,,contentMDK:20286128~menuPK:632615~pagePK:148956~piPK:216618~theSitePK:376855,00.html>

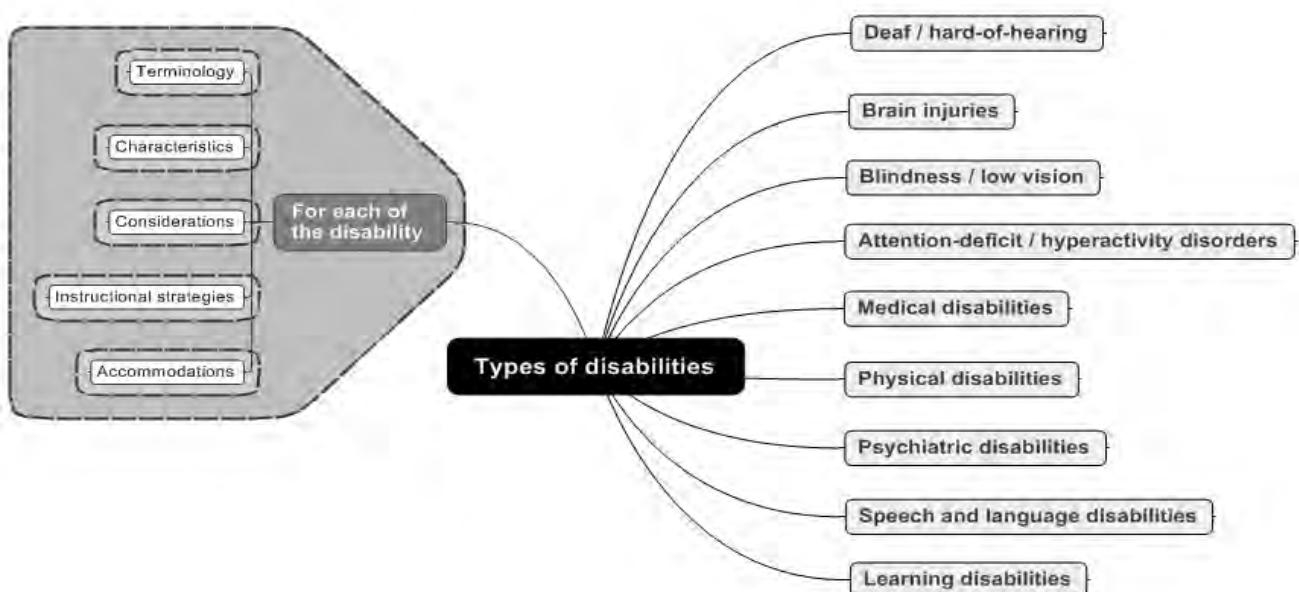
59. ibid

60. UN. (2006). *Convention on the Rights of Persons with Disabilities*. United Nations, December 6, [accessed 9 October 2012]. <http://www.un.org/esa/socdev/enable/rights/convtexte.htm>

61. <http://www.who.int/topics/disabilities/en/>

3.2 provides some context to disabilities as recognized by Johns Hopkins University⁶² with the broad categories and the four areas of information provided about each:

Figure 1.6.: Types of Disabilities*



Adapted by M. Blakemore from Johns Hopkins University

* Types of disabilities: (i) deaf / hard-of-hearing, brain injuries, blindness / low vision, attention-deficit / hyperactivity disorders, medical disabilities, physical disabilities, psychiatric disabilities, speech and language disabilities, learning disabilities. (ii) For each of the disability: terminology, characteristics, considerations, instructional strategies, accommodations.

For each of the conditions the **educators, governments and industry first need to recognize what are the characteristics of the condition, and second what are the interventions that are required**. Furthermore, it is often the case that a student will not have a single disability, but many, and some of them may impact on educational needs more than others. Some disabilities are short-term (for example mobility impairment through an injury), others are permanent. This complexity was most publicly visible in the 2012 Paralympics where the classification system⁶³ is something that is negotiated and accepted at a global level. At the London 2012 Paralympics this meant:

"During classification – which involves observation of sport-specific tasks and activities – athletes are assessed for their ability to perform in a particular event. In case of any dispute there would be a physical examination too"⁶⁴.

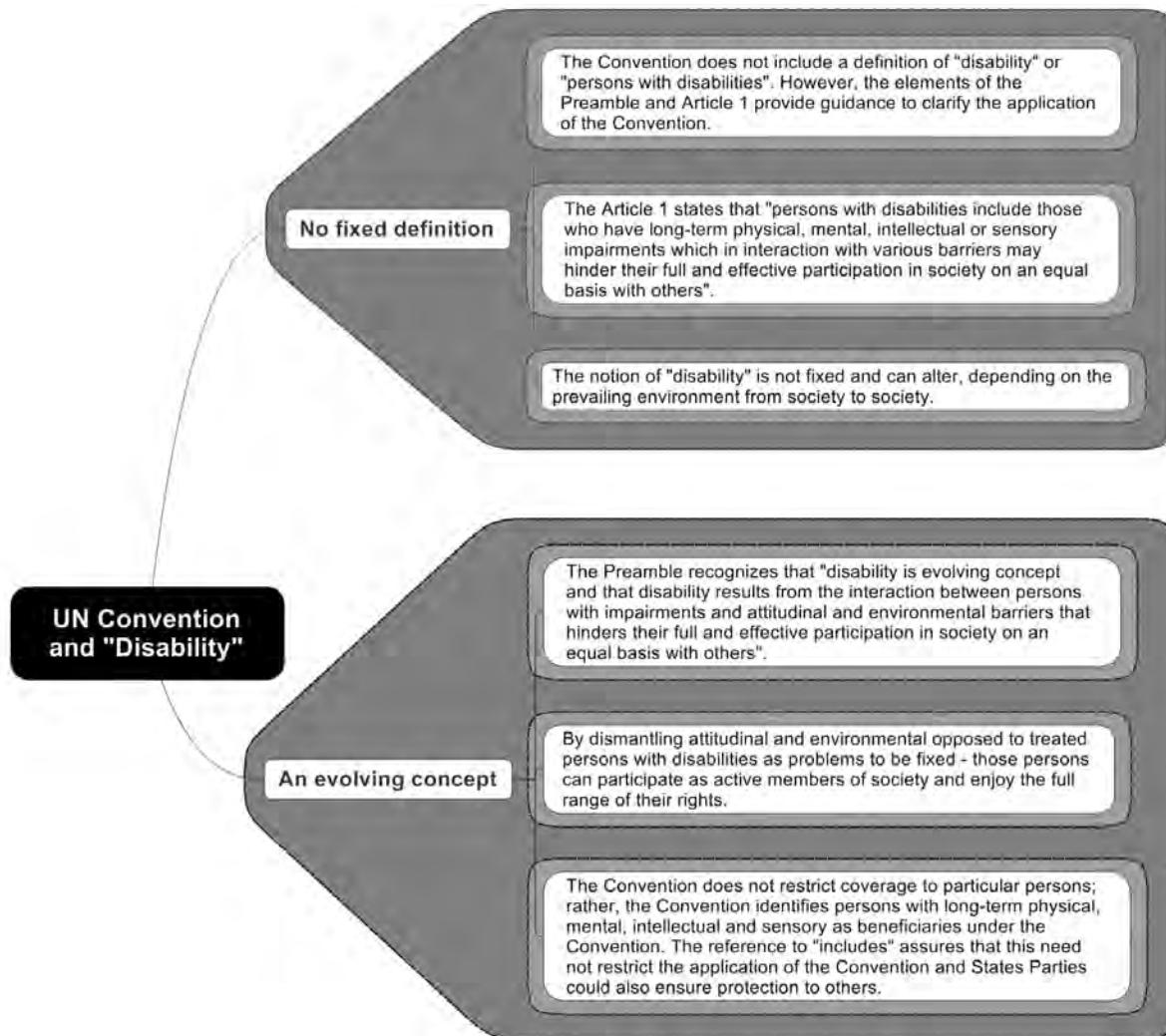
62. http://web.jhu.edu/disabilities/faculty/types_of_disabilities/

63. <http://www.paralympic.org/Classification/Introduction>

64. LOCOG. (2012). *The London 2012 guide to the Paralympic Games*. The London Organising Committee of the Olympic Games and Paralympic Games Ltd, [accessed 1 October 2012]. <http://www.london2012.com/mm%5CDocument%5C Publications%5CJoinin%5C01%5C24%5C08%5C10%5Clondon-2012-guide-to-the-paralympic-games.pdf>

For the UN Convention **there is not a globally recognized set of disabilities**, as the frequently asked questions resource for the Convention confirms⁶⁵. Figure 3.3. presents the key points.

Figure 1.7.: UN Convention and 'Disability'*



Adapted by M. Blakemore from United Nations

* UN Convention and "Disability": 1. No fixed definition: (i) The Convention does not include a definition of "disability" or "persons with disabilities". However, the elements of the Preamble and Article 1 provide guidance to clarify the application of the Convention. (ii) The Article 1 states that "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". (iii) The notion of "disability" is not fixed and can alter, depending on the prevailing environment from society to society. 2. An evolving concept: (i) The Preamble recognizes that "disability is evolving concept and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others". (ii) By dismantling attitudinal and environmental barriers as opposed to treating persons with disabilities as problems to be fixed - those persons can participate as active members of society and enjoy the full range of their rights. (iii) The Convention does not restrict coverage to particular persons; rather, the Convention identifies persons with long-term physical, mental, intellectual and sensory impairments as beneficiaries under the Convention. The reference to "includes" assures that this need not restrict the application of the Convention and States Parties could also ensure protection to others.

65. UN. (2012a). *Frequently Asked Questions regarding the Convention on the Rights of Persons with Disabilities*. UN Department of Economic and Social Affairs, October, [accessed 12 October 2012]. <http://www.un.org/disabilities/default.asp?navid=24&pid=151#sqc3>

Definitions of who is disabled can differ significantly from one country to another, and accepting that a condition is a recognized disability also differs between countries.

For Johns Hopkins University there is a detailed list (Figure 3.2) of the conditions that are recognized as needing interventions, an understanding of what are the characteristics and needs of the conditions, and a clear identification of the educational interventions (ICT and non-ICT) than can provide educational value. For example regarding brain injury, which the University notes in the USA is “*one of the fastest growing types of disabilities, especially in the age range of 15 to 28 years*”, the students can be challenged in a variety of ways:

- ▶ Organizing thoughts, cause-effect relationships, and problem solving;
- ▶ Processing information and word retrieval;
- ▶ Generalizing and integrating skills;
- ▶ Social interactions;
- ▶ Short-term memory;
- ▶ Balance or coordination; and
- ▶ Communication and speech.⁶⁶

In other words, a combination of ICT and non-ICT interventions accessing information and knowledge can provide value. However, what the previous lists do not show is an ‘*a priori*’ requirement that is needed so that the interventions can deliver value – and that is a **suitable ‘learning environment’**. In some developed countries, functions, physical infrastructure, facilities, staff and services provided by the educational institutions are undoubtedly be world-class. That is not a luxury afforded to students across other countries, and **the levels of resources required to reach the level of advanced economies can be beyond the capacity of many higher education systems**. Even in advanced economies there is not a comprehensive and fully inclusive system for PWDs to access information and knowledge.

In the past the general expectation tended to be one of waiting for the education system to overcome challenges. This is a traditional view of government as the primary provider of services which citizens have paid for, often through taxation. Within the context of current (and emerging) ICTs, however, there are significant opportunities to move towards **greater partnership and innovation**. Learning does not have to operate now within the physical confines of a ‘classroom’. **Teaching and learning content is available online and much of it is ‘open source’** – freely available. Furthermore, many ICT innovations such as speech synthesis and automated voice recognition can make text and sound (seeing and listening) more usable for many PWD, and prosthetic devices can provide opportunities for people who cannot use arms or hands to manipulate a device or to ‘type’ text.

Adding more complexity to this discussion there are disabilities that can be challenging in the policy context, because they are more often cognitive disabilities and syndromes that require professional diagnosis. These are often grouped under the term ‘SEN – Special Education Needs’ and the challenge

66. ibid

is to provide educational interventions that address the needs of disabilities where there often are no clear 'borders' between them – for example the interplay of ODD (Oppositional Defiance Disorder), ADHD (Attention Deficit Hyperactivity Disorder⁶⁷), and Asperger's Syndrome.

To some people who do not have training in recognizing and understanding disabilities, those with such cognitive disorders may be labelled as disobedient, confrontational, or lacking concentration, so the potential for such PWD to benefit from inclusive education can be limited by social prejudice and misunderstanding⁶⁸.

Policy and legislative frameworks will provide powerful drivers for a more widespread adoption of interventions that help persons with disabilities to access information and knowledge. At the World Summit on the Information Society Forum 2012 the advice was:

- ▶ **Build awareness** – at all levels from global to local
- ▶ **Mainstream accessibility** – understand that disabilities are not fixed conditions, and that most people will have some form of disability through life, particularly as they age;
- ▶ Provide drivers and incentives through **regulation and enforcement**;
- ▶ Use education to **affect cultural change and a wider acceptance of PWD**;
- ▶ Develop **quality labels** as defining a minimum standard of policy interventions;
- ▶ **Capacity development** is critical – little can be achieved without resources; and
- ▶ **Involve all stakeholders** (Nothing about us without us). As noted above PWDs are innovative and energetic actors in the education process.⁶⁹

And bringing these issues together the UNESCO 2011 report on "*ICTs in Education for People with Disabilities*" sets the following objectives:

- ▶ **Increase the life chances and opportunities for people with disabilities**;
- ▶ Enact policies geared towards supporting **inclusive education**;
- ▶ View inclusive education within **a continuum of educational opportunities across lifelong learning**; and
- ▶ Take a **systemic approach from individual to system levels**.⁷⁰

67. And research shows that very different classroom environments benefit ADHD children: Coughlan, Sean. (2012). *Shouting out in class 'helps pupils to learn'*. BBC, February 2, [accessed 9 February 2012]. <http://www.bbc.co.uk/news/education-16836497>

68. Devlin, Richard, and Dianne Pothier. (2006). *Introduction: Toward a Critical Theory of Dis-Citizenship*. University of British Columbia Press, [accessed 7 August 2012]. <http://www.ubcpress.ca/books/pdf/chapters/pothier.pdf>

69. Unwin, Tim. (2012). *Ensuring disability agendas are embedded effectively in national ICT strategies*. Wordpress.com, May 17, [accessed 15 August 2012]. <http://unwin.wordpress.com/2012/05/17/ensuring-disability-agendas-are-embedded-effectively-in-national-ict-strategies/>

70. UNESCO. (2011b). *ICTs in Education for People With Disabilities: Review of innovative practice*. UNESCO Institute for Information Technologies in Education, [accessed 15 August 2012]. <http://www.european-agency.org/publications/ereports/ICTs-in-Education-for-People-With-Disabilities/ICTs-in-Education-for-people-with-disabilities.pdf>

The definition of disability is complex and evolving, the interaction with societal attitudes and the recognition of a disability varies across countries.

Interventions require a sensitive understanding of the disabilities and a systemic approach to providing ICTs in the education context.

2 EVIDENCE FROM REGIONAL STUDIES - UNCRPD AND THE USE OF ICTS TO ACCESS INFORMATION AND KNOWLEDGE FOR PERSONS WITH DISABILITIES



Staff member of the Disability Unit, University of Namibia, Namibia.

"Even in countries with higher overall levels of adult literacy skills, certain groups continue to face disadvantage linked to characteristics such as gender, poverty, ethnicity, language and disability."⁷¹

In structuring the material from the regional studies, the accessibility principles are defined in terms of three criteria: availability, affordability and accessibility.

This approach is based on the UN Convention framework provided for ICTs to access information and knowledge for persons with disabilities.

- ▶ **Availability** addresses the distribution of ICTs and ATs⁷², competencies and content;
- ▶ **Affordability** concerns the cost of ICTs and ATs; and
- ▶ **Accessible design** involves the incorporation of accessibility or universal design features into mainstream ICTs and content (Figure 2.1.: Approach).

Figure 2.1.: Approach*



* 1 level: Affordable, accessible and available ICTs. 2 level: Technology, content, competencies and cost.

71. UNESCO. (2012q). *Youth and skills: Putting education to work. EFA Monitoring Report 2012*. UNESCO, October, [accessed 11 September 2012]. <http://unesdoc.unesco.org/images/0021/002180/218003e.pdf>

72. In addition to distribution, availability may also be affected by whether or not the ICT is available in the local language. If it is not available in the local language, then it cannot be distributed.

All three principles work together to maximize social inclusion of persons with disabilities, particularly in education.⁷³ And, as the previous section has noted, the extent to which the accessibility delivers the desired outcomes depends also on a range of externalities such as social acceptance, employment opportunities, availability of trained teachers, and accessible infrastructure.

Article 24 of the UNCRPD recognizes the **right** of persons with disabilities to education, and calls for signatories to ensure an **inclusive education system** at all levels, as well as life-long learning, on the basis of equal opportunity. Other relevant articles cover issues such as access to information, vocational training, independent living, and cultural life.

ICTs are expressly provided for in the treaty foundational articles of Article 4 (Obligations) and Article 9 (Accessibility), and both directly affect Article 24 (Education). The use of ICTs to help persons with disabilities to access information and knowledge is not the end goal, but rather the means to achieving equality through inclusive education.

For example, Article 9, requires:

Appropriate measures to be taken to ensure that persons with disabilities have access, on an equal basis with others, to information and communications as well as ICTs and systems.

This requires countries to promote the universal design, development, production and distribution of accessible ICTs and systems at an early stage so that they become accessible at minimum cost. In addition to conventional hardware, software and operating systems, accessibility includes access to the Internet, distance learning online tools, electronic textbooks, smart phone applications and mobile telecommunications devices. State Parties are also invited to develop their human resources in order to use accessible ICTs and systems effectively and efficiently.

Article 4 concerning Obligations requires the promotion of ICTs that are designed to be accessible under **universal design principals** as well as the promotion and availability of both ICTs and ATs.

Finally, if there are barriers to the use of ICTs to access information and knowledge, the Convention requires a **barrier-removal plan**. Such a plan would maximize the ability to use ICTs to access information and knowledge. This barrier-removal plan ties in with the Article 31 obligation to compile statistical and research data to assess the implementation of the Convention.

Barrier-removal obligations imply that whenever ICTs are used to access information and knowledge (the physical and social environment, hardware, software, Internet environment, electronic tools, digital content and telecommunications products and services) they must be accessible to all, regardless of disabilities. ICTs need to be considered in the wider education and social context, because when physical barriers prevent access to the teaching and learning environment by persons with disabilities then these barriers will necessarily also limit their access to ICTs. Similarly, when inaccessible

73. Waddell, Cynthia D. (2008). *Meeting Information and Communications Technology Access and Service Needs for Persons with Disabilities: Major Issues for Development and Implementation of Successful Policies and Strategies*. International Telecommunications Union, June, [accessed 14 June 2012]. http://www.itu.int/ITU-D/study_groups/SGP_2006-2010/events/2007/Workshops/documents/18-waddell.pdf

ICTs are used or assistive technologies are lacking, then the accessibility of the physical environment itself is only of limited use.

As part of the implementation and monitoring requirements, each country that has signed and ratified the UNCRPD is required by Article 35 to submit a comprehensive report⁷⁴ on measures taken and progress made under its UNCPRD obligations. These reports are then reviewed by a committee of independent experts called the *Committee on the Rights of Persons with Disabilities*, that also works with each country by providing its observations and recommendations. If the country has also ratified the Optional Protocol, the Committee is empowered to receive and examine individual complaints and to undertake inquiries in cases of reliable evidence showing grave and systematic violations of the Convention.

As of December, 2012 the Committee had received five Country studies from five regions on the use of ICTs to access information and knowledge:

- ▶ Arab States and North Africa – Tunisia;
- ▶ Asia-Pacific – China and Republic of Korea;
- ▶ Europe – Spain;
- ▶ Eastern Europe and Central Asia – Azerbaijan; and
- ▶ Latin America – Peru.

The level of detail in the five country studies is sometimes greater than the synthesized data compiled in the regional studies. For example, both China and the Republic of Korea demonstrate a funding linkage for the provision of ICT in education as it relates to national policies, plans and efforts. Peru's study includes details on domestic laws enacted in response to the UNCRPD and the progress made towards implementing those laws. It also notes the creation of a first virtual library of Congress, which has published a work on the history of Peru in Braille; the promotion of Internet access for persons with disabilities and the its subsequent modification of public Internet booths; the distribution of AT and accessible school materials; and, among other initiatives, the promotion of education for young women with disabilities in rural areas. Both Tunisia and Azerbaijan report on their efforts to make the web more accessible.

2.1 Headline outcomes of ICT to access information and knowledge for people with disabilities from the UNESCO Regions

This section provides a general overview of the challenges, recommendations, policies and practices that are discussed in each of the regional studies. The main outcomes are summarized, and then the overall conclusions and recommendations from all of them are grouped together to provide the **organizing framework** for further action.

74. These are available at <http://www.ohchr.org/EN/HRBodies/CRPD/Pages/Sessions.aspx>

Africa

For the **Africa regional study**, 32 countries were surveyed, but only 11 provided information on policy frameworks and ICTs on which to build a summary. Its findings are therefore based on the policies and experience of Botswana, Ghana, Ethiopia, Lesotho, Niger, Rwanda, South Africa, South Sudan, Zambia, Zimbabwe and Uganda.

The African study notes that significant numbers of individuals with disabilities in Africa experience chronic poverty. Many families are unable to afford school fees in the examination-based culture of many African education systems, often leading to a lack of requisite qualifications to enter higher education institutions. In addition, many local community members, including both families and teachers, hold negative social attitudes about disabilities. Frequently compounding these problems are the lack of schools, roads, public transport, access to reliable electricity supply in rural and urban areas.⁷⁵

The regional study identified a set of challenges to the effective and cost-efficient use of ICTs in the Africa:

- ▶ An uneven landscape of advanced ICT infrastructure;⁷⁶
- ▶ Varying rates of implementation of country ICT policies is;
- ▶ The costs of establishing ICT infrastructure that relies on hardware and software imported from high income countries;
- ▶ The disparity in capacity between rural and urban areas to fully exploit ICTs;
- ▶ The unavailability of most software in local languages, except French or English; and
- ▶ Often low levels of ICT and disabilities literacy among students, educators, library professionals and others.⁷⁷

Four African countries responded to the surveys assessing policy frameworks for enabling access to information and knowledge through ICTs for persons with disabilities in the Africa region: Botswana, Lesotho, South Sudan and Zambia. The principal findings:

- ▶ In all four countries education for people with disabilities is a fundamental right enshrined in their respective constitutions. These are fortified by explicit rights for people with disabilities within the new Education Acts in Lesotho (2010) and Zambia (2011);
- ▶ In none of the four countries does their Copyright Act permit the conversion and distribution of books in an accessible format without the permission of the rights holder. The Ministry of Education in South Sudan reported that only a tiny (below 1%) percentage of published books are available in an accessible format;

75. Africa Regional Study, p. 6.

76. But the Report observed that changes underway in the North African countries such as Sudan and Tunisia raise questions as to what impact changes in government will have on prior legislation, policy, and implementation.

77. Ibid.

- ▶ In three of the countries, respondents reported that integrated and inclusive schools are available to persons with disabilities (Botswana, South Sudan and Lesotho); in South Sudan and Lesotho special schools are available;
- ▶ None of the respondents reported that computer training was part of the school curriculum, and of the four respondents, only Zambia has a policy mandating schools and colleges to have computer terminals accessible to students with disabilities⁷⁸;
- ▶ All respondents noted a generally low level of ICT literacy among persons with disabilities; and
- ▶ Other challenges identified were inadequate policy frameworks; limited ICT infrastructure; lack of trained teachers; and limited exposure to, and awareness of, emerging technologies.⁷⁹

Four institutions based in African countries also responded to the use of ICTs questionnaire, but their responses cannot be generalized beyond their own experiences: the UNESCO Office in Harare (Zimbabwe), Fédération Nigérienne de Sports pour Personnes Handicapées (Niger), the Adaptive Technology Centre for the Blind (Ethiopia) and Kwame Nkrumah University of Science and Technology (Ghana). The main points from the regional study:

- ▶ Zimbabwe, Niger and Ethiopia have special schools for PWDs, and all four countries have, to some extent, implemented inclusive education, with Ethiopia in particular having an inclusive education policy;
- ▶ ICT training is part of the national curriculum in all countries;
- ▶ Respondents in Niger, Ghana and Ethiopia stated that they use open source software, but offer few details;
- ▶ The most popular computer applications used are JAWS, NVDA Braille display and Braille embossers, mainly for students with visual impairments;
- ▶ More traditional forms of communication technologies are used in education, television and radio; and
- ▶ All respondents report major challenges related to a lack of trained teachers, limited infrastructure, and limited exposure to emerging technologies. Three out of four respondents also report that an inadequate policy framework, prohibitive costs, low internet penetration and the lack of availability of assistive technologies (and text-to-speech software) in local languages further contribute to the challenges faced.

78. The regional study reported another important issue (page 28) regarding gender: "A further compounding issue relates to gender: In many African societies, there has been a strong tendency to view the education of girls as less important than the education of boys, in the belief that the latter will be the breadwinner in the present and next-generation's family household."

79. See Africa Regional Study, p. 7.

Middle East and North Africa (MENA) Region

The major findings of the **Middle East and North Africa Region** (MENA) report provide an overview of eight countries: Lebanon, Kuwait, Sudan, Saudi Arabia, Syria, Tunisia, United Arab Emirates, and Qatar. The regional study cites a 2006 study as concluding that the greatest PWD challenge in the region at that time was a lack of awareness of the rights of persons with disabilities as well as a lack of clear and actionable legislation protecting those rights⁸⁰. However, this study was published prior to the opening of the UNCRPD for signature in 2007 and the subsequent activity in the region surrounding the signature and ratification of the UNCRPD and Option Protocol.

The situation in 2005-2006 regarding the education of persons with disabilities in the MENA region (Middle East and North Africa) was that educational systems excluded more than 95%⁸¹ of the population of school-aged students with disabilities at the primary level. Some of the major obstacles they faced included: 1) the absence of policies and planning and inappropriate programmes for special education at national levels, 2) a lack of policy understanding about the value of education for PWDs in some countries, and 3) the professional dichotomy between regular and special education where the two are seen as separate professional areas.⁸²

In the MENA region, social exclusion of people with disabilities can occur in combination with several forms of discrimination, including gender bias, unequal employment opportunities, and lack of access to education, inadequate access to health and information services, patriarchal cultural or religious norms that do not view disability inclusively.

The resulting problems interact and can exacerbate the situation for PWDs. For example, cultural norms can marginalize females and girls with disabilities, and this interaction constitutes a double jeopardy in terms of access to education and quality of life as well as employment. The economic status of individual families influences the choices parents make regarding whether or not to send their children to school, and this 'choice' often interacts with cultural norms and gender.⁸³

The Cairo Declaration on Supporting Access to Information and Communication Technology Services for Persons with Disabilities was issued by the First Arab Regional Conference on Sharing Experience on Best Practices in ICT Services for Persons with Disabilities in November 2007. It noted that at that time most countries in the region lacked robust statistics about PWDs and their needs, that PWDs suffered from widespread lack of access to ICTs⁸⁴. Since the Cairo Declaration was issued there have been further meetings to build consensus about the need for strong policy interventions in the context of telecommunications and PWDs. For example, the Arab States Regional Preparatory Meeting

80. See Arab Region and North Africa Regional Study at Part I, Section 1.2. Hereinafter referred to as the Arab Regional Study.

81. Human Development Dept., MENA Region. A Note on Disability Issues in the Middle East and North Africa. Washington, D.C., World Bank, June 30, 2005.

82. See Regional Study at Part I, Section 1.4.

83. Ibid.

84. Arab Regional Study, at Part I, 1.8.

for the World Telecommunication Development Conference (WTDC-10), Damascus, Syria, 17-19 January 2010, where there were calls for action to:

- ▶ Adopt a self-regulation approach for rendering ICT equipment and services accessible for persons with disabilities. It is expressly understood that self-regulation does not override legal and regulatory provisions;
- ▶ Adopt a universal design principle when designing, producing and creating ICT equipment, services and software from an early stage to avoid costly retrofitting measures;
- ▶ Promote, if applicable, research and development of ICT accessible equipment, services and software, taking due regard to affordability by persons with disabilities;
- ▶ Take due consideration of the needs of persons with disabilities, encouraging their active participation to receive first-hand information on their requirements for ICT accessibility; and
- ▶ Collaborate with Member States to render ICTs accessible for persons with disabilities.

Since the Cairo Declaration a number of countries in the Arab World have adopted domestic laws regarding the Rights of Persons with Disabilities. For example, in 2010 Kuwait adopted Law Number 8 for the Rights of People with Disabilities⁸⁵. Article (9) ensures the government's commitment to providing educational and teaching services and teaching aids for persons with disabilities.

In November 2011 the Qatar Supreme Council of Information and Communication Technology (ictQATAR) took a major step towards ensuring that the whole country experiences the full benefits of technology with the introduction of the Qatar's first e-Accessibility Policy.

The policy⁸⁶ aims to ensure that people with disabilities in Qatar have equal access to the technologies that can enrich their lives, and covers a range of e-Accessibility issues, including websites, telecommunications services, handsets, ATMs (Automatic Teller Machines), government services, access to assistive technologies and digital content. The policy was effective immediately and ictQATAR will oversee the implementation of the policy across sectors and monitor progress.

Tunisia has elaborated a comprehensive programme to facilitate the integration of persons with disabilities into society. This is done through the creation of special education centres to supplement, but not substitute for, the school system, under the supportive orientation law for persons with disabilities (August 2005), and professional integration programmes.⁸⁷

In addition, Tunisia guarantees children with disabilities access to public schools without restriction. Act No. 80 of 23 July 23, 2002, as amended and supplemented by Law 2008-9 and 2008-10 of 11 February, 2008 on vocational training, provides in Article 4 that "*the government shall ensure the esta-*

85. Kuwait Law Number 8 in 2010 for the Rights of People with Disabilities at <http://www.kaldkuwait.com/images/KALD20110318.pdf>.

86. ictQatar news announcement on the new National e-Accessibility Policy of November 29, 2011 at <http://www.ictqatar.qa/en/news-events/news/ictqatar-introduces-national-e-accessibility-policy>.

87. Arab Regional Study, Part II, II.4.

blishment of adequate conditions for children with special needs to enable them to enjoy this right." Similarly, Article 2 of the Act provides that "*education is provided on an equal basis without discrimination.*"⁸⁸

The Copyright Act in Tunisia does not permit conversion and distribution of books into accessible formats without permission from the rights holders, and the regional study notes that only a low percentage of published books are available in accessible formats.⁸⁹

In contrast, while Lebanon and Syria have a Copyright Act that permits conversion, there are few books available in accessible formats.⁹⁰ In 2007, Tunisia made a decision to adapt all websites of public institutions so they conform to the accessibility standards of W3C WCAG by the end of 2009.⁹¹

In the United Arab Emirates (UAE), Abu Dhabi's Federal Law No.29/2006 is the UAE's first law to protect the rights of people with special needs. This law requires that all barriers to equal opportunities be removed, and guarantees the rights of people with disabilities and special needs to enjoy a decent life and comprehensive care in education, training, health and rehabilitation. The law is comprehensive and includes access to the built environment.⁹²

The UAE Copyright Act permits conversion and distribution of books into Braille formats without permission from the rights holders. This is being achieved through government funding of conversion activities via the Executive Council which provides 100% of conversion funding.⁹³

In the UAE, the government funds development of assistive technologies in local languages to support regional language content. For instance, Zayed Higher Organization for Humanitarian Care and Special Needs (ZHO) purchased Boardmaker software, which supports 44 languages including Arabic, and which can be used to create instructional materials and communication symbols for devices. Communication devices purchased by ZHO can be programmed in Arabic using the Emirati dialect.⁹⁴

Courses for future special education teachers at ZHO centres are provided in Assistive Technology and Computer Applications, and the government-sponsored centres like ZHO provide on-going professional development programmes for teachers related to ICTs for teaching students with disabilities.⁹⁵

88. Arab Regional Study, Part III, III.7.

89. Ibid.

90. Arab Regional Study, Part III, III.2 for Lebanon and III.3 for Syria.

91. Ibid.

92. Arab Regional Study, Part III. III.1. Also See Abu Dhabi website at http://www.abudhabi.ae/egovPoolPortal_WAR/appmanager/ADeGP/Citizen?_nfpb=true&_pageLabel=p_citizen_homepage_hidenav&did=231072&lang=en.

93. Ibid.

94. Ibid. ZHO is an independent government organization established under Law No. (2) of the year 2004, offering social and humanitarian services to people with special needs in Abu Dhabi Emirate in order to support and strengthen their position as active members of the society.

