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SCIENCE TO
POLICY BRIEF

ICT-BASED INCLUSIVE
EDUCATION

Bridging the gap: Raising digital
accessibility for all

SCIENCE TO POLICY
BRIEF

INDEX

ICT-BASED
INCLUSIVE
EDUCATION

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ANNEX
PLEASE NOTE THAT THE
ANNEX IS AVAILABLE IN
A SEPARATE DOCUMENT

ABSTRACT

OVER the past decades, Information and Communication Technologies (ICTs) have attracted massive attention across various fields of international development cooperation, including the field of education. Attention has increasingly shifted away from tech-centric approaches, which see ICTs as drivers of change, towards a stronger people-centric approach, which recognises diversity. As a result, only context-driven and needs-based approaches can enable ICTs to be used to maximum effect in supporting inclusive and equitable change processes. With the 2030 Agenda for Sustainable Development, inclusive, equitable and quality education has been made a priority for the years to come.

1 BACKGROUND INFORMATION

THE TERM 'ICTS FOR EDUCATION' (ICT4E) is generally used to denote the use of ICTs to achieve an overarching goal of making educational programmes or systems more effective and more efficient. The term 'education' as used in those regards broadly relates to pedagogical and scholarly activities inside and outside formal institutions. ICTs can be used in the areas of learning, teaching, assessment, accreditation, policy-making, and administration[1]. ICTs have the potential to play a supportive role in making available, facilitate, and/or support educational processes by providing innovative ways of transmitting, storing, transforming, and publishing information, which is seen as a basic prerequisite for inclusive and equitable quality education (2030 Agenda for Sustainable Development). The concept of ICT4E can be expanded to embrace the goal of inclusive education (ICT4IE) as laid out in Goal 4 of the SDGs (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all) and in line with UNESCO's definition of

universal access to education for all children, youth and adults, and promoting equity[3] adds the concepts of equity and continuity.

' [...] ICTS can contribute to universal access to education, equity in education, the delivery of quality learning and teaching, teachers' professional development as well as improve education management, governance and administration provided the right mix of policies, technologies and capacities are IN PLACE. '

UNESCO
2015[2]

THE IDEA OF USING ICTS in change processes is not new. ICTs were recognised as being useful in international development cooperation as early as the 1950s. Early tech-centric approaches paid little attention to local context and demands and have been widely criticized as a result. In consequence, the 1990s were termed the 'failed decade' with regard to the use of ICT in international development cooperation.

WITH THE MILLENNIUM DEVELOPMENT GOALS and the rapid spread of the internet and mobile technology, it was realised that ICTs are not stand-alone solutions or catalysts. They are tools with the potential to support wider change purposes. This realisation has triggered increasing debate about the need for context-relevant and needs-based approaches that never depart from a technology as their starting point.

WHERE TEACHERS have no electricity in their homes, it is not context-appropriate to provide devices like tablets for them to prepare lessons. On the other hand, teachers who are used to working with certain digital devices might be disinclined to move to areas with limited power supply, where the school might have electricity, but not their home. These factors must be taken into account when considering how ICT can support an EDUCATION PROGRAMME.

' YOU FIND that teachers' houses do not have electricity and have no solar panels, so teachers are reluctant to go and teach in such schools, they ask, "how are we going to write lesson plans, how are we going to write schemes OF WORK."'

STUDENT OF PRIMARY TEACHER TRAINING IN MALAWI
refie 2015, p. 43

PHOTO

GIZ

Leyton Alvarado,

EDUVIDA

IN MOST PROJECTS THE PEOPLE INTENDED to benefit do not belong to one homogeneous group. They exhibit great diversity in terms of their potential to engage, communication needs, familiarity with ICTs, role in the project, etc. Thus, in order to genuinely identify local needs and contexts, a participatory approach [4] is required, which actively involves all actors who make up both the enabling environment and the restricting environment throughout an entire programme design cycle [5]. In the field of education these stakeholders include learners, teachers, parents, communities, policy-makers, potential government representatives, etc.

EVEN A SUPPORTIVE ENVIRONMENT, however, needs to be enabled and nurtured. Much has been learned with regard to the use of ICTs in change processes in all major fields of development (ICT4D). This knowledge base should provide a strong foundation for the field of ICT4IE. Although it is realised that ICTs do not drive inclusive education, they have the potential, when used in a meaningful and sustainable way, to support inclusive and equitable quality education and promote lifelong learning opportunities. For ICT4IE, data on ICT availability and accessibility is every bit as relevant as data on in- and out-of-school realities [6].

EXAMPLES OF AREAS in which ICTs in the field of education bear opportunities:

- Improving access to educational materials

- Providing free and open access to software and learning content (strengthening access and sharing)

- Teacher training and training-of-trainers (TOT) (also distance training)

- Connecting for knowledge exchange and peer-to-peer learning (students, teachers, parents, etc. within countries, communities, or across the world)

- Supporting skills development (e.g. through Open Educational Resources)

- Offering swifter and better student assessment

- Adjusting the teaching content and pace to the particular requirements of individual learners (child-centred approach)

- Supporting monitoring and evaluation as well as evidence-based policy in the education sector through Education Management Information Systems (EMIS)

- Distance teaching and learning; tackling spatial marginalisation

- Bridging language, literacy and disability-related barriers

- Providing education in emergency and transitional situations (e.g. refugee camps)

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[2] EXEMPLARY RESEARCH ACTIVITIES AND KEY RESEARCH FINDINGS

TO EXAMINE THE CURRENT state of research on the role of ICTs for inclusive education in a development context, we have analysed research, policy papers and case studies. Given the paucity of research on the intersection of ICTs and inclusive education in particular, we have focused on triangulating ICT for development (ICT4D) as explained in the section on background information, ICT for education (ICT4E/EduTech), and inclusive education. This has allowed us to draw some conclusions on the intersections of all three fields. Exemplary case studies spotlighted good practices, challenges remaining, and required action for sustainable, relevant ICT4IE policies and practices.

