ANNEX 1: GLOBAL ACCESS AND EDUCATION REALITIES

Global access and education realities

Most people on our planet remain entirely disconnected. Even today, only slightly more than one third of humanity has access to the internet.

Internet penetration 2015
- Individual: 35% in developing countries, 10% in LDCs
- Households: 34% in developing countries, 7% in LDCs (as compared to 80% in developed countries and 46% world average)
- 28 countries in sub-Saharan Africa have internet penetration rates lower than 10%
- 2/3 of the population of developing countries remain offline

Internet usage
- 9.5% of the 940 million people living in LDCs

- Computer ownership, age, English language ability and education have the biggest impact on whether or not someone uses the internet

Mobile subscription penetration rate 2015
- 97% worldwide

Mobile broadband penetration
- 47% worldwide (12-fold increase since 2007)
- 3G coverage: 69% (rural areas: 29%, urban areas: 89%)
- Africa is the only region where mobile broadband penetration remains below 20%

- In developing countries, average monthly fixed broadband prices (in PPPs) are 3 times higher than in developed countries; mobile broadband prices are twice as high as in developed countries

Education
- Globally 58 million children of school age do not attend school (25 million in rural, low-income regions)
- Worldwide 61 million children are not enrolled in primary school, 71 million have no secondary schooling (UNESCO, 2012)
- The majority of these children belong to marginalised groups, such as ethnic and language minorities, geographically marginalised groups, children forced into child labour, persons with disabilities or infectious diseases (i.e. HIV/AIDS), girls and young women, etc.

ANNEX 2: UNIVERSAL DESIGN

Unlike the traditional one-size-fits-all curriculum, Universal Design in Education (UDE) / UD for Instruction (UDI) or more specifically, Universal Design for Learning (UDL) offers a curriculum-building tool for highly flexible instructional goals, methods, materials, and assessments that can be customised to respond to the needs of individual learners. The concept of UDL originally evolved from the universal design approach in architecture to ensure accessible buildings and city planning (see Policy Brief on Accessibility), supplemented with pedagogical research and cognitive neuroscience in particular.¹

The three underlying principles of UDL address and enhance the ways in which (1) information is presented to and understood by learners, (2) students can express what they know and (3) students become engaged and stay motivated.² The appropriation of learning materials and environments on the basis of UDE creates solutions that benefit all students in all their potential diversity. Universal Design has been applied to educational products ranging from hard- and software to textbooks and learning equipment. It has also been applied to learning environments, such as classrooms, libraries and distance learning courses.

¹ Meyer, A. et al. (2014)

ANNEX 3: INCLUSIVE EDUCATION AND E-ACCESSIBILITY

‘INCLUSIVE EDUCATION’: Parties shall ensure that: a) Persons with disabilities are not excluded from the general education system on the basis of disability, and that children with disabilities are not excluded from free and compulsory primary education, or from secondary education, on the basis of disability. (UN Convention on the Rights of Persons with Disabilities, Article 24)³

Over 80% of the world’s 1 billion persons with disabilities live in developing countries. In environments where basic infrastructure and access to information are often scarce, barriers that prevent these people living an equal life are significantly higher than in the developing world, and the environment offers little prospect of support and inclusion.

According to the World Health Organization (2011), descriptive data shows that persons with disabilities are at a disadvantage in terms of educational attainment and labour market outcomes.

The relevance of ICTs in international development is increasingly being recognised and debated. However, as supported by Article 9 of the Convention on the Rights of Persons with Disabilities, ICTs must be accessible to the whole population, including persons with disabilities.  

**E-accessibility**

E-accessibility is a measure of the extent to which a product or service can be used by a person with a disability as effectively as it can be used by a person without that disability. With a fast growing ICT industry which is pervading every aspect of everyday life, ICT accessibility is becoming increasingly important if people are to participate fully in society.