95. Ibid.

Asia-Pacific Region

The **Asia-Pacific regional study** presents the situation in 10 countries: Bangladesh, China, India, Japan, Malaysia, Nepal, Pakistan, Philippines, South Korea, and Sri Lanka. It notes that many developing countries are struggling to attain their Millennium Development Goal (MDG) of providing universal primary education for all by 2015 and one of the reasons is that many persons with disabilities still face slow involvement in education. It also notes there are still barriers to access information, a lack of regulation, limited application of AT and mainstream ICTs and systems as well as services and content, particularly in local languages. Overall, the regional study found that barriers exist in the successful integration of ICT into education for persons with disabilities that are common across all countries:

- ▶ A general lack of affordable AT and mainstream ICTs in local languages;
- ▶ Uneven access to finance for capacity building;
- ▶ A general lack of flexible copyright laws to facilitate provision of reading materials in accessible formats;
- ▶ Limited information and training related to the use of assistive technologies; and
- ▶ Limited availability of open educational resources that can be used by persons with disabilities.

It was found that even in countries where there are ICT educational policies in place for the general population, there is limited access to education for persons with disabilities.⁹⁶ Regarding policies:

- ▶ Bangladesh and Nepal are the only two countries studied that have signed and ratified the UNCRPD as well as the Optional Protocol, while China, India, Malaysia and the Philippines have only signed and ratified the UNCRPD;
- ▶ Philippines, Malaysia, Pakistan and South Korea have taken measures to implement the UNCRPD within a year of signing it. China,⁹⁷ Japan and Nepal have yet to take steps towards its implementation;
- ▶ All countries studied except Japan and Malaysia recognise the right to education as a fundamental right in their constitution either expressly or indirectly;
- ▶ Domestic legislation relating to disability exists in all the countries. However, specific education policies for the benefit of persons with disabilities are in place only in China, Japan, Nepal, South Korea and Sri Lanka.
- ▶ While policies in India and Nepal were yet to be finalised, Bangladesh, China, Japan, Malaysia, Philippines, and South Korea had already adopted policies, plans and guidelines on internet and ICT accessibility;
- ▶ Japan has a fair use provision in its copyright law which allows for the free reproduction of published material for persons with print disabilities including vision impairment;

96. Asia Pacific Regional Study, p. 77. Hereinafter APAC Regional Study

97. But contrary to this observation in the regional study, see China's UN Country Report showing measures taken to implement the UNCRPD in Appendix 2.

- ▶ A review of copyright law in the region indicates additional exceptions exist in China, Malaysia, and South Korea for those who are blind and read Braille. The requirements and restrictions differ between countries;
- ▶ Most countries in the study seemed to be developing policies to promote special education rather than integrated education, but terms and scope were poorly defined;
- ▶ Few countries focus specifically on the need for teacher-training or the development of curriculum and learning material to accommodate the needs of PWDs; and
- ▶ The distinction between the needs of students with physical disabilities and those with mental disabilities is not clear in the policies.⁹⁸

The study found overall that there is more emphasis on formulation of policy rather than its implementation. It found a “huge gap” in implementation and gave a number of examples. For instance, the study found that the transition from one stage of education to another stage was not clearly planned with the needs of PWDs in mind. It also found that implementing policy was often affected by a lack of affordable infrastructure and skilled teachers and specialists in ICTs for persons with disabilities.

Eastern Europe and Central Asia

The **Eastern Europe and Central Asia regional study** presents findings from 11 countries: Armenia, Azerbaijan, Belarus, Bulgaria, Estonia, Georgia, Latvia, Kazakhstan, Kyrgyzstan, Russian Federation, and Tajikistan. The report observes that many countries in the region, except Estonia and Latvia, have insufficient levels of broadband infrastructure and communication services to support online learning. For this reason, educational resources tend to be distributed more on CDs.⁹⁹ However; there are two Russian universities that have developed e-learning resources for online tests.¹⁰⁰ Another challenge is pirated software. There are reports of widespread use of illegal software¹⁰¹, and problems regarding the protection of intellectual property in the telecommunications field.¹⁰²

According to national experts interviewed for the regional study, the more expensive and complex the service or product needed by a person, the more difficult it is to gain the necessary support for resources to be allocated to provide them, particularly concerning technical aids and ATs. National experts noted problems of physical accessibility to the social and education infrastructure, as well as transportation poorly suited to PWDs. In some countries the human rights of people with disabilities are not yet recognized and respected.¹⁰³

98. Ibid, p. 32-33

99. Eastern Europe and Central Asia Regional Study, p. 122. (EECA).

100. Ibid.

101. EECA, p. 123.

102. Ibid.

103. EECA, p. 121.

Even though some countries have declared their citizens' right to open information access, they have yet to legislate the specific obligations to provide information in formats, channels and structures suited to people with disabilities.¹⁰⁴

The regional study observes that a medical approach is often used across the region for providing educational and social services for persons with disabilities. The system of education for children and adults was formed during the Soviet period and is based on the integrated scientific discipline called "defectology," which is unique to the region. It the development of children having physical or mental defects and the problems encountered in their training and upbringing. Because Soviet defectology was historically the policy approach, segregated schools and institutions were established across the region.¹⁰⁵

But more recently, the principles of inclusive education are emerging in the region. Although legal regulations have been adopted in Armenia, Estonia, Kazakhstan, Latvia and Russia, the inclusive approach is often not fully incorporated into the education system at the policy level and application of ATs and ICTs is not that broad. Partly this is the result of there being a large existing network of special education institutions, such as kindergartens, schools and boarding schools, and the administrative procedures that limit access for children with disabilities to general education programmes. The outcome has been the narrowing of future opportunities for children with disabilities.¹⁰⁶

With respect to women with disabilities in the region, access to education is generally less favourable in comparison with men.¹⁰⁷ Available data from the countries also show that at the state level there are few effective steps to encourage women with disabilities to use ICTs to help access information and knowledge. At the same time, most countries maintain NGOs of women with disabilities that are active in campaigns to protect their rights and social inclusion.¹⁰⁸

The results of the regional study show evidence of uneven development of AT and ICTs. Governments are installing and updating ICT infrastructures and establishing new services, but often they are not directly linked so as to also take into consideration accessibility aspects. Efforts to promote e-accessibility for persons with disabilities or stimulate the development of specialized hardware and software can be restricted by remaining poor ICT infrastructure.¹⁰⁹

However, the number of educational resources, including open ones, and services in the region is increasing. Experts from several countries have expressed a desire to help persons with disabilities and have indicated their interest in new technologies and creating innovative resources.¹¹⁰

104. Ibid.

105. EECA, p.p. 7 and 120.

106. EECA, p. 120.

107. Nagata, K K. (2003). Gender and disability in the Arab region: The challenges in the new millennium. *Asia Pacific Disability Rehabilitation Journal* 14 (1): pp. 11-16.

108. EECA, p. 124.

109. EECA, p. 127.

110. Ibid.

The Latin America and the Caribbean

The regional study¹¹¹ for this world report was prepared in partnership with The Trust for the Americas (TRUST). It covers the three regions of **South America, Central America and the Caribbean** and comprises 20 countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Jamaica, Mexico, Panama, Peru, Paraguay, Saint Lucia, Saint Vincent, Uruguay and Venezuela.

The study notes that the region's 'megadiversity' in areas of culture, governance, inclusion policies and attitudes towards disability makes it difficult to generalise across boundaries. Nevertheless, at a certain political level there are agreed guidelines, ranging from the Inter-American Convention for the Elimination of All Forms of Discrimination against Persons with Disabilities (OAS, 1999) to the more recent and local initiatives in the Caribbean such as the eLAC 2010 Regional Plans.¹¹²

The study also notes that there still is a need for a better connection between the high-level political will to sign-up to conventions and agreements, and the effectiveness with which these are transformed into meaningful structural and organizational changes and actions. Indeed the study warns that there is a "*serious underlying risk is that the initial "contentment produced by ratification by a State is followed by disappointment and discouragement at not going beyond discourse".*

Consequently it could be difficult to overcome four prevailing problems that were identified with regard to inclusive education. First the social attitudes towards disability too often are negative and result in discrimination. Second, PWD too often are taught separately in special education units, rather than being seen as part of a more comprehensive and inclusive system. Third, resources and budgets are not sufficient to meet the educational and ICT needs of persons with disabilities. Finally, the curriculum is not well-designed and the training of teachers in inclusive education is uneven. These four problems are in strong contrast to the widespread access to ICTs and mobile telephony found in the regions (although there are substantial differences in Internet and mobile telecoms access between urban and rural areas), and where citizens expect their governments to implement information society and digital strategies to use ICTs more efficiently and effectively to develop new services.

On the positive side the study notes that seven countries possess national ICT strategies are advanced and integrated?:

"The institutional framework for implementation is inter-agency in three countries (Bolivia, Chile and Ecuador), four directly under the Presidency of the Republic (Argentina, Colombia, Peru and Uruguay) and one with a specific ministry (Venezuela)"¹¹³.

111. <http://unesdoc.unesco.org/images/0021/002163/216382e.pdf>

112. <http://www.carib-is.net/elac-2010>

113. Regional Study for South America, Central America and Mexico and the Caribbean

It cites the following examples of what countries are doing:

- ▶ “Argentina incorporates ICTs into the curriculum to train specific human resources in these technologies, in addition to forming R+D+I (Research, Development and Innovation) alliances among the production sectors.
- ▶ Uruguay includes citizen oriented toward the job market, driving projects in research and education, developing a national system of innovation and scientific publications, among others. Further, complementing digital policy actions – as a policy in its own right – the CEIBAL plan – applying the One Laptop Per Child (OLPC) initiative – covers areas of instructional infrastructure, curricular reform and digital inclusion.
- ▶ Chile focuses its actions on developing educational contents and digital capacities (in teachers and students), ensuring optimal infrastructure and improving educational management”¹¹⁴.

Good practice was identified in a number of areas. In Uruguay the CIEBAL¹¹⁵ initiative was motivated by the One Laptop per Child concept, but from the outset the specific needs of PWD were embedded into the project. The regional study acknowledges:

“Special education schools were included from the outset of the CEIBAL Plan. For students with visual disability, computers are adapted to users’ needs with the JAWS software for blind students and a magnifying glass to enlarge images for those whose vision requires this. They have also incorporated the pedagogical and instructional needs outlined by teachers. For the XO laptops, specific software and hardware have been developed. Adaptations have been done by LATU, with collaboration by the Teletón Foundation”¹¹⁶.

Furthermore, teacher training and organisational adaption has been core to the CIEBAL initiative. Teacher training is also central in Argentina through the POETA¹¹⁷:

“National Program of Study Grants and Opportunities to promote access by persons with disabilities and in situations of vulnerability to higher education, vocational training and knowledge about technological tools, favouring educational, social and workplace inclusion ... and e-opportunities to give virtual vocational training through distance education, with official certificates”¹¹⁸.

A prevailing theme in the regional study is how difficult the general environment for PWD has been. Addressing that challenge has fuelled the efforts of NGOs, disability organizations and their members themselves to promote awareness, political momentum and energising changes in the social attitudes towards persons with disabilities. Without enabling an inclusive strategy for the education of PWDs, there is the risk that people with disabilities will continue to be educated in isolation, or not at all. Activities are also aimed at placing more emphasis on integrated strategies that link the education of PWD using ICTs to the telecommunication competences needed in the labour market.

114. Regional Study for South America, Central America and Mexico and the Caribbean

115. <http://www.ceibal.org.uy/>

116. Regional Study for South America, Central America and Mexico and the Caribbean

117. <https://www.cilsa.org/>

118. Regional Study for South America, Central America and Mexico and the Caribbean

For example, the regional study takes note of developments in the Dominican Republic, even though the country has no formal laws or policies in the use of ICTs in the education of PWD:

"The National Council on Disabilities (CONADIS¹¹⁹) has signed inter-institutional collaboration agreements with the Technological Institute of the Americas (ITLAS) and the Institute of Technical and Vocational Training (INFOTEP¹²⁰) as a way of progressively ensuring accessibility to information for all persons with disabilities"¹²¹.

Working with institutions, university researchers and government officials the organization aims to provide personalised ICTs to people having visual impairments. But it also is very sensitive to the cost of these technologies, and in February 2012 it ceased distributing some well-known ICTs because a price increases¹²² made them difficult for people with disabilities to afford.

The National Union of the Blind in Uruguay (UNCU¹²³) runs courses in Braille literacy¹²⁴, and provides information about assistive technologies and their acquisition and usage. Its Agora project provides vocational and ICT training that helps people enter the labour market, and it also has a "Programa Red Mate" which [*"is a joint initiative of the National Union of the Blind of Uruguay and the Argentinian non-profit organization, Tiflonexos, to produce accessible materials for high school students and beyond who are blind or have low vision¹²⁵"*].

In Mexico the Illumina¹²⁶ organization uses ICTs in its mission to "*improve the development, education and independence of people with visual disabilities to contribute to social inclusion*". Significantly, Illumina regards the educational process as starting from birth for children with visual disabilities, since "*in the early stages of life is essential stimuli lead to them through experiential practices. Experiences that later, will give them the ability to exploit*". They focus first on early identification of needs, then on visual stimulation of children, leading to inclusive education through relevant and integrated programmes using assistive technologies, and then ensuring that both parents and teachers are provided with the knowledge and competences to help the children exploit the ICTs and educational programmes. Specific ICT education covers:

- ▶ Computer Classes for Children between 4 and 12 years of age with visual disabilities: These involve the beneficiary from an early age in the use of computers to familiarize them with the use of technology. Computer courses: These provide professional training to visually impaired people to contribute to their education and employability.
- ▶ Distance education: Its goal is to provide professional training in the use of software tools to visually impaired people in the distance education mode

119. <http://www.conadis.gob.ec/>

120. <http://www.infotep.gov.do/>

121. Regional Study for South America, Central America and Mexico and the Caribbean

122. <http://www.laratec.org.br/Noticias.html>

123. <http://www.uncu.org.uy/>

124. <http://www.uncu.org.uy/servicios.htm>

125. http://www.uncu.org.uy/red_mate.htm

126. <http://ilumina.mx/>

- ▶ Development of courses in audio format. The service generates the material in audio format requested by the Head of the platform technology for distance education of lights, blindness and low vision. It also develops outreach materials or training in specific areas requested by other institutions.
- ▶ Software development. The service develops software that helps children in learning school subjects like math or Spanish.
- ▶ Podcast lights. In order to raise awareness of issues of interest to people who are blind or have low vision (low vision), such as: advances in adaptive technology, computer lessons or human issues related to disability, constantly publish audio files for free that allow the users to listen as many times as they want to interviews with specialists in different areas. This material is online and available 24 hours a day, 365 days a year¹²⁷.

From these examples of good practice it is clear that there are significant levels of activity across the regions covered in the study. However, in some countries the activity has yet to sit within a consistent legislative and organizational framework that can drive the movement towards fully inclusive education for PWDs. In the absence of such frameworks the initiatives of NGOs and disability organisations organizations will provide selective beacons of excellence, but leave spaces of exclusion for PWDs between them.

The regional study concluded with some overall observations and recommendations:

- ▶ To increase the number of disability-trained teachers, reduce the high costs of ICT equipment, further develop public policies and improve the ICT infrastructure – all challenges shared throughout the region;
- ▶ To address the “inadequate legal framework” for defending the rights of persons with disabilities, and public policies that often do not integrate education, work and society;
- ▶ To ensure legislation are effectively ‘joined up’ regarding the rights of persons with disabilities with those regulating education, information and communication technologies, access to information, copyright and non-discrimination;
- ▶ To overcome the prevailing medical rehabilitation approach to disability;
- ▶ To encourage governments to undertake initiatives relating to ICTs and as well as civil-society organizations; and
- ▶ To expand knowledge among policy-makers about disability, ICTs and ATs and their advantages for helping to achieve equal opportunities and inclusion in education and other areas of life for persons with disabilities.¹²⁸

127. http://ilumina.mx/?page_id=9

128. Regional Study for South America, Central America and Mexico and the Caribbean, p. 60. (LAC Regional Study).

2.2 Common Challenges and Issues Across the Regional Studies, and Overall Recommendations

Although the regional studies were subject to limitations and constraints in data gathering regarding the use of ICTs in education for persons with disabilities, there are some overall challenges that cut across all regions. These challenges reflect the systemic socio-economic challenges facing not just developing countries, and countries emerging and in transition, but all countries during a period of global economic crisis. These challenges and conclusions have been organized into a common set of themes.

The final outcome is a set of 18 high-level recommendations relevant to the use of ICTs to allow people with disabilities to access information and knowledge. The first three are strategic underpinning actions that are needed in all contexts for PWD. Recommendations 4-16 are specific for ICTs and creating an enabling environment. Recommendations 17 and 18 are generally applicable to the particular needs of PWD:

1. Promote understanding of the benefits to society by empowering PWDs to access information and knowledge using ATs and ICTs

- ▶ Adopt a **holistic** approach: Use of ICTs should not be seen as an end goal by itself, but rather as an important means of empowerment of PWDs, and a way to achieve international goals and commitments;
- ▶ Make **access to information and knowledge by persons with disabilities** a fundamental right guaranteed under law, in accordance with the internationally recognized commitments such as Millennium Development Goals (MDG), Education for All (EFA) goals of equitable access to quality education as a human right, and Rio+20, which puts countries on the path to sustainable development.- Communicate clearly to relevant public and private organizations the **economic and social benefits** of providing access to information and knowledge, building capacities and creating an enabling environment for PWDs;
- ▶ Encourage governments to adopt a holistic approach to give persons with disabilities all their **human rights** including education, access to information, freedom of expression, medical care, mobility etc.; and
- ▶ Demonstrate tangible benefits by developing **teacher skills** and embedding ATs in the curriculum.

2. Understand the wider global benefits of the UN Convention

- ▷ Encourage governments to **ratify the UN Convention** through demonstrating the economic and societal value obtained when meeting its obligations;
- ▷ **Promote and disseminate the UN Convention** on the Rights of Persons with Disabilities at all levels, so that, through their purposes, principles and general obligations, this sector's rights can be guaranteed;
- ▷ **Foster awareness** that the UN Convention is a comprehensive and integral normative instrument to promote and protect the rights and dignity of persons with disabilities as well as enhance their participation in the civil, economic, social and cultural spheres with equal opportunities; and
- ▷ Highlight that access to information and knowledge using ICTs by PWDs is seen as integral part in enabling them to fully enjoy all **human rights and fundamental freedoms**.

3. Build a supportive civil society

- ▷ Achieve a **change in societal attitudes** toward a human rights perspective for PWD;
- ▷ Work to **overcome stereotypes, prejudice and discrimination** towards persons with disabilities;
- ▷ Change the **approach to disability** away from the medical rehabilitation approach to a social and holistic approach;
- ▷ **Raise awareness about available resources**, primarily for persons with disabilities, their families and friends, as well as specialists in charge of education and social inclusion of PWD; and
- ▷ Develop a **deep culture of inclusion** in societies among various stakeholders.

4. Develop appropriate policies and legislation to access information and knowledge for PWDs using ICTs

- ▷ **Elaborate interlinked normative frameworks regarding the inclusion of PWDs** and use of ICTs to access information and knowledge;
- ▷ Formulate, approve and implement **harmonised public policies** relating to social inclusion, e-accessibility, educational, technology-industry, labour-related and social contexts;
- ▷ Include **concrete provisions in the budget allocations** of governments required to develop ICTs and services making them accessible for PWDs; and
- ▷ Develop an **electronic accessibility policy** to ensure that all information which is digitally available, such as web sites, electronic documents, educational resources and others adhere to accessibility standards.

5. Provide policy incentives

- ▷ **Consider government incentives for investment and innovation** in assisted technologies and encourage social responsibility as well as investing more efforts in human and institutional capital;
- ▷ **Implement measures** for the engagement and development of assistive technology or in localising assistive technology such as providing tax holidays/breaks, awards and prizes to IT companies that are;
- ▷ Offer **subsidies or grants to education establishments** that purchase assistive technology for their students; and
- ▷ Encourage, stimulate and provide support for the development of **universally designed products and services**, particularly ICT accessibility which calls for the design, creation and application of the environments, products, applications, and content to be usable by everyone, including PWD, without need for special modification and design.

6. Show leadership through design for all

- ▷ Maximise efforts to make **government websites and services** accessible (design, accessibility and language etc.);
- ▷ Encourage developments of **text-to-speech synthesisers in local languages**; and
- ▷ **Encourage other stakeholders** to adapt similar accessibility standards.

7. Promote procurement standards/procedures/practices that include accessibility standards and requirements for PWDs from the outset

- ▷ Apply **e-accessibility as a compulsory procurement requirement** for ICTs purchased by government, for example requiring W3C/Web Accessibility Initiative (WAI) guidelines); and
- ▷ Contribute to the development and adoption of **guidelines for accessibility-friendly procurement practices**.

8. Help to make AT and ICTs affordable for persons with disabilities

- ▷ Promote **the development and adaptations of open source assistive software** and open hardware technologies, favouring better responses to local needs and large-scale cost-effective deployments. Explore strategies to ensure hardware and software assistive technologies are **available at locally affordable prices**;

- ▶ Promote the development and adaptation of appropriate open strategies for to **maximise the proportion of the disabled population is able to use assistive software and technologies**; and
- ▶ Promote the use of **low-cost applications for mobile phones** to maximise the availability of ICT solutions for PWD at affordable local prices.

9. Encourage multi-sector and multi-stakeholder partnerships

- ▶ Develop **multi-stakeholder partnerships** to maximise participation and to oversee the monitoring and implementation of policies and practices in ICTs for the education of persons with disabilities; and
- ▶ Through the multi-stakeholder partnerships, alliances and networks **ensure long-term sustainability of initiatives for inclusion of PWD**.

10. Build robust evidence

- ▶ Conduct **robust research** on e-inclusion and access to information and knowledge using ICTs by PWD based on reliable and evidence-based data;
- ▶ Build **robust and geographically detailed statistics and indicators** relating to disabilities, covering for example rural-urban, gender, language, literacy and employment divides and ICT usage; and
- ▶ Formulate **evidence-led policies and initiatives** based on robust evidence and focused towards effective implementation.

11. Empower persons with disabilities

- ▶ **Involve PWDs fully as key stakeholders** in all policy-making, legislative development and social processes, in order to ensure that proposals and decisions are relevant; and
- ▶ **Promote a fully participatory approach**, by creating structures for communication and collaboration to enable coordination, to strengthen actions among governments, key stakeholders, international organizations, NGOs, the private sector and civil society.

12. Create an enabling environment where all players can raise capacity and competences:

- ▶ **Invest in institutional capital and human beings** knowledgeable and skilled in Assistive Technology and ICTs. For example, through resource centres and structures that can provide awareness-raising and specific training for students and educators;
- ▶ **Enhance teaching through the training** of education professionals, administrative and managerial personnel of educational institutions as well as IT staff, media, library and other; and

- ▶ Develop programmes and opportunities where **those trained become trainers of others.**

13. Support and develop capacities of educators

- ▶ **Increase the number of suitably trained teachers** through vocational training, on-the-job training, study circles or groups, inter-institutional gatherings, internships, and video-conferences;
- ▶ Ensure that **teacher training programmes include AT and ICTs for disability as an integral component of the curriculum**; and
- ▶ Ensure that **special educators have the same status as trainers/teachers** in mainstream education.

14. Encourage innovative and relevant curricula

- ▶ Include AT and ICTs for persons with disabilities in **curricular plans for basic education, technical and university education**, so that teachers are well prepared for 'mainstreamed' students with disabilities;
- ▶ Include accessibility, particularly web-accessibility in the training programmes provided for **the training of IT staff**; and
- ▶ Encourage development and dissemination of **accessible Open Educational Resources (OER)**.

15. Maximise the availability of content and Intellectual Property Rights (IPR) for PWD:

- ▶ **Amend copyright laws** to include an exception permitting conversion and sharing of publications and resources in open and accessible formats without cumbersome procedural requirements;
- ▶ **Promote the role of library and museum networks** for sharing virtual accessible content taking into consideration Open Access to scientific information principles; and
- ▶ **Establish a common education and information space** (fully accessible web platform), devoted to the issues of ICT usage for persons with disabilities, open and accessible teaching and training materials, including OERs, as well as establish a network of users and specialists.

16. Promote employability

- ▶ Ensure that access to information and knowledge as well as education of PWD opens up **significant and widespread opportunities for employability** and economic productivity.

17. Share information and good practice:

- ▶ Increase the availability of **knowledge about disability and AT and ICTs**;
- ▶ Make information and resources available through **channels that are relevant to PWDs**;
- ▶ **Encourage the mass media** and other information providers such as libraries, Internet information providers to provide more information and services adapted to the needs of PWDs, including accessible television, mobile telephony, library services;
- ▶ **Provide and share information and support** rapidly to PWDs during conflict and post conflict and disaster situations; and
- ▶ **Share information** about successful projects and establish communities of practice on disability related issues.

18. Promote a culture of non-violence, respect and tolerance

- ▶ **Create an enabling environment that overcomes stereotypes, narrow-mindedness and harmful practices** towards persons with disabilities, including on the grounds of gender, age, ability, language or race;
- ▶ **Prevent violence and harmful practices against PWDs**, particularly women and girls with disabilities;
- ▶ Develop **gender specific programmes** to access information and knowledge using ICTs by PWDs; and
- ▶ Stimulate dialogue, respect and tolerance towards PWDs.

The next sections of this report will focus on the good practice examples that relate to the use of ICTs to access information and knowledge of people with disabilities and which address the recommendations above, first (Section 5) looking at conceptual and technology issues more widely, and then (section 6) noting specific examples that were identified in the regional studies.

3 EMERGING OPPORTUNITIES – ICTs FOR INNOVATIVE PRACTICES



UNESCO's exhibition, Geneva, 2009.

We have seen how difficult and complex a matter it is to define in policy terms what exactly constitutes a disability. It is equally difficult to identify cognitive disabilities and then plan suitable interventions because the experts don't agree. For example, attention deficit hyperactivity disorder (ADHD) research from Michigan State University has argued that in the USA "nearly 1 million children may have been mis-diagnosed with attention deficit hyperactivity disorder, or ADHD, not because they have real behavior problems, but because they're the youngest kids in their kindergarten class"¹²⁹. The implication could be that some 'disabilities' are themselves caused, or exacerbated, by an inadequate education environment.

Other research further emphasizes how complex are the issues of ICTs and PWD. **There are potential societal prejudices that make an impact on people with disabilities' ability to access information and knowledge, but there are also policy challenges when people with certain disabilities fight must fight for official recognition and interventions.** Without this recognition their issues cannot and will not be addressed; the answer often lies in organizing themselves politically¹³⁰.

How a disability is recognized therefore depends on the conceptual, political and societal framework{s} used to define and acknowledge it, for example whether from a medical (which focuses on acknowledging that something is a disability) or social perspective (which looks at barriers, attitudes and exclusion), or both¹³¹. Where ICTs are involved:

*"factors such as accessibility, design for all, and user participation in development and implementation processes are key strategies in promoting equal rights and equal opportunity for persons with disability in the different environments of the information society."*¹³²

So what ICTs are optimal and in what context? While advanced economies may celebrate innovative and sophisticated approaches, in other cases an 'appropriate' approach could be decidedly low-tech. In India, for example, innovators have found 'work-around' solutions for location-based services using older generation mobile phones¹³³ - in effect making older and cheaper technologies act 'smartly'.

Another consideration, underlined in the calls for more effective training of educators cited in this report, is the extent to which educators may or may not feel 'comfortable' with an ICT or a training context, because:

*"There are a variety of parameters associated with efficiency that factor into the degree of contextual fit between an intervention strategy and an educator's "intervention strategy comfort zone."*¹³⁴

129. Szabo, Liz. (2010). *Youngest in class get ADHD label*. USA Today, [accessed 17 August 2010]. http://www.usatoday.com/news/health/2010-08-17-1Aadhd17_ST_N.htm

130. Allen, Julie. (2010). The sociology of disability and the struggle for inclusive education. *British Journal of Sociology of Education* 31 (5): pp. 603-619.

131. http://en.wikipedia.org/wiki/Social_model_of_disability

132. Toboso, Mario. (2011). Rethinking disability in Amartya Sen's approach: ICT and equality of opportunity. *Ethics and Information Technology* 13 (2): pp. 107-118.

133. Aron, Jacob. (2012). *GPS workaround helps make dumb phones smart*. New Scientist, September 27, [accessed 4 October 2012]. <http://www.newscientist.com/article/mg21528844.600-gps-workaround-helps-make-dumb-phones-smart.html>

134. Reichle, Joe. (2011). Evaluating Assistive Technology in the Education of Persons with Severe Disabilities *Journal of Behavioral Education* 20 (1). , ibid.

It is as if an educator is required to become ‘multi-lingual’ and ‘multi-skilled’ in a variety of ICTs, in addition to their regular subject skills, so any policy intervention will need to be appropriate for the environments in which ICTs are used for persons with disabilities. How many students are in a class and how many have disabilities that need interventions? Will ICTs be used to save money, or to deliver better learning outcomes? Will ICTs be used to minimize the number of teaching staff needed, or will they be used by teaching staff to enrich learning? Are the ICTs also used (or usable – thanks to design for all) by those without a disability? How is the intervention monitored and evaluated, and how do you know if the outcomes are better than would have occurred without the intervention?

Lidström et al. report research that set out to assess whether students without disabilities use ICTs differently than students with disabilities. The most frequent users of ICTs were those with disabilities, but they used them for less varied educational activities. This reinforces the need to link appropriate ICTs to appropriate curriculum and learning environments¹³⁵. The study concluded that:

- “regardless of whether they use a computer-based ATD or not, **students with a physical disability have restricted participation in some computer-based educational activities in comparison to students from the general population. An individual plan could be beneficial for each student** to: focus on the aim of the computer use; examine the students’ needs in terms of computer-based ATDs and their inclusion in education; and ensure that the students’ digital skills are fully utilized”¹³⁶

That research clearly supports the call for holistic and integrated approaches to education for PWDs, for personalization to meet the specific needs of PWDs, and cautions against considering ICTs as ‘stand-alone’ interventions. For example, the research into ICT use for the education of people with severe disabilities concludes that there is:

“strong evidence that **behavioral education can in fact enable individuals with severe disabilities to use and benefit from a range of assistive technologies**. This contribution will hopefully reduce the underutilization of assistive technology in educational programs for individuals with severe disabilities”¹³⁷

To finish setting the current context of ICTs, PWDs and education, this section examines what has been happening in both top-down and bottom-up developments. There is a particular focus on Africa, because research shows that the continent is significantly challenged by disabilities, and that government-level policies and interventions have often been slow to respond.

It is estimated that in Africa between 5-10% of children have a disability, with the majority of those recognized being medically defined disabilities¹³⁸. Yet in Southern Africa the SADC (Southern African

135. Lidström, Helene, Mats Granlund, and Helena Hemmingsson. (2012). Use of ICT in school: a comparison between students with and without physical disabilities. *European Journal of Special Needs Education* 27 (1): pp. 21-34.

136. ibid

137. Sigafoos, Jeff. (2011). Introduction to the Special Issue: Evaluating Assistive Technology in the Education of Persons with Severe Disabilities. *Journal of Behavioral Education* 20 (1): pp. 1-3.

138. UNICEF. (2012). *Africa: UNICEF Calls for Social Inclusion of Children With Disabilities in Africa*. United Nations Children’s Fund, June 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201206180384.html>

Development Community) has acknowledged "the lack of progress since the African Union declared 1999-2009 as the African Decade for Persons with Disabilities"¹³⁹. In 2012 only 25 of 55 African countries had ratified the UN Convention, and there have been systemic issues relating to the education of PWDs, including prejudice and discrimination. For example:

"A 2011 UNICEF study undertaken in Madagascar found that on average only 11 per cent of children with disabilities attended primary school, with school attendance among girls much lower. Almost all **children interviewed reported that they were ridiculed by other children**. Because of such bullying, as well as a lack of inclusive practices, **children with disabilities are more likely to drop out of school than their peers without disability**. Their learning achievements are often worse than those of other children, because schools are not designed to cater for them and teachers are often not adequately trained"¹⁴⁰

The same study identified **particular prejudice** against children with albinism, and in Tanzania such children need particular protection in special centers where they are sheltered from potential violence towards them. The African Union promotes a yearly Day of the African Child (June 16), and the 2012 Day focused on *The Rights of Children with Disability in Africa: The Duty to Protect, Respect, Promote and Fulfill*. There was particular concern about **peer-group prejudice**, since no amount of ICT interventions will overcome the issue of exclusion.