ICTS FOR EDUCATION

ALTHOUGH ICTS clearly do offer potential in the field of education as in other fields, as outlined above, very little in-depth research has yet been conducted on the impact of investment in educational technologies in middle- and low-income countries. The evidence base is, however, slowly growing, with several rigorous randomised studies and a significant body of practical case evidence now available. Various studies deal with the impact of ICT in education and come to similar conclusions. A 'knowledge mapping' exercise conducted by the World Bank's Information for Development Programme (InfoDev) revealed that, despite decades of large investments in ICT to benefit education in OECD countries and its increased use in developing countries, data to support the perceived benefits from ICTs are limited and evidence of effective impact is debatable[7]. These findings highlighted various knowledge gaps and underscored the need for internationally accepted standards, methodologies and indicators to better measure the real benefits of ICT in education[8]. Furthermore, a review of the literature on ICT in Education conducted by UNESCO[9] and including various meta studies, revealed limited consistent results in regards to the impact of ICTs on educational outcomes alongside with the recognition of challenges in measuring clear benefits of ICT use in education.

An OECD landmark report similarly revealed that ICTs in Education are not nearly as pervasive as in daily life. The impact of ICTs in formal education remains limited so far. Specifically in countries that have made massive investment in IT infrastructure, developed and developing countries alike, no significant improvement has been demonstrated over the last decade [10]. These findings are corroborated by the 2016 World Development Report [11]. The report warns that the greatest obstacle in educational policy-making related to the potential use of ICTs in remote, low-income communities around the world is still the top-down 'import' of most products, services, expertise, and research from high income contexts. A prominent example is provided by the profound lessons learned from the One Laptop Per Child Initiative (see annex 9). A historical look at studies of ICTs for Education reveals that more attention must be paid to processes and wider enabling environments as well as to quality indicators to measure the digital literacy and skills needed to function adequately in today's information society [12]. Thus, the study recognises the need for contextuality, a lesson learned from the general field of ICT4D over the last decades (see Chapter 1).

IN THE SAME VEIN, the World Bank has recently concluded a research project which analysed more than 800 policy documents related to the use of ICTs in education in high-, middle-, and low-income countries. This study aims to provide policy-relevant guidance for informed decision-making on how to use ICTs in pursuit of core developmental objectives. Guidance is provided in eight domains of the education sector that the study identifies as key policy issues, including equity and inclusion [13].

TRUCANO DERIVED a set of common messages from this analysis of national ICT/education policies over time in over 100 countries [14], which revealed similarities in terms of key criticism in the general field of ICT4D, such as

- 🔷 ICTs alone do not drive change (nor education).

- 🟥 Access alone is not enough (tech-determinism will not result in any change).

- 🔶 Many education systems find it difficult to address the realities of the information society.

- 🔵 Insufficient attention is paid to the underlying purpose of ICT use. (What is the core need to be addressed through the use of ICTs?)

Despite the growing interest in ICT for education (ICT4E) and the expanding body of literature available, it remains difficult to identify convincing concepts and examples of successful implementation that move beyond pilot phases [15].

SPOTLIGHT ON INCLUSION

WITHIN THE AGENDA 2030 (Goal 4b SDGs), the only explicit mention of ICTs relates to increasing enrolment in related higher educational programmes. Yet the debate within the global community still centres strongly on how to reach the next billion, and still sidesteps the issue of how to serve the needs of the poorest and most marginalised. More explicit mention is found in the Education 2030 Framework for Action, which propounds the need for appropriate ICTs in order to foster education for all. The framework also recognises the need to pay attention to adequate teacher training in which ICTs should play a sustainable role, also to properly integrate pupils with special needs. This is not, however, translated directly into proposed indicators, where mention of ICTs only relates to students' ICT skills, and to rates of internet access and computer equipment at schools.[16] As a UNESCO policy brief on ICTs for Inclusion states, 'the corpus of international laws and texts contains significant human rights obligations and some development targets on the provision of accessible ICTs. However policy makers are left with little guidance on policy development and implementation.'[17]

THE MOST RECENT comprehensive study on inclusion and education has been conducted by the Zero Project initiative[18]. Within the project, research innovation relates to practices that 'employ a comprehensible method that can be transferred or copied to other countries, regions, or contexts, and have a proven and measurable impact' and speed up the process of implementing the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD).

THE MOST RELEVANT contemporary approach for the field of inclusive education is the Universal Design in Education[19]. The Universal Design moves beyond the limited notion of accessibility to embrace a concept of inclusion that addresses the individual needs of all people (see Annex 2). As such, it moves beyond the limitations of a mere focus on, for instance, assistive technologies that are usually tailored to the needs of specific target groups. A focus of this sort is in line with the recognition of needs-based and context-relevant approaches in ICT4D.