Specific ICT-related mechanisms are of specific relevance for the inclusion of persons with disabilities:

- Multiple means of communication (voice, text, and gestures) can facilitate access to information and engagement with others.
- Voice recognition, magnification, and text-to-speech functionality benefit persons with visual, cognitive, learning, and mobility disabilities.
- SMS, instant messaging, telephone relay, and video captions can reduce communication barriers for persons with hearing and speech disabilities.
- Hands-free navigation and gesture-controlled interfaces can assist persons with severe mobility impairments in using digital devices.

When designing and distributing ICT equipment and services, developers should ensure that people with disabilities gain the same benefits as the wider population and that accessibility is taken into account from the outset.

Further information on e-accessible tools, methods and procurement:

- **Teach ICT**: an introduction to how technology can assist participation and key assistive devices
- **Information and Communication Technologies for Development**: a clearing house for resources and commentary on tech tools related to disability and development
- **Global Initiative for Inclusive ICTs**: includes an e-accessibility toolkit

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ANNEX 4: PRINCIPLES FOR DIGITAL DEVELOPMENT

The Principles for Digital Development are the result of over a decade of multi-stakeholder efforts to provide comprehensive and co-crafted living guidelines for practitioners. The Principles reflect the efforts of individuals, development organisations and donors to institutionalise the hard lessons learned throughout the last decades of utilising ICTs for development.9

The Principles as provide a helpful overall framework to check against when developing demand-driven and context-relevant programmes or projects.

The highlighted aspects are of particular relevance when it comes to inclusion.

<table>
<thead>
<tr>
<th></th>
<th>Design with the User</th>
<th>Understand the Existing Ecosystem</th>
<th>Design for Scale</th>
<th>Build for Sustainability</th>
<th>Be Data Driven</th>
<th>Use Open Standards, Open Data, Open Source, and Open Innovation</th>
<th>Reuse and Improve</th>
<th>Address Privacy and Security</th>
<th>Be Collaborative</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Develop context-appropriate solutions that respond to user needs.</td>
<td>Participate in networks and communities of like-minded practitioners.</td>
<td>Design for scale from the start, and assess and mitigate dependencies that might limit ability to scale up.</td>
<td>Plan for sustainability from the start, including planning for long-term financial health e.g., assessing total cost of ownership.</td>
<td>Design projects so that impact can be measured at discrete milestones with a focus on outcomes rather than outputs.</td>
<td>Adopt and expand existing open standards.</td>
<td>Use, modify and extend existing tools, platforms, and frameworks when possible.</td>
<td>Assess and mitigate risks to the security of users and their data.</td>
<td>Engage diverse expertise across disciplines and industries at all stages.</td>
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<td>2</td>
<td>Include all user groups in planning, development, implementation and assessment. Develop projects in an incremental and iterative manner.</td>
<td>Align to existing technological, legal, and regulatory policies.</td>
<td>Employ a 'systems' approach to design, considering implications of design beyond an immediate project.</td>
<td>Utilise and invest in local communities and developers by default and help catalyse their growth.</td>
<td>Evaluate innovative solutions and areas where there are gaps in data and evidence.</td>
<td>Open data and functionalities and expose them in documented APIs (Application Programming Interfaces) where use by a larger community is possible.</td>
<td>Develop in modular ways favouring approaches that are interoperable over those that are monolithic by design.</td>
<td>Consider the context and needs for privacy of personally identifiable information when designing solutions and mitigate accordingly.</td>
<td>Work across sector silos to create co-ordinated and more holistic approaches.</td>
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<td>3</td>
<td>Design solutions that learn from and enhance existing workflows and plan for organisational adaptation.</td>
<td>Be replicable and customisable in other countries and contexts. Demonstrate impact before scaling a solution.</td>
<td>Be data-driven</td>
<td>Engage with local governments to ensure integration into national strategy and identify high-level government advocates.</td>
<td>Use real-time information to monitor and inform management decisions at all levels.</td>
<td>Use real-time information to monitor and inform management decisions at all levels.</td>
<td>Invest in software as a public good.</td>
<td>Ensure equity and fairness in co-creation, and protect the best interests of the end-users.</td>
<td>Document work, results, processes and best practices and share them widely.</td>
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<tr>
<td>1</td>
<td>Design with the User</td>
<td>2</td>
<td>Understand the Existing Ecosystem</td>
<td>3</td>
<td>Design for Scale</td>
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<td><strong>Ensure solutions are sensitive to, and useful for, the most marginalised populations: women, children, those with disabilities, and those affected by conflict and disaster.</strong></td>
<td><strong>Analyze all technology choices through the lens of national and regional scale.</strong></td>
<td><strong>Factor in partnerships from the beginning and start early negotiations.</strong></td>
<td><strong>When possible, leverage data as a by-product of user actions and transactions for assessments.</strong></td>
<td><strong>Develop software to be open source by default with the code made available in public repositories and supported through developer communities.</strong></td>
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ANNEX 5:
FREE AND OPEN SOURCE SOFTWARE VERSUS COMMERCIAL PRODUCTS