Particular **challenges exist with cognitive disabilities**, and a contributor from Nigeria noted that "it is a common sight to see a child with Downs syndrome being teased and made fun of by both children and adults".¹⁴¹ As a consequence in Africa:

"Disability is one of the least visible but most potent factors in education marginalization. Beyond the immediate health-related effects, physical and mental impairment carries a stigma that is often a basis for exclusion from society in general and the education system in particular".¹⁴²

Viewed from a continental level the picture can seem discouraging, but that approach looks (as do the UNESCO regional studies) at the extent to which countries in Africa overall are performing. When the activity within countries is reviewed, the picture is brighter, for there are clear moves to build inclusive education and to innovate and collaborate at the local levels. For example, the University of Botswana has a Disability Support Unit that aims to provide a **coherent support service** across the institution, ranging from **assessment, support and counseling to the provision of assistive technology**

139. Lee, Richard. (2012). *Africa: Conference Calls for Inclusive Education in SADC*. Open Society Initiative for Southern Africa (Johannesburg), June 25, [accessed 13 August 2012]. <http://allafrica.com/stories/201206260169.html>

140. ibid

141. Anon. (2012h). *Nigeria: International Day of the African Child - Rights of Special Children*. Daily Trust (Abuja), June 22, [accessed 13 August 2012]. <http://allafrica.com/stories/201206220497.html>

142. OSISA. (2012b). *Education for Children with Special Education Needs in Southern Africa*. Open Society Initiative for Southern Africa (Johannesburg), [accessed 13 August 2012]. <http://www.osisa.org/education/regional/education-children-special-education-needs-southern-africa>

devices¹⁴³. Ghana ratified the UN Convention and Optional Protocol in July 2011¹⁴⁴, and believes that? The Convention should provide an incentive “to identify and **assist persons with disabilities, including children ... because some parents hide them in their homes**”¹⁴⁵, and policy interventions need to overcome shame and social prejudice as well as planning education interventions.

The task of identifying those PWD who need interventions first requires that the disabilities be recognized (a problem noted earlier in this report) and needs an understanding of how many PWD there are who need a special intervention in order to access information and knowledge. However, in Ghana the National Council on Persons with Disabilities cautions that “statistics on disabilities in Ghana are notoriously unreliable, and the actual number could be much higher ... {it} wants to raise 13 million dollars so it can conduct a national census on disabilities”¹⁴⁶.

As in many countries the physical infrastructure can be a challenge, and in Ghana “**the power to run an ICT center is also an obstacle**, as 30% of the country is without power. There is also the high cost of equipment such as laptops, desktop computers, network databases, etc., that would require careful budgeting”¹⁴⁷. But there are initiatives where the infrastructure business re-invests in social project, thereby increasing market size and potential. Through its **corporate social responsibility activities** MTN, a telecoms network, supports projects in the west of Ghana including “ICT Centres in all the ten regions, while also supporting Persons with Disability (PWDs) and offering scholarships”¹⁴⁸.

Infrastructure also appears as a major priority in Kenya through a developing “National Plan of Action to ensure all buildings, means of transport and roads are disability friendly”.¹⁴⁹ A National Council for Persons with Disabilities was established as a semi-autonomous government agency in 2004¹⁵⁰, but the Government also clearly acknowledges that achieving the goals for PWDs “**requires the collective efforts of the government, private agencies and stakeholders**”¹⁵¹. Also identified as strategic needs

143. Kotzé, Hermien. (2012). *Southern Africa Disability Rights and Law School Project*. Open Society Initiative for Southern Africa (Johannesburg), June, [accessed 28 September 2012]. http://www.osisa.org/sites/default/files/disability_open_learning_-_country_reports_final.pdf

144. Anon. (2012c). *Ghana: Parliament Ratifies UN Convention On Rights of Persons With Disability*. Accra Mail, March 14, [accessed 13 August 2012]. <http://allafrica.com/stories/201203160678.html>

145. Jalulah, William N-lanjerborr. (2012). *Ghana: Parents Urged to Stop Concealing Children With Disabilities*. The Chronicle (Ghana), July 20, [accessed 13 August 2012]. <http://allafrica.com/stories/201207270409.html>

146. Migneault, Jonathan, and Jamila Akweley Okertchiri. (2012). *Ghana: Autism ‘Relegated to the Sidelines’*. Inter Press Service (Johannesburg), May 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201205180181.html>

147. Hinchliffe, Tim. (2012). *Ghana: Civil Society Education Manifesto 2012 Launched in Accra*. Ghanaian Chronicle, May 17, [accessed 21 September 2012]. <http://allafrica.com/stories/201205170523.html>

148. Boateng, Estelle Graciela. (2012). *Ghana: MTN Spends Ghc600,000 On Projects in W/R Communities*. Public Agenda (Accra), June 29, [accessed 21 September 2012]. <http://allafrica.com/stories/201206290721.html>

149. Wekesa, Chrispinus (2012). *Kenya: Action Plan to Ensure Buildings, Roads Are Friendly to the Disabled*. The Star (Nairobi), June 26, [accessed 13 August 2012]. <http://allafrica.com/stories/201206270985.html>
, ibid.
, ibid.

150. <http://ncpwd.go.ke/>

151. ibid

are the developments of skills and competences of teachers and other education staff¹⁵², and also for a wider provision of mass media products in formats suitable for disabilities, such as those who are blind or have low vision.¹⁵³

From Lesotho there is a report of multiple challenges including inadequate accessibility to school buildings, a lack of suitably trained teachers, and social prejudices where "**disability has long been regarded as a taboo**. Consequently, the birth of children with disability is a source of embarrassment to their families."¹⁵⁴ Social discrimination has likewise been identified as a challenge in Liberia, but the country has taken initiatives to overcome it through a Community Empowerment Programme.¹⁵⁵ Lesotho ratified the UN Convention in 2012¹⁵⁶.

Prejudice and discrimination against PWDs have been cited in Malawi. These are being addressed through local level initiatives such as a Special Needs Education Resource center in Mvera (Dowa District) which will specifically train teachers to become specialists in the education of PWDs¹⁵⁷. Overcoming prejudice also means achieving? inclusion in the governance processes, but in Namibia it was reported that PWDs "in the Erongo Region are not adequately represented on organisations that decide in issues affecting their future"¹⁵⁸, but it also has been acknowledged that the "current trend in Namibia is a paradigm shift, from the medical and social model of rehabilitation of people with disabilities to the human rights model. To keep up with this new approach, advocacy capacity building for the staff members, volunteers and care givers working in this field is necessary".¹⁵⁹

Nigeria presents a diverse picture relating to the access to information and knowledge of PWDs. It is estimated that there are over 1.2 million people in the country who are blind, but that there is still a need for concerted Government intervention¹⁶⁰. At State level there are ICT interventions, for example in Ekiti State "N16 million worth of Braille computers for students with disability in public schools across the

152. Murithi, Kirimi. (2012). *Kenya: Disabled Want More Teachers*. The Star (Nairobi), April 13, [accessed 13 August 2012]. <http://allafrica.com/stories/201204131173.html>

153. Muriithi, Kirimi. (2012). *Kenya: Help the Blind Access Information, State Told*. Nairobi Star, February 27, [accessed 4 March 2012]. <http://allafrica.com/stories/201202280546.html>

154. Kotzé, Hermien. (2012). *Southern Africa Disability Rights and Law School Project*. Open Society Initiative for Southern Africa (Johannesburg), June, [accessed 28 September 2012]. http://www.osisa.org/sites/default/files/disability_open_learning_-_country_reports_final.pdf

155. Anon. (2012e). *Liberia: EU Identifies Likely Source of Future Conflict in Liberia*. Heritage (Monrovia), July 11, [accessed 13 August 2012]. <http://allafrica.com/stories/201207111005.html>

156. Anon. (2012d). *Liberia: Disabled Commission Gets Teeth to Bite*. Heritage (Monrovia), August 7, [accessed 13 August 2012]. <http://allafrica.com/stories/201208071107.html>

, Anon. (2012f). *Liberia: Govt. Finally Ratifies UN Convention On Disability - Disable Community Lauds The Informer* (Monrovia), August 7, [accessed 13 August 2012]. <http://allafrica.com/stories/201208071099.html>

157. OSISA. (2010). *Special Needs Education: Actions for Real Change (SNEAR)*. Open Society Initiative for Southern Africa (Johannesburg), [accessed 13 August 2012]. <http://www.osisa.org/education/malawi/special-needs-education-actions-real-change-snear>

158. De Clerk, Eveline. (2012). *Namibia: Disabled Not Fully Represented*. New Era (Windhoek), June 22, [accessed 13 August 2012]. <http://allafrica.com/stories/201206221046.html>

159. OSISA. (2012a). *Advocacy for an Inclusive Education Policy in Namibia*. Open Society Initiative for Southern Africa (Johannesburg), [accessed 13 August 2012]. <http://www.osisa.org/education/namibia/advocacy-inclusive-education-policy-namibia>

160. Omoniyi, Tosin. (2012). *Nigeria: Why More Should Be Done for the Blind*. Daily Trust (Abuja), June 22, [accessed 13 August 2012]. <http://allafrica.com/stories/201206220502.html>

state", and to boost infrastructure capability "33,000 of the 95,000 secondary school students and Science teachers in public schools will benefit from the solar-panel computers in 2012 while the others will benefit from that of 2013 and 2014 respectively".¹⁶¹ There remain many challenges relating to the training of teachers, and in 2011 the National Teachers Institute (NTI) in Kaduna "trained 125,000 specialised primary and secondary school teachers on Special Education Need and Disabilities (SENDs)".¹⁶²

Similar pictures of adversity and innovative responses exist in other African countries. **Social and parental prejudice** is identified in Rwanda¹⁶³, but the country has "invested significantly in specialized education for children with disabilities. The number of children benefiting from special education increased from 632 in 2000 to around 17,000 in 2010".¹⁶⁴ While there are not enough suitably trained teachers¹⁶⁵, training centers do exist, for example in the Gasabo, Kamonyi, Muhanga, and Rustiro districts: "they now have 200 teachers able to teach children with special needs. Recently, 40 more teachers were awarded diplomas in inclusive education at Kigali Institute of Education (KIE)".¹⁶⁶ In another Ministry of Education initiative the Director of Special Education cited a capacity building approach to skills through pilot schools and cluster schools, where the pilot schools are given the training and then become the trainers for the cluster schools¹⁶⁷. The Ministry of Education also has a 'one laptop per child' strategy¹⁶⁸.

South Africa presents a broad spectrum of issues, ranging from a lack of specialized and suitably trained teachers¹⁶⁹, to a system where disability rights were "severely underfunded" and the disability movement was not "focusing on access to justice and rights promotion issues but rather on welfarist approaches to disability".¹⁷⁰

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- 161. Adebusuyi, Doyin. (2012). *Nigeria: Ekiti Buys Braille Computers for Disabled Students*. Daily Trust (Abuja), March 12, [accessed 13 August 2012]. <http://allafrica.com/stories/201203120444.html>
 - 162. SA'Idu, Isa. (2012). *Nigeria: 'Training, Solution to Unqualified Teachers'*. Daily Trust (Abuja), July 26, [accessed 13 August 2012]. <http://allafrica.com/stories/201207260417.html>
 - 163. Bucyensenge, Jean Pierre. (2012). *Rwanda: Challenges of Raising Children With Disabilities*. The New Times (Rwanda), July 24, [accessed 13 August 2012]. <http://allafrica.com/stories/201207240272.html>
 - 164. UNICEF. (2012). *Africa: UNICEF Calls for Social Inclusion of Children With Disabilities in Africa*. United Nations Children's Fund, June 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201206180384.html>
 - 165. Mugisha, Stevenson. (2012). *Rwanda: Schools for Disabled Appeal for Qualified Teachers*. The New Times (Rwanda), June 29, [accessed 13 August 2012]. <http://allafrica.com/stories/201207020118.html>
 - 166. Mugoya, Grace. (2012). *Rwanda: 160 Graduate in Special Needs Education*. The New Times (Rwanda), April 23, [accessed 13 August 2012]. <http://allafrica.com/stories/201204230168.html>
 - 167. Anon. (2012g). *Liberia: MOE, Partners Brainstorm On Inclusive Education*. The Informer (Monrovia), September 17, [accessed 21 September 2012]. <http://allafrica.com/stories/201209180513.html>
 - 168. Anon. (2012i). *Rwanda: Mineduc Distributes OLPC Computers to Disabled Students*. Rwanda Express (Kigali), June 23, [accessed 13 August 2012]. <http://allafrica.com/stories/201206240094.html>
 - 169. Mannak, Miriam. (2012). *South Africa: The Plight of South Africa's Disabled Youth*. Radio Netherlands Worldwide, July 26, [accessed 13 August 2012]. <http://allafrica.com/stories/201207270270.html>
 - 170. Oliver, Louise. (2012). *Southern Africa: Fighting for Disability Rights*. Open Society Initiative for Southern Africa (Johannesburg), July 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201207190696.html>

In Uganda “it is estimated that PWDs make up between 12-15% of the country’s population. Some commentators say this percentage is an underestimation”¹⁷¹.

“Many countries in Africa have not fully taken the issues of PWDs seriously in terms of resource allocation and policy formulation because **they are such a small constituency of the people who make up the voting blocs for their parties**”¹⁷²

In the final part of this chapter the challenges of African countries are put into a wider context. The situation between developing African economies and advanced economies often is communicated as binary, for example when referring to a ‘digital divide’ with regard to internet access, as if there were clearly identifiable situations either side of a divide. However, with the idea of digital inclusion the situation becomes much more complex, perhaps viewed more as ‘unevenly changing unevenness’. There are many excluded PWDs in advanced economies, but as the Africa examples show, the number of persons with disabilities in many developing countries who are excluded can represent a much greater proportion of the population.

Even in advanced economies the education of persons with disabilities is not satisfactory. In the UK, with its focus on eGovernment and the digital channel, “almost half of **local authority websites remain inaccessible to disabled users**, and 12% (51 sites) were classed as ‘Inaccessible’”.¹⁷³ That situation exists in spite of the UK’s has ratified the UN Convention in 2009¹⁷⁴. A new UK Disability Strategy focuses on empowerment, individual control, and changing attitudes and behaviors, moving away from central government interventions¹⁷⁵. It uses the context of ‘**Valuing People**’ to understand not only the educational challenges, but also to look at long-term health issues and “to investigate the **premature deaths of people with learning disabilities**”¹⁷⁶.

In the USA, there may be educational interventions, but:

“Students with disabilities face several longstanding challenges accessing services that may assist them as they transition from high school into postsecondary education or the workforce—services such as tutoring, vocational training, and assistive technology … This may be due, in part, to **limited opportunities to engage in vocational and life skills training or obtain work experience while in school**”¹⁷⁷.

171. Kiapi, Frederick K. (2012). *Uganda: Harmonise Laws to Accommodate People With Disabilities*. New Vision (Kampala), September 17, [accessed 21 September 2012]. <http://allafrica.com/stories/201209170766.html>

172. Ibid.

173. HEADSTAR. (2012a). *Councils Still Struggling With Website Accessibility*. Headstar.com, March 30, [accessed 30 March 2012]. <http://www.headstar.com/eablive/?p=697>

174. eGovmonitor. (2009a). *UK ratifies human rights treaty for disabled people*. Egovmonitor.com, [accessed 14 June 2009]. <http://www.egovmonitor.com/node/25560>

175. COMMONS. (2012). *Implementation of the Right of Disabled People to Independent Living: Government Response to the Committee's Twenty-third Report of Session 2010-12* House of Commons, Joint Committee on Human Rights, July 2, [accessed 20 July 2012]. <http://www.publications.parliament.uk/pa/jt201213/jtselect/jtrights/23/2302.htm>

176. eGovmonitor. (2009b). *Valuing people now - New vision for people with learning disabilities*. Egovmonitor.com, [accessed 19 January 2009]. <http://www.egovmonitor.com/node/23047>

177. GAO. (2012). *Students with Disabilities: Better Federal Coordination Could Lessen Challenges in the Transition from High School*. General Accounting Office, July 12, [accessed 17 August 2012]. <http://www.gao.gov/products/GAO-12-594>

Also, there have been concerns in the United States where proposed "**changes in the definition of autism** would sharply reduce the skyrocketing rate at which the disorder is diagnosed and may make it harder for many people who would no longer meet the criteria to get health, educational and social services"¹⁷⁸, a situation that yet again shows how controversial cognitive disabilities can be. The uneven adoption of ICTs also impacts on PWDs, as in the case where American colleges and universities have rapidly adopted eBook readers in teaching and learning but a "serious problem with some of these devices is that they lack an accessible text-to-speech function"¹⁷⁹. This shows how important it is to **follow 'design for all' principles when developing ICTs for educational use.**

In Australia the Royal Institute for Deaf and Blind Children (RIDBC) uses recent developments in telecommunications technologies to "expand their **services to better support families and children living in regional and remote areas** of Australia"¹⁸⁰, which shows how ICTs can be used to provide education at a distance for PWD. New Zealand has an extensive national approach through the *Click SpecialEDNZ Trust* which:

*"Is a professional learning community that has been funded and developed by New Zealand Special Schools and the Special Education Principals' Association in New Zealand (SEPANZ) At the heart of the Click SpecialEDNZ Trust initiative is the website. This **enables special education professionals to work collaboratively to share knowledge, skills and expertise** to improve the quality of teaching and learning for all learners with special needs."¹⁸¹*

In Europe, at the regional level, the European Commission promotes integrated strategies and policies, yet a recent report shows that:

*"Around 45 million EU citizens of working age have a disability and 15 million children have special educational needs. The report shows that in some cases, they are deprived of educational and employment opportunities altogether. **Children with special educational needs frequently leave school with few or no qualifications, before moving into specialist training which can, in some cases, impair rather than increase their job prospects.** People with disabilities or special educational needs are much more likely to be unemployed or economically inactive, and even those who are relatively successful in the job market often earn less than their non-disabled counterparts"¹⁸²*

178. Carey, Benedict. (2012). *New Definition of Autism May Exclude Many, Study Suggests*. New York Times, January 19, [accessed 19 January 2012]. <http://www.nytimes.com/2012/01/20/health/research/new-autism-definition-would-exclude-many-study-suggests.html>

179. Perez, Thomas E, and Russlynn Ali. (2010). *Letter to College and University Presidents*. US Department of Justice, [accessed 26 July 2010]. http://www.ada.gov/kindle_ltr_eddoj.htm

180. McCarthy, Melissa. (2011). Using technology to support children with sensory disability in remote areas: the RIDBC Teleschool Model. *Telecommunications Journal of Australia* 61 (2): pp. 27.1-27.7. <http://www.tja.org.au/index.php/tja/article/view/207/372>

181. Anon. (2012b). *Click SpecialedNZ Trust*. Click SpecialedNZ Trust, August, [accessed 13 August 2012]. <http://clickspecialednz.com/>

182. EUROPE. (2012d). *Special needs children and disabled adults still getting a raw deal from education, says report*. European Commission, July 10, [accessed 10 July 2012]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/12/761&format=HTML&aged=0&language=EN&guiLanguage=en>

Such a large group of consumers with particular needs should be able to support (directly or indirectly) a large EU market for assistive devices, but the market:

"which has an estimated annual value of €30 billion, is still fragmented and the devices are expensive. Policy and regulatory frameworks do not reflect the needs of the people with disabilities and the manufacturing industry. More standardisation would improve economies of scale and traders could more easily offer their products and services across borders."¹⁸³

To set the framework for more effective and efficient policies the European Commission is developing a European Accessibility Act¹⁸⁴. A public consultation in 2012 is leading to a proposal for a European Commission Regulation. Meanwhile there also is a proposal (December 2012) to mandate accessibility of all public sector websites¹⁸⁵ in the EU.

Some of the most **dramatic developments are in the area of ICTs that can directly overcome a disability, with one objective being that a person with a specific disability can overcome it partially or totally, and then engage with the educational processes that are used by the wider community of students.**

Such developments include a "**retinal implant** - or bionic eye - which is powered by light"¹⁸⁶, implanted brain chips in paralyzed people where "people with the brain chips can use the devices to perform complex three-dimensional tasks that could be helpful in daily life"¹⁸⁷, and also for paralyzed people the development of exoskeletons, enabling:

"Paraplegics to walk with motorised legs, by responding to gestures made above the waist. Its adjustable titanium frame encases the legs, with straps around the waist, shoulders and thighs, and a computer with two batteries sits as a backpack, powering four electromechanical motors

183. EUROPE. (2010). *European Disability Strategy 2010-2020 – frequently asked questions*. European Commission, November 15, [accessed 15 November 2010]. <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/10/578&format=HTML&aged=0&language=EN&guiLanguage=en>

184. EUPARL. (2011). *Doing more to include people with disabilities*. European Parliament, October 25, [accessed 25 October 2011]. <http://www.europarl.europa.eu/en/pressroom/content/2011025IPR30227/html/Doing-more-to-include-people-with-disabilities>

, EUROPE. (2011b). *European Commission seeks public input on measures to break down barriers to disabled people*. European Commission, December 13, [accessed 13 December 2011]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1533&format=HTML&aged=0&language=EN&guiLanguage=en>

, EUROPE. (2011c). *High-Level Meeting on Disability: Presidents of Commission, Parliament and European Council join forces with the European Disability Forum*. European Commission, December 6, [accessed 6 December 2011]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1507&format=HTML&aged=0&language=EN&guiLanguage=en>

185. EUROPE. (2012). *Proposal for a Directive of the European Parliament and of the Council on the accessibility of public sector bodies' websites* [accessed 4 February 2013], <https://ec.europa.eu/digital-agenda/en/news/proposal-directive-european-parliament-and-council-accessibility-public-sector-bodies-websites>

186. Gallagher, James. (2012). *Light-powered bionic eye invented to help restore sight*. BBC, May 14, [accessed 15 May 2012]. <http://www.bbc.co.uk/news/health-18061174>

187. Young, Susan. (2012). *Brain Chip Helps Quadriplegics Move Robotic Arms with Their Thoughts*. Technology Review, May 16, [accessed 16 May 2012]. <http://www.technologyreview.com/biomedicine/40418/>

that propel the legs. An intelligent algorithm responds to gestures, making use of 15 sensors: as weight is shifted on to one crutch, the leg on the opposite side steps forward accordingly.”¹⁸⁸

Also, “researchers have demonstrated a striking method to reconstruct words, based on the brain waves of patients thinking of those words. The method may in future help comatose and locked-in patients communicate”¹⁸⁹. Such ICTs present a potentially new approach for persons with disabilities to access information and knowledge, particularly when the disabilities are physical. In that context the ICTs themselves may help to overcome the infrastructure problem by direct empowerment and innovation by and for **PWDs who will be increasingly be able to engage with the previously ‘abled’ world** than previously was the case.

Such innovations offer potential solutions for the future. For the present one of the most radical ICTs has been the iPhone, although “*that the iPhone and its world of apps have transformed the lives of its visually impaired users may seem counter-intuitive – but their impact is striking*”¹⁹⁰. It is the development of Apps (Applications) either commercially developed or developed and shared through open source by the ‘crowd’ of iPhone users, that has delivered remarkable solutions. For example, there is “*Sendero – “an app made for the blind, by the blind,” an accessible GPS that announces the user’s current street, city, cross street, and nearby points of interest*”¹⁹¹. When paying a bill the “*LookTel Money Reader can scan the bill you’re being handed, instead of depending on the kindness of strangers*”¹⁹².

Apps that cater to the very special sensory needs of the visually impaired are being rapidly developed. Flo Longhorn, a multi-sensory education expert leads developments in special education resources of this kind. She has extensively documented the Apps being developed¹⁹³. Apple and Android technologies are being developed to help blind people text using touchscreen mobile devices¹⁹⁴. Apple Inc. has many in-built accessibility solutions within its products such as “*VoiceOver, screen-reading technology ... Text to Speech to hear a word or paragraph as they’re seeing it onscreen .. and closed captioning*”¹⁹⁵. Other ICTs that can help to transform the teaching and learning environment include a low-cost por-

188. Anstett, Patricia. (2012). *Robotic devices help paralyzed become more independent*. USA Today, January 6, [accessed 20 January 2012]. <http://yourlife.usatoday.com/health/story/2012-01-06/Robotic-devices-help-paralyzed-become-more-independent/52410820/1>

, Ekso. (2012). *Ekso Bionics*. Ekso Bionics, January, [accessed 20 January 2012]. <http://eksobionics.com/>, Kingsley, Jeremy. (2012). *Wearable robot puts paralysed legs through their paces*. Wired.com, January 17, [accessed 20 January 2012]. <http://www.wired.co.uk/magazine/archive/2012/02/start/step-by-cybernetic-step>

189. Palmer, Jason. (2012). *Science decodes ‘internal voices’*. BBC, February 1, [accessed 1 February 2012]. <http://www.bbc.co.uk/news/science-environment-16811042>

190. Kornowski, Liat. (2012). *How the Blind Are Reinventing the iPhone*. The Atlantic, May 2, [accessed 4 May 2012]. <http://www.theatlantic.com/technology/archive/2012/05/how-the-blind-are-reinventing-the-iphone/256589/>

191. ibid

192. ibid

193. Longhorn, Flo. (2012). *Flo Longhorn’s favourite apps*. Blogspot, August, [accessed 13 August 2012]. <http://ipadspecial.ed.blogspot.co.uk/2011/04/flo-longhorns-favourite-apps.html> and see also <http://www.clickspecializednz.com/>

194. BBC. (2012a). *App helps blind to send text messages*. BBC, February 20, [accessed 20 February 2012]. <http://www.bbc.co.uk/news/technology-17105225>

195. Lima, Paul. (2009). *Virtual pal helps autistic kids make social connections*. Globe and Mail (Toronto), [accessed 12 July 2010]. <http://www.theglobeandmail.com/news/technology/tech-for-tomorrow/virtual-pal-helps-autistic-kids-make-social-connections/article1330468/>

table voice-based ‘notetaker’ computer for the blind¹⁹⁶, technology to translate sign language into text¹⁹⁷. Also of potential relevance is “software that can correct spelling as the user types into any programme – hugely valuable for people with dyslexia”¹⁹⁸.

What this section has shown is that in Africa there are still large scale challenges, but there also is significant innovation. It has shown also the potential of leading-edge research and development to provide radical solutions for PWD, while also noting that advanced economies clearly have their own problems and challenges. This report now turns to a structured overview of ICTs in the education of PWD, noting some specific examples of good practice identified in the five regional reports.

196. Den Hartigh, Wilma. (2012). *South Africa: ICT Helps the Blind*. Biz-Community, January 30, [accessed 13 August 2012]. <http://allafrica.com/stories/201201301675.html>

197. BBC. (2012b). *Sign language ‘turned into text’ by Aberdeen scientists*. BBC, March 12, [accessed 12 March 2012]. <http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-17297489>

198. HEADSTAR. (2012b). *Dyslexia Spelling Checker Wins Techology4Good Award*. Headstar.com, July 27, [accessed 29 July 2012]. <http://www.headstar.com/eablive/?p=749>

4 USING ICTS INNOVATIVELY IN EDUCATION TO IMPROVE AFFORDABILITY, ACCESSIBILITY AND ADAPTABILITY



Person with disabilities working in SAMU (Emergency Services) in São Paulo, Brazil.

4.1 Overview

This chapter addresses the use of information and communication technology in education for PWD, covering a range of assistive technology solutions where products and applications can be used by persons with disabilities to help accomplish tasks that they cannot otherwise accomplish or do easily. Assistive technology can be anything from a prosthetic to computer software that speaks what is on the screen. When used with computers, assistive technologies are sometimes referred to as adaptive software or hardware. In this document assistive technology refers to computer software, hardware, or tools used in the access of such information and communication devices.

ICT accessibility is the ability for everyone, including persons with disabilities to access information or communication technology. ICT accessibility is related to Universal Design, which calls for the design or creation of the environment, products, applications, and content so they are usable by everyone -- including people with disabilities -- without need for special modification. Universal design is not a one-size-fits-all paradigm; instead it focuses on meeting the needs of each user. This takes into account the challenge that a particular setting may assist one group of people with disabilities but be problematic for another group.

Universal design provides a flexible design that allows the users to select those settings best suited to their requirements. For example, users with low vision often benefit from high contrast between background and foreground colours. However, other people with light sensitivity may find that low contrast is beneficial for them. Allowing the individual to adjust the contrast settings either by separating content and presentation and or by directly adding user settings is one example of following universal design. In the case of certain closed ICT products where assistive technology cannot be used, the technology must directly provide access for users with different types of disabilities. In these situations, assistive technology should not be mutually exclusive requiring that accessibility features be available for one type of disability at a time.

In order for persons with disabilities to access ICT, the technology or content must be designed to be accessible; much like the built environment must allow access by people with disabilities. The social model of disability suggests that the biggest barriers for people with disability arise from the obstacles and attitudes that exist in society and prevent access to ICT and the built world. Addressing these obstacles means technology and content should be created to be accessible, and it should be acknowledged that assistive technology and ICTs must be interoperable.

In other words, the operating system and the assistive technology must not block, disable, corrupt, or disrupt each other or cause each other to stop functioning. Additionally, assistive technologies often rely on applications programming interfaces (APIs) to allow the exchange of information about the user interface with the operating system or platform. By itself, assistive technology often cannot make an inaccessible technology or content accessible to persons with disabilities.

The assistive technologies do not require that each application would explain how the user interface works so it can then relay that information to the user in the preferred format such as speech, Braille, or text. Rather, the applications come as fully accessible. Often the creator of the assistive technology

must customize it for a specific application in order to allow for and efficient use by a user with a disability. Thus, technical as well as functional accessibility must be taken into consideration.

There has been much innovation in the area of assistive technology and in creation of accessible and universally designed information and communication technologies. However, despite these improvements much of what ICTs have to offer is partially or completely inaccessible to users with disabilities.

In the developed world and to a lesser extent in the developing and emerging countries, government laws and regulations have been created to ensure that content in government websites and web-based software is designed and procured to be accessible. **Accessibility of websites can be measured by a set of international guidelines – the Web Content Accessibility Guidelines (WCAG) version 2.0¹⁹⁹.** These guidelines and accessibility policies from various countries are discussed later in this chapter.

In the United States, efforts to stimulate accessibility in ICT largely began when the federal government made it a procurement requirement that all mainstream IT have certain accessibility features.²⁰⁰ While this requirement only applies to ICT products and services procured by the US federal government, its impact has been felt in non-federal government areas as well. Many state and local governments and educational institutions have adopted these or similar guidelines. Because companies wanted to continue selling ICT products and services to the US government and the industry created products with accessibility features built in. These same products and services are then sold nationally and internationally. Since the implementation of the accessibility standards, other countries in the developed world and some in emerging countries have adopted similar standards for ICT accessibility and conformance, and recognize the significant cost-benefits to be gained by regulating procurement²⁰¹.

The good will of others who also believe that access to information should be a right of all people regardless of circumstances has likewise played a role in ensuring that universal design and accessibility features have been integrated into ICT. Many Linux desktop environments such as GNOME²⁰² is a case in point: GNOME is “*an international community dedicated to making great software that anyone can use, no matter what language they speak or their technical or physical abilities*”. Assistive features like

199. <http://www.w3.org/TR/WCAG/>

200. See Section 508 of the Rehabilitation Act and the Electronic and Information Technology Standards promulgated by the US Access Board at <http://www.access-board.gov/508.htm>.

201. Waddell, Cynthia D. (2009). *Public Procurement of Accessible ICTs*. Global Initiative for Inclusive Information and Communication Technologies, August, [accessed 12 October 2012]. http://g3ict.org/download/p/fileId_812/productId_151

202. <http://www.gnome.org/>

sticky keys allows one hand operation by multiple key keystrokes on a standard keyboard and are implemented in many desktop environments including Linux desktops, and also Windows and MacOS operating systems.

Some for-profit companies have decided that implementing accessibility directly into IT products makes good business sense. For example, Apple Inc. incorporates assistive technology, interoperability, and accessibility features directly into mainstream technology such as the Mac OSX operating system and in iOS based devices such as the iPhone, iPad, and iPod Touch. There are, however, challenges with assistive technologies built into proprietary devices; it is often difficult or impossible to create third party assistive technologies that provide device-wide access. Additionally, updates to the assistive technology must be made by the creator of the device. Thus far, Apple Inc. has continued to update the assistive technologies found in the iOS devices and has released new assistive technologies such as the “assistive touch” feature. One challenge presented by iOS accessibility features is that they tend to be mutually exclusive – that is, often you can only run one assistive technology at a time.

Challenges still remain regarding accessibility – especially as the rapid rate of innovation in ICTs is producing so many new products. Often access to mainstream technology with assistive technology lags behind with new generations of ICT coming out as often as every six months. Accessibility standards must also be updated to ensure their current relevance to ICT. Accessibility solutions must also be developed for new types of interfaces – for example, touch screen interfaces that rely on gestures such as those on mobile and tablet devices.

4.2 Emerging solutions for Assistive Technology

There are many types of commercial, proprietary, free, and open source assistive technologies available to assist persons with disabilities to access information and communication technology.

Assistive technology allows users to perform an action (or more easily perform the action) that they would not be able to perform without the assistive technology. Assistive technologies can assist persons with autism or cognitive disabilities in the comprehension and retention of information. These solutions can be either software or hardware based.

In the past many assistive technologies were proprietary commercial products and very expensive. In recent years more free and open source software (FOSS) has become available. A repository for this technology referred to as open source assistive technology software (OATS)²⁰³ was created in 2006 to promote free and open source assistive technology. For example, open source screen readers were

203. <http://www.oatsoft.org/>

created such as non-visual desktop access (NVDA²⁰⁴) on Windows and Orca²⁰⁵ under Linux based systems. Browser based assistive technologies (such as FireVox²⁰⁶ for the Firefox browser) are also available on different platforms. Furthermore, many operating systems such as Windows, Linux, iOS, Android, and Mac OS contain accessibility features that assist users with disabilities. Examples of such features include key repeat and high contrast viewing options.