SPOTLIGHT ON INCLUSIVE ICTS

THE MODEL POLICY for inclusive ICTs in education for persons with disabilities focuses on the use of ICTs to help implement the United Nations Convention on the Rights of Persons with Disabilities [20]. The model explicitly emphasises that its policy objectives and actions apply equally to all learners who are vulnerable to exclusion from any sector of education. It also sets out the principle of the need for 'active and effective involvement of learners with disabilities, their families, representatives, or advocates in the development, implementation, monitoring and evaluation of policies and services aimed at facilitating learners' access to inclusive education opportunities' [21].

GENERAL (NON-DEVELOPMENT-SPECIFIC) research and policy discourse retains a strong focus on the level of accessibility [22]. According to the Global Initiative for Inclusive ICTs (G3ICT), there are three aspects of accessibility. A user must be able to perceive, understand, and operate every control, instruction or output. Perception in those regards relates to the awareness of a tool's existence as much as the ability to access its information.

AN ICT PRODUCT is accessible to a person with a disability if they can use it either:

- as it is,
- with minor adjustment or configuration, or
- in conjunction with some assistive technology.

(Global Initiative for Inclusive ICTs)

THIS ALREADY GOES further than many frameworks which often fail to distinguish sufficiently between availability and accessibility [23]. Increasingly, countries are expanding the definition of accessibility in their legal frameworks, embracing ICT, including mobile devices, internet, computers, video programming, services using digital interfaces, and assistive technologies [24] (See Annex 3 for further elaboration). However, none of the above policy models, nor research or policy discourse, look at the problem of potential exclusion from ICTs due to the wider environment, including the cultural and socio-political context. In most cases the main focus is on the technology itself, rather than looking at the wider accessibility issue. Where wider accessibility is taken into account, the focus is limited to infrastructural and economic aspects in most cases. [25] Such tendencies are also recognised by the synthesis report of the ICT Consultation in support of the High Level Meeting on Disability and Development of the sixty-eighth session of the United Nations General Assembly [26].

THE FACT that the vast majority of members of society have access to mobile phones, for instance, does not mean that everyone has equal access to the device itself, far less to specific services, such as educational services, that would be provided via such. Bias can be due to cultural restrictions (e.g. mobile phone controlled by men at household level) as much as physical LIMITATIONS (E.G. BLINDNESS).

THE GLOBAL INITIATIVE for Inclusive ICTs (G3ICT) does take into account these findings in the fields of ICT4D and ICT4E, and focuses on another level.
Recognising the core relevance of participation in empowering people, G3ICT emphasises the relevance of allowing the user to design or appropriate the product to adapt it to their own needs. This is also reflected in the Principles for Digital Development (further elaborated in Chapter 3, see Annex 3).
The rapidly growing open source and free source community (see Annex 5 for further elaboration) can bring significant benefits, helping to avoid isolated technology design and utilisation and to prevent missed learning opportunities by failing to appreciate what is already out there. The development community is increasingly engaging with the movement, as reflected in the Digital Principles.
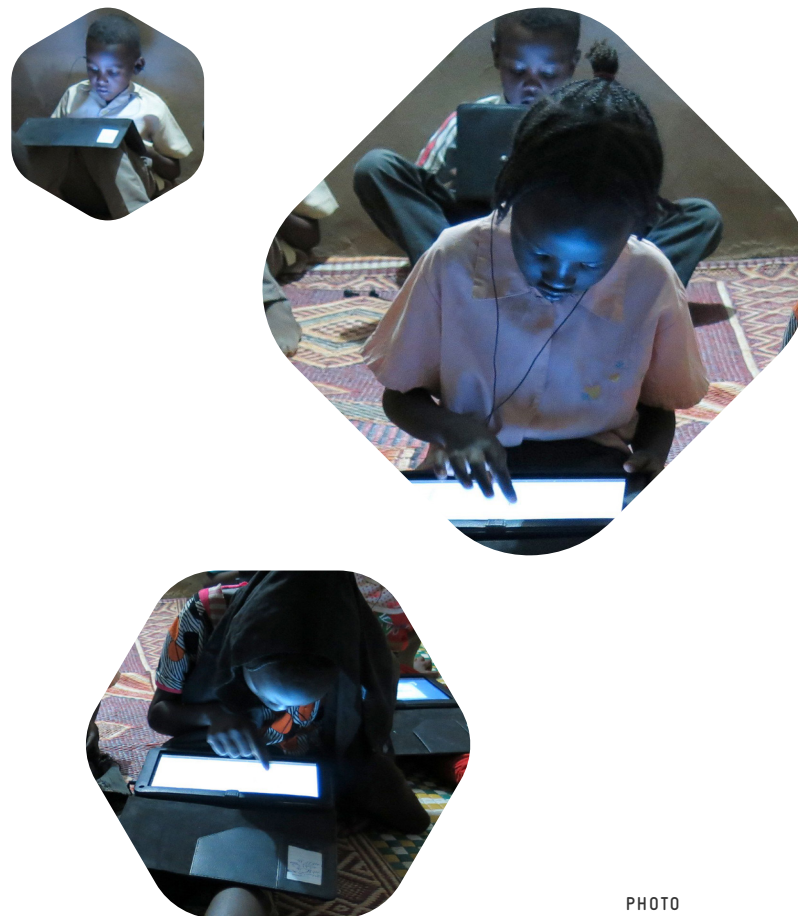

PHOTO
War Child Holland
Camille Lemouchoux

3 DECODING RESEARCH RESULTS INTO PRACTICE

RESEARCH HAS SHOWN that ICT4IE needs to be considered from a wider angle if it is to have a chance of generating relevant and sustainable policies and practice. Research and practical findings from the three areas analysed allow a set of recommendations for the niche area of ICTs for Inclusive Education.