A huge advance of the digital age is the opportunity to share and appropriate technologies for various contexts rather than being forced to build new ICT solutions from scratch. This is not only enormously resource-efficient but also brings forth a diverse user and support community, with members contributing their concrete contextual knowledge for appropriation on the basis of a wide diversity of needs. This helps the community as a whole identify optimal solutions.

Beyond the advantages of Free and Open Licence Software (FLOSS), freely accessible, open licensed resources for teaching, learning, assessing, and research purposes are increasingly becoming available – for institutional education and self-education. Most Open Educational Resources (OER) content is still provided by western educational institutions, but there are an increasing number of initiatives and contributions from developing countries that provide contextualised content, sometimes also in local languages.

In general, an ‘open license’ allows users to appropriate resources like textbooks, but also audio or video, to meet specific pedagogical needs in various contexts.\(^\text{10}\)

Public-private partnerships (PPPs) are another way of reducing costs, especially when it comes to infrastructure. PPPs with IT companies are welcomed by many governments as a way of keeping down the costs of educational technology projects. They can also benefit from the technical expertise of the private sector partner. One has to bear in mind, however, that IT companies also pursue their own interests within the scope of cooperation, like exploring future markets and training potential future customers in specific tools, systems or applications, as Cisco does with its Networking Academy approach.\(^\text{11}\)

Another critical aspect is that emphasis here is mostly on technical and less on educational and pedagogical aspects. It should be considered beforehand whether it makes sense to involve technologies in a specific educational context, and if so to what extent.

Finally, see above, free and open solutions are usually much cheaper, easier to adapt and more likely to be distributed. Yet there are fewer options for entering into PPPs with Open Source IT companies, meaning that projects have fewer financial resources.

**ANNEX 6: ROBOBRAILLE**

RoboBraille  
Austria / other countries, Austrian association supporting the blind and visually impaired

Free and openly available, award-winning service, capable of automatically converting documents into alternative formats.

Goal  
Exploring new, smarter and easier methods of preparing and producing educational materials in alternative formats (e.g., digital Braille, audio books, e-books, and other accessible documents) using RoboBraille and other relevant free ICT tools.

Sustainability measurements  
- Designed to further educate teachers, parents, and professional alternative media producers who are helping people with visual and reading impairments to use methods and tools like these.
- Multi-stakeholder approach (partnering with schools, national resource centres, colleges, universities, NGOs, disabled peoples’ organisations, assistive technology...
providers, and private consultants) from six European countries.

• Knowledge sharing between various countries/partners using RoboBraille as a learning tool in various educational contexts (shared learning environment RoboBraille Best Practice Catalogue).

• Plans to include more countries.

• Process-focused, agile project process: During the project, partners discovered the need to develop a practical hands-on training course aimed at improving the skills of teachers, parents, and alternative media producers so as to support people with visual and reading impairments in a timely and inclusive way.