The price of some mainstream assistive technology has been decreasing and often is supplied directly with information and communication products at no additional cost. For example, mobile devices created by Apple Inc. and the Mac operating system include several types of assistive technology built directly into the operating system. These include screen reading, screen magnification, and software to assist people with hearing and mobility impairments. Other mobile platforms such as phones that use the Android operating system have built-in screen reading functionality using the Talkback screen reader.²⁰⁷ Braille displays used by people who are blind or visually impaired have dropped in price by more than half within the past decade. However, the cost of a Braille display is still often beyond the means of many individuals with disabilities, even in rich economies.

Most assistive technology is designed for a specific type of user with disability – such as screen magnification software for users with low vision and screen readers and Braille displays for users who are blind or visually impaired. Screen readers can also help readers with significant learning disabilities. Users with multiple disabilities will also find that some assistive technology is designed for their use. For example, a screen reader with accompanying refreshable Braille display²⁰⁸ can be used by individuals who are both deaf and blind to access a computer.

Assistive technology centres are help people make informed decisions before they purchase any assistive technology. These centres may also provide access to shared assistive technology for those who cannot afford to purchase it²⁰⁹. The centres can be private²¹⁰, public, or private-public partnerships and may offer other services such as training, internet access, and job skills training. They are usually located in organizations supporting people with disabilities, libraries, job centres, and universities. The Adaptive Technology Centre for the Blind (ATCB)²¹¹ in Ethiopia is an example of a resource run by an NGO to provide access to and training on assistive technology. Other examples include the MADA²¹² Centre in Qatar, and the Centre for Assistive Technology in New Zealand²¹³.

204. <http://www.nvda-project.org/>

205. <https://live.gnome.org/Orca>

206. <http://firevox.clcworld.net/about.html>

207. http://eyes-free.googlecode.com/svn/trunk/documentation/android_access/services.html

208. <http://www.afb.org/section.aspx?FolderID=2&SectionID=7&TopicID=330&SubTopicID=97&DocumentID=3652>

209. Examples around the world are available at <http://www.microsoft.com/enable/centers/worldwide.aspx>

210. e.g. Microsoft Accessibility Centers <http://www.microsoft.com/enable/centers/>

211. Africa Regional Study, p. 60.

212. <http://mada.org.qa/en/>

213. <http://www.minedu.govt.nz/NZEducation/EducationPolicies/SpecialEducation/ServicesAndSupport/AssistiveTechnology/CentreForAssistiveTechnologyAndNewsletters.aspx>

4.2.1 Assistive Technology Software

Assistive technology software is usually stand-alone, but may be bundled with required assistive technology hardware. It can be commercial, proprietary, free/libre or open source. A non-exhaustive list of assistive software is presented below.

Accessibility Features Built into Mainstream Technologies

Accessibility features

Most computer operating systems provide built-in accessibility features such as the ability to increase font sizes, change the colour scheme to support different contrast levels between foreground and background colours, and allow for keyboard and mouse alternatives such as mouse keys which allows the user to control their mouse via the keyboard or sticky keys allowing the user to perform multi-key keystrokes with just one hand.

Software office applications

Software office applications like word processors, document readers, spreadsheets, and presentation software allow for changes in font size, colour, and often reflowing of text so that it can be enlarged without the user's having to scroll horizontally to read it.

Web Browsers

Web Browsers – most web browsers allow changes to font size, the ability to zoom in to enlarge content, and permit change in colours associated with style sheets.

Mobile devices

Mobile devices – many mobile devices allow the user to adjust font size or call contacts by speaking a name.

For Persons who are Blind or Visually Impaired

Optical character recognition software (OCR)

Software that allows images of text or typed paper documents to be converted to text in order to be read using text-to-speech software or displayed using different fonts and colours.

Screen magnification software

Software that enlarges the content on a computer screen by anywhere from 1.25 to 20 times. Additionally, screen magnification software packages often increase the size, shape, and colour of the cursor/pointer, provide visual focus and caret tracking, and smooth the fonts of the magnified screen.

Screen reading software

Software that uses a speech synthesizer to convert text-to-speech. Screen readers provide keyboard commands to allow the user to navigate and access information on a computer. In addition to speech synthesis most screen readers will also display information on a refreshable Braille display (a hardware device) when available.

Text-to-speech based software

Software that converts text from content such as books (through OCR) or eBooks into spoken text either to be consumed immediately or saved for later playback in an audio file such as mp3 format.

For Persons with Physical and Mobility Impairments

On-screen keyboards

Software that allows users to enter text and press one or more keystrokes via on-screen keys that the user activates with a mouse, joystick, eye tracking software, or other adapted tool.

Motion based alternative text entry

Software that allows for text entry based on the movement of the mouse or other pointing device.

Speech recognition software

Software that allows the user to dictate or give commands to the computer using their voice.

Sticky keys, key repeat, and mouse control software/features

Software that controls the keyboard to allow users to operate a keyboard with one hand, prevents the user from unintentionally entering extra characters, and allows for control of the mouse via the keyboard.

Word prediction software

Software that helps to minimize the amount of typing a user must perform by predicting what word they will enter. This software is often used in conjunction with other software such as on-screen keyboards.

For Persons with Cognitive Impairments (including learning disabilities)

Cognitive reminding software or device

These products can remind a person with a cognitive impairment when to get off a bus, when to take medicine, or notify someone when the cooking stove has not been turned off.

Electronic dictionaries, thesauruses, and writing assistant software

Software that provides quick access to dictionaries and other resources. This information may be displayed automatically as the user types or displayed by activating a toolbar or balloon.

Optical character recognition software

Software that allows images of text or typed paper documents to be converted to text in order to be read using text-to-speech software or displayed using different fonts and colours.

Reading software

Software that speaks content such as documents or web pages to the users with print disabilities and provides the text of this content in fonts, colours, and spacing to assist users to effectively read. Additional features may include a built-in dictionary, thesaurus, or glossary.

Text-to-speech software

Software that converts text from content such as books (through OCR), eBooks, or other documents into spoken text either to be consumed immediately or saved for later playback in an audio file such as mp3 format.

Word prediction software

Software that helps to minimize the amount of typing a user must do by predicting what word or phrase they will enter. This software is often used in conjunction with other software such as on-screen keyboards.

For Persons with Communications Disabilities

Augmentative and alternative communication software

Software that allows persons who have difficulty communicating to indicate by pointing, or acknowledge a particular icon to indicate a word, need, or concept.

Persons who are Deaf or Hard of Hearing

Caption and sub-title supported media player software

Software that allows for the showing of captions from media such as online videos or movies including those on DVD.

Real-time text (RTT) software

Software that transmits text live while it is being typed (or otherwise created). RTT allows the receiver to view the text as it is created similar to speech where a person hears the other person live as they talk. RTT also allows users to connect with a legacy TTY/TDD using a special gateway.

Show sounds or visual alert software

Software that monitors for system events, alerts, or sounds that are generated and creates visual notifications or vibrations to alert users who are deaf or hard of hearing that a sound, event, or alert has occurred. Sounds and vibrations can often be customized by the user.

Total Conversation Software

Software that enables the user to communicate simultaneously with audio, video and real-time text, or any combination thereof. The video medium allows users to communicate directly with sign or lip reading. The RTT and audio allow users to join together speech and text as well, and to combine them with other assistive services like sign to speech or text to speech and vice versa.

- The above list of assistive technologies is not exhaustive. It gives just some of the common types of software assistive technologies used by persons with disabilities.

4.2.2 Assistive Technology Hardware

Assistive hardware is a physical piece of technology used to provide or increase access to a task that the user would normally have difficulty performing or not be able to perform at all. A non-exhaustive list of assistive hardware is provided below.

For Persons who are Blind or Visually Impaired

Braille displays

A refreshable Braille display displays a Braille representation of text from a screen reader. Refreshable Braille displays often have associated keys and often allow the user to input text using Braille chords. The number of Braille cells on the display can vary from 18 or fewer to 80 cells.

Handheld telescope and magnifying glasses

Ocular devices that allow people with low vision to magnify content either close up or in the distance. With magnification comes a reduction in the size of the field of view.

Video magnifiers

A video magnifier or closed-circuit television (CCTV) system uses a handheld or stand-mounted camera to project an enlarged image onto a video monitor, television screen or computer monitor. Cameras with zoom lenses provide variable magnification. Some systems employ an auto-focus camera.

- ▶ Other types of low tech accommodations can be made such as changing the size and position of the monitor, reducing glare from windows, and use of a slant board to bring materials including communication boards to the proper angle for viewing with low vision.

For Persons with Physical and Mobility Impairments

Eye tracking or head pointer hardware and accompanying software

Allow the user to move and control a mouse pointer with their eyes or head movements

Joysticks, mouth sticks, trackballs, switches, one handed and chorded keyboards, large key keyboards, and other adaptive hardware

These technologies allow the user to use alternative input devices to interact with a computer.

For Persons who are Deaf or who have Hearing Impairments

Assistive listening devices

Allow for the amplification of sound from a sound source or directly from the environment.

Closed caption decoding device on televisions

Mechanisms built into devices such as televisions to allow for the display of encoded captions that are broadcast with video content.

Telecommunication device for the deaf (TDD)

Allows users who are deaf or hard of hearing to communicate through text in real time. This device may also be referred to as a teletypewriter (TTY) or textphone.

There are many other forms of assistive technologies used to assist people in the home and workplace that are not listed above.

4.2.3 Proprietary Assistive Technology in the Five Regional Studies

The five regional studies clearly indicated that commercial and proprietary assistive technology is commonly being used across all of the regions. The JAWS²¹⁴ screen reading software along with Dolphin's SuperNova²¹⁵ were the most widely mentioned assistive technology for people who are blind.²¹⁶

Additionally, Braille translation software such as Duxbury²¹⁷ was indicated by a number of respondents. The refreshable Braille displays are used most in centres and national libraries to help in transcribing print into Braille.²¹⁸ The cost of refreshable Braille displays often limits the individual procurement of these devices even in the developed world. The use of note taking devices was also indicated at the university level but the types and specifics of these devices were not indicated. In general, note taking devices can range from simple audio recording devices to personal digital assistant devices that allow keyboard or Braille entry of text with accompanying text-to-speech output. Finally, scan-and-read type software was discussed in several regions such as at the National Library in Egypt for providing access to books in print.²¹⁹

Region specific commercial screen readers such as IBSAR²²⁰ and an Arabic version of the Hal²²¹ screen reader in the Arab region were also found. Both of these screen readers provide a user interface, documentation, and speech synthesis in Arabic and allow for right to left writing.²²²

Two major screen magnification software packages, MAGic²²³ and SuperNova, were also found to be used. Other handheld telescopes and magnifiers as well as video magnifiers²²⁴ (also referred to as CCTVs) that can be connected to a television or computer monitor were also indicated in the different regions.

Augmentative and alternative communication (AAC) software and hardware such as BoardMaker²²⁵ was mentioned in several regions. Other solutions for mobility impaired users such as alternative

214. <http://www.freedomscientific.com/products/fs/jaws-product-page.asp>

215. <http://www.yourdolphin.co.uk/productdetail.asp?id=1>

216. Africa Regional Study, p. 9.

217. <http://www.duxburysystems.com/dbt.asp>

218. Ibid p. 47.

219. Arab Regional Study, p. 19.

220. <http://www.sakhr.com/>

221. <http://www.yourdolphin.com/v11.asp?id=5>

222. Ibid, pp. 8, 17, 33.

223. <http://www.freedomscientific.com/products/lv/magic-bl-product-page.asp>

224. Africa Regional Study, p.47.

225. <http://www.mayer-johnson.co.uk/boardmaker-software/>

keyboards,²²⁶ joysticks, and switches were indicated within several regional studies. Some regions such as the Arab region said there is a lack of proper augmentative communication products. The study stated that most of the available products are made for communication in the English language and are also tuned to western accents and foreign socio-cultural contexts. These AAC devices are designed to suit western culture and to be written from left-to-right and are therefore not suitable for Arab users.²²⁷ Both the Arab and other regions have signalled the use of the Boardmaker AAC tool which supports over 40 languages including Arabic.²²⁸ Assistive technology that is used by several different groups of people with disabilities such as reading software and book players like DAISY were also mentioned²²⁹. These devices assist users who are blind, visually impaired, or have cognitive problems such as learning disabilities. DAISY book readers typically store electronic books in DAISY format and allow them to be played back in audio mode. Software based DAISY readers provide visual displays of the content with options to allow the user to adjust the font size, colour, spacing, and other attributes of the text.

In general, all regions cited the limited availability of assistive technology due to its cost. In many cases the cost of the assistive technology can be as much as, or several times more than, the cost of a computer itself.²³⁰ The majority of countries in the regions do not help users in the procurement of assistive technology. Even within schools and centres most assistive technology is donated by companies and charitable organizations. However, the demand for assistive technologies is not likely to be met solely through this approach. An additional challenge indicated by multiple regions was the lack of research and development for ATs and text-to-speech software in the local languages of many countries.²³¹

It was noted that most of the assistive technology provided is through individual projects receiving short term maintenance and support. For example, some projects only provided three months of support for training teachers how to use the technology²³² while others provided support for one year. This trend indicates that countries must build their local capacity to use, train, and support assistive technologies in order to achieve the full benefits of this technology.

A number of regional studies have indicated that assistive technology, when available, is generally to be found in computer labs and not in individual classrooms.²³³ This has several implications for students with disabilities. Many students do not receive the full benefit of the assistive technology because it is not available in the general classroom. Moving the assistive technology into the classroom would allow for greater use and also allow the technology to be a means to an education rather than the education itself. Additionally, placing the assistive technology within a resource room in an inclusive

226. Arab Regional Study, p. 22.

227. Ibid., p. 8.

228. Ibid., p. 27.

229. Africa Regional Study, p. 48.

230. LAC Regional Study, p. 14.

231. Asia Regional Study, p. 3.

232. Africa Regional Study, p. 61.

233. Ibid., p. 67.

school can lead to students with disabilities spending the entire school day “isolated” in the resource room rather than participating fully in the general education classes.

Another option is the use of free (libre) software/open source assistive technology. However, there are challenges regarding the availability of feature equality, installation/configuration, and deployment of open-source solutions. To be viable, open source software requires a certain level of local expertise, infrastructure and a supporting development community.²³⁴ Thus, this development/distribution model, focusing on the provision of services rather than the sale of software licenses, allows avoiding vendor lock-in²³⁵ situations, and could foster the development of local expertise and entrepreneurship.

There are costs associated with the maintenance and support of free and open source software and assistive technologies just as there are with proprietary software, except for license fees. Both approaches will likely be necessary to meet the short and long term needs of countries in regions around the world.

It is necessary to provide on-going support in the form of research and development into new assistive technology solutions at differing levels including the university and industry. In fact it appears that many region-specific solutions are generated at the local University level. Implementation of free and open source software will increase the need for local ICT skills and knowledge and ultimately assist the community by re-investing monies spent in the local economy.

4.3 Free and Open Source Software (FOSS)

4.3.1 Overview

Most free and open source (FOSS) products are software based and are licensed in a way that they can be freely used, studied, shared, and improved.²³⁶ The GPL – General Public License²³⁷ – is the most widely used Free Software license, with a half dozen other licenses also in widespread use. FOSS programmes are often available free of charge. These programmes are frequently (but not necessarily) developed in an open process, where in principle anyone may participate, if they have the required skills. As with proprietary software, there may be further costs associated with using the software, such as training or system administration.

234. Ibid., p. 22.

235. http://en.wikipedia.org/wiki/Vendor_lock-in

236. <http://www.gnu.org/philosophy/free-sw.html>.

237. <http://opensource.org/licenses/gpl-license>

The approach of using copyright licensing to allow others to modify works has branched out into many other areas, for example encyclopaedias (Wikipedia), Open Educational Resources (OER), and Open Hardware. Under this model, the goal is to enable continuous improvement of a knowledge product by inviting broad participation.

4.3.2 Benefits

The benefits of free and open source software are the cost and availability (access) to the software. The use of open source software does not mean that cost will not be incurred to use or maintain the software.

For example, if an open source Learning Management System²³⁸ (LMS) is used by a school or school district, the school may have to hire someone to create pages and content for the LMS and purchase or procure computers to host the LMS. This model has its benefits and challenges. Open source licenses allow the modification and changing of code, thus, open source software can be modified and updated to improve accessibility or add localization capabilities.

There are several benefits to FOSS:

- ▶ Services may be contracted from local companies in areas where the requisite skills are present. This means that local high-tech skills are improved, and the money spent on these services continues to circulate in the local economy.
- ▶ The software can more easily adapt to the needs of the institution if the requisite skills are available locally.
- ▶ In an educational setting, students can examine and adapt the software, providing a valuable hands-on lesson in ICT.
- ▶ Many FOSS projects are available in a wide variety of languages and even provide a ready-made translation framework.
- ▶ FOSS programmes are not dependent entirely on a single company (vendor lock-in) to develop and publish them. The same applies to maintenance services.
- ▶ Contrary to popular belief, few FOSS developers are hobbyists. Most people working on FOSS projects are paid to do so. Companies and individuals have a variety of business motivations to participate in FOSS development, as can be seen from the broad corporate participation in the Linux kernel community. This broad set of motives for participation adds to the longevity of many large FOSS programmes. The impact on smaller FOSS projects such as assistive technology, however, may not always follow this larger model.

238. A list is available at http://en.wikipedia.org/wiki/List_of_learning_management_systems

4.3.3 Challenges

FOSS software does have some challenges. Most of the development on small and medium scale FOSS software is peer-based development that often starts with an individual or group who initially makes the software and releases the source code of the software under a liberal license such as the GPL.²³⁹ Then other people take the source code and port it to different operating systems and languages. Localization of the software (open source or proprietary) and its accompanying documentation can sometimes be a challenge for languages that are not widely spoken. This can be an obstacle as localization into a different language may require someone with the technical skills and resources to make the conversion. However, the Free (libre) / Open source model allows communities and even individuals to start localization projects on their own.

The sustainability of small-scale free and open source assistive technology is also a concern. Many software products are created by an individual or initially funded by a grant. When the initial development or grant funding work is finished, the maintenance of the code is left up to the associated software development community for someone to maintain – sometimes without remuneration. Foundations and large companies will take up the effort to maintain and update larger widely used software but this does not always occur for smaller software such as assistive technologies. For example, software packages such as OpenOffice²⁴⁰ are open source but have commercial and financial support and ties to a specific company. In the case of OpenOffice the company which made it was later purchased by another company. This change placed the development on hold for over a year and caused concerned parties to create a fork on the software branch creating LibreOffice²⁴¹. The OpenOffice code was later turned over to an open source foundation, Apache, which is now in the incubation stages of restarting development on the OpenOffice package. This flexibility of open source software keeps the software open source and alive, it does not provide a degree of certainty regarding updates and sustainability required by some institutions. Admittedly, this same issue can occur to commercially available software when a company is purchased, merged, or becomes defunct. LibreOffice, supported by the Document Foundation²⁴² is now actively developed and adopted by major Linux distributions, such as Ubuntu, Fedora and Debian.

Like proprietary software, the setup and configuration of some open source software requires technical resources which may be limited in developing countries. This aspect of open source software has made great progress but is still a valid concern in areas without a large number of technical resources. Additionally, open source software is typically distributed electronically and may require large bandwidth and local servers to ensure access to the initial download and updates. This can be an obstacle in developing and emerging countries.

239. <http://www.gnu.org/copyleft/gpl.html>.

240. <http://www.openoffice.org/>

241. <http://www.libreoffice.org/>

242. <http://en.wikipedia.org/wiki/LibreOffice>

Practices Reported across the Five Regions

There does appear to be wide use of free (*libre*) and open source software across the different regions. At least four different categories can be identified: – general free (*libre*)/open source software that is not an assistive technology, free (*libre*) and open source assistive technology, open educational resources (content) and free of charge assistive technologies solutions. In this chapter, the focus will be on the latter three areas. Regarding general open source software, Linux and other Unix-like operating systems such as Ubuntu are often used in the developing and emerging countries as they are also used in the developed world. Free of charge (often called freeware²⁴³) assistive technologies may be either proprietary or FOSS based.

Open source and Free Assistive Technology

In regards to open source assistive technology, feature parity with commercial assistive technology software can be a concern. For example, some commercial screen reader packages have widespread many commercial programmes, Braille displays, and speech synthesizers.

On the other hand, some of the open source screens readers, while excellent products, do not support the depth and breadth of software, Braille displays, and synthesizers. Open source software creators often do not have the financial leverage to obtain rights to optional components. For example, the open source screen reader NVDA is not able to be legally used with a popular speech synthesizer used with other commercial screen readers called Eloquence without purchasing a license.²⁴⁴ NVDA comes with an open source speech synthesizer called eSpeak²⁴⁵ which has many localized versions and is also available on the Android mobile platform. Efforts on behalf of NVDA to negotiate with the owner of the Eloquence software broke down over the cost and volume of licenses. Different languages are currently supported across different regions.²⁴⁶

Open source technology can also be found in the hardware space. One example is the design for an open source/open hardware Braille display. The open source Audrey Braille display²⁴⁷ aims to make a “build as you go” Braille display a reality – so a person can build their own or buy one.

The two most popular open source screen readers indicated across the regional studies are 1) the Orca screen reader²⁴⁸ that runs on the GNOME desktop environment of open source Linux systems and 2) the Non-visual Desktop Access (NVDA) screen reader under Windows. Each screen reader has localized versions with a notable Arabic version of NVDA. Other open source screen readers such as those for the Android mobile platform exist and provide support for multiple languages. The market share of the Talkback and other open source mobile screen readers is very limited compared to commercial

243. <http://en.wikipedia.org/wiki/Freeware>

244. <http://www.nvda-project.org/blog/EloquenceUpdateDec2011>

245. <http://espeak.sourceforge.net/>

246. EECA Regional Study, p. 94.

247. <http://www.utopiamechanicus.com/915/refreshable-display-gearing/>

248. <http://live.gnome.org/Orca>

mobile screen readers. Some browsers such as FireVox²⁴⁹ which works within the Firefox web browser, are also available.

Odt²braille is a free and open source extension for the OpenOffice Writer and LibreOffice Writer word processors. The goal of the software is to make Braille available to everyone who can use a word processor. The extension enables users to use Writer as a Braille authoring environment, to emboss Braille to a Braille embosser and to export to various Braille formats. Odt2daisy is an OpenOffice Writer extension allowing the export of DAISY formatted materials including mathematical content conforming to the MathML standard²⁵⁰. This software is part of the AEGIS project's open accessibility framework, which aims to provide frameworks for third generation accessibility.²⁵¹

Another tool to assist users having mobility and dexterity impairments is Dasher.²⁵² Dasher is a text entry tool that works on many platforms including the Google Android mobile platform, PocketPC, Windows, Mac OS, and Unix-link operating systems. It is based on advanced language modelling techniques. The current Android version supported by the AEGIS Project and Cambridge University allows for efficient text entry by pointing or using finger gestures and requires less accuracy than onscreen or reduced-size keyboards. It also has tilt and accelerometer control requiring no screen contact or it can be used via number entry with numeric buttons (physical, onscreen, or external). It supports multiple languages.

Project F123²⁵³ is a Latin American-based solution that enables access to educational and employment opportunities through free and open source assistive technologies. Project F123 provides a copy of the open source Ubuntu²⁵⁴ operating system with assistive technologies such as the Orca screen reader, screen magnification, or the GNOME on-screen keyboard.²⁵⁵ It is available to users in a turnkey solution installed on a USB thumb drive that allows access to a computer without installing anything on the hard drive.

Free Assistive Technology

Other types of free assistive technologies reported in the regional studies including on-screen keyboard such as click-n-type, the point-n-click virtual mouse, a keyboard designer called "CNT designer", and text based web browsers and browser toolbars. The Mouse Gestures software allows the use of mouse gestures to control the Firefox web browser to allow 'mouse only' internet browsing. Several free screen readers exist such as the Thunder screen reader, but they generally have a very limited user base. A site titled "AccessApps" was launched in 2008 (now "EduApps"²⁵⁶) to provide access to over 50

249. <http://www.firevox.clcwld.net/>

250. <http://odt2daisy.sourceforge.net/>

251. <http://sourceforge.net/blog/potm-201104/odt2braille>

252. <http://www.inference.phy.cam.ac.uk/dasher/>

253. <http://f123.org/visual>

254. <http://www.ubuntu.com/>

255. <http://www.gok.ca/>

256. <http://eduapps.org/>

Windows- based open source or free assistive applications that can be installed and run from a USB thumb drive. These apps can be used without being installed – thus allowing access to systems without installation access – and permitting portability of settings and preferences. However, some functionality may be limited without an installation.

The National Center for Accessible Media in the United States created a free software package called Magpie²⁵⁷ that facilitates the creation of captions used in online multimedia. The software plays the desired video and displays an interface allowing the user to enter the captions for the audio based on the current time point in the multimedia. Other tools are provided to allow the user to quickly caption and then export these captions into different formats for the purposes of creating open or closed captions.

On the Android mobile platform, Apps4Android²⁵⁸ provides a number of free applications including a stand-alone text-to-speech web browsing app. Other free apps include an eBook reader, item identifier, IDEAL Magnifier, and an open source e-mail reader.

In the same way that Google Translate is typical of a ‘free’ service available to anyone connected to the Internet, so there are free services emerging for persons with disabilities. Robobraille²⁵⁹ is:

“An email service which can convert digital text documents into either Braille or audio files. You simply send an email with an attached text document to the specific RoboBraille e-mail account that suits your needs. Or you can upload your file by using our web interface. Both ways you will receive the document back from RoboBraille in the specified format - an audio file, for example. You do not need to install expensive and complicated software on your computer to use RoboBraille.”

Assistive Technology in Research

A number of research projects exist in different regions to facilitate the research and development of new open source, free, or low cost assistive technology solutions. In the Asia regional study two such projects are discussed. Both projects aim to accommodate the needs of persons who are unable to use the keyboard or mouse. The Eye-Based Pointing Device (Eye B-Pod)²⁶⁰ developed by students of the Bina Nusantara University in Indonesia allows users to operate the computer by using their eyes. The other programme, titled Linux IGOS Voice Command,²⁶¹ is in application in the Indonesian language Bahasa. It allows users to operate their computers using voice commands with an application developed for the Linux platform.

In 2005, the Bulgarian Association for Computational Linguistics developed a Bulgarian screen reading application called SpeechLab 2.0.²⁶² This application supports the reading and processing of Bulgarian

257. http://ncam.wgbh.org/invent_build/web_multimedia/tools-guidelines/magpie

258. <http://www.apps4android.org/>

259. <http://www.robobraille.org/frontpage>

260. Asia Regional Study, p. 63.

261. Ibid., p.62.

262. EECA Regional Study, p.46.

text in different applications including word processors and the Internet. The regional studies indicate that a number of local solutions have been created to address local languages and needs. This application is available as a free individual non-commercial license to individuals who are blind or visually impaired in Bulgaria.

4.4 Open Educational Resources (OER)

Open educational resources are electronic materials, such as content, for teachers, students, and researchers that are openly licensed to allow their use and repurposing without requiring express permission from the owner of the content. A related concept, Open Access, is a term applied to the unrestricted access to peer-reviewed journals on the internet.

Access to these resources allows a wider use of the content because it allows access to materials that might otherwise be costly and difficult to view or use under more restrictive copyright terms.

OER includes materials for teaching, learning and research as well as other kinds. Unfortunately there has been limited awareness of OER, its benefits and potential. Additionally, the accessibility of OER by individuals with disabilities is a critical issue that is not always taken into consideration. Accessibility features of educational resources in digital archiving and preservation is discussed later in this chapter. OER that relies on open standards allows for greater interoperability and access to the contents. While accessible OER content is critical, it cannot be used without accessible ICT including the OER portal itself and the computer or mobile used to access the resources.

Open education resources can promote distance education and allow access to resources that might not otherwise be locally available. They may allow educators to provide instruction to students with disabilities in new pedagogical areas and allow specialized teachers to provide distance education, thus increasing their range past physical barriers to remote locations. The presence of OER in an accessible format can also facilitate conversion of the materials to the format of choice for the student with a disability.

OERs can include everything from courses, content, stories and articles, to learning and collaboration software as well as learning management software. Much OER is created under Creative Commons (CC) licenses. There are six (6) different types of creative commons license that are a combination of three main elements: 1) attribution (the right to be identified as the author of the work); 2) commercial use (the choice of whether the work can be made available for commercial use); and 3) modification/creation or derivative works (whether the work can be modified or a work can be created or published that is based on the CC work).

In some of the regions, such as Eastern Europe and Central Asia, most countries have virtual collections of educational resources and repositories of educational materials that can be freely accessed by the

Internet in a local language. In addition, countries with sufficient Internet access can also gain access to OER in other regions like Western Europe and North America. Many OER resources are ‘published’ in English, French, German, and Russian and are therefore available under OER licencing to those who know one of these languages.²⁶³

The regional study review shows that despite the serious focus given to enhancing educational systems in these regions, the ideas and principles of open education opportunities and open educational resources are not widely known. Moreover, **the potential for OER to increase access to education for persons with disabilities and improve the quality of education and life remains underexploited.**²⁶⁴ Additionally, many open resources are located within individual universities and department websites and not easily located or categorized for access. In fact, some resources are only available to students of certain universities and are restricted by IP address to people within certain countries.

In many countries of the world the insufficient level of infrastructure and communication services does not allow for online learning. As broadband access to the Internet at schools is not yet widespread, many regions use CDs for distribution of educational resources as an alternative solution.²⁶⁵

4.4.1 Currently Available Solutions

The Moodle²⁶⁶ course management system (CMS), also known as a learning management system (LMS), or a virtual learning environment (VLE), was indicated as a resource used in several countries including Armenia, Kazakhstan, Latvia, and Russia, of the Eastern Europe and Central Asia regional study.²⁶⁷ Moodle is a free web application that educators can use to create effective online learning sites. The accessibility of Moodle has been tested, documented,²⁶⁸ and in general it has been found capable of supporting different types of users with disabilities. There is a plan in place to address the accessibility issues that remain. It should also be noted that authors need to address the accessibility of content that is created for or posted to Moodle. Use of the Web Content Accessibility Guidelines (WCAG) discussed later in this chapter should be taken into account when creating content for any CMS, LMS, or OER resources.

Another collaboration and learning environment, used in Armenia, is Sakai. Sakai has also been evaluated for accessibility by persons with disabilities and a plan has been created to address these issues.²⁶⁹ As with other CMS and LMS environments, the accessibility of content posted to the site must also be taken into consideration.

263. Ibid., p. 122.

264. Ibid.

265. Ibid.

266. <http://moodle.org/>

267. EECA Regional Study, p. 103.

268. http://docs.moodle.org/dev/Moodle_Accessibility_Specification

269. <http://sakaiproject.org/accessibility>

Drupal is another free open source content management system that also supports accessibility.²⁷⁰ The Eastern Europe and Central Asia study reports that Latvia uses the Drupal system.²⁷¹

The Asia study reports that India is using a number of OERs including an application called GCompris.²⁷² GCompris is an educational software suite comprising numerous activities for children aged 2 to 10. It runs under Mac, Windows, and Linux and supports many languages. While GCompris is not fully accessible, some components of it have a degree of accessibility. For example, some keyboard access is provided and a number of the activities and user interface controls may support techniques used by students with learning disabilities. The software does not mention accessibility for the blind or visually impaired.

Other regional studies have indicated that Wiki-related OER was being used including Wikiversity,²⁷³ Wikipedia,²⁷⁴ and MediaWiki.²⁷⁵ Another resource is WikiEducator. WikiEducator²⁷⁶ has a goal to establish a free version of education curriculum by 2015.²⁷⁷ Wikis allow any user to contribute content by adding new content or modifying existing content. These tools provide opportunities for collaboration and a source of open resources. The Gutenberg Project²⁷⁸ was also indicated in the Latin America and Caribbean regional study as a site that is being used to obtain electronic copies of books. There are additional OER resources such as blogging software. WordPress²⁷⁹ is an open source software package for creating blogs, tagging content, and interacting through comments. All of these open resources have many benefits to inspire students to read and author content.

Some regions have established portals for open educational resources such as OER Africa.²⁸⁰ Along with teaching about open education resources, the site also provides educational resources in many areas including teacher education. Unfortunately, OER Africa, like other many other regional OER sites, does not appear to address teaching students with disabilities in the teacher education curriculum.

Another project indicated in both the Africa and Latin America and Caribbean regional studies is One Laptop per Child (OLPC). The main goal of OLPC is learning. The project stresses that they do not focus on computer literacy as that is a by-product of what the children gain through use of the laptop for learning.