WHILE THE POTENTIAL offered by ICTs to achieve more inclusive education is being increasingly appreciated, there are still challenges in terms of using ICTs in a truly integrative way.[27] Many educational technology programmes around the world have implemented technological 'solutions' to problems that have not been fully understood. Research tends to show limited positive results where insufficient attention has been paid to the context [28]. Findings relating specifically to ICTs for inclusion correlate strongly with recognitions for the wider field of ICT4D. In order for ICTs to be of game-changing relevance in education, a departure from local educational challenges and locally used and trusted technologies will be essential. The potential offered by assistive technologies must be considered within this framework. Where general obstacles to a structural integration of ICTs persist, due perhaps to financial, access-related or capacity-related factors, assistive technologies will not be the solution. The necessary enabling environment must first be put in place. Thus, for further research and concrete policy design, a distinction must be made between inclusive process design and inclusive ICTs within such a process; these would include accessible hardware or assistive technologies where these are sustainable and accessible. In the programme design phase where ICT decisions are to be made, free source and open source technologies should be given precedence over privatised, non-localisable technologies (see Annex 6) both to foster mutual learning and to ensure that resources are used efficiently.

ROBOBRAILLE, an Austrian association supporting the blind and visually impaired has developed a free, openly available, award-winning service, which can automatically convert documents into alternative formats, including digital Braille and audio books. Technology of this sort can be easily and freely used and appropriated by organisations in other countries and contexts (see Annex 7). Efforts like this, if used more widely, offer a great potential to overcome remaining financial barriers, and thus to increase inclusion, especially in marginalised settings.

TO BUILD ON LESSONS learned in the field of ICT4D as identified above, we must go beyond the role of ICTs in the classroom to embrace the wider enabling and disabling environments in which educational systems operate, including all direct and indirect stakeholders.

YOUNG POWER IN SOCIAL ACTION BANGLADESH, for instance, is using the universal design approach in order to produce and distribute digital multimedia books, fully accessible e-books, and digital Braille books. 80% of project staff are persons with disabilities and the project is integrated in the official educational system (see Annex 5).

RESEARCH HAS further shown that policy and practise is lacking a clear pro-equity approach. An approach like this would go beyond a general definition of inclusion and explicitly target marginalised groups. Findings like this link up to the discussion of wider accessibility (see Chapter 2), i.e. ensuring that technologies, where integrated, can be used with minor adjustments or in conjunction with assistive technology.

THE LEAGUE OF THE BLIND IN TANZANIA, for instance, has integrated assistive technologies in the regular school environment in order to prevent a double-stigmatisation of students with visual impairment, as computers are increasingly introduced in the school environment (see Annex 7).

THERE IS NOW a realisation that ICTs (including assistive technologies, or ATs) are only one element within any change process, and that wider contexts and networks beyond the school environment are crucial factors in determining whether or not an approach will be successful. It will therefore be essential to focus on high-level national frameworks as an integrative part of any change process. More than fifty per cent of countries around the world have expanded their definitions of accessibility in their legal frameworks accordingly. Progress like this opens doors for engagement at policy level, which will help link legal frameworks to concrete processes in the educational systems, and at the level of specific schools and networks.

IT HAS BECOME apparent that more systematic attention must be paid to processes and to both enabling and disabling environments, in policy models and in practice. Where the context has been taken into account it has hitherto generally been reduced to infrastructural and financial factors. Yet even infrastructural realities are often not taken fully into consideration. The need to take into account the socio-political and cultural context, which has been identified as imperative in lessons learned in the field of ICT4D, has still to find its way into studies addressing ICT4E and ICT for inclusion work.

HOWEVER, wider discourse has been stimulated and attempts made to provide frameworks that respond to the above criticism.

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THE PRINCIPLES FOR DIGITAL DEVELOPMENT WORKING GROUP has led a process that has resulted in the collective shaping and endorsement of a set of guiding principles for all areas of international development cooperation in the digital age. These principles embrace an inclusive approach at every stage of the project cycle. Years of participatory development went into drawing up the Principles, [29] resulting in the endorsement process for organisations to officially adopt the Principles in their work [30]. Given the shortcomings already identified and the requirement that can be derived for ICT4IE, it would be extremely helpful to use the Digital Principle process from a specifically pro-equity standpoint: By actively engaging in shaping the Principles for Digital Development, so as to foster recognition of marginalised civil society groups and ensure that they are more effectively represented, we could make a meaningful contribution to rendering this currently leading framework truly inclusive. While inclusion plays a key role in the framework, case studies show that inclusion is often used in a very general way. No explicit attention is yet accorded to the inclusion of persons with disabilities, for instance.

OVER AND ABOVE this, organisations working in the field of ICT4IE can avoid many of the mistakes of the past, by establishing their own organisational and programme frameworks on the basis of the Digital Principles, and by learning from other organisations' reform processes. UNICEF and USAID are among the first organisations to develop their own reform processes based on the Digital Principles [31].