Considerations
It needs to be integrated into wider educational processes / programming frameworks / national education systems. Hardware needs to be available in order to use software. Specifically in development context, questions of maintenance and computer skills arise.

http://robobraille.org/

ANNEX 7:
YOUNG POWER
IN SOCIAL ACTION
BANGLADESH

Accessible learning materials for students with visual impairments
Bangladesh, YPSA (Young Power in Social Action)

The organisation produces and distributes digital multimedia books, fully accessible e-books, and digital Braille books.

Universal Design Approach
The project converts printed textbooks from classes 1-10 into DAISY digital multimedia format. The contents can then be converted into DAISY full text or full audio books, Braille and accessible e-books. Consequently, once the books are digitalised they are transformed into universally designed learning materials, accessible to all, including students with visual, print, and/or learning disabilities.

Sustainability measurements:
• The project was initiated in cooperation with policy-level actors and a multi-stakeholder consortium of expert stakeholders (DAISY Consortium, Accessible Book

- The project was integrated into the official educational system, with a view to providing textbooks for classes 1 to 10 in DAISY digital multimedia format (contents can then be converted into DAISY full text/full audio textbooks, Braille, and accessible e-books).
- 80% of project staff are persons with disabilities and students with disabilities who are involved in planning (identifying problems, required books, formats), implementation, and the monitoring process.
- Cost-effective method.

www.ypsa.org

**ANNEX 8: LEAGUE OF THE BLIND**

Integration of ATs to support blind learners at all levels of the national education system
Tanzania, League of the Blind

Challenge
Double stigmatisation of persons with visual impairment due to computer illiteracy, lack of assistive technology and the non-consideration of special needs where ICTs are introduced in schools.

Goal
To integrate assistive technology in the national education system, in order to ensure the availability of assistive technology for people with visual impairment at the workplace and all levels of education.

Contextualisation
Translating the screen reader into a Swahili speech synthesiser.
Sustainability measurements

- Representatives from identified proposed project areas were involved in the planning process.
- The project is implemented from policy level and with multi-stakeholder involvement (representatives from the proposed project areas, Tanzania Education Authority, Sightsavers, Tanzania League of the Blind).
- The project will be adapted on policy-level, by the Ministry of Education and thus mainstreamed.
- ICT training curriculum for all school levels will be developed, and teacher-training course on assistive technology provided.
- The project is piloted on a smaller scale, including training in the application of screen reader prior to mass roll-out.

Considerations

- Computer labs will be installed in schools but who will maintain those labs and where will financial resources come from?
- If trained teachers leave, a vacuum will be created.
- ATs might be available in schools but what about inclusion of graduate students when they enter the working world?


ANNEX 9:
ONE LAPTOP PER CHILD INITIATIVE (OLPC) – THE ‘FAILED EXPERIMENT’ OF HARDWARE DRIVEN PROGRAMMING

Introduced in 2005 at the World Summit on Information Society, the ‘XO’ laptop quickly raised high expectations amongst many technology enthusiasts. The robust and low-cost device was equipped with software to encourage self-learning among primary school children in developing countries even without any external support by teachers, parents or peers and thus provide education to the most marginalised children that did not have access to quality education. Evaluation of large-scale distributions in Uruguay and Peru found no effect, however, on enrolment, maths, language and reading scores. Yet some positive effects were reported in general cognitive skills and verbal fluency. The weak results were at least partially attributed to the lack of compulsory teacher training and involvement. Apart from

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the lack of verifiable learning impact, it was criticised that without the necessary ecosystem to repair and maintain the device it was far from sustainable and could not compete with low-cost mainstream technology \(^\text{13}\); the money (about USD 220 per child) could be spent more effectively for alternative education programmes \(^\text{14}\). On the plus side, OLPC is said by some to have triggered the development of low-cost devices by the IT industry itself, which has recognised and addressed a new target group \(^\text{15}\). OLPC also initiated a wider discussion on the role of technology for education.