270. <http://drupal.org/>

271. EECA Regional Study, p. 94.

272. APAC Regional Study, p. 72.

273. EECA Regional Study, p. 108.

274. <http://www.wikipedia.org/>

275. <http://www.mediawiki.org/wiki/MediaWiki>

276. APAC Regional Study, p. 79.

277. http://wikieducator.org/Main_Page

278. LAC Regional Study, p.33.

279. <http://wordpress.org/about/>

280. <http://www.oerafrica.org/>

Currently OLPC laptop computers appear to be used on all continents except Antarctica, with the largest numbers in Peru (594,000 students and teachers), Uruguay (480,000 students and teachers), and Rwanda (110,000 students and teachers).²⁸¹ This project is covered here in the OER section of the report because the OLPC mission statement indicates that it is an educational project, not a laptop project. The learning vision of OLPC is that “*by giving children direct access to connected laptops, they can actively take part in processes of knowledge construction, and not be limited to passive reception of information.*”²⁸² OLPC laptops are specifically designed laptops with a Unix-like operating system with a unique user interface currently named Sugar. Specially developed education software is provided on the laptops. The laptops are typically provided to students through international donations. When laptops are provided to students, a team is deployed to provide the laptops and training to the teachers and then to the students.

Uruguay has implemented a plan entitled “Education Connectivity of Basic Computer Science for Online Learning” (CEIBAL) in English. CEIBAL is implemented through the Flor de Ceibo Center, a central project of the University of the Republic, Channel CEIBAL, and the RAP-CEIBAL Support Network, a volunteer driven nationwide network.

The Latin America and Caribbean regional study states that

“Special education schools were included from the outset of the CEIBAL Plan. For students with a visual disability, computers are adapted to users’ needs with the JAWS software for blind students and a magnifying glass to enlarge images for those whose vision requires this. They have also incorporated the pedagogical and instructional needs outlined by teachers. For the XO laptops, specific software and hardware have been developed. Adaptations have been done by LATU, with collaboration by the Teletón Foundation. Each school specifically studies the needs of each student, to make the required adaptations. For students with motor disability, the School of Engineering has also provided eight devices and five programs they developed to handle laptops.”²⁸³

The Sugar graphical interface on the OLPC laptops lacks accessibility options, however, which are commonly present in other operating systems. For the CEIBAL project some solutions were proposed and created by the community.²⁸⁴ Several small applications which supported basic accessibility options such as the ability to control the mouse with keys and enhancing the keyboard’s accessibility were designed. Additionally, a programme which could turn the XO laptop into an alternative and augmentative communication (AAC) tool using speech output was also created. After the adaptions were made teachers were trained on the use of these assistive features.

281. <http://one.laptop.org/map>

282. <http://www.mendeley.com/research/usability-study-children-testing-olpc-one-laptop-per-child-xo-interface/>

283. Latin America and Caribbean Regional Study, p.17.

284. <http://www.mendeley.com/research/usability-study-children-testing-olpc-one-laptop-per-child-xo-interface/>

4.5 Open Standards

Open standards are publically available and are often developed using an open process. While some open standards may have restrictions placed on their use, many are made available royalty-free such as W3C standards. Open standards encourage collaboration and harmonization and offer opportunities for different stakeholders to be involved.

The promotion and use of products that follow open standards can be beneficial in mainstreaming assistive technology and assistive features into products.

Organizations such as the International Telecommunications Union (ITU) and the Internet Engineering Taskforce (IETF) create standards through an open process that strives to increase interoperability and data exchange between different products. These two principles are often requirements for third party assistive technologies. Having representatives from many regions, countries, and populations is very important to ensure that creation of and updates to standards reflect the needs of the communities they affect. Having accessibility features as part of mainstream products used by a wider community will provide greater access and reduced cost compared to products designed specifically for use by people with disabilities.

4.5.1 Open Document Standards

The Open Document Format (ODF) is becoming widely used by many proprietary and open source productivity suites such as Open-Office and LibreOffice. This format is a non-proprietary format for storing different types of documents such as word processing files, spread sheets, databases, presentations, and other content. A standard format like ODF is useful as many products – and especially FOSS products -- can read and write this format without requiring a license fee. Additionally, the specification of the format can be updated to meet the needs of the community without a commercial company blocking changes and keeping information about the structure internal.

Having full access to the file format and the ability for anyone to know how the data is stored could allow for increased accessibility, testing for accessibility, and use of the format by special assistive software packages. Another benefit to ODF is that content and style are separated into different files. This allows for the content and structure to be stored in a way that allows it to be easily extracted and viewed applying the user's own preferences, rather than as an image in other formats. This has increased benefits for users with visual reading disabilities or learning/cognitive disabilities. For example, persons with disabilities often choose to change the font size, color, and spacing, to help them read. Of key importance to users of assistive technologies when accessing content in an electronic format is whether the content contains a structure which can be interpreted by assistive technologies. For example, in an accessible HTML format, 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 correct reading order.

Open standards support interoperability. This promotes the use of assistive technology formats.

An example is the Digital Accessible Information System (DAISY) format which is now harmonized with the EPUB (Electronic Publication) 3 specification for digital publications. DAISY books use the open publication specification which allows for reflowing of page content based on the screen size. This means that text can be enlarged or viewed on smaller screens and will reflow to meet the user’s need without requiring the user to scroll horizontally to read the text. This is very important to users with print disabilities. Similarly, the EPUB specification version 3 also supports text-audio synchronization, global language support (right-to-left, left-to-right, and vertical writing systems), and supports scientific and mathematic writing systems.

DAISY and EPUB books can be read on a number of devices and applications. One such application is AMIS, an open source DAISY book reader created in Japan.²⁸⁵ AMIS can be used with assistive technology such as screen readers or can provide direct text-to-speech. It also provides options to adjust font size, color, and other visual attributes.

4.5.2 W3C/WAI Guidelines for Web Accessibility

The World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) developed the Web Content Accessibility Guidelines (WCAG) version 2.0²⁸⁶ which were made an official recommendation of the W3C in 2008.

The guidelines are internationally recognized as the standards on web accessibility. These guidelines provide the success criteria and associated requirements to ensure that web based content can be accessed by a wide range of persons with different disabilities.

The guidelines were created with input from the international accessibility community as well as the research and development community, governments and businesses.

The guidelines were also created in conjunction with updated User Agent Accessibility Guidelines (UAAG) and the Authoring Tool Accessibility Guidelines (ATAG). Guidelines such as the UAAG are desi-

285. APAC Regional Study, p.61.

286. <http://www.w3.org/TR/WCAG/>

gned to ensure that user agents such as web browsers properly implement accessibility requirements and agreed upon methods for exposing information about accessibility to assistive technologies. Without these additional guidelines WCAG conformant content would likely not be presented in a manner that people with disabilities can use.

While the WCAG guidelines were specifically designed for web content including web sites, web applications, and other web based software. In many cases they can equally be applied to other types of content such as software and electronic documents. The guidelines are organized according to four main criteria. They must be: perceivable, operable, understandable, and robust. The guidelines address the accessibility needs of people with cognitive, hearing, neurological, physical, speech, and visual disabilities. They include user requirements that are formulated as technology-neutral, testable statements. The Guidelines are supplemented by supporting documents to help developers implement and evaluate accessibility. Specifically these documents help developers and testers evaluate and understand if a success criterion has been met by giving example of techniques that are known to work and ones that are known to be failures. Finally, conformance to the guidelines must be determined based on five supporting factors including support for assistive technology.

Several of the regional studies indicated that WCAG guidelines were being used in different countries, primarily as a basis for national web guidelines for government sites. There were mixed results toward progress making government sites accessible, with some governments only having limited accessibility. Yet other government sites have many pages that broadly support the WCAG guidelines. Meeting the WCAG standards is also cited as a goal by several different OER products such as Moodle.²⁸⁷

A few countries covered by the regional studies have additional accessibility guidelines for ICT use: Abu Dhabi and the United Arab Emirates (UAE). The Abu Dhabi Systems & Information Centre (ADSI) has developed a set of Abu Dhabi guidelines to address government public access kiosks, websites as well as guidelines for access at counters and via the phone.²⁸⁸ Qatar has also just announced an e-Accessibility policy. This policy applies to websites, telecommunications services, handsets, ATMs, government services, access to assistive technologies and digital content.²⁸⁹ The Korea Disability Discrimination Act requires government and public web sites to conform to web accessibility standards.²⁹⁰

While many governments in the different regions surveyed have general anti-discrimination regulations and laws that may apply to non-government ICT and educational resources – it was found that these laws often lacked the authority or specific requirements to be enforceable. El Salvador indicated that all official government websites were on a plan to be conformant with the web content accessi-

287. http://docs.moodle.org/dev/Moodle_Accessibility_Specification

288. Arab Regional Study, p. 26.

289. <http://www.ictqatar.qa/en/documents/document/qatar%20%99s-e-accessibility-policy>

290. APAC Regional Study, p.30.

bility guidelines and that employees of the institutional communication ministry had been trained on the guidelines.²⁹¹

The Arab regional study has indicated that "*in order to raise awareness of web accessibility and spread this technology in the Arab region, the laboratory UTIC in collaboration with the Tunisian Association of E-accessibility (www.e-access.tn) are leading a project of translation the WCAG 2.0 guidelines of the W3C to the Arabic Language.*"²⁹² This will help implement the 2007 Tunisian government decision to have all official government websites follow WCAG.²⁹³

4.5.3 Other Standards Organizations

There are a number of international organizations that are involved in the creation of standards. Some of these organizations produce copyright protected standards. The process for public input varies, but typically involves input from a country's ISO member. **The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) have developed several standards and other documents that are important for promoting accessibility.** The most fundamental document on accessibility in ISO and IEC is ISO/IEC Guide 71 Guidelines for standards developers to address the needs of older persons and persons with disabilities.

ISO committees are dealing with accessibility in many areas such as accessibility in the built environment (e.g. ISO 21542 developed by ISO/TC 59/SC 16). In the area of ICT, standards have been developed by ISO/TC 154/SC 4 on ergonomics of human-systems interaction (the ISO 9241-series), which comprises individual standards with requirements for computer screens and menu systems, but also with generic accessibility guidelines for ICT equipment and services and guidance on general software accessibility as well as accessible web design and web user interfaces.

ISO and IEC's joint technical committee ISO/IEC JTC 1 Information Technology has a special working group on accessibility which - amongst other initiatives - developed in the series ISO/IEC TR 29138 a user needs analysis with regard to ICT accessibility and an approach to mapping accessibility needs of users to standards. Similarly, the JTC 1/SC 36 Information Technologies for Learning, Education and Training group has developed a number of standards on adaptability and accessibility of e-learning and online teaching programmes (the ISO/IEC 24751-series).

291. LAC Regional Study, p. 42.

292. Arab Regional Study, p. 10.

293. Ibid, p. 40.

4.6 Accessibility Features in Digital Archiving and Preservation of Educational Resources

The accessibility of educational resources including courses, curriculums, teacher materials, journals, etc. is critical to ensure their use by all people. The archival method used to preserve content makes a huge difference regarding the accessibility of the content.

For example, scanning a sheet of paper containing content may preserve the resource electronically but typically results in an image that is inaccessible to users with print disabilities such as those who are blind, visually impaired, or who have cognitive impairments. It is possible to convert the image back to accessible text by using optical character recognition (OCR) which has a good, but not perfect, accuracy rate. OCR software is also able to perform some detection on the content to determine whether the content is in one or two columns and may detect the proper reading correctly. However, issues around reading order and lack of structure for elements such as headings, tables, and font attributes can mean that having the text of a resource is not sufficient to properly read and understand the association of content in the resource.

Properly structuring this information (often called tagging) of the information is very time consuming. It is best to create and preserve education resources in a format that preserves the structure of the information whenever possible. Formats such as (X)HTML, EPUB, DAISY, or those that provide structure for accessibility but separate structure from presentation should be used. In addition to the structure of the document, following proper metadata conventions indicating the level of accessibility of the document can be included. This metadata will in the future allow persons seeking accessible formats to search and find the most accessible versions of works that meet their individual needs.

Ensuring the accessibility of text content, while it is a challenge in certain situations, is generally straightforward. Non-text elements such as pictures, charts, diagrams, and graphs can be challenging to consistently and properly describe at a reasonable cost for persons who have print disabilities. Additional standards based work is needed in this area. The DIAGRAM Center²⁹⁴ aims to address this issue by researching the current state of the problem, developing innovative Open source tools to address the challenge and by recommending practices and training to support the effort.

It is also important to note that when archiving audio-visual materials that have captioning and/or audio description, these accessibility features need to be preserved and not stripped out. For example, by choosing to archive the accessible version of the multi-media materials, it means that the content will be easily searchable and catalogued for archival purposes because of the availability of the content due to the captioning and audio description.

294. <http://diagramcenter.org/>

Another significant barrier to access of electronic material such as literary works is Digital Rights Management (DRM) and technological protection measures (TPMs).²⁹⁵ Articles 11 and 12 of the WIPO (World Intellectual Property Organization) 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.

WIPO serves to ensure a balanced and accessible international intellectual property system. Currently WIPO is working a treaty/instrument to create a universal exception of copyright for persons with print disabilities and to ensure the cross border exchange of accessible materials. A copyright exception would allow materials to be converted to alternative formats without permission from the copyright holders. **Most countries in the regional studies do not have a copyright exception for persons with print disabilities including those who are blind and visually impaired.** Some countries such as Korea and Japan²⁹⁶ do make an exception for written works while others, such as several countries in Latin America²⁹⁷ have exceptions for communication alternatives (broadcast, etc.) in regards to sign language, captioning, and video description. Copyright law is territory based and thus brokering cross border exchange of accessible versions of books would allow the sharing of accessible versions of copyright protected works. This would reduce redundancy in converting materials into accessible formats and would increase the volume of works available to persons with print disabilities where a mutual language is used.

The TIGAR project²⁹⁸ initiated by WIPO, DAISY, and the International Federation of Library Associations (IFLA) seeks to address the challenge of transferring copyrighted electronic book files across borders to be used by persons with print disabilities in accessible formats. The pilot project's goals are to create a set of trusted intermediaries (e.g. libraries and charitable organizations) in different countries that serve persons who are blind, visually impaired, or otherwise print disabled. Being able to share copyright protected works across borders for this purpose provides persons in these locations with more materials, and faster access to the materials at a lower cost. Secure transportation of these files is of utmost importance, other considerations are the need for a method of searching and locating these works in an accessible format and determining if accessible versions are already in progress. These efforts aim to reduce redundant efforts to make materials electronically accessible, thus saving resources and allowing production of new works in accessible electronic format.

4.7 Future Possibilities in Education Including Cloud-Based Services & Mobile Web Applications

There is great potential for the use of mobile and cloud-based services in education. Some of the current challenges in developing and emerging countries are the limited access to and high cost of the Internet. The mobile networks are constantly changing.

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

296. APAC Regional Study, p. 2.

297. LAC Regional Study, p. 29.

298. <http://www.visionip.org/tigar/en/>

Mobile Internet access promises to bring access to underserved populations around the world. However, many of the mobile networks in developing countries currently do not support the bandwidth to access these education and cloud based services.

The Alippe.Tv project described in the Eastern Europe and Central Asia regional study was created in Kyrgyz to bring educational opportunities to students in under privileged areas with insufficient funding for education, and underdeveloped infrastructures, through an interactive television network.²⁹⁹ The study suggests that “one of the main achievements of the Alippe.TV project is promoting opportunity for children and adults with disabilities to receive education while staying at home or in the hospital. Most of] PWDs are unable to travel between home and campus, and/or sit in classrooms.”³⁰⁰ The channel works by allowing instructors to provide programming over the television with a return channel available through a special set-top-box. The return channel can provide this feedback through a number of possible methods such as SMS (text messaging), phone line, radio, digital subscriber line, or cable etc. Students are also given a microphone and special keyboard. This project is an example of how distance education can be leveraged even without sufficient broadband access.

The use of social media sites and applications will likely become an important tool in education. Social media sites allow for sharing content, collaboration, discussion and the ability to easily publish thoughts, writing, questions, and surveys. They are also good environments in which to read the most current topics and to promote student projects. The social connections are also a way for students to become excited about using technology and gain real world skills such as responsibility for what is written and said. However, schools will have to assist students in navigating to appropriate content and finding ways to prevent contact with inappropriate material or irresponsible use of social media.

Social networking will likely be beneficial to people with disabilities and those facing multiple discrimination, such as gender and disability discrimination.

Anecdotal evidence is showing that networks are being formed allowing people to share stories, experiences, and receive peer support and mentorship via social networks. Up to this point individuals with disabilities lack access to most popular social media and network sites. This trend will need to change in order to ensure education for all.

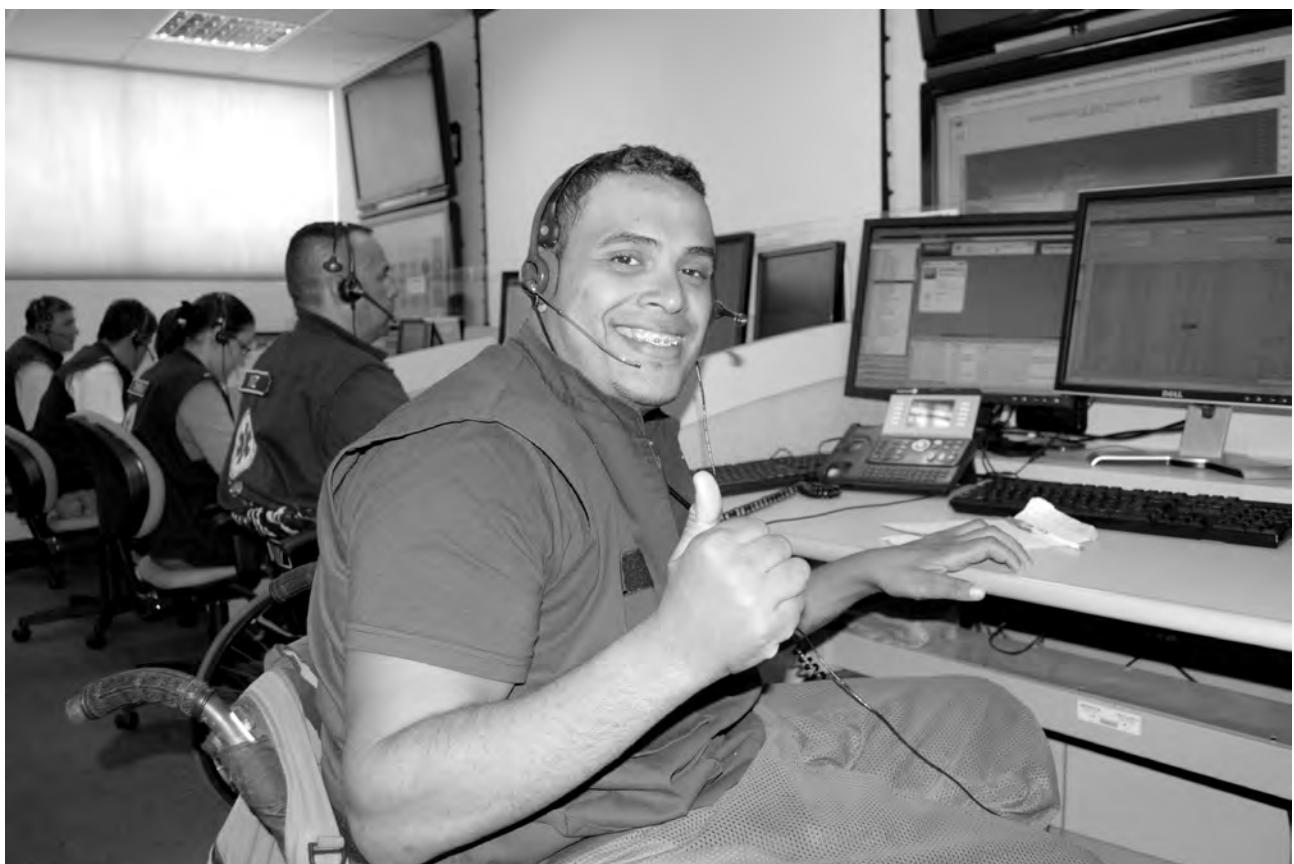
299. <http://www.itu.int/ITU-D/membership/portal/index.asp?Name=45526>

300. EECA Regional Study, p. 82.

Finally, the area of accessible gaming and virtual reality -- with its educational, recreational, and social benefits -- is beginning to be taken more seriously. **In the past many games were designed specifically for persons with disabilities. While this provided some educational and recreational opportunities, it did not meet the social needs of people with disabilities seeking to play with people that did not have disabilities.** Games designed specifically for people with disabilities lacked certain aspects that are appealing to people without disabilities. For instance, games designed for users who are blind lacked visual attractiveness for those who can see. Popular games that were made accessible were often older games that were no longer being played by a large audience.

Going forward, **it will be important for those who design game, virtual reality, and interactive simulators to take persons with disabilities' needs into account when designing these products.** This can be done by building the infrastructure in place to support different modes of presentation depending on the user's needs. For example, in a virtual environment the system knows who is talking, who is in a given room, and the location of objects. This information can be presented differently to users based on their indicated needs. For instance, real time text to speech can be used to convert spoken audio to text for users who cannot hear and visual indication of the current speaker can be indicated audibly to users who cannot see a visual indicator.

5 CONCLUSIONS



Person with disabilities working in SAMU (Emergency Services) in São Paulo, Brazil.

A theme running through this Report has been the interaction between the global (particularly the momentum provided by the UN Convention) and the local (the ability to use ICTs in affordable and effective local interventions for the education of PWD). **As this report was being finalised late in 2012 this interaction was demonstrating both a continuing development of policies for people with disabilities and ICT innovations. But it was also being affected by the global economic crisis and the resulting funding and resource challenges that governments were facing.** The UN Convention provides a significant focus for policy development. For example, in the Asia Pacific Region:

“...regional governments sent representatives a month ago {November 2012} to a UN Economic and Social Commission for Asia and the Pacific conference in Incheon, South Korea, to address the barriers that prevent the growing number of disabled people participating in social, economic and political life.”³⁰¹

The governments adopted the world’s first set of disability-inclusive development goals. For the first time, the region will be able to track and measure progress to improve the quality of life for these people.

In the Solomon Islands there have been calls for the government to follow up ratification of the Convention by robust action for PWD³⁰². Following its ratification of the Convention Jamaica will publish a National Disabilities Bill in 2013 with specific attention to the rights of PWD to receive education³⁰³. In New Zealand there is heightened sensitivity to the needs of PWDs³⁰⁴, a focus on ICT use in Ghana³⁰⁵, and a policy initiative is aiming to achieve wider acceptance of PWD in Botswana³⁰⁶.

Citizens in general are becoming more sensitised to the needs of persons with disabilities and for their needs to be mainstreamed in policies. A Eurobarometer Survey in 2012 for the European Commission found:

“Europeans strongly believe that disabled people should be able to participate fully in society, according to a new survey by the European Commission released ahead of the European Day for People with Disabilities on 3 December. Among those asked, 97% said that people with disabilities should be able to go to school, get a job or access shops like anyone else. 7 in 10 respondents say better accessibility of goods and services would very much improve the lives

301. Heyzer, Noeleen. (2012). *People with disabilities deserve to enjoy life, too*. South China Morning Post, December 3, [accessed 2 December 2012]. <http://www.scmp.com/comment/insight-opinion/article/1095796/people-disabilities-deserve-enjoy-life-too>

302. Namosua, Daniel. (2012). *Disability body calls for govt’s support*. Solomon Star (Solomon Islands), November 30, [accessed 2 December 2012]. <http://www.solomonstarnews.com/news/national/16597-disability-body-calls-for-govts-support>

303. Anon. (2012a). *Disabilities friendly gala*. The Gleaner (Jamaica), November 23, [accessed 2 December 2012]. <http://jamaicagleaner.com/gleaner/20121123/social/social8.html>
, Braham, Andrea. (2012). *National Disabilities Bill to be tabled in Parliament Soon*. Jamaica Information Service, November 21, [accessed 2 December 2012]. <http://www.jis.gov.jm/news/leads/32360>

304. Ward, Darren. (2012). *Giving to the world’s largest minority*. Dominion Post (New Zealand), December 3, [accessed 2 December 2012]. <http://www.stuff.co.nz/dominion-post/comment/8027491/Giving-to-the-worlds-largest-minority>

305. Anon. (2012c). *Gov’t Committed To Providing ICT Skills To People With Disabilities - Mahama*. Ghana Web, November 22, [accessed 2 December 2012]. <http://www.ghanaweb.com/GhanaHomePage/politics/artikel.php?ID=257271>

306. Bothoko, Pini. (2012). *Association of people with disabilities aims high*. The Monitor (Botswana), November 26, [accessed 2 December 2012]. <http://www.mmegi.bw/index.php?sid=1&aid=257&dir=2012/November/Monday26>

of disabled people, the elderly and others, such as parents with young children. 84% believe more accessible goods and services would also create more opportunities for industry.”³⁰⁷

By surrounding the UN Convention with significant events such as the International Day of Persons with Disabilities³⁰⁸ countries, organizations and people have a common focus. The result of this concentrated effort can be a powerful motivator, leading to, for example, the provision of scholarships in Sierra Leone³⁰⁹ and Ukraine³¹⁰, and can add pressure on governments to expedite interventions, such as in Kenya³¹¹, or Kyrgyzstan where:

“The delayed ratification of the UN Convention means that disabled children in Kyrgyzstan continue to face limited access to educational opportunities. Currently, only 25 percent of Kyrgyz children with special needs go to school”³¹².

It energises people to organize events that reflect on the educational needs of PWD³¹³, and at an individual level, a blind female in a remote Indian village could communicate her experiences widely, and emphasise the serious need for trained teachers in rural schools:

“As my village is in a remote location, it’s a real struggle to get enough trained teachers to stay here – they keep changing frequently. There are still too few teachers who can support the needs of children like me and are also willing to live in such a remote location”³¹⁴.

A teacher of a child with significant disabilities was motivated to write to the Australian Prime Minister about the value of the educational interventions enabled through government funding:

“The unexpected result of intervention with Billy, which has included a lot of sensory integration activities accompanied by communication practice, is that Billy has not only begun talking meaningfully to others, but is also interacting socially and beginning to copy other children, giving him a platform for development”³¹⁵.

307. EUROPE. (2012). *European Day for People with Disabilities on 3 December: Europeans strongly back better accessibility for disabled*. European Commission, November 30, [accessed 30 November 2012]. http://europa.eu/rapid/press-release_IP-12-1296_en.htm?locale=en

308. <http://www.un.org/disabilities/default.asp?id=1597>

309. Tarawally, Abu Bakarr S. (2012). *Sierra Unite Donates Scholarships to the Disabled*. Sierra Express Media (Sierra Leone), November 14, [accessed 2 December 2012]. <http://www.sierraexpressmedia.com/archives/50314>

310. Anon. (2012b). *Gifted students with disabilities to get Hr 850 ministerial scholarship*. Kyiv Post (Ukraine), November 22, [accessed 2 December 2012]. <http://www.kyivpost.com/content/ukraine/gifted-students-with-disabilities-to-get-hr-850-ministerial-scholarship-316555.html>

311. Anon. (2012e). *Mutula wants school calendar reviewed*. Kenya Broadcasting Corporation, November 3, [accessed 2 December 2012]. <http://www.kbc.co.ke/news.asp?nid=78894>

312. Huang, Ying Jia. (2012). *Fighting for Equal Access to Education in Kyrgyzstan*. Open Equal Free, November 16, [accessed 2 December 2012]. <http://www.openequalfree.org/fighting-for-equal-educational-access-in-kyrgyzstan/17691>

313. Gwalani, Payal. (2012). *Cure teaching disability for kids with learning disabilities*. Times of India, December 2, [accessed 2 December 2012]. <http://timesofindia.indiatimes.com/city/nagpur/Cure-teaching-disability-for-kids-with-learning-disabilities/articleshow/17445867.cms>

314. Sethiya, Manisha. (2012). *International Day of Persons with Disabilities: Being blind in a remote village of India*. Independent (London), December 1, [accessed 2 December 2012]. <http://blogs.independent.co.uk/2012/12/01/international-day-of-persons-with-disabilities-being-blind-in-a-remote-village-of-india/>

315. Collins, Jacinta. (2012). *Disability funding can cause miracles and change lives*. Herald Sun (Melbourne), December 3, [accessed 2 December 2012]. <http://www.heraldsun.com.au/opinion/disability-funding-can-cause-miracles-and-change-lives/story-e6frfhqf-1226528415619>

In countries such as Canada the rights and policy interventions are much more advanced, and in the City of York (Ontario):

"If you have Down Syndrome you have a condition that causes delays in physical and intellectual development. These and other birth conditions can place you under the coverage of the IDEA (Individuals with Disabilities Education Act). You will then be entitled to an IEP (Individualized Education Plan) which is designed to address your particular educational needs, possibly in a Special Education Classroom (SEC). You will have a specially trained teacher and probably a PCA (Personal Care Attendant), who is a specially trained assistant to your teacher. That PCA and teacher will be supported by PaTANN (Pennsylvania Training and Technical Assistance Network), an agency of the state government that provides special education and support for local school districts"³¹⁶.

Moreover, the human rights aspect of education for persons with disabilities was strongly confirmed by the British Columbia (Canada) Supreme Court, which argued:

"The reason all children are entitled to an education, is because a healthy democracy and economy require their educated support. Adequate special education, therefore, is not a dispensable luxury. For those with severe learning disabilities, it is the ramp that provides access to the statutory commitment to education made to all children in British Columbia."³¹⁷

What that statement reminds us is that while ICTs can deliver significant benefits to access information and knowledge to PWD. They are one of many education interventions that need to be delivered in a holistic learning environment – the ‘holistic’ theme has come out strongly through the regional studies, and in this context in Singapore the government announced “*a pilot project for pre-schools for disabled children*”³¹⁸.

A review of the situation in Ireland communicated a challenging situation where an official report called:

"Our Bill of Health: Health, Disability and Carers in Ireland, published by the CSO using census data, shows that people with disabilities are seriously discriminated against in all aspects of Irish life and prevented from getting a basic education, gaining qualifications, getting jobs, having families and leading fulfilling lives. This is an unacceptable reality and a wake-up call for our systems of education and employment... Disability awareness is not a mandatory component of teacher-training courses, leaving teachers ill-equipped to manage disability."³¹⁹

316. Haldeman, George. (2012). *A special education jewel in a box of rocks*. York Daily Record (Canada), November 30, [accessed 2 December 2012]. http://www.ydr.com/letters/ci_22099391/special-education-jewel-box-rocks

317. Finch, Carola. (2012). *Canadian court rules school board discriminated against boy with dyslexia*. Examiner.com, November 9, [accessed 2 December 2012]. <http://www.examiner.com/article/canadian-court-rules-school-board-discriminated-against-boy-with-dyslexia>

, Simons, Paula. (2012). *Who decides what constitutes adequate special education?* Edmonton Journal, November 14, [accessed 2 December 2012]. <http://www.edmontonjournal.com/health/Simons+decides+what+constitutes+adequate+special/7549999/story.html>

318. NST. (2012). *Pre-schools for disabled kids to ease burden of poor families*. New Straits Times, November 13, [accessed 2 December 2012]. <http://www.nst.com.my/latest/pre-schools-for-disabled-kids-to-ease-burden-of-poor-families-1.170526>

319. Heelan, Anne. (2012). *The education system fails our citizens with disabilities*. Irish Times, November 27, [accessed 2 December 2012]. <http://www.irishtimes.com/newspaper/education/2012/1127/1224327139356.html>

In South Africa the Convention provides an important benchmarking framework where organizations promoting the needs of PWD can review government progress, for example where they are concerned about a lack of special schools and where "about 10 per cent of children with disabilities were not attending school in South Africa"³²⁰. In all countries, therefore, there are significant challenges in the education of PWD.

Even in the USA the ratification of the UN Convention has been controversial, with some politicians arguing that the Convention may prejudice the human rights of parents to educate their children at home³²¹. However, the education momentum is significant in the USA, where

*"The biggest issue for us recently in higher education has been the changes to the ADA (Americans with Disabilities Act)," ... "What it has done is significantly expand the definition of disability and significantly reduce what we can require as far as information and documentation in order to qualify a student."*³²²

The UN Convention is therefore a motivator, but it is finance and resources that are the enablers. Governments across the world are being faced with budgetary pressures, and the need to aggressively prioritise their public spending. In Portugal there were concerns that NGOs who received government funds to address the needs of PWD will have less money, and that funds often are being delayed. This leads to staff reductions and a reduction in programme interventions³²³. There are cases, for example in India, where funding was no longer available to take children with disabilities to the schools where they would receive education, and governments struggle to balance the obligations in meeting rights with a finite amount of money:

*"There are hundreds of disabled children who meet a similar fate and at a time when the government, both at Centre and state levels, is making efforts to ensure that every child between the ages of six and 14 receives elementary education under the Right to Education (RTE) Act."*³²⁴

In Scotland (UK) "A review of educational provision carried out on behalf of the Scottish Government raised concerns about falling numbers of specially trained teachers, educational psychologists, classroom assistants and paediatricians with disability training"³²⁵.