GIVEN THE EXISTING gap in ICT4IE research and practise, organisations can serve as role models by implementing the Digital Principles from a specifically inclusive standpoint, and addressing all individuals in society on an equitable basis.

PHOTO
GIZ
Leyton Alvarado,
EDUVIDA

4 SCIENCE TO POLICY IMPLICATIONS

THE LACK OF RESEARCH on the triangulated intersection of ICTs, education and inclusion makes it difficult to make direct policy recommendations. However, as this brief has already demonstrated, existing key frameworks from the three sub-topics can and should be taken to build a sound framework for informed policy-making processes. The main criticism in all three fields can be taken into account and future policy and practice can learn from the experience already gained.
Consequently, this policy brief suggests a two-level framework approach to using ICTs to foster inclusive education.

1) OVERALL POLICY GUIDANCE FOR INCLUSIVE EDUCATION

THE OVERALL GUIDING principle for every Tech4IE policy and practical development process should be Goal 4 of the 2030 Agenda [32]. 'Ensure inclusive and equitable quality education and promote life-long learning opportunities for all.'

CONSEQUENTLY, every policy should understand inclusive education in the broadest possible terms. 'Inclusive education is a process of strengthening the capacity of the education system to reach out to all learners. As an overall principle, it should guide all education policies and practices, starting from the fact that education is a basic human right and the foundation for a more just and equal society' [33].

AS SUCH, TECH4IE does not take as its starting point the targeting of a concrete marginalised group, but aims to provide equitable access to education for all groups, taking into account their individual context and consequent needs.

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SUPPORTIVE FRAMEWORKS

FOCUSING ON THE CONCRETE EDUCATIONAL PROCESS: THE UNIVERSAL DESIGN FOR LEARNING APPROACH [34]

A guiding framework for the policy level

Unlike the traditional one-size-fits-all curriculum, the Universal Design in Education (UDE) and Universal Design for Learning (UDL) is a curriculum-building tool for highly flexible instructional goals, methods, materials, and assessments that can be customised to meet individual needs.
The three underlying principles of UDL address and enhance the ways in which:

- Information is presented to and understood by learners;
- Students can express what they know;
- Students become engaged and stay motivated [35].

The appropriation of learning materials and environments on the basis of UDE creates solutions that benefit all students with all their potential diversity.

INCLUSIVE INTEGRATION OF ICTS AT POLICY LEVEL: THE MODEL POLICY FOR INCLUSIVE ICTS

The model policy for inclusive ICTs provides guidance for the policy level [36], addressing the factors that must be taken into account at meta level. Despite its focus on the use of ICTs to support the implementation of the United Nations Convention on the Rights of Persons with Disabilities [37], it emphasises the fact that the policy objectives and actions outlined in the model are equally applicable for all learners who are vulnerable to exclusion from any sector of education.

While it is based on a set of guiding principles, the following critical aspects for policy development and implementation are singled out:

- Multi-stakeholder engagement and participation,
- Cross sectoral and inter-governmental agency cooperation and coordination,
- Multi-level policy objectives,
- Progressive policy implementation based upon the prioritisation of strategic actions,
- Continuous monitoring and evaluation of policy implementation and achievement of targets and milestones.

2) ACTIONABLE FRAMEWORK FOR ICT INTEGRATION

Following the steps laid out in the overall inclusive education policy frameworks, the integration of ICTs within these strategies is to be considered. To ensure that ICT4IE incorporates lessons learned, we recommend taking the Principles for Digital Development as a guiding framework.

THE PRINCIPLES FOR DIGITAL DEVELOPMENT [38]
The Principles provide a concrete actionable framework that makes it possible to move forward from the abstract policy guidance provided by the model policy. They lay out specific ICT-related principles and linked action points.
The Principles will ensure that experience in using ICTs in all fields of development is taken into account (see Annex 4).

DP 1: Design with the user
- Develop context appropriate solutions informed by user needs
- Include all user groups in planning, development, implementation and assessment
- Ensure solutions are sensitive to, and useful for, the most marginalised populations: women, children, those with disabilities, and those affected by conflict and disaster

DP 4: Build for Sustainability
- Utilise and invest in local communities and developers by default and help catalyse their growth
- Engage with local governments to ensure integration into national strategy and identify high-level government advocates

DP 7: Reuse and improve
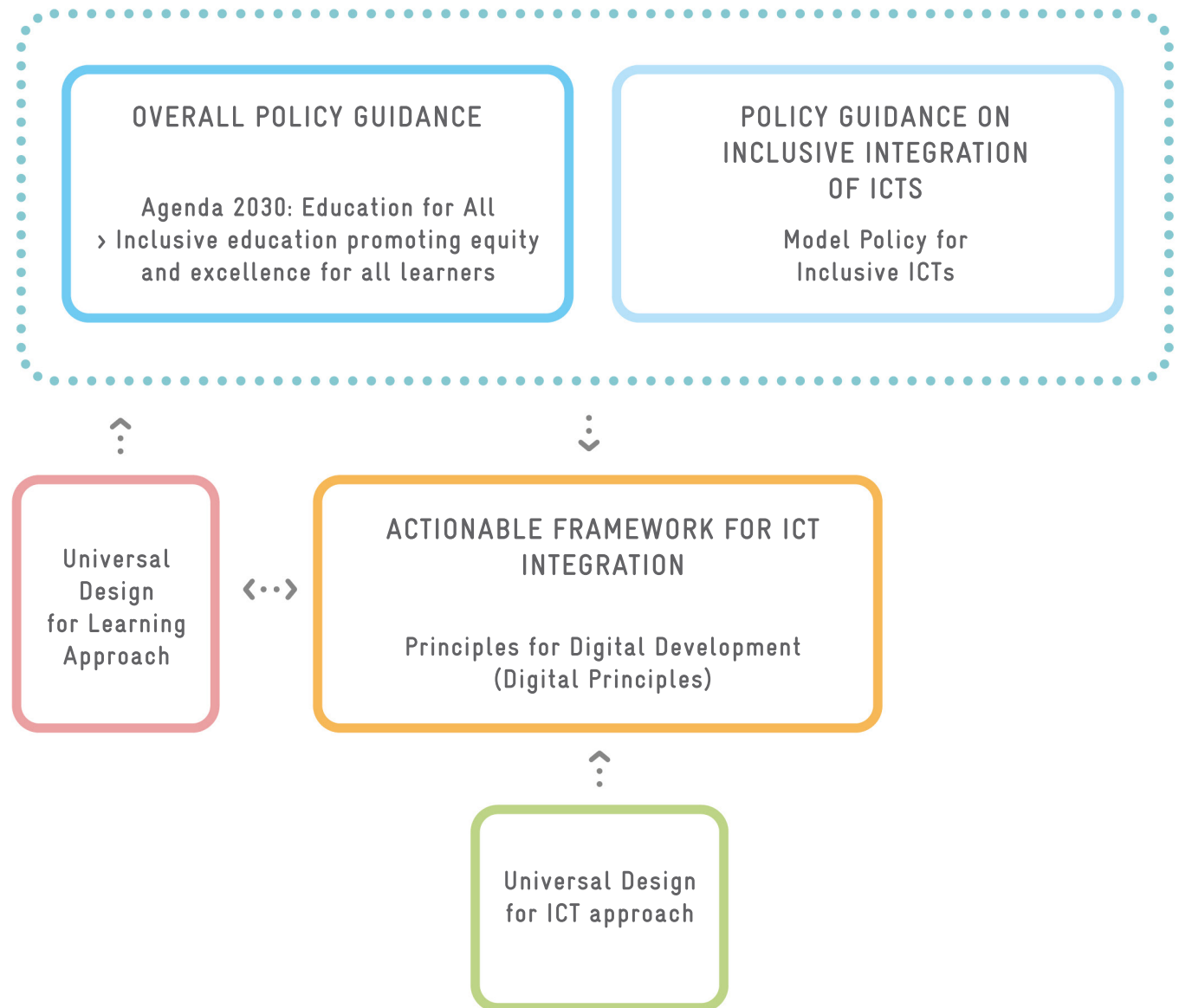- Use, modify and extend existing tools, platforms, and frameworks when possible.
Develop in modular ways favouring approaches that are interoperable over those that are monolithic by design.

SPECIAL FOCUS ON PERSONS WITH DISABILITIES: UNIVERSAL DESIGN FOR ICT
At a later stage, when needs have been identified relating to the learning situation, and after careful stakeholder-driven identification of the relevant contexts, the Universal Design for ICT approach can be particularly helpful in guiding the selection and appropriate of ICTs for persons with disabilities. [39]

PROPOSED FRAMEWORK FOR ICT4IE POLICY AND PRACTISE

OVERALL POLICY GUIDANCE

Agenda 2030: Education for All
› Inclusive education promoting equity and excellence for all learners

POLICY GUIDANCE ON INCLUSIVE INTEGRATION OF ICTS

Model Policy for Inclusive ICTs

Universal Design for Learning Approach

ACTIONABLE FRAMEWORK FOR ICT INTEGRATION

Principles for Digital Development (Digital Principles)

Universal Design for ICT approach

CONCRETE ACTION

At project level, the most relevant aspects to emerge from research work are summarised below in concrete recommendations:

THE POINT OF DEPARTURE – INCLUSIVE EDUCATION

The point of departure should always be inclusive education and the contextual challenges involved in achieving it. The question of how and where ICTs can play a supportive role should be the final step.

CONTEXT AND DEMAND – THE GUIDING PRINCIPLES

The context and demand should be the guiding principles when identifying the best tactics and tools in a given context.

- Closely analyse the learning environment in the local context.
- Start with the problem/need identified by or co-identified with the target group, rather than the (technical) solution.
- Understand the full range of challenges not only in the classroom, but also in society as a whole and in the specific local context.

At the micro level, the first step must be to analyse the situation and identify the target groups for inclusion.

- How many learners face exclusion from the local mainstream educational system and for what reason?
- What digital tools and ICT infrastructure are currently being used by any of the stakeholders and thus are potentially available for educational purposes?

By consulting with all stakeholders to establish their view of the challenges and barriers, and by engaging in open dialogue with parents, carers, advocates, civil society organisations (e.g. disabled people's organisations) and educational staff, the appropriate technology measures for inclusion can be identified.

- Are teachers already ICT-literate or do they need basic ICT training?
- What measures can be taken immediately to allow for inclusion and where is further investment and planning needed?

PROCESS-BASED APPROACH

Focusing on processes rather than outcomes and incorporating the wider enabling environment in terms of actors, networks and contexts will be crucial for sustainable research, policy and project design.