320. Moeketsi, Sandy. (2012). *Many disabled kids not in school*. Independent Online (South Africa), November 21, [accessed 2 December 2012]. <http://www.iol.co.za/news/south-africa/many-disabled-kids-not-in-school-1.1428147#.ULu0p4bnOuk>

321. Abrams, Jim. (2012). *Senate takes up UN disability treaty*. Associated Press, November 27, [accessed 2 December 2012]. <http://www.wistv.com/story/20197970/senate-takes-up-un-disability-treaty>
, Waterstone, Michael. (2012). *We Can Do Better on Disability Rights*. Pacific Standard (California), November 30, [accessed 2 December 2012]. <http://www.psmag.com/legal-affairs/we-can-do-better-49986/>

322. Swift, James. (2012). *The Next Wave: Autistic Students in Higher Education*. Youth Today, November 5, [accessed 2 December 2012]. http://www.youthtoday.org/view_article.cfm?article_id=5670

323. Mahony, Honor. (2012). *Disability and EU austerity: a Portuguese case study*. EU Observer, November 23, [accessed 27 November 2012]. <http://euobserver.com/disability/118246>

324. Jain, Isha. (2012). *Funds crunch deprives them of right to education*. Times of India, December 2, [accessed 2 December 2012]. <http://timesofindia.indiatimes.com/city/lucknow/Funds-crunch-deprives-them-of-right-to-education/articleshow/17447807.cms>

325. Marshall, Chris. (2012). *Education cutbacks and red tape threaten children with special needs, report finds*. The Scotsman, November 13, [accessed 2 December 2012]. <http://www.scotsman.com/news/education/education-cutbacks-and-red-tape-threaten-children-with-special-needs-report-finds-1-2631260>

There were concerns about funding from the UK, that while it is anecdotal it does illustrate the difficult decisions that education authorities have to take over the allocation of limited funds:

"In another case, she says, a disabled teacher was paid off from her job because this was cheaper than the school spending tens of thousands of pounds adapting it and buying in the specialist equipment she needed. And just as pupils who are disabled need a support worker to accompany them, so do teachers. Many schools simply don't provide them."³²⁶

Furthermore, the task of identifying funding in the first place continues, for example in Botswana where the 'Disability Education Reform Lobby' is contesting government policy regarding the resourcing of the education of PWDs, arguing that budgets must not just be discretionary³²⁷. By contrast, some countries such as Abu Dhabi are focusing specifically on the mainstreaming of teacher training in PWD³²⁸.

While this report has specifically focused on the opportunities presented by the use of ICTs, it also emphasizes that ICTs by themselves are simply ICTs, not educational tools. The cost-benefits can be significant and this motivates their adoption, for example in Vietnam where an initiative in Ha Noi, HCM City, the northern province of Thai Nguyen and the central province of Quang Binh will include "*software with screen readers for the visually impaired, setting up video lectures for the deaf and setting up remote learning models for children who cannot go to school*"³²⁹. However, there is little to be gained in ICT interventions in education for persons with disabilities if their wider societal inclusion is not assured. New Zealand has expressed concerns about the difficulties PWDs face to become "*involved in employment, continuing education, sporting, recreational, creative, cultural and political communities*"³³⁰.

326. Lepkowska, Dorothy. (2012). *Where are the disabled teachers?* Guardian (London), November 12, [accessed 2 December 2012]. <http://www.guardian.co.uk/education/2012/nov/12/disabled-not-encouraged-teacher-training-costs>

327. ABC. (2012). *Parents seek better disability support.* ABC News, November 30, [accessed 2 December 2012]. <http://www.abc.net.au/news/2012-11-30/parents-lobby-for-better-disability-service/4400548>

328. Zaman, Samihah (2012). *4,700 special needs pupils integrated into Abu Dhabi public schools.* Gulf-news.com, November 11, [accessed 2 December 2012]. <http://gulfnews.com/news/gulf/uae/education/4-700-special-needs-pupils-integrated-into-abu-dhabi-public-schools-1.1103277>

329. Anon. (2012d). *IT training opens doors for young people with disabilities.* Vietnam.net Bridge, November 25, [accessed 2 December 2012]. <http://english.vietnamnet.vn/fms/society/52879/it-training-opens-doors-for-young-people-with-disabilities.html>

330. Backhouse, Matthew. (2012). *NZ made disabled people 'invisible'.* New Zealand Herald, December 2, [accessed 2 December 2012]. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10851481

In conclusion, this report does not present simplistic solutions to access information and knowledge to people with disabilities using ICTs, but instead presents an overall 'status report' of the highly varied situation across countries and within societies.

After all, "*not all disabilities are created equal*"³³¹, and the interventions provided for people with physical disabilities are very different to those with cognitive disabilities along the autistic spectrum.

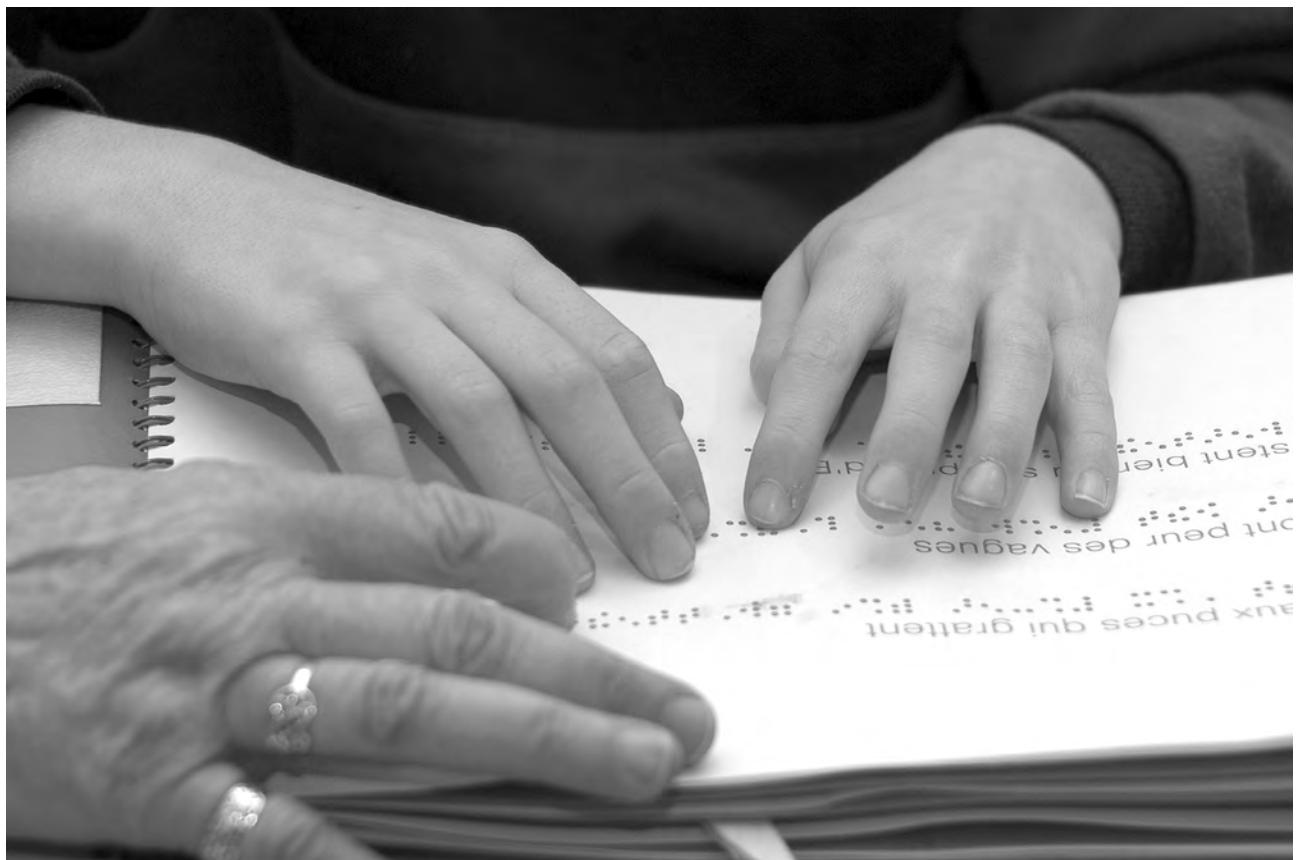
If there is a headline outcome from this report, it is that ICTs can significantly empower PWD at the local level, and in some instances can provide them with a means to supplement government interventions, or to overcome situations where there is a lack of policy.

A second headline outcome is that the UN Convention is clearly providing governments and PWD with an organizing framework to mobilise policy and resources.

A third outcome is that the challenge to provide education for PWD, and in linking it to holistic outcomes such as employability and social inclusion, remains significant in all countries, and the current environment of global economic crisis is putting significant resource constraints on policy interventions. The need, therefore, to use innovative ICTs in ways that are cost efficient and offer productive education programmes has never been greater.

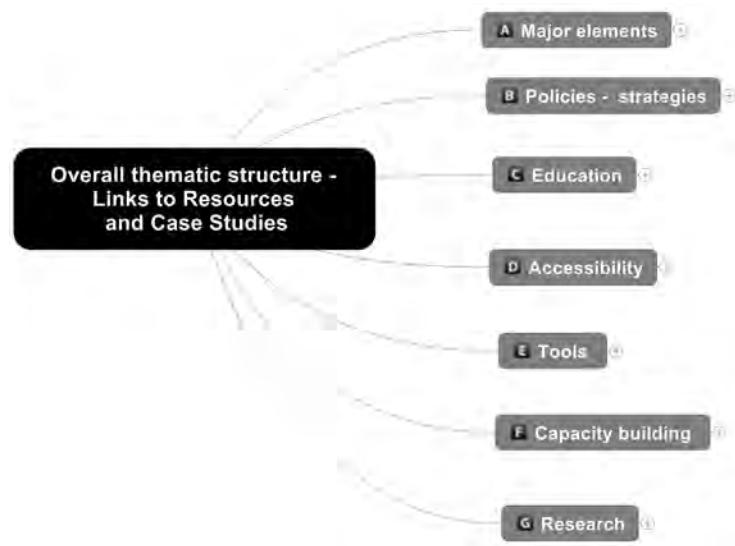
331. Wicks, Kathryn. (2012). *Not all disabilities are created equal*. Sydney Morning Herald, November 10, [accessed 2 December 2012]. <http://www.smh.com.au/opinion/politics/not-all-disabilities-are-created-equal-20121109-29313.htm>

6 LINKS TO RESOURCES AND CASE STUDIES



Braille workshop organised on the occasion of the International Mother Language Day 2005.

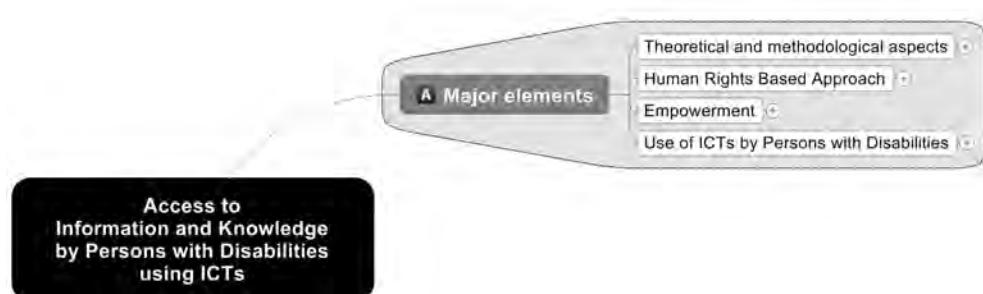
The following links to resources and case studies were gathered at the time of writing and were active in November 2012. A more dynamic version with additions and updates will be made available online by UNESCO, but the list that follows is provided as a means for readers to explore more widely the issues and activities surrounding the education of PWDs using ICTs, and the overall thematic structure of the online resource is shown below.



* Overall thematic structure. 1 level: Access to information and knowledge by Persons with Disabilities. 2 level: A. Major elements, B. Policies - strategies, C. Education, D. Accessibility, E. Tools, F. Capacity building, G. Research.

Disclaimer: The links and resources in this list were checked in November 2012. No official attribution is made by UNESCO towards these links, which are provided as representative examples of activity.

MAJOR ELEMENTS



Theoretical and methodological aspects

Education and Disability Issues (UNESCO)

http://www.unesco.org/education/efa/know_sharing/flagship_initiatives/disability_last_version.shtml

University of Leeds Centre for Disability Studies – Publications

<http://www.leeds.ac.uk/disability-studies/publish.htm>

Stanford University Encyclopaedia of Philosophy

[www.plato.stanford.edu:](http://www.plato.stanford.edu)

Human Rights

<http://plato.stanford.edu/entries/rights-human/>

Disability: Definitions, Models, Experience

<http://plato.stanford.edu/entries/disability/>

Cognitive Disability and Moral Status

<http://plato.stanford.edu/entries/cognitive-disability/>

Feminist Perspectives on Disability

<http://plato.stanford.edu/entries/feminism-disability/>

Human Rights Based Approach

UN enable: Human Rights and Persons with Disabilities

<http://www.un.org/esa/socdev/enable/rights/humanrights.htm>

Global Disability Rights Library, University of Iowa

<http://www.widernet.org/egranary/gdrl>

Centre on Human Rights for People with Disabilities (COHRPD)

<http://www.disabilityaction.org/centre-on-human-rights/>

International Disability Rights Monitor

<http://www.idrmnet.org/>

UNICEF - Promoting the rights of children with disabilities

http://www.un.org/esa/socdev/unvin/documents/children_disability_rights.pdf

UNICEF - The Right of Children with Disabilities to Education

http://www.unicef.org/ceecis/Background_NoteFINAL.pdf

Empowerment

UNESCO Presentation: First Findings – Opening New Avenues for Empowerment: ICT to Access Information and Knowledge for Persons with Disabilities

http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/images/wsis/WSIS_Forum_2012/C3%20Accessibility.pdf

Conference summary: How ICT can empower youth and disabled in Botswana
<http://www.mmegi.bw/index.php?sid=1&aid=130&dir=2012/October/Friday5>

UNSDN - UN Social Development Network Empowerment portal
<http://unsdn.org/?cat=96>

Disability Empowerment Center
<http://www.decpa.org/>

Rural Women Development Center
<http://www.ruwdec.org/>

UNESCO - The challenges of women with disabilities in rural areas
http://www.unesco.org/en/amman/dynamic-content-single-view/news/the_challenges_of_women_with_disabilities_in_rural_areas/back/13935/cHash/cb9ad00a13/

Key questions: use of ICTs by Persons with Disabilities

10 Questions about inclusive education (UNESCO)
<http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/10-questions-on-inclusive-quality-education/>

UNESCO - ICTs in Education for People With Disabilities: Review of innovative practice – 2011
<http://www.european-agency.org/publications/ereports/ICTs-in-Education-for-People-With-Disabilities/ICTs-in-Education-for-people-with-disabilities.pdf>

UNESCO - Report on Using Information and Communication Technologies (ICTs) in Education for Persons with Disabilities – 2012
<http://unesdoc.unesco.org/images/0021/002163/216382e.pdf>

INFODEV Quick guide: ICTs in education challenges and research questions
<http://www.infodev.org/en/Publication.106.html>

INFODEV Quick Guides to ICT and Education Issues and Topics
<http://www.infodev.org/en/Project.91.html>

ITU - Summary: Making ICTs accessible to people with disabilities – 2012
<http://www.itu.int/en/wcit-12/Documents/WCIT-background-brief13.pdf>

ICTs in Education - thematic and country links
<http://ictec.wordpress.com/icts-in-education/>

Quick Guides to ICT and Education Issues and Topics
<http://www.infodev.org/en/Project.91.html>

UK Parliament Briefing Paper
<http://www.parliament.uk/briefing-papers/POST-PN-411.pdf>

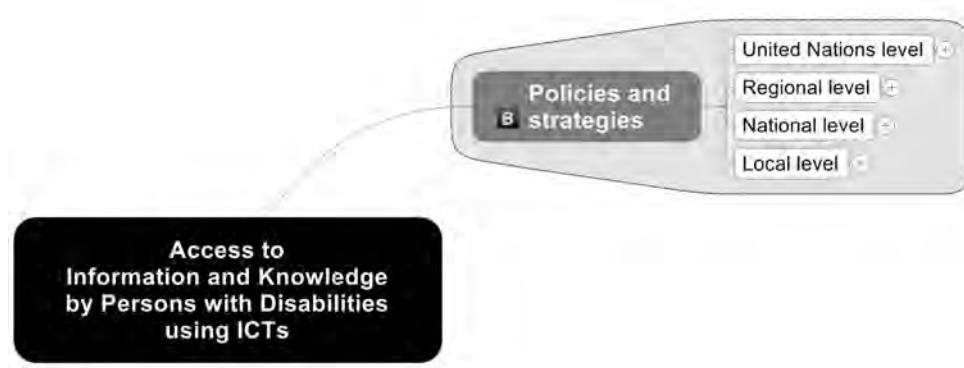
Presentation on costs and benefits of ICTs for Person with Disabilities
http://inova.snv.jussieu.fr/evenements/colloques/colloques/70_article_en_252.html

Accessible Information and Communication Technologies Benefits to Business and Society – 2010
<http://www.onevoiceict.org/sites/default/files/Accessible%20ICT%20-%20Benefits%20to%20Business%20and%20Society.pdf>

G3ict - Benefits and Costs of e-Accessibility: How Economics and Market Forces can support e-Accessibility and the Convention on the Rights of Persons with Disabilities – 2012
http://g3ict.org/download/p/fileId_938/productId_248

One Laptop per Child (OLPC) initiative
<http://one.laptop.org/>

POLICIES - STRATEGIES



UN level

United Nations Economic and Social Council
<http://www.un.org/ecosoc/>

Including Education and Training Policies by Country
<http://webapps01.un.org/nvp/polcat.action?id=1974>

UN - Persons with Disabilities
<http://www.un.org/en/globalissues/disabilities/index.shtml> ;

UN Convention on the Rights of Persons with Disabilities
<http://www.un.org/esa/socdev/enable/rights/convtexte.htm>

The latest status information about UN Convention
<http://g3ict.org/about/convention>

Mobile learning and education policies (UNESCO)
http://www.unesco.org/new/en/unesco/themes/icts/single-view/news/mobile_learning_and_policies_key_issues_to_consider/

ITU and Accessibility
<http://www.itu.int/themes/accessibility/>

Regional level

Asia-Pacific Development Center on Disability

<http://www.apcdfoundation.org/>

European Commission Disability Links

http://ec.europa.eu/health-eu/my_health/people_with_disabilities/index_en.htm

European Commission link to disability NGOs

http://ec.europa.eu/health-eu/my_health/people_with_disabilities/ngo_en.htm

European Commission: 2020 Strategy, ICT Challenge 5: ICT for Health, Ageing Well, Inclusion and Governance

http://cordis.europa.eu/fp7/ict/programme/challenge5_en.html

UN Economic and Social Commission for Asia and the Pacific

<http://www.unescap.org/about/>

with a database of disability policy in Asia and the Pacific

<http://www.unescap.org/sdd/issues/disability/policycentral/index.asp>

National level

India: Media Lab Asia

<http://medialabasia.in/>

India: A Comprehensive Satellite/Internet based National Network for Education, Training and Empowerment of persons with disabilities

<http://punarbhava.in/>

Ireland: The Disability Act 2005

<http://www.justice.ie/en/JELR/DisabilityAct05Guide.pdf/Files/DisabilityAct05Guide.pdf>

Jordan: Higher Council for Affairs of Persons with Disabilities

<http://hcd.gov.jo/ar>

USA: 'Digital Promise' and innovative education

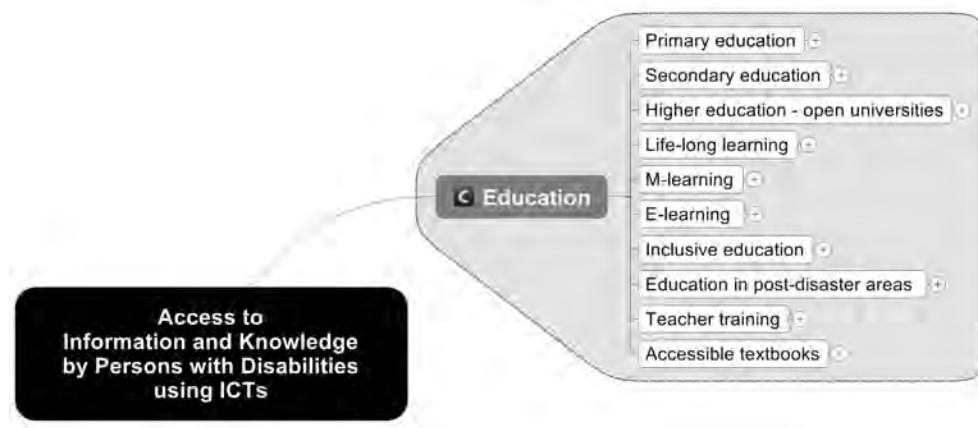
<http://www.digitalpromise.org/>

Local level

Web accessibility policy in Texas, USA

<http://www.utexas.edu/cio/policies/web-accessibility/>

EDUCATION



Primary education

Botswana - Accessible schools and assistive ICTs

<http://www.gov.bw/Global/MTC/E-gov.Working-Draft%20Strategy.pdf>

See also inclusive education and accessibility of junior secondary school buildings in Botswana. F. M. Mthombeni, L. C. Fidzani.

http://www.unicef.org/infobycountry/files/Thari_ya_bana_2011.pdf

Estonia: Clover Primary school for children with SEN

<http://www.ristiku.tln.edu.ee/>

Japan: In-Class Use of Mobile Phones for Children with Disabilities

http://www.itu.int/dms_pub/itu-t/oth/06/27/T06270000040032PPTE.ppt

Thailand: ICTs for disabled children - targeted ICTs and teacher training

<http://www.unescobkk.org/education/ict/online-resources/features/it-princess/educational-development-for-the-disabled/>

Thailand: ICTs for PWD in schools

<http://ictec.wordpress.com/2010/02/11/it-for-disabled-program-in-schools-in-thailand/>

Secondary education

Special Schools as a Resource for Inclusive Education. A Review of the Open Society Foundations' Experience Working with Special Schools in Armenia – 2012

<http://www.opensocietyfoundations.org/reports/special-schools-resource-inclusive-education>

European Schoolnet

<http://www.eun.org/>

Designing a Future Classroom

<http://itec.eun.org/>

<http://itec.eun.org/web/guest/technologies>

Higher education – open universities

India - Delhi University central services for PWDs

http://www.du.ac.in/fileadmin/DU/DUCorner/pdf/Braille%20Library_AA%20Report.pdf

<http://eoc.du.ac.in/>

Disabilities, Opportunities, Internet Working, and Technology

<http://www.washington.edu/doit/>

See also MESA Curriculum Addendum: How to Fully Include Students with Disabilities

http://www.washington.edu/doit/Stem/mesa_add.html

Life-long learning

European Agency for Development in Special Needs Education – Accessible Information Provision for Lifelong Learning - Key Policy Messages – 2012

<http://www.european-agency.org/publications/flyers/iaccess-policy-paper/i-access-policy-paper.pdf>

Promotion of digital literacy in people with psychological disabilities:

Some European Initiatives

<http://www.elearningeuropa.info/en/download/file/fid/19252>

UNESCO Accessible ICTs and Personalized Learning for Students with Disabilities 2012

http://www.unesco.org/pv_obj_cache/pv_obj_id_038EC363BE2116DF3EE127D60A3A76E069A71100/filename/accessible_ict_personalized_learning_2012%20.pdf

UNESCO - Youth and skills: Putting education to work. EFA Monitoring Report – 2012

<http://unesdoc.unesco.org/images/0021/002180/218003e.pdf>

M-learning

UK JISC - Mobile Learning Portal

<http://www.jisc.ac.uk/whatwedo/topics/mobilelearning.aspx>

ITU, G3ict - Making mobile phones and services accessible for persons with disabilities

http://www.itu.int/ITU-D/sis/PwDs/Documents/Mobile_Report.pdf

ITU/G3ict - REPORT: Making Mobile Phones and services accessible for Persons with disabilities – 2012

http://www.itu.int/ITU-D/sis/PwDs/Documents/Mobile_Report.pdf

E-learning

South Korea: Cyberhome learning online resource for PWD

<http://english.keris.or.kr/ICSFiles/afieldfile/2009/01/09/CHLSofKorea.pdf>

<http://iite.unesco.org/pics/publications/en/files/3214677.pdf>

<http://english.keris.or.kr/ICSFiles/afieldfile/2006/08/10/KERISRandD.pdf>

South Korea: e-learning strategy and disability

<http://iite.unesco.org/publications/3214677/>

<http://iite.unesco.org/pics/publications/en/files/3214677.pdf>

<http://info.worldbank.org/etools/docs/library/243157/day1Session3Myungsook%20Pang.pdf>

Inclusive education

UNESCO – Inclusive education

<http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/>

UNESCO - Policy Guidelines for Inclusive in Education

<http://unesdoc.unesco.org/images/0017/001778/177849e.pdf>

Inclusive Education Case Studies (Leonard Cheshire)

<http://www.disabilitydatabase.org/inclusive-education>

Commonwealth Secretariat: Implementing Inclusive Education: A Commonwealth Guide to Implementing Article 24 of the UN Convention on the Rights of Persons with Disabilities. Richard Rieser (2012)

http://g3ict.org/download/p/fileId_911/productId_225

Education in post-disaster areas

China - 2008 Earthquake in Sichuan - accessible schools and integrated services

<http://csr.cisco.com/casestudy/connecting-sichuan>

http://newsroom.cisco.com/dlls/2010/ts_071210b.html

Plan Haiti - 2011

<http://www.planusa.org/docs/PlanHaitiReport12monthson.pdf>

UNICEF and UNESCO – 2012 Disaster Risk Reduction in School Curricula Case from Thirty Countries

<http://www.unicef.org/education/files/DRRinCurricula-Mapping30countriesFINAL.pdf>

Planning education in and after emergencies

<http://www.unesco.org/iiep/PDF/Fund73.pdfom>

Teacher training

Estonia: Integrated resources on SENs for teachers

<http://www.hev.edu.ee/>

Bulgaria: Pleven resource centre for SEN educational integration

<http://rcpleven.com/>

Afghanistan - capacity needs and the shortage of PWD-trained educators

http://www.olpcnews.com/countries/afghanistan/can_help_students_with_disabilities.html

Sri Lanka - Training Teachers in the education of PWDs using ICTs
<http://www.dinf.ne.jp/doc/english/resource/srilanka.html>

"Every Child Needs a Teacher" (2012) Reviews gaps in teacher training needs
http://www.campaignforeducation.org/docs/reports/ECNAT%20Report_RGB.pdf

Accessible textbooks

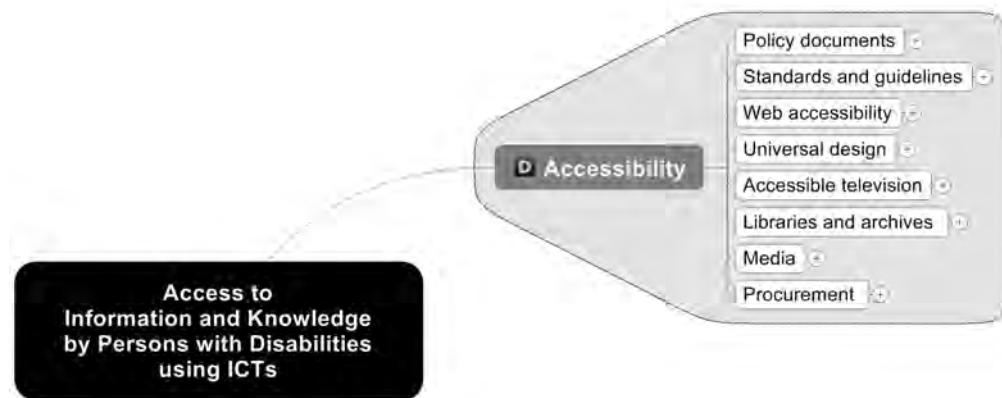
US Universities and the use of electronic book readers which were not suitable for PWD
http://www.ada.gov/kindle_ltr_eddoj.htm

ICT-in-Education Toolkit
<http://www.ictinedtoolkit.org/usere/login.php>

Singapore: Special Education Portal with links
<http://www.moe.gov.sg/education/special-education/schoollist/>

BBC article about developments in South Korea and other countries
<http://www.bbc.co.uk/news/business-15175962>

ACCESSIBILITY



Policy Documents

Web accessibility policy in Texas, USA
<http://www.utexas.edu/cio/policies/web-accessibility/>

UNESCO IITE Policy and research on ICT in education for people with disabilities
http://iite.unesco.org/policy_and_research/icts_in_special_needs/
<http://iite.unesco.org/publications/list/>

ITU, G3ict - Making mobile phones and services accessible for persons with disabilities
http://www.itu.int/ITU-D/sis/PwDs/Documents/Mobile_Report.pdf

G3ict e-Accessibility Policy Toolkit for Persons with Disabilities
<http://www.e-accessibilitytoolkit.org/>

Standards and guidelines

Accessible Digital Office Document (ADOD) Project
<http://adod.idrc.ocad.ca/node/1>

Guidelines for Persons with Disabilities
<http://connectaschool.org/itu-module/15/331/en/persons/w/disabilities/connectivity/introduction/>

Web Accessibility Initiative (WAI)
<http://www.w3.org/WAI/>
<http://www.w3.org/2005/11/Translations/Lists/OverviewLang.html>

Creating accessible websites for the blind
<http://www.afb.org/section.aspx?SectionID=57&TopicID=167>

Global: Connect a School Initiative (ITU)
<http://connectaschool.org/>

Accessible publishing

Accessible publishing
<http://accessiblepublishing.org/>

Daisy Consortium
<http://www.daisy.org/project/save-as-daisy-microsoft-word-add-in>

Accessible EPUB 3
http://www.niso.org/publications/isq/2011/v23no2/kasdorf/FE_Kasdorf_EPUB_isqv23no2.pdf

Accessible Digital Office Document (ADOD) Project
<http://adod.idrc.ocad.ca/node/1>

Web accessibility

Web Accessibility Initiative (WAI)
<http://www.w3.org/WAI/>
<http://www.w3.org/2005/11/Translations/Lists/OverviewLang.html>

Web accessibility checker
<http://achecker.ca/checker/index.php>

Web Accessibility Inspector – Fujitsu
<http://www.fujitsu.com/global/accessibility/assistance/wi/>

Universal design

Universal Design

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

Universal Design Conferences

<http://www.uld-conference.org/en>

Web Accessibility Initiative (WAI)

<http://www.w3.org/WAI/>

<http://www.w3.org/2005/11/Translations/Lists/OverviewLang.html>

Centre for Excellence of Universal Design

<http://www.washington.edu/doit/Resources/technology.html>

Technology and Universal Design

<http://www.washington.edu/doit/Resources/technology.html>

ITU Focus Group on Audiovisual Media Accessibility

<http://www.itu.int/en/ITU-T/focusgroups/ava/Pages/default.aspx>

G3ict e-Accessibility Policy Toolkit for Persons with Disabilities

<http://www.e-accessibilitytoolkit.org/>

Accessible Digital Office Document (ADOD) Project

<http://adod.idrc.ocad.ca/node/1>

Accessible Television

ITU - G3ict Making accessible television

http://www.itu.int/net/pressoffice/press_releases/2011/51.aspx

Accessible media

http://www.ami.ca/ami/A.M.I_Home.aspx

Afb: television accessible

<http://www.afb.org/afbpress/pub.asp?DocID=aw131008>

European eAccess+ Hub

http://hub.eaccessplus.eu/wiki/Main_Page

Disabled world: Accessible TV Program Guide

<http://www.disabled-world.com/entertainment/accessible-tv-guide.php>

European Broadcasting Union EBU - Accessible television

<http://www.euroblind.org/newsletter/online/2011/november-december/newsletter/online/en/newsletter/eu-update/nr/949/>

Libraries and archives

IFLA - Libraries Serving Persons with Print Disabilities Section

<http://www.ifla.org/lpd>

Electronic Information for Libraries EIFL - Enabling access to knowledge through libraries in developing and transition countries

<http://www.eifl.net/home>

EIFL-FOSS Disability Tools for Libraries Step-By-Step Guide (November 2012)

<http://www.eifl.net/disability-tools-step-step-guide>

EIFL FOSS Disability Tools having impact in Zimbabwe

<http://www.eifl.net/news/foss-disability-tools-having-impact-zimbabwe>

Libraries for Blind and Partially Sighted People in Europe

<http://www.euroblind.org/resources/useful-services/nr/386>

India: Online Braille Library, National Institute for Visually Handicapped

<http://www.oblindia.org/>

<http://news.outlookindia.com/items.aspx?artid=746546>

Japan Braille Library

<http://www.nittento.or.jp/>

African Public Libraries Summit 2012 – Presentations

<http://www.african-public-libraries-summit.org/index.php>

EUROBLIND Links to global resources for low vision and blind people

1

<http://www.euroblind.org/resources/useful-links/>

Media

ILO - Media guidelines`

http://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_127002.pdf

OHCHR - Guidance for human rights monitors

http://www.ohchr.org/Documents/Publications/Disabilities_training_17EN.pdf

Guidelines for Reporting and Writing about People with Disabilities

<http://www.rtcil.org/products/RTCIL%20publications/Media/Guidelines%20for%20Reporting%20and%20Writing%20about%20People%20with%20Disabilities.pdf>

NAPAS - Reporting and Writing About Disabilities

<http://www.napas.org/en/media/press-kit/265-reporting-and-writing-about-disabilities.html>

Procurement

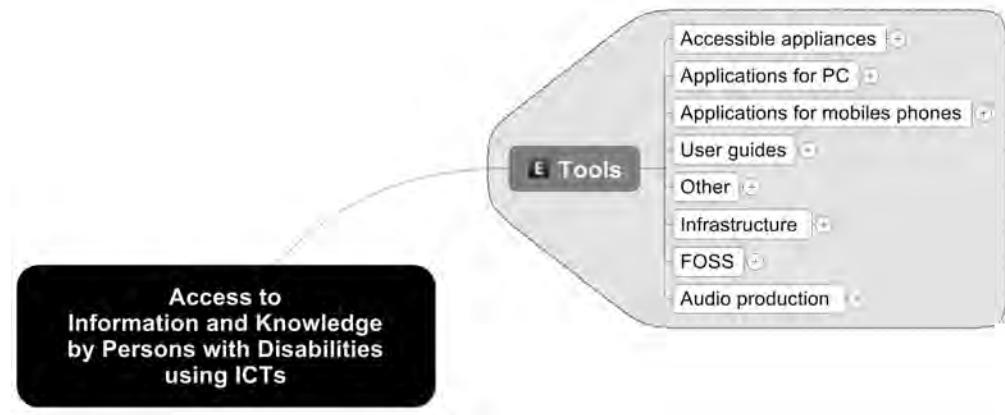
Canada - Accessible Procurement Toolkit

<http://www.apt.gc.ca/>

Sweden - Free Choice of Assistive Technology

<http://www.hi.se/Global/Dokument/fritt-val-av-hjalpmedel/Free%20Choice%20of%20Assistive%20Technology%20-%20summary.pdf>

TOOLS



Accessible appliances

Sightsavers: Low Vision and Inclusive Education

http://www.sightsavers.org/in_depth/quality_and_learning/learning/18940_Insight%20plus%20-%20towards%20inclusive%20education.pdf

Canada: Assistive Technology British Columbia

<http://www.at-bc.ca/>

<http://www.at-bc.ca/skillsdevelopment.html>

Robobraille - E-mail Service to convert digital text documents into either Braille or audio files

<http://www.robobraille.org/>

Applications for PC

Bulgaria: Text to speech in Bulgarian language

<http://www.bacl.org/speechlab.html>

India: Media Lab Asia

<http://medialabasia.in/>

India: Sanyog™: Indian Language based Communication Tool for children with Cerebral Palsy

<http://medialabasia.in/index.php/research/projects/empowerment-of-disabled>

Applications for Mobiles

Health and Disability Apps for iPhone Android and Mobile Devices

<http://www.disabled-world.com/assistivedevices/apps/>

Top 15 iPhone Apps for People with Physical Challenges

<http://www.silvercross.com/blog/general/15-iphone-apps-for-the-disabled/>

40 Amazing iPad Apps for the Learning Disabled

<http://nsingit.wordpress.com/2011/03/31/40-amazing-ipad-apps-for-the-learning-disabled/>

Apps for Dyslexia and Learning Disabilities

<http://dyslexiahelp.umich.edu/tools/apps>

User guides

World Blind Union – Toolkits

<http://www.worldblindunion.org/English/resources/Pages/Toolkits.aspx>

Assistive Technologies resources

<http://www.widernet.org/portals/index.php?PortalPageID=4619&action=display>

AT Resource links at the Open University, UK

<http://www.open.ac.uk/inclusiveteaching/pages/inclusive-teaching/assistive-technologies.php>

<http://www.emptech.info/>

G3ict AT Toolkit

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

DAISY Consortium

<http://www.daisy.org/>

DAISY Consortium - Educational resources and case studies

<http://www.daisy.org/education>

India (Kerala) INSIGHT: ICTs for PWD

<http://insight.kerala.gov.in/>

<http://insight.kerala.gov.in/learn-about-service-of-insight/>

Other

ICT Accessibility Resources

<http://www.widernet.org/portals/index.php?PortalID=91&view=public>

Infrastructure

Global: Connect a School Initiative (ITU)

<http://connectaschool.org/>

PWD guidelines

<http://connectaschool.org/itu-module/15/331/en/persons/w/disabilities/connectivity/introduction/>

G3ict links to communication technologies

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

FOSS

Brazil: Mais Diferenças Vocational Training using FOSS

<http://www.maisdiferencias.org.br/site/home/index.php>

<http://f123.org/>

<http://f123.org/en/our-company>

UNESCO Global Open Access Portal

<http://www.unesco.org/new/en/communication-and-information/portals-and-platforms/goap/>

UNESCO Information about FOSS

<http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/free-and-open-source-software-foss/>

UNESCO - Gender Equality in FOSS

<http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/free-and-open-source-software-foss/gender-equality-in-foss/>

UK - JISC Foss Resources

<http://www.jisctechdis.ac.uk/techdis/technologymatters/enablingtech/FOSS>

FOSS Disability Tools having impact in Zimbabwe

<http://www.eifl.net/news/foss-disability-tools-having-impact-zimbabwe>

Electronic Information for Libraries EIFL-FOSS Disability Tools for Libraries Step-By-Step Guide
(November 2012)

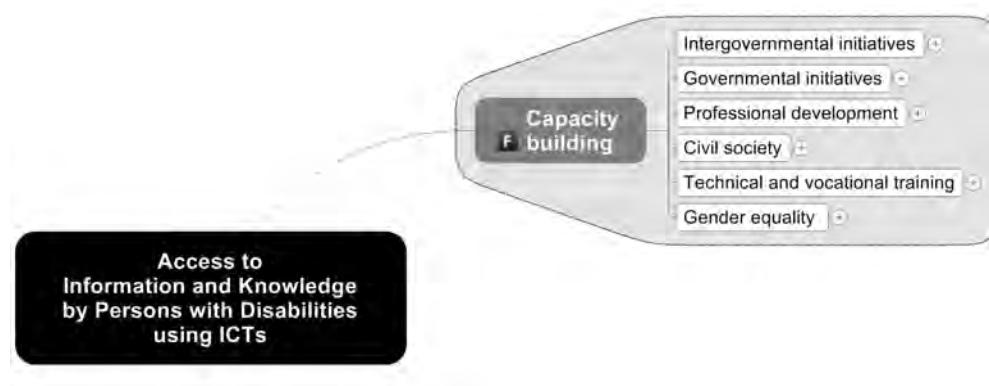
<http://www.eifl.net/disability-tools-step-step-guide>

Audio production

ITU Focus Group on Audiovisual Media Accessibility

<http://www.itu.int/en/ITU-T/focusgroups/ava/Pages/default.aspx>

CAPACITY BUILDING AND COMMUNITY-BASED INITIATIVES



Intergovernmental initiatives

Europe: ViPi Virtual Portal for Interaction and ICT Training for People with Disabilities

<http://www.vipi-project.eu/>

Accessible Twitter feed for discussions and advice

<http://www.vipi-project.eu/twitter/>

World Blind Union links to National sites and organisations

<http://www.worldblindunion.org/English/about-wbu/membership/Pages/default.aspx>

International Council for Education of People with Visual Impairment (ICEVI)

<http://www.icevi.org/> and their higher education initiative at

<http://www.icevi.org/Projects.htm>

Governmental initiatives

Jordan: Rural ICT Centre at Safawi and skills for Bedouin women and children

http://www.arabianpeninsula.mepi.state.gov/j_10022012.html

<http://www.stockholmchallenge.org/project/data/jordan-it-community-centers-jitcc>

Trinidad and Tobago: T & T Case Study: Using TVET to ensure decent work for the disadvantaged or displaced in society

http://www.commonwealthministers.com/special_reports/

trinidad_and_tobago_case_study_using_technical_vocational_education_and_training-trinidad_and_tobago_case_study_using_technical_vocational_education_and_training.html

Asia-Pacific Training for Inclusive Education in Bhutan 2012

<http://www.apcdfoundation.org/?q=content/training-promotion-community-based-inclusive-education-bhutan-apcd-bangkok-6-10-august-2012>

Armenia: National Centre for Educational Technology

<http://www.ktak.am/>

Malta: Foundation for Information Technology Accessibility (FITA)

<http://www.fitamalta.eu/>

South African National Council for the Blind
<http://www.sanbc.org.za/>

Professional development

DISCAPNET (Spanish) Accessible Resource for PWD
<http://www.discapnet.es/castellano/Paginas/default.aspx>
See also courses, training, online resources, newsletters, grants and projects

Internet Governance Forum Dynamic Coalition on Accessibility and Disability
<http://www.intgovforum.org/cms/dynamic-coalitions/80-accessibility-and-disability>

Institute for Special Education of the Russian Academy of Education
<http://институт-коррекционной-педагогики.рф/>

Civil society

Internet Governance Forum Dynamic Coalition on Accessibility and Disability
<http://www.intgovforum.org/cms/dynamic-coalitions/80-accessibility-and-disability>

G3ict - Global Initiative for Inclusive Information and Communication Technologies
<http://g3ict.org/>

Disability Alliance
<http://www.internationaldisabilityalliance.org/en>

Europe - Cardiac Project of stakeholders in accessible and assistive ICTs
<http://www.cardiac-eu.org/index.htm>

Pakistan: Danishkadaah disability NGO
<http://www.danishkadaah.org.pk/index.html>
<http://www.danishkadaah.org.pk/activities/index.html>

Pakistan: Family Education Services Foundation (FESF)
<http://www.fesf.org.pk/>

EDUSERVE educational training programme
<http://www.fesf.org.pk/projects/eduserve-program>

Deaf Reach Programme- training centres, community empowerment
<http://www.fesf.org.pk/projects/deaf-reach-program>

NepalAbility
<http://www.nepalability.org/>

Training and capacity building: disability re-habilitation programmes
<http://www.givemeaning.com/project/nepalability>

Brazil: Mais Diferenças Vocational Training using FOSS
<http://www.maisdiferencias.org.br/site/home/index.php>

Technical and vocational training

QATRAIN2 - web-based resource aims to enable disabled learners to participate more fully in Vocational Education and Training (VET)
<http://uk.qatrain2.eu/> and case studies at
<http://uk.qatrain2.eu/case-studies>

Gender equality

Women, disabilities, and peace-building
<https://sites.google.com/site/womenenabled/recent-publications>

Jordan: Rural ICT Centre at Safawi and skills for Bedouin women and children
http://www.arabianpeninsula.mepi.state.gov/j_10022012.html
<http://www.stockholmchallenge.org/project/data/jordan-it-community-centers-jitcc>

International Network of Women with Disabilities
<http://inwwd.wordpress.com/>

Young girls and women with disabilities
<http://www.widernet.org/portals/index.php?PortalID=91&PortalPageID=4216&view=public>

ITU - Girls in ICT Day Events
<http://girlsinict.org/fr/girls-in-ict-day-events>

International Network of Women with Disabilities
<http://inwwd.wordpress.com/>

Girls with Disabilities & Education - Links to resources
<http://www.widernet.org/portals/index.php?PortalID=91&PortalPageID=4216&view=public>

WHO/ World Bank - World Report on Disability 2011
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALPROTECTION/EXTDISABILITY/0,,contentMDK:23063040~menuPK:282704~pagePK:148956~piPK:216618~theSitePK:282699,00.html>

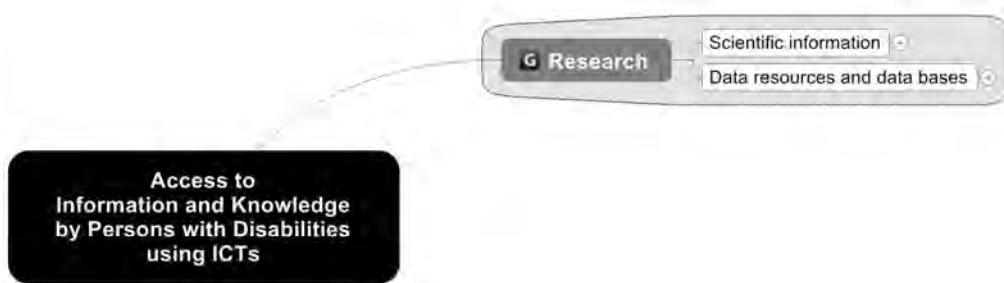
World Bank: Blog 'people with disabilities'
<http://blogs.worldbank.org/taxonomy/term/3871>

World Bank: Convergence in information and communication technology: strategic and regulatory considerations – 2010
http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/Convergence_in_ICT.pdf

World Bank: Disability and Development. Country Information
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALPROTECTION/EXTDISABILITY/0,,contentMDK:20192372~menuPK:282725~pagePK:210058~piPK:210062~theSitePK:282699,00.html>

WSIS Forum 2013 Programme, themes, papers
<http://www.itu.int/wsis/implementation/2013/forum/>

RESEARCH



Scientific information - journals, relevant articles, research networks and research reports

Europe - Academic Network of European Disability experts (ANED)

<http://www.disability-europe.net/>

UNESCO IITE Policy and Research on ICT in education for people with disabilities

http://iite.unesco.org/policy_and_research/icts_in_special_needs/

<http://iite.unesco.org/publications/list/>

GAATES - Global Alliance on Accessible Technologies and Environments. Publications, etc. at

<http://www.gaates.org/013Papers.shtml>

Asia-Pacific: Training trainers, skills for inclusive education and other PWD publications

<http://www.apcdfoundation.org/?q=category/activities/publication/-document>

Centre for Disability Research (CeDR), Lancaster University, UK

<http://www.lancs.ac.uk/fass/centres/cedr/index.php>

Disability Studies Conferences Archive

http://www.lancs.ac.uk/fass/events/disabilityconference_archive/conference_home/

IGF workshop no. 137: "Mainstreaming the disability perspective for an inclusive society" Nairobi, Kenya, 28 September 2011

<http://www.itu.int/themes/accessibility/dc/workshops/201109/137/index.html>

ICCHP - International Conference on Computers Helping People with Special Needs (ICCHP)

<http://www.icchp.org/>

Universal Design Conferences

<http://www.uld-conference.org/en>

Center on Disabilities, through the International Conference on Assistive Technology and Persons with Disabilities – CSUN Conference
<http://www.csun.edu/cod/conference/>

Data resources and data bases

UNESCO World Data on Education Seventh edition 2010/11

<http://www.ibe.unesco.org/en/services/online-materials/world-data-on-education/seventh-edition-2010-11.html>

UNESCO ICT in Education Database (search on: disability)

<http://www.unescobkk.org/education/ict/online-resources/databases/ict-in-education-database/tag/resources/>

DOTCOM - Disability Online Tool of the European Commission

<http://www.disability-europe.net/dotcom>

Open Society Foundations - search for material and case studies

<http://www.opensocietyfoundations.org/search?sort=created&order=desc&key=disabilities>

RNIB (UK) - Links to global resources for blind people

http://info.rnib.org.uk/exe/Agencies/Simple_Search.pl?NAME=&TOWN1=&STATE=&COUNTRY=&ORDER=Organization&SCOPE=INTERNATIONAL&rad1=Normal

7 BIBLIOGRAPHY



© Nevada Center for Excellence in Disabilities (NCED) and Enabled Nevada, University of Nevada, Reno (USA).

The material in the bibliography was checked at the time of writing in November 2012. URLs may change and some material may cease to be accessible over time, so there is no guarantee that all the material will be available at the URLs shown.

- ABC. (2012). *Parents seek better disability support*. ABC News, November 30, [accessed 2 December 2012]. <http://www.abc.net.au/news/2012-11-30/parents-lobby-for-better-disability-service/4400548>
- Abrams, Jim. (2012). *Senate takes up UN disability treaty*. Associated Press, November 27, [accessed 2 December 2012]. <http://www.wistv.com/story/20197970/senate-takes-up-un-disability-treaty>
- Adebusuyi, Doyin. (2012). *Nigeria: Ekiti Buys Braille Computers for Disabled Students*. Daily Trust (Abuja), March 12, [accessed 13 August 2012]. <http://allafrica.com/stories/201203120444.html>
- Al-Sibai, Amal. (2012). *Youth to support disabled children*. Saudi Gazette, November 30, [accessed December 2 2012]. <http://www.saudigazette.com.sa/index.cfm?method=home.regcon&contentid=20121130144470>
- Allen, Julie. (2010). The sociology of disability and the struggle for inclusive education. *British Journal of Sociology of Education* 31 (5): pp. 603-619.
- Ananian, C. Scott, Chris J Ball, and Michael Stone. (2012). *Growing Up With Nell: A Narrative Interface for Literacy*. ACM International Conference Proceeding Series, June, [accessed October 31 2012]. <http://cscott.net/Publications/OLPC/idc2012.pdf>
- Anon. (2012a). *Africa: UN Report - Indigenous Children On the Sidelines of Society*. All Africa News Agency, October 17, [accessed 19 October 2012]. <http://allafrica.com/stories/201210190877.html>
- Anon. (2012b). *Click SpecialedNZ Trust*. Click SpecialedNZ Trust, August, [accessed August 13 2012]. <http://clickspecialednz.com/>
- Anon. (2012c). *Disabilities friendly gala*. The Gleaner (Jamaica), November 23, [accessed 2 December 2012]. <http://jamaicagleaner.com/gleaner/20121123/social/social8.html>
- Anon. (2012d). *For children with developmental disabilities, parenting style matters*. Healthcanal.com, November 13, [accessed 2 December 2012]. <http://www.healthcanal.com/child-health/33843-For-children-with-developmental-disabilities-parenting-style-matters.html>
- Anon. (2012e). *Ghana: Parliament Ratifies UN Convention On Rights of Persons With Disability*. Accra Mail, March 14, [accessed 13 August 2012]. <http://allafrica.com/stories/201203160678.html>
- Anon. (2012f). *Gifted students with disabilities to get Hr 850 ministerial scholarship*. Kyiv Post (Ukraine), November 22, [accessed 2 December 2012]. <http://www.kyivpost.com/content/ukraine/gifted-students-with-disabilities-to-get-hr-850-ministerial-scholarship-316555.html>
- Anon. (2012g). *Gov't Committed To Providing ICT Skills To People With Disabilities - Mahama*. Ghana Web, November 22, [accessed 2 December 2012]. <http://www.ghanaweb.com/GhanaHomePage/politics/artikel.php?ID=257271>
- Anon. (2012h). *Haiti - Social : Positive results of Gérald Oriol, Jr. (May-October 2012)*. Haiti Libre, November 26, [accessed 2 December 2012]. <http://www.haitilibre.com/en/news-7253-haiti-social-positive-results-of-gerald-oriol-jr-may-october-2012.html>
- Anon. (2012i). *IT training opens doors for young people with disabilities*. Vietnam.net Bridge, November 25, [accessed 2 December 2012]. <http://english.vietnamnet.vn/fms/society/52879/it-training-opens-doors-for-young-people-with-disabilities.html>
- Anon. (2012j). *Liberia: Disabled Commission Gets Teeth to Bite*. Heritage (Monrovia), August 7, [accessed August 13 2012]. <http://allafrica.com/stories/201208071107.html>
- Anon. (2012k). *Liberia: EU Identifies Likely Source of Future Conflict in Liberia*. Heritage (Monrovia), July 11, [accessed 13 August 2012]. <http://allafrica.com/stories/201207111005.html>
- Anon. (2012l). *Liberia: Govt. Finally Ratifies UN Convention On Disability - Disable Community Lauds The Informer (Monrovia)*, August 7, [accessed 13 August 2012]. <http://allafrica.com/stories/201208071099.html>
- Anon. (2012m). *Liberia: MOE, Partners Brainstorm On Inclusive Education*. The Informer (Monrovia), September 17, [accessed 21 September 2012]. <http://allafrica.com/stories/201209180513.html>

- Anon. (2012n). *Mutula wants school calendar reviewed*. Kenya Broadcasting Corporation, November 3, [accessed 2 December 2012]. <http://www.kbc.co.ke/news.asp?nid=78894>
- Anon. (2012o). *Nigeria: International Day of the African Child - Rights of Special Children*. Daily Trust (Abuja), June 22, [accessed 13 August 2012]. <http://allafrica.com/stories/201206220497.html>
- Anon. (2012p). *Rwanda: Mineduc Distributes OLPC Computers to Disabled Students*. Rwanda Express (Kigali), June 23, [accessed 13 August 2012]. <http://allafrica.com/stories/201206240094.html>
- Anon. (2012q). *Rwanda: Mobile Phone Cash Transfer Assists Rebuild Haiti*. The New Times (Rwanda), March 3, [accessed 9 March 2012]. <http://allafrica.com/stories/201203040122.html>
- Anstett, Patricia. (2012). *Robotic devices help paralyzed become more independent*. USA Today, January 6, [accessed 20 January 2012]. <http://yourlife.usatoday.com/health/story/2012-01-06/Robotic-devices-help-paralyzed-become-more-independent/52410820/1>
- Aron, Jacob. (2012). *GPS workaround helps make dumb phones smart*. New Scientist, September 27, [accessed 4 October 2012]. <http://www.newscientist.com/article/mg21528844.600-gps-workaround-helps-make-dumb-phones-smart.html>
- Ashington, Nicola. (2010). *Accessible Information and Communication Technologies Benefits to Business and Society*. OneVoice for Accessible ICT, [accessed 15 September 2012]. <http://www.onevoiceict.org/sites/default/files/Accessible%20ICT%20-%20Benefits%20to%20Business%20and%20Society.pdf>
- Aturo, Suzan. (2012). *Wasige overcame disability to shine in education*. New Vision (Kampala), November 12, [accessed 2 December 2012]. <http://www.newvision.co.ug/news/637226-wasige-overcame-disability-to-shine-in-education.html>
- Backhouse, Matthew. (2012). *NZ made disabled people 'invisible'*. New Zealand Herald, December 2, [accessed 2 December 2012]. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10851481
- Balescut, Jill, and Kenneth Eklindh. (2002). *Literacy and Persons with Developmental Disabilities: Why and How?* . UNESCO, [accessed 9 October 2012]. http://portal.unesco.org/education/fr/files/43484/11315369001Balescut_J.doc/Balescut_J.doc
- Ball, Simon. (2012). *FOSS Accessibility Tools for Libraries Step-By-Step Guide*. EIFL - Electronic Information for Libraries, November 6, [accessed 10 November 2012]. <http://www.eifl.net/news/eifl-foss-launches-disability-tools-libraries>
- Batonon, Av Eric, and Kate Norton. (2010). *Combating social exclusion in post-conflict recovery: education and disability in Burundi*. Inter-Agency Network for Education in Emergencies, [accessed 15 October 2012]. http://www.ineesite.org/uploads/documents/store/NRC_Burundi_-_Inclusive_education_Pedagogisk_Profil.pdf
- BBC. (2012a). *App helps blind to send text messages*. BBC, February 20, [accessed February 20 2012]. <http://www.bbc.co.uk/news/technology-17105225>
- BBC. (2012b). *Interactive school desk 'boosts maths' claims research*. BBC, November 23, [accessed 23 November 2012]. <http://www.bbc.co.uk/news/education-20462117>
- BBC. (2012c). *Sign language 'turned into text' by Aberdeen scientists*. BBC, March 12, [accessed 12 March 2012]. <http://www.bbc.co.uk/news/uk-scotland-north-east-orkney-shetland-17297489>
- Boateng, Estelle Graciela. (2012). *Ghana: MTN Spends Ghc600,000 On Projects in W/R Communities*. Public Agenda (Accra), June 29, [accessed 21 September 2012]. <http://allafrica.com/stories/201206290721.html>
- Bothoko, Pini. (2012). *Association of people with disabilities aim high*. The Monitor (Botswana), November 26, [accessed 2 December 2012]. <http://www.mmegi.bw/index.php?sid=1&aid=257&dir=2012/November/Monday26>
- Braham, Andrea. (2012). *National Disabilities Bill to be tabled in Parliament Soon*. Jamaica Information Service, November 21, [accessed 2 December 2012]. <http://www.jis.gov.jm/news/leads/32360>
- Bucyensenge, Jean Pierre. (2012). *Rwanda: Challenges of Raising Children With Disabilities*. The New Times (Rwanda), July 24, [accessed 13 August 2012]. <http://allafrica.com/stories/201207240272.html>
- Carey, Benedict. (2012). *New Definition of Autism May Exclude Many, Study Suggests*. New York Times, January 19, [accessed 19 January 2012]. <http://www.nytimes.com/2012/01/20/health/research/new-autism-definition-would-exclude-many-study-suggests.html>

- Chavkin, Sasha. (2012). *Education Department Adopts Crucial Reform for Disabled Borrowers*. The Chronicle of Higher Education, November 15, [accessed 15 November 2012]. <http://chronicle.com/article/Education-Department-Adopts/135796/>
- Chen, Brian X. (2012). *New Breed of Robotics Aims to Help People Walk Again*. New York Times, September 11, [accessed 12 September 2012]. <http://www.nytimes.com/2012/09/12/technology/wearable-robots-that-can-help-people-walk-again.html>
- Collins, Jacinta. (2012). *Disability funding can cause miracles and change lives*. Herald Sun (Melbourne), December 3, [accessed 2 December 2012]. <http://www.heraldsun.com.au/opinion/disability-funding-can-cause-miracles-and-change-lives/story-e6frfhqf-1226528415619>
- COMMONS. (2012). *Implementation of the Right of Disabled People to Independent Living: Government Response to the Committee's Twenty-third Report of Session 2010-12*. House of Commons, Joint Committee on Human Rights, July 2, [accessed 20 July 2012]. <http://www.publications.parliament.uk/pa/jt201213/jtselect/jtrights/23/2302.htm>
- Cossou, Egan. (2011). *Botswana bets on technology to save rural economies*. BBC, August 2, [accessed 25 August 2011]. <http://www.bbc.co.uk/news/business-14328157>
- Coughlan, Sean. (2012). *Shouting out in class 'helps pupils to learn'*. BBC, February 2, [accessed 9 February 2012]. <http://www.bbc.co.uk/news/education-16836497>
- De, Han. (2012). *Software urged to be friendly for the blind*. China Daily, November 6, [accessed 8 November 2012]. http://usa.chinadaily.com.cn/china/2012-11/06/content_15878673.htm
- De Clerk, Eveline. (2012). *Namibia: Disabled Not Fully Represented*. New Era (Windhoek), June 22, [accessed 13 August 2012]. <http://allafrica.com/stories/201206221046.html>
- Den Hartigh, WIlma. (2012). *South Africa: ICT Helps the Blind*. Biz-Community, January 30, [accessed 13 August 2012]. <http://allafrica.com/stories/201201301675.html>
- Devlin, Richard, and Dianne Pothier. (2006). *Introduction: Toward a Critical Theory of Dis-Citizenship*. University of British Columbia Press, [accessed 7 August 2012]. <http://www.ubcpress.ca/books/pdf/chapters/pothier.pdf>
- EADSNE. (2012). *Accessible Information Provision for Lifelong Learning - Key Policy Messages*. European Agency for Development in Special Needs Education, [accessed 11 November 2012]. <http://www.european-agency.org/publications/flyers/iaccess-policy-paper/i-access-policy-paper.pdf>
- ECONOMIST. (2012). *Innovation in Africa: Upwardly mobile*. Economist, August 25, [accessed 2 August 2012]. <http://www.economist.com/node/21560912>
- eGovmonitor. (2009a). *UK ratifies human rights treaty for disabled people*. Egovmonitor.com, [accessed 14 June 2009]. <http://www.egovmonitor.com/node/25560>
- eGovmonitor. (2009b). *Valuing people now - New vision for people with learning disabilities*. Egovmonitor.com, [accessed 19 January 2009]. <http://www.egovmonitor.com/node/23047>
- eGovmonitor. (2010). *UNESCO and G3ict sign a partnership on ICT for persons with disabilities*. Egovmonitor.com, [accessed 1 March 2010]. <http://www.egovmonitor.com/node/34080>
- Elde, Arne H. (2012). *Education, employment and barriers for young people with disabilities in southern Africa*. UNESCO, [accessed 25 September 2012]. http://www.unesco.org/ulis/cgi-bin/ulis.pl?catno=217877&set=508FDC44_3_49&gp=1&lin=1&ll=1
- EIFL. (2011). *FOSS Disability Tools having impact in Zimbabwe*. EIFL - Electronic Information for Libraries, May 27, [accessed 2 September 2012]. <http://www.eifl.net/news/foss-disability-tools-having-impact-zimbabwe>
- Ekso. (2012). *Ekso Bionics*. Ekso Bionics, January, [accessed 20 January 2012]. <http://eksobionics.com/>
- EUPARL. (2011). *Doing more to include people with disabilities*. European Parliament, October 25, [accessed 25 October 2011]. <http://www.europarl.europa.eu/en/pressroom/content/20111025IPR30227/html/Doing-more-to-include-people-with-disabilities>
- EUROPE. (2006). *Promotion of digital literacy in people with psychological disabilities: Some European Initiatives*. European Commission, May, [accessed 12 September 2012]. <http://www.elearningeuropa.info/en/download/file/fid/19252>

- EUROPE. (2010). *European Disability Strategy 2010-2020 – frequently asked questions*. European Commission, November 15, [accessed 15 November 2010]. <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/10/578&format=HTML&aged=0&language=EN&guiLanguage=en>
- EUROPE. (2011a). *Digital Agenda: simple smart phones and remote controls help elderly and disabled to manage their homes*. European Commission, January 6, [accessed 6 January 2011]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/11&format=HTML&aged=0&language=EN&guiLanguage=en>
- EUROPE. (2011b). *European Commission seeks public input on measures to break down barriers to disabled people*. European Commission, 13 December, [accessed December 13 2011]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1533&format=HTML&aged=0&language=EN&guiLanguage=en>
- EUROPE. (2011c). *High-Level Meeting on Disability: Presidents of Commission, Parliament and European Council join forces with the European Disability Forum*. European Commission, December 6, [accessed 6 December 2011]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1507&format=HTML&aged=0&language=EN&guiLanguage=en>
- EUROPE. (2012a). *European Day for People with Disabilities on 3 December: Europeans strongly back better accessibility for disabled*. European Commission, November 30, [accessed 30 November 2012]. http://europa.eu/rapid/press-release_IP-12-1296_en.htm?locale=en
- EUROPE. (2012b). *Grundtvig – Training of trainers to provide basic ICT skills' education to people with disabilities*. European Commission, September, [accessed 9 October 2012]. <http://www.accessforall.eu/2012/09/grundtvig-training-of-trainers-to-provide-basic-ict-skills-education-to-people-with-disabilities/>
- EUROPE. (2012c). *ICTs in Education for People with Disabilities - Review of Innovative Practice*. European Agency for Development in Special Needs Education, [accessed 15 August 2012]. <http://www.european-agency.org/publications/ereports/ICTs-in-Education-for-People-With-Disabilities/Review-of-Innovative-Practice>
- EUROPE. (2012d). *Intellectual Property: Commissioner Michel Barnier determined to ensure equal access to books for visually impaired persons*. European Commission, July 26, [accessed 26 July 2012]. <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/12/603&format=HTML&aged=0&language=EN&guiLanguage=en>
- EUROPE. (2012e). *Special needs children and disabled adults still getting a raw deal from education, says report*. European Commission, July 10, [accessed 10 July 2012]. <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/12/761&format=HTML&aged=0&language=EN&guiLanguage=en>
- Finch, Carola. (2012). *Canadian court rules school board discriminated against boy with dyslexia*. Examiner.com, November 9, [accessed 2 December 2012]. <http://www.examiner.com/article/canadian-court-rules-school-board-discriminated-against-boy-with-dyslexia>
- G3ict. (2007). *The Accessibility Imperative: Implications of the Convention on the Rights of Persons with Disabilities for Information and Communication Technologies*. Global Initiative for Inclusive Information and Communication Technologies, [accessed 15 November 2012]. http://g3ict.com/resource_center/publications_and_reports/p/productCategory_books/id_118
- G3ict. (2012a). *2012 CRPD Progress Report on ICT Accessibility*. Global Initiative for Inclusive Information and Communication Technologies, [accessed 21 September 2012]. http://g3ict.org/download/p/fileId_933/productId_244
- G3ict. (2012b). *About G3ict*. Global Initiative for Inclusive Information and Communication Technologies, September, [accessed 21 September 2012]. <http://g3ict.org/about>
- G3ict. (2012c). *Convention on the Rights of Persons with Disabilities*. Global Initiative for Inclusive Information and Communication Technologies, [accessed 9 October 2012]. <http://g3ict.org/about/convention>
- G3ict. (2012d). *e-Accessibility Policy Toolkit for Persons with Disabilities*. Global Initiative for Inclusive Information and Communication Technologies, [accessed 9 October 2012]. <http://www.e-accessibilitytoolkit.org/>
- G3ict. (2012e). *Education Case Studies*. Global Initiative for Inclusive Information and Communication Technologies, October, [accessed 9 October 2012]. http://g3ict.org/resource_center/case_study_database/case_study_search_result
- G3ict. (2012f). *Enabling Access for Persons with Disabilities to Higher Education and Workplace: Role of ICT and Assistive Technologies*. Global Initiative for Inclusive Information and Communication Technologies, [accessed 23 September 2012]. http://www.g3ict.org/download/p/fileId_883/productId_198