- Focus on the objective (What is the challenge to be mastered?), rather than the technology.
- Think strategically, addressing all stakeholders with appropriated strategies, tactics, and means of communication.

INNOVATION - WHAT IS RELEVANT TO THE USER

Re-focus on local realities and needs as the point of departure and derive pertinent solutions (tools and tactics). Innovation should be seen as what is needed to bring measures into line with local reality rather than the latest technological hype.

STARTING POINT - LOCALLY ACCESSIBLE AND IN-USE (RELEVANT) TECHNOLOGY

Take as your point of departure locally accessible and technology that is already in use and thus relevant. ICT implementation is often prohibitively expensive for communities and schools with limited or no technical infrastructure.

- Public-private partnerships are one way to cut the costs of establishing technological infrastructure.
- Non-governmental organisations that have gained expertise in ICT, IE, or both, and are familiar with the local context can act as consultants, co-funders and advocates for targeted ICT4IE measures.

INCLUDE THE ENABLING ENVIRONMENT

Social inclusion of marginalised learners and ICT functionality both depend on political will and societal readiness.

- Ensure that support for inclusion is part of the political agenda at community, regional and national level such that educational institutions have the support they need to implement measures.
- Ensure sustainable policies – policy-makers are asked to invest in a lasting technical infrastructure that allows education practitioners and pedagogical staff to utilise ICT for the purposes of inclusion, while also benefiting society as a whole.
- Ensure ICT4IE policies and programmes are addressing direct and indirect target groups.

THINK SUSTAINABLY

- Use open source and freely available solutions.
- Invest and help to improve what is already available.
- Provide teacher training, technical training and technical maintenance.
- Policy-level involvement (adding ICT and inclusion to the curriculum)
- Teachers should receive regular training and support for both ICT and inclusive education to enable them to develop the curriculum to respond to the specific needs of their students.

NOTES

[1] Learning [whether through instruction, guide of activity or self-directed learning]; teaching [which can include mentoring and all non-instructivist activities around the deliberate nurturing of knowledge]; assessment [may be any combination of summative, formative and/or diagnostic]; accreditation [can include recognizing learner or educator accomplishment]; policy-making [at any level of education or governance where this influences curriculum, funding, and procedure]; administration [dealing with recruitment, admission, retention, progression, graduation, timetabling, etc.] (Open Education Working Group, 2014).

[2] UNESCO website 'ICT in Education'. (http://en.unesco.org/themes/ict-education)

[3] UNESCO (2009). Policy Guidelines on Inclusion in Education. UNESCO: Paris. http://unesdoc.unesco.org/images/0017/001778/177849e.pdf, p. 10

[4] Various methods enable such an approach, of which one is co-creation. Co-creation aims to bring together various parties in order to collaboratively develop a result that is relevant to and thus supported by all stakeholders. Co-creation is an iterative process of new approaches that ensures all users will receive a product or programme that is truly serving their needs. In principle, co-creation is about developing solutions together with and for all stakeholders.

[5] See here for an interesting post on information asymmetries – the essence of asking the user: http://blogs.worldbank.org/edutech/innovation-edges

[6] See Annex 1 for global access and education realities

[7] Trucano, M.(2015b). Key themes in national educational technology policies. EduTech A World Bank Blog on ICTs in Education. (http://blogs.worldbank.org/edutech/key-themes-national-educational-technology-policies)

[8] See http://www.uis.unesco.org/Library/Documents/ICT_Guide_EN_v19_reprintwc.pdf for a more comprehensive set of internationally comparable indicators on the use of ICT in education.

[9] UNESCO Institute for Statistics (2009). GUIDE TO MEASURING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) IN EDUCATION (Technical Paper No. 2). UNESCO, Montreal. (http://www.uis.unesco.org/Library/Documents/ICT_Guide_EN_v19_reprintwc.pdf)

[10] Avvisati (2015) and OECD (2015). Students, Computers and Learning: Making the Connection, PISA, OECD Publishing, Paris. DOI (http://dx.doi.org/10.1787/9789264239555-en)

[11] The World Bank (2016) states that practises of 'introducing hardware-centric educational technology projects conceived in highly developed environments into less developed places without sufficient attention to local contexts' too often remain without success; p.146

[12] UNESCO Institute for Statistics (2009).GUIDE TO MEASURING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) IN EDUCATION (Technical Paper No. 2). UNESCO, Montreal. (http://www.uis.unesco.org/Library/Documents/ICT_Guide_EN_v19_reprintwc.pdf)

[13] For full study see http://saber.worldbank.org/index.cfm?indx=8&tb=10

[14] For a full elaboration on the themes see http://blogs.worldbank.org/edutech/key-themes-national-educational-technology-policies

[15] UNESCO (2015). EDUCATION FOR ALL 2000-2015: Achievements and challenges. Paris: UNESCO. (http://unesdoc.unesco.org/images/0023/002322/232205e.pdf)

[16] See: Education 2030 Incheon Declaration – Towards inclusive and equitable quality education and lifelong learning for all (http://www.uis.unesco.org/Education/Documents/education_2030_incheon_declaration_en.pdf)

[17] UNESCO (2010). ICT FOR INCLUSION: REACHING MORE STUDENTS MORE EFFECTIVELY. (http://iite.unesco.org/files/policy_briefs/pdf/en/ict_for_inclusion.pdf)