- G3ict. (2012g). *Making Mobile Phones and services accessible for Persons with disabilities*. Global Initiative for Inclusive Information and Communication Technologies, August, [accessed 26 September 2012]. http://www.itu.int/ITU-D/sis/PwDs/Documents/Mobile_Report.pdf
- Gallagher, James. (2012). *Light-powered bionic eye invented to help restore sight*. BBC, May 14, [accessed 15 May 2012]. <http://www.bbc.co.uk/news/health-18061174>
- GAO. (2012). *Students with Disabilities: Better Federal Coordination Could Lessen Challenges in the Transition from High School*. General Accounting Office, July 12, [accessed 17 August 2012]. <http://www.gao.gov/products/GAO-12-594>
- Greco, Lucy. (2012). *Who is Responsible for all the Inaccessible Technology in the World?* Global Initiative for Inclusive Information and Communication Technologies, May 14, [accessed 9 October 2012]. http://g3ict.com/resource_center/newsletter/news/p/id_356
- Gwalani, Payal. (2012). *Cure teaching disability for kids with learning disabilities*. Times of India, December 2, [accessed 2 December 2012]. <http://timesofindia.indiatimes.com/city/nagpur/Cure-teaching-disability-for-kids-with-learning-disabilities/articleshow/17445867.cms>
- Haldeman, George. (2012). *A special education jewel in a box of rocks*. York Daily Record (Canada), November 30, [accessed 2 December 2012]. http://www.ydr.com/letters/ci_22099391/special-education-jewel-box-rocks
- Hamada, Suad. (2012). *Creativity Award for the disabled*. Khaleej Times (Bahrain), November 4, [accessed 2 December 2012]. http://www.khaleejtimes.com/displayarticle.asp?xfile=data/middleeast/2012/November/middleeast_November46.xml§ion=middleeast&col=1
- HEADSTAR. (2012a). *Councils Still Struggling With Website Accessibility*. Headstar.com, March 30, [accessed 30 March 2012]. <http://www.headstar.com/eablive/?p=697>
- HEADSTAR. (2012b). *Dyslexia Spelling Checker Wins Techology4Good Award*. Headstar.com, July 27, [accessed 29 July 2012]. <http://www.headstar.com/eablive/?p=749>
- Heelan, Anne. (2012). *The education system fails our citizens with disabilities*. Irish Times, November 27, [accessed 2 December 2012]. <http://www.irishtimes.com/newspaper/education/2012/1127/1224327139356.html>
- Heyzer, Noeleen. (2012). *People with disabilities deserve to enjoy life, too*. South China Morning Post, December 3, [accessed 2 December 2012]. <http://www.scmp.com/comment/insight-opinion/article/1095796/people-disabilities-deserve-enjoy-life-too>
- Hinchliffe, Tim. (2012). *Ghana: Civil Society Education Manifesto 2012 Launched in Accra*. Ghanaian Chronicle, May 17, [accessed 21 September 2012]. <http://allafrica.com/stories/201205170523.html>
- Huang, Ying Jia. (2012). *Fighting for Equal Access to Education in Kyrgyzstan*. Open Equal Free, November 16, [accessed 2 December 2012]. <http://www.openequalfree.org/fighting-for-equal-educational-access-in-kyrgyzstan/17691>
- INFODEV. (2005). *ICT in Education: Gender, Special Needs and Disadvantaged Groups: A Knowledge Map on Information & Communication Technologies in Education*. infodev.org, [accessed 9 October 2012]. <http://www.infodev.org/en/Publication.158.html>
- INFODEV. (2009). *Survey of ICT and Education in the Caribbean: Regional Trends and Analysis (Volume 1)*. infodev.org, February, [accessed 9 October 2012]. <http://www.infodev.org/en/Publication.441.html>
- ITU. (2011a). *Connect a School, Connect a Community Toolkit Module 4: Using ICTs to promote education and job training for persons with disabilities*. International Telecommunications Union, May, [accessed 1 September 2012]. http://www.itu.int/ITU-D/sis/Connect_a_school/Modules/ES/ES04.pdf
- ITU. (2011b). *Making Television Accessible*. International Telecommunications Union, November, [accessed 15 August 2012]. http://www.itu.int/ITU-D/sis/PwDs/Documents/Making_TV_Accessible-FINAL-WithAltTextInserted.pdf
- ITU. (2011c). *Report 2 - Broadband, a Platform for Progress*. International Telecommunications Union, June, [accessed 7 July 2011]. <http://www.broadbandcommission.org/#outcomes>
- ITU. (2012a). *Connect a School, Connect a Community*. International Telecommunications Union, [accessed 2 September 2012]. <http://connectaschool.org/>
- ITU. (2012b). *Focus Group on Audiovisual Media Accessibility (FG AVA)*. International Telecommunications Union, [accessed 15 August 2012]. <http://www.itu.int/en/ITU-T/focusgroups/ava/Pages/default.aspx>

- ITU. (2012c). *Making ICTs accessible to people with disabilities*. International Telecommunications Union, [accessed 17 August 2012]. <http://www.itu.int/en/wcit-12/Documents/WCIT-background-brief13.pdf>
- ITU. (2012d). *Making Mobile Phones and Services Accessible for Persons with Disabilities*. International Telecommunications Union, August, [accessed 20 October 2012]. http://g3ict.org/resource_center/publications_and_reports/p_productCategory_books/subCat_1/id_191
- ITU. (2012e). *Measuring the Information Society 2012*. International Telecommunications Union, [accessed 14 September 2012]. http://www.itu.int/ITU-D/ict/publications/idi/material/2012/MIS2012_without_Annex_4.pdf
- Jain, Isha. (2012). *Funds crunch deprives them of right to education*. Times of India, December 2, [accessed 2 December 2012]. <http://timesofindia.indiatimes.com/city/lucknow/Funds-crunch-deprives-them-of-right-to-education/articleshow/17447807.cms>
- Jalulah, William N-lanjerborr. (2012). *Ghana: Parents Urged to Stop Concealing Children With Disabilities*. The Chronicle (Ghana), July 20, [accessed 13 August 2012]. <http://allafrica.com/stories/201207270409.html>
- Kett, Maria. (2012a). *Inclusive Education in Conflict-affected Countries*. Leonard Cheshire Disability/UNESCAP, March, [accessed 15 October 2012]. www.lcint.org/download.php?id=929
- Kett, Maria. (2012b). *Skills development for youth living with disabilities in four developing countries*. UNESCO, August, [accessed 25 September 2012]. http://www.unesco.org/ulis/cgi-bin/ulis.pl?catno=217882&set=508FE00C_2_35&gp=1&lin=1&ll=1
- Kgokgwé, Bore P. (2012). *ICT for Education: Botswana, Malawi, Namibia*. Ministry of Education & Skills Development, Botswana, January, [accessed 2 September 2012]. <http://africanbrains.net/edusa/wp-content/uploads/2012/01/Botswana-Presentation.pdf>
- Kiapi, Frederick K. (2012). *Uganda: Harmonise Laws to Accommodate People With Disabilities*. New Vision (Kampala), September 17, [accessed 21 September 2012]. <http://allafrica.com/stories/201209170766.html>
- Kingsley, Jeremy. (2012). *Wearable robot puts paralysed legs through their paces*. Wired.com, January 17, [accessed 20 January 2012]. <http://www.wired.co.uk/magazine/archive/2012/02/start/step-by-cybernetic-step>
- Kornowski, Liat. (2012). *How the Blind Are Reinventing the iPhone*. The Atlantic, May 2, [accessed 4 May 2012]. <http://www.theatlantic.com/technology/archive/2012/05/how-the-blind-are-reinventing-the-iphone/256589/>
- Kothari, Miloon. (2005). *Women and adequate housing*. United Nations Economic and Social Council, February 23, [accessed 24 October 2012]. <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G05/112/98/PDF/G0511298.pdf?OpenElement>
- Kotzé, Hermien. (2012). *Southern Africa Disability Rights and Law School Project*. Open Society Initiative for Southern Africa (Johannesburg), June, [accessed 28 September 2012]. http://www.osisa.org/sites/default/files/disability_open_learning_-_country_reports_final.pdf
- Landsman, Moshe, and Edona Maloku-Berdyna. (2009). *Justice Denied: The State of Education of Children with Special Needs in Post-Conflict Kosovo*. UNICEF, [accessed 15 October 2012]. http://www.unicef.org/kosovo/Eng_-_Justice.pdf
- Lapham, Kate, and Hayarpi Papikyan. (2012). *Special Schools as a Resource for Inclusive Education. A Review of the Open Society Foundations' Experience Working with Special Schools in Armenia*. Open Society Foundations, October, [accessed 11 November 2012]. <http://www.opensocietyfoundations.org/reports/special-schools-resource-inclusive-education>
- Leahy, Stephen. (2012). *Africa: Untreated Mental Illness the Invisible Fallout of War and Poverty*. Inter Press Service (Johannesburg), October 10, [accessed 19 October 2012]. <http://allafrica.com/stories/201210110511.html>
- Lee, Richard. (2012). *Africa: Conference Calls for Inclusive Education in SADC*. Open Society Initiative for Southern Africa (Johannesburg), June 25, [accessed 13 August 2012]. <http://allafrica.com/stories/201206260169.html>
- Lepkowska, Dorothy. (2012). *Where are the disabled teachers?* Guardian (London), November 12, [accessed 2 December 2012]. <http://www.guardian.co.uk/education/2012/nov/12/disabled-not-encouraged-teacher-training-costs>
- Lidström, Helene, Mats Granlund, and Helena Hemmingsson. (2012). Use of ICT in school: a comparison between students with and without physical disabilities. *European Journal of Special Needs Education* 27 (1): pp. 21-34.
- Lima, Paul. (2009). *Virtual pal helps autistic kids make social connections*. Globe and Mail (Toronto), [accessed 12 July 2010]. <http://www.theglobeandmail.com/news/technology/tech-for-tomorrow/virtual-pal-helps-autistic-kids-make-social-connections/article1330468/>

- LOCOG. (2012). *The London 2012 guide to the Paralympic Games*. The London Organising Committee of the Olympic Games and Paralympic Games Ltd, [accessed 1 October 2012]. <http://www.london2012.com/mm%5CDocument%5CPublications%5CJoinin%5C01%5C24%5C08%5C10%5Clondon-2012-guide-to-the-paralympic-games.pdf>
- Longhorn, Flo. (2012). *Flo Longhorn's favourite apps*. Blogspot, August, [accessed 13 August 2012]. <http://ipadspecial.ed.blogspot.co.uk/2011/04/flo-longhorns-favourite-apps.html>
- Mahony, Honor. (2012). *Disability and EU austerity: a Portuguese case study*. EU Observer, November 23, [accessed 27 November 2012]. <http://euobserver.com/disability/118246>
- Mannak, Miriam. (2012). *South Africa: The Plight of South Africa's Disabled Youth*. Radio Netherlands Worldwide, July 26, [accessed 13 August 2012]. <http://allafrica.com/stories/201207270270.html>
- Marshall, Chris. (2012). *Education cutbacks and red tape threaten children with special needs, report finds*. The Scotsman, November 13, [accessed 2 December 2012]. <http://www.scotsman.com/news/education/education-cutbacks-and-red-tape-threaten-children-with-special-needs-report-finds-1-2631260>
- McCarthy, Melissa. (2011). Using technology to support children with sensory disability in remote areas: the RIDBC Teleschool Model. *Telecommunications Journal of Australia* 61 (2): pp. 27.1-27.7. <http://www.tja.org.au/index.php/tja/article/view/207/372>
- Migneault, Jonathan, and Jamila Akweley Okertchiri. (2012). *Ghana: Autism 'Relegated to the Sidelines'*. Inter Press Service (Johannesburg), May 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201205180181.html>
- Moeketsi, Sandy. (2012). *Many disabled kids not in school*. Independent Online (South Africa), November 21, [accessed 2 December 2012]. <http://www.iol.co.za/news/south-africa/many-disabled-kids-not-in-school-1.1428147#.ULu0p4bnOuk>
- Moskitch, Katia. (2011). *Mobile phones could soon be 'powered by walking'*. BBC, August 24, [accessed 24 August 2011]. <http://www.bbc.co.uk/news/technology-14647639>
- Mugisha, Stevenson. (2012). *Rwanda: Schools for Disabled Appeal for Qualified Teachers*. The New Times (Rwanda), June 29, [accessed 13 August 2012]. <http://allafrica.com/stories/201207020118.html>
- Mugoya, Grace. (2012). *Rwanda: 160 Graduate in Special Needs Education*. The New Times (Rwanda), April 23, [accessed 13 August 2012]. <http://allafrica.com/stories/201204230168.html>
- Muriithi, Kirimi. (2012). *Kenya: Help the Blind Access Information, State Told*. Nairobi Star, February 27, [accessed 4 March 2012]. <http://allafrica.com/stories/201202280546.html>
- Murithi, Kirimi. (2012). *Kenya: Disabled Want More Teachers*. The Star (Nairobi), April 13, [accessed 13 August 2012]. <http://allafrica.com/stories/201204131173.html>
- Nagata, K K. (2003). Gender and disability in the Arab region: The challenges in the new millennium. *Asia Pacific Disability Rehabilitation Journal* 14 (1): pp. 11-16.
- Namosua, Daniel. (2012). *Disability body calls for govt's support*. Solomon Star (Solomon Islands), November 30, [accessed 2 December 2012]. <http://www.solomonstarnews.com/news/national/16597-disability-body-calls-for-govts-support>
- Narayan, Swati. (2012). *Education for All: Beyond 2015. Mapping Current International Actions to Define the Post-2015 Education and Development Agendas*. UNESCO, June, [accessed 12 September 2012]. <http://unesdoc.unesco.org/images/0021/002179/217935e.pdf>
- NEF. (2012). *Local innovations for disabled people*. New Economics Foundation, October 11, [accessed 4 November 2012]. <http://neweconomics.org/publications/doing-services-differently>
- NST. (2012). *Pre-schools for disabled kids to ease burden of poor families*. New Straits Times, November 13, [accessed 2 December 2012]. <http://www.nst.com.my/latest/pre-schools-for-disabled-kids-to-ease-burden-of-poor-families-1.170526>
- OECD. (2009). *Information Economy Product Definitions Based on the Central Product Classification (Version 2)*. OECD, June, [accessed 2 September 2012]. <http://www.oecd.org/science/scienceandtechnologypolicy/42978297.pdf>
- OECD. (2011). *Inclusion of Students with Disabilities in Tertiary Education and Employment*. OECD, May 27, [accessed 30 May 2011]. <http://www.oecdbookshop.org/oecd/display.asp?K=5KGH3ZTK1KB&CID=&LANG=EN>
- Oliver, Louise. (2012). *Southern Africa: Fighting for Disability Rights*. Open Society Initiative for Southern Africa (Johannesburg), July 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201207190696.html>

- Omoniyi, Tosin. (2012). *Nigeria: Why More Should Be Done for the Blind*. Daily Trust (Abuja), June 22, [accessed 13 August 2012]. <http://allafrica.com/stories/201206220502.html>
- OSISA. (2010). *Special Needs Education: Actions for Real Change (SNEAR)*. Open Society Initiative for Southern Africa (Johannesburg), [accessed 13 August 2012]. <http://www.osisa.org/education/malawi/special-needs-education-actions-real-change-snear>
- OSISA. (2012a). *Advocacy for an Inclusive Education Policy in Namibia*. Open Society Initiative for Southern Africa (Johannesburg), [accessed 13 August 2012]. <http://www.osisa.org/education/namibia/advocacy-inclusive-education-policy-namibia>
- OSISA. (2012b). *Education for Children with Special Education Needs in Southern Africa*. Open Society Initiative for Southern Africa (Johannesburg), [accessed 13 August 2012]. <http://www.osisa.org/education/regional/education-children-special-education-needs-southern-africa>
- Palmer, Jason. (2012). *Science decodes 'internal voices'*. BBC, February 1, [accessed 1 February 2012]. <http://www.bbc.co.uk/news/science-environment-16811042>
- PEACEBUILDING. (2008). *Empowerment: Persons with Disabilities: Persons with Disabilities & Peacebuilding Processes*. International Association for Humanitarian Policy and Conflict Research [accessed 15 September 2012]. <http://www.peacebuildinginitiative.org/index.cfm?pageld=1966>
- Perez, Thomas E, and Russlynn Ali. (2010). *Letter to College and University Presidents*. US Department of Justice, [accessed 26 July 2010]. http://www.ada.gov/kindle_ltr_eddoj.htm
- POST. (2012). *ICT for Disabled People*. UK Parliamentary Office of Science and Technology, May, [accessed 15 October 2012]. <http://www.parliament.uk/briefing-papers/POST-PN-411.pdf>
- Reichle, Joe. (2011). Evaluating Assistive Technology in the Education of Persons with Severe Disabilities *Journal of Behavioral Education* 20 (1).
- Rieser, Richard. (2012). *Implementing Inclusive Education: A Commonwealth Guide to Implementing Article 24 of the UN Convention on the Rights of Persons with Disabilities*. [accessed 2 November 2012]. http://g3ict.org/download/pfiled_911/productId_225
- SA'idiu, Isa. (2012). *Nigeria: 'Training, Solution to Unqualified Teachers'*. Daily Trust (Abuja), July 26, [accessed 13 August 2012]. <http://allafrica.com/stories/201207260417.html>
- Sethiya, Manisha. (2012). *International Day of Persons with Disabilities: Being blind in a remote village of India*. Independent (London), December 1, [accessed 2 December 2012]. <http://blogs.independent.co.uk/2012/12/01/international-day-of-persons-with-disabilities-being-blind-in-a-remote-village-of-india/>
- Sigafoos, Jeff. (2011). Introduction to the Special Issue: Evaluating Assistive Technology in the Education of Persons with Severe Disabilities. *Journal of Behavioral Education* 20 (1): pp. 1-3.
- Simons, Paula. (2012). *Who decides what constitutes adequate special education?* Edmonton Journal, November 14, [accessed 2 December 2012]. <http://www.edmontonjournal.com/health/Simons+decides+what+constitutes+adequate+special/7549999/story.html>
- Singal, Nidhi. (2009). *Background paper prepared for the Education for All Global Monitoring Report 2010: Reaching the marginalized Education of children with disabilities in India*. UNESCO, [accessed 9 October 2012]. <http://unesdoc.unesco.org/images/0018/001866/186611e.pdf>
- Singh, Rajendra, and Siddhartha Raja. (2010). *Convergence in information and communication technology : strategic and regulatory considerations* World Bank, [accessed 4 September 2012]. http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/Convergence_in_ICT.pdf
- Sowl, Maggie. (2012). *Disability week: defined by ability, not disability*. University of Nebraska, November 7, [accessed 2 December 2012]. http://unkantelope.com/wordpress_antelope/2012/11/07/disability-week-defined-by-ability-not-disability/
- Swift, James. (2012). *The Next Wave: Autistic Students in Higher Education*. Youth Today, November 5, [accessed 2 December 2012]. http://www.youthtoday.org/view_article.cfm?article_id=5670
- Szabo, Liz. (2010). *Youngest in class get ADHD label*. USA Today, [accessed 17 August 2010]. http://www.usatoday.com/news/health/2010-08-17-1Aadhd17_ST_N.htm

- Talbot, David. (2012a). *African Social Networks Thrive in a Mobile Culture*. Technology Review, April 19, [accessed 20 April 2012]. <http://www.technologyreview.com/computing/40250/>
- Talbot, David. (2012b). *Given Tablets but No Teachers, Ethiopian Children Teach Themselves*. Technology Review, October 29, [accessed 29 October 2012]. <http://www.technologyreview.com/news/506466/given-tablets-but-no-teachers-ethiopian-children-teach-themselves/>
- Talbot, David. (2012c). *Kenya's Startup Boom*. Technology Review, March, [accessed 23 February 2012]. <http://www.technologyreview.com/communications/39673/>
- Tamashiro, Tami. (2010). *Impact of Conflict on Children's Health and Disability*. UNESCO, [accessed 15 October 2012]. <http://unesdoc.unesco.org/images/0019/001907/190712e.pdf>
- Tarawally, Abu Bakarr S. (2012). *Sierra Unite Donates Scholarships to the Disabled*. Sierra Express Media (Sierra Leone), November 14, [accessed 2 December 2012]. <http://www.sierraexpressmedia.com/archives/50314>
- Tett, Gillian. (2012). *When tablet turns teacher*. Financial Times (London), October 5, [accessed 31 October 2012]. <http://www.ft.com/cms/s/2/6a071e00-0db6-11e2-97a1-00144feabdc0.html#axzz2ArQsWOnj>
- Toboso, Mario. (2011). Rethinking disability in Amartya Sen's approach: ICT and equality of opportunity. *Ethics and Information Technology* 13 (2): pp. 107-118.
- UN. (2006). *Convention on the Rights of Persons with Disabilities*. United Nations, December 6, [accessed 9 October 2012]. <http://www.un.org/esa/socdev/enable/rights/convtexte.htm>
- UN. (2007). *Handbook for Parliamentarians on the Convention on the Rights of Persons with Disabilities*. United Nations, [accessed 9 October 2012]. <http://www.un.org/disabilities/default.asp?id=212>
- UN. (2012a). *Frequently Asked Questions regarding the Convention on the Rights of Persons with Disabilities*. UN Department of Economic and Social Affairs, October, [accessed 12 October 2012]. <http://www.un.org/disabilities/default.asp?navid=24&pid=151#sqc3>
- UN. (2012b). *Links to UN System sites on disabilities and related topics*. United Nations, October, [accessed 9 October 2012]. <http://www.un.org/disabilities/convention/unsystem.shtml>
- UN. (2012c). *Persons with Disabilities*. United Nations, [accessed 9 October 2012]. <http://www.un.org/en/globalissues/disabilities/index.shtml>
- UN. (2012d). *Status of the Convention on the Rights of the Child: Report of the Secretary-General*. United Nations, August 3, [accessed 19 October 2012]. <http://allafrica.com/download/resource/main/main/idatcs/00050267:19e2d776783623d342f50c69b1e122fd.pdf>
- UNDG. (2012). *Chapter 1: MDG-1:Poverty, Employment and Hunger*. United Nations Development Group, [accessed 25 September 2012]. http://mdgpolicynet.undg.org/ext/MDG-Good-Practices/GP_chapter1_poverty.pdf
- UNESCO. (2005a). *Towards Knowledge Societies*. UNESCO, [accessed September 2 2012]. <http://unesdoc.unesco.org/images/0014/001418/141843e.pdf>
- UNESCO. (2005b). *Workshop on ICT and persons with disabilities. Tunis, Tunisia* UNESCO, November, [accessed 10 October 2012]. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/wsis_tunis_roundtable_disabilities_report.pdf
- UNESCO. (2006). *ICT in Education for People with Special Needs. Specialized training course*. UNESCO, [accessed 9 October 2012]. <http://iite.unesco.org/publications/3214663/>
- UNESCO. (2007). *Operational Definition of Basic Education*. UNESCO, [accessed 25 September 2012]. <http://www.unesco.org/education/framework.pdf>
- UNESCO. (2008). *Teaching Children with Disabilities in Inclusive Settings*. UNESCO, [accessed 9 October 2012]. http://www2.unescobkk.org/elib/publications/243_244/Teaching_children.pdf
- UNESCO. (2009). *Towards Inclusive Education for Children with Disabilities: A Guideline*. UNESCO, [accessed 9 October 2012]. <http://www.uis.unesco.org/Library/Documents/disabchild09-en.pdf>
- UNESCO. (2010). *Consultative Meeting on Mainstreaming Information and Communication Technologies (ICTs) for Persons With Disabilities to Access Information and Knowledge*. UNESCO, February, [accessed 10 October 2012]. <http://unesdoc.unesco.org/images/0018/001892/189237e.pdf>

- UNESCO. (2011a). *The hidden crisis: Armed conflict and education*. UNESCO, [accessed 15 October 2012]. <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/efareport/reports/2011-conflict/>
- UNESCO. (2011b). *ICTs in Education for People With Disabilities: Review of innovative practice*. UNESCO Institute for Information Technologies in Education, [accessed 15 August 2012]. <http://www.european-agency.org/publications/ereports/ICTs-in-Education-for-People-With-Disabilities/ICTs-in-Education-for-people-with-disabilities.pdf>
- UNESCO. (2012a). *Access for people with disabilities*. UNESCO, [accessed 29 July 2012]. <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/access-for-people-with-disabilities/>
- UNESCO. (2012b). *Accessible ICTs and Personalized Learning for Students with Disabilities: A Dialogue among Educators, Industry, Government and Civil Society*. UNESCO, March, [accessed 10 July 2012]. http://www.unesco.org/new/en/media-services/single-view/news/unesco_launches_report_on_accessible_icts_for_students_with_disabilities/
- UNESCO. (2012c). *Accessible ICTs and Personalized Learning for Students with Disabilities: A Dialogue among Educators, Industry, Government and Civil Society*. UNESCO, [accessed 29 July 2012]. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/accessible_ict_personalized_learning_2012.docx
- UNESCO. (2012d). *Children with Disabilities*. UNESCO, October, [accessed 9 October 2012]. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/children-with-disabilities/>
- UNESCO. (2012e). *Crowdsourcing for education*. UNESCO, October 8, [accessed 9 October 2012]. http://www.unesco.org/new/en/unesco/themes/icts/single-view/news/crowdsourcing_for_education/
- UNESCO. (2012f). *Douglas Biklen: "Begin by presuming competence"*. UNESCO, February 24, [accessed 9 October 2012]. http://www.unesco.org/new/en/education/resources/online-materials/single-view/news/douglas_biklen_winner_of_unesco_kuwait_prize_begin_by_presuming_competence/
- UNESCO. (2012g). *Education and Disability* UNESCO, October, [accessed 9 October 2012]. http://www.unesco.org/education/efa/know_sharing/flagship_initiatives/disability_last_version.shtml
- UNESCO. (2012h). *The Flagship on Education for All and the Right to education for Persons with Disabilities: Towards Inclusion*. UNESCO, [accessed 29 July 2012]. http://www.unesco.org/education/efa/know_sharing/flagship_initiatives/disability_last_version.shtml
- UNESCO. (2012i). *Free and Open Source Software (FOSS)*. UNESCO, October, [accessed 9 October 2012]. <http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/free-and-open-source-software-foss/>
- UNESCO. (2012j). *Inclusive Education*. UNESCO, [accessed 29 July 2012]. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/>
- UNESCO. (2012k). *Mobile Learning and Policies: Key Issues to Consider*. UNESCO, September 27, [accessed 9 October 2012]. http://www.unesco.org/new/en/unesco/themes/icts/single-view/news/mobile_learning_and_policies_key_issues_to_consider/
- UNESCO. (2012l). *Open Educational Resources in Non-English-Speaking Countries*. UNESCO, [accessed 9 October 2012]. <http://iite.unesco.org/publications/3214703/>
- UNESCO. (2012m). *Ten questions on inclusive education*. UNESCO, October, [accessed 9 October 2012]. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/10-questions-on-inclusive-quality-education/>
- UNESCO. (2012n). *The UNESCO Emir Jaber al-Ahmad al-Jaber al-Sabah Prize*. UNESCO, February, [accessed 9 October 2012]. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/inclusive-education/prizes/>
- UNESCO. (2012o). *UNESCO IITE Policy and Research ICT in education for people with disabilities*. UNESCO, [accessed 9 October 2012]. http://iite.unesco.org/policy_and_research/icts_in_special_needs/
- UNESCO. (2012p). *UNESCO launches meeting report on accessible ICTs for students with disabilities*. UNESCO, March 1, [accessed 15 August 2012]. http://www.unesco.org/new/en/communication-and-information/resources/news-and-in-focus-articles/all-news/news/unesco_launches_report_on_accessible_icts_for_students_with_disabilities/
- UNESCO. (2012q). *Youth and skills: Putting education to work. EFA Monitoring Report 2012*. UNESCO, October, [accessed 11 September 2012]. <http://unesdoc.unesco.org/images/0021/002180/218003e.pdf>

- UNICEF. (2009). *It's About Ability: Learning Guide on the Convention on the Rights of Persons with Disabilities*. UNICEF, May, [accessed 15 September 2012]. http://www.unicef.org/publications/files/Its_AboutAbility_Learning_Guide_EN.pdf
- UNICEF. (2012). *Africa: UNICEF Calls for Social Inclusion of Children With Disabilities in Africa*. United Nations Children's Fund, June 18, [accessed 13 August 2012]. <http://allafrica.com/stories/201206180384.html>
- UNIRIN. (2002). *Website Set Up for War Amputees*. UN Integrated Regional Information Networks, [accessed 8 July 2002]. <http://allafrica.com/stories/200207050041.html>
- Unwin, Tim. (2012). *Ensuring disability agendas are embedded effectively in national ICT strategies*. Wordpress.com, May 17, [accessed 15 August 2012]. <http://unwin.wordpress.com/2012/05/17/ensuring-disability-agendas-are-embedded-effectively-in-national-ict-strategies/>
- Waddell, Cynthia D. (2008). *Meeting Information and Communications Technology Access and Service Needs for Persons with Disabilities: Major Issues for Development and Implementation of Successful Policies and Strategies*. International Telecommunications Union, June, [accessed 14 June 2012]. http://www.itu.int/ITU-D/study_groups/SGP_2006-2010/events/2007/Workshops/documents/18-waddell.pdf
- Waddell, Cynthia D. (2009). *Public Procurement of Accessible ICTs*. Global Initiative for Inclusive Information and Communication Technologies, August, [accessed 12 October 2012]. http://g3ict.org/download/p/filed_812/productId_151
- Ward, Darren. (2012). *Giving to the world's largest minority*. Dominion Post (New Zealand), December 3, [accessed 2 December 2012]. <http://www.stuff.co.nz/dominion-post/comment/8027491/Giving-to-the-worlds-largest-minority>
- Waterstone, Michael. (2012). *We Can Do Better on Disability Rights*. Pacific Standard (California), November 30, [accessed 2 December 2012]. <http://www.psmag.com/legal-affairs/we-can-do-better-49986/>
- Wekesa, Chrispinus (2012). *Kenya: Action Plan to Ensure Buildings, Roads Are Friendly to the Disabled*. The Star (Nairobi), June 26, [accessed 13 August 2012]. <http://allafrica.com/stories/201206270985.html>
- White, Peter. (2012). *Digital books may not be for everyone. But for blind people, they're a true revolution*. Guardian (London), August 17, [accessed 15 November 2012]. <http://www.guardian.co.uk/commentisfree/2012/aug/17/peter-white-books-braille-ebooks>
- WHO. (2012a). *International Classification of Functioning, Disability and Health (ICF)*. World Health Organisation, October, [accessed 11 October 2012]. <http://www.who.int/classifications/icf/en/>
- WHO. (2012b). *New world report shows more than 1 billion people with disabilities face substantial barriers in their daily lives*. World Health Organisation, June 9, [accessed 13 August 2012]. http://www.who.int/mediacentre/news_releases/2011/disabilities_20110609/en/index.html
- WHO. (2012c). *World report on disability*. World Health Organisation and the World Bank, [accessed 15 October 2012]. http://www.who.int/disabilities/world_report/2011/en/index.html
- Wicks, Kathryn. (2012). *Not all disabilities are created equal*. Sydney Morning Herald, November 10, [accessed 2 December 2012]. <http://www.smh.com.au/opinion/politics/not-all-disabilities-are-created-equal-20121109-29313.htm>
- WORLD. (2012). *Africa: Transform, Innovate, and Connect - a New Strategy for Information and Communication Technology*. World Bank, July 25, [accessed 13 August 2012]. <http://allafrica.com/stories/201207250990.html>
- WRC. (2008). *Disabilities among Refugees and Conflict-Affected Populations*. Womens Refugee Commission, [accessed 15 October 2012]. http://womensrefugeecommission.org/resources/doc_download/609-disabilities-among-refugees-and-conflict-affected-populations
- Young, Susan. (2012). *Brain Chip Helps Quadriplegics Move Robotic Arms with Their Thoughts*. Technology Review, May 16, [accessed 16 May 2012]. <http://www.technologyreview.com/biomedicine/40418/>
- Zaman, Samihah (2012). *4,700 special needs pupils integrated into Abu Dhabi public schools*. Gulf-news.com, November 11, [accessed 2 December 2012]. <http://gulfnews.com/news/gulf/uae/education/4-700-special-needs-pupils-integrated-into-abu-dhabi-public-schools-1.1103277>

Building on the *United Nations Convention on the Rights of Persons with Disabilities*, the Global Report addresses strong recommendations to all stakeholders – from decision-makers to educators, civil society and industry – on how concretely to advance the rights of people living with disabilities.

The report uses as its primary resource five regional studies commissioned by UNESCO. It introduces additional material to build an overview and critical understanding of the use of ICTs to access information and knowledge and to inform both in policy and practice with regard to people living with disabilities.



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