[18] Zero Project Report 2016 on Inclusive Education and ICT (http://zeroproject.org/wp-content/uploads/2016/02/ZeroProjectReport_2016_barrierfree.pdf)

[19] see also Policy Brief on Accessibility

[20] – UNICEF (2014). Principles for Innovation and Technology in Development. (http://www.unicef.org/innovation/innovation_73239.html)
– United Nations Human Rights Office of the High Commissioner, n.d. Convention on the Rights of Persons with Disabilities (http://www.ohchr.org/EN/HRBodies/CRPD/Pages/ConventionRightsPersonsWithDisabilities.aspx#24)
– Watkins, A., Leblois, A. (2014). Model policy for inclusive ICTs in education for persons with disabilities. UNESCO: Paris. (http://unesdoc.unesco.org/images/0022/002272/227229e.pdf)

[21] UNESCO 2014, p. 12

[22] See more on accessibility: http://www.e-accessibilitytoolkit.org/toolkit/eaccessibility_basics/basic_accessibility_principles

[23] Check: Report Web Accessibility Policy Making: An International Perspective (Revised Edition 2012) - See more at: http://www.g3ict.org/resource_center/publications_and_reports/p/productCategory_whitepapers/subCat_0/id_150#sthash.kdVShHlu.dpuf

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[24] G3ICT (2016). Accessibility Worldview by G3ict – An Information Service for Global ICT Companies. (http://g3ict.org/resource_center/g3ict_accessibility_worldview_information_service#accessibilityworldview)

[25] See page 10: 'Access to appropriate ICTs in education is hindered by: physical barriers when inclusive ICTs and learning environments, content and materials are not accessible; cognitive barriers for some learners with intellectual disabilities or specific learning problems; content barriers that may occur when the operating language of a device or software is not the same as a learner's mother tongue; didactical barriers where learning is inflexible and teachers lack the skills to facilitate inclusive education; and financial barriers relating to the cost of devices, hardware and software.'

[26] Leblois et al (2013). The ICT OPPORTUNITY FOR A DISABILITY-INCLUSIVE DEVELOPMENT FRAMEWORK, Synthesis report of the ICT Consultation in support of the High Level Meeting on Disability and Development of the sixty-eighth session of the United Nations General Assembly. (https://www.itu.int/en/action/accessibility/Documents/The%20ICT%20Opportunity%20for%20a%20Disability_Inclusive%20Development%20Framework.pdf)

[27] World Bank 2016, p. 147

[28] – The World Bank Group (2016). World Development Report 2016 – Digital Divides. The World Bank Group: Washington DC. (http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2016/01/13/090224b08405ea05/2_0/Rendered/PDF/World0developm-0000digital0dividends.pdf)
– UNESCO (2009). Policy Guidelines on Inclusion in Education. UNESCO: Paris. (http://unesdoc.unesco.org/images/0017/001778/177849e.pdf)

[29] Starting in the late 2000s, several large donors and multilateral organisations began discussing failures in ICT4D. First results culminated in the UNICEF Innovation Principles, eventually leading to 500 individuals who together represented over 100 national and supranational stakeholders establishing the Principles for Digital Development Working Group.

[30] Waugaman, A. (2016). FROM PRINCIPLE TO PRACTICE: Implementing the Principles for Digital Development. The Principles for Digital Development Working Group. (http://digitalprinciples.org/wp-content/uploads/2016/03/From_Principle_to_Practice_v4.pdf)

[31] See blog post by Frances Sibbet, 'Putting digital principles into practice in our aid programmes,' https://dfid.blog.gov.uk/2015/11/10/putting-digital-principles-in¬to-practice-in-our-aid-programmes/

[32] World Education Forum (2015): http://www.uis.unesco.org/Education/Documents/education_2030_incheon_declaration_en.pdf

[33] See The UN General Assembly (2015): Transforming our world: the 2030 Agenda for Sustainable Development. United Nations. p.8 (http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)

[34] The concept of UDL originally evolved from the architectural universal design approach for accessible buildings and city planning (see Policy Brief on Accessibility), supplemented with pedagogical research and cognitive neuroscience in particular (Rose, DH., Meyer, A, 2002). Universal Design has been applied to educational products ranging from hardware and software to textbooks and learning equipment. It has also been applied for learning environments, such as classrooms, libraries and distance learning courses.

[35] Meyer, A. et al. (2014): Universal design for learning: Theory and Practice. Wakefield, MA: CAST Professional Publishing. (http://udltheorypractice.cast.org/); Katz, J (2013). THE THREE-BLOCK MODEL OF UNIVERSAL DESIGN FOR LEARNING IMPLEMENTATION IN A HIGH SCHOOL. CJEAP, 141.

[36] Watkins, A., Leblois, A. (2014). Model policy for inclusive ICTs in education for persons with disabilities. UNESCO: Paris. (http://unesdoc.unesco.org/images/0022/002272/227229e.pdf)

[37] United Nations Human Rights Office of the High Commissioner, n.d. Convention on the Rights of Persons with Disabilities: (http://www.ohchr.org/EN/HRBodies/CRPD/Pages/ConventionRightsPersonsWithDisabilities.aspx#24)

[38] http://digitalprinciples.org/

[39] http://universaldesign.ie/Technology-ICT/Universal-Design-for-ICT/

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LIST OF FIGURES