Information and Communication Technology for Inclusion

Developments and Opportunities for European Countries

EUROPEAN AGENCY
for Special Needs and Inclusive Education

INFORMATION AND COMMUNICATION TECHNOLOGY FOR INCLUSION

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European Agency for Development in Special Needs Education

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FOREWORD

Information and Communication Technology (ICT) is now part of everyday life for many people. It has an impact on many aspects of society, including education, training and employment, but in particular, is a valuable tool for people with disabilities and special needs. ICT's potential for improving quality of life, reducing social exclusion and increasing participation is internationally recognised, as are the social, economic and political barriers that inaccessible ICT can create (World Summit on the Information Society, 2010).

Within today's information and knowledge society, learners with disabilities and special educational needs are among the groups most likely to encounter barriers to accessing and using ICT. This is a key argument within the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) which mandates Convention signatories to '… promote access for persons with disabilities to new information and communications technologies and systems, including the Internet' (2006, Article 9).

The essential purpose of using ICT in education for learners with disabilities and special needs is to promote equity in educational opportunities: 'the use of ICT is not an end in itself; rather it is a means of supporting individual people's learning opportunities' (United Nations Educational, Scientific and Cultural Organization Institute for Information Technologies in Education and European Agency for Development in Special Needs Education, 2011).

The European Agency for Development in Special Needs Education (the Agency) has previously been involved in two major activities relating to the use of ICT in education. The first was the *Information Communication Technology in Special Needs Education* project that ran from 1999 to 2001 and involved 17 Agency member countries. The second was a practice review on the use of *ICTs in Education for People with Disabilities*, conducted in 2010/2011 jointly with the United Nations Educational, Scientific and Cultural Organization Institute for Information Technologies in Education (UNESCO IITE).

In 2011, Agency member countries put forward ICT for Inclusion (ICT4I) as a topic for investigation during 2012 and 2013. Agency country representatives agreed that the project would focus upon the use of ICT to support inclusion in educational settings. This report presents the main findings and conclusions emerging from this work.

The ICT4I project is based upon contributions from: Belgium (Flemish speaking community), Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Sweden, Switzerland, UK (England), UK (Northern Ireland) and UK (Scotland).

Agency Representative Board members and National Co-ordinators conducted all the information collection activities via their established country networks. The Agency wishes to acknowledge their invaluable contributions to the development of the project findings and final project outputs, all of which can be downloaded from the project web area: http://www.european-agency.org/agency-projects/ict4i

Cor Meijer, Director, European Agency for Development in Special Needs Education

EXECUTIVE SUMMARY

This report presents the main findings from the Agency *Information and Communication Technology for Inclusion* (ICT4I) project and draws upon all sources of project information developed during project activities. The report attempts to identify the critical factors that underpin the effective use of information and communication technology (ICT) in inclusive settings for all learners, but pays specific attention to learners with disabilities and special educational needs.

The project's main target group is decision-makers working within inclusive education. This target group includes national and regional level policy-makers for ICT in education and/or inclusive education, as well as school leaders and ICT specialists who support schools in their work.

The report considers the challenges faced in using ICT in inclusive settings. It also discusses developments in the field and the ways that ICT can be used to support all learners, especially those with disabilities and special educational needs.

Annex 1 presents a glossary of key terms used in the report. Annex 2 presents sources of further, more detailed information gathered during the project.

Five key propositions linked to the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD, 2006) have been used as the main themes for the overall project information collection and analysis:

1. ICT should be considered as a key tool for promoting equity in educational opportunities.
2. Access to appropriate ICT should be considered an entitlement.
3. Training of educational staff in the use of general and specialist ICT must be considered a priority area.
4. The promotion of ICT research and development requires a multi-stakeholder approach.
5. Data collection and monitoring in the use of ICT in inclusion should be considered an area requiring attention at all levels of educational provision.

The project analysis has identified critical policy issues linked to each of the five thematic areas, as well as specific factors impacting upon these policy issues. The critical issues for each of the thematic areas are:

- bridging the digital divide in order to ensure all learners benefit from ICT as a tool for their learning;
- ICT4I must be seen as a cross-sectoral issue and be considered and visible in all relevant policy fields;
- the availability and take-up of comprehensive and integrated pathways of teacher training in ICT4I is a vital 'pre-condition' for any ICT4I initiative;
- the perceived gap between ICT4I-related research findings and evidence and classroom practice;
- the challenge of making meaningful data – both qualitative and quantitative – available for monitoring and informing policy and practice in ICT4I.

The findings from the ICT4I project suggest that the most successful programmes and strategic initiatives usually consider access, entitlements, training, research and monitoring.

A wide range of developments relating to ICT in education generally and ICT4I specifically have been identified through the ICT4I project activities. These developments have already had a positive impact on ICT4I, or will potentially have a positive impact in the future. Specific developments and opportunities can be identified in the following areas:

- legislation and policy focussing upon rights and entitlements;
- ensuring an accessible and sustainable ICT4I infrastructure;
- improving professional training for ICT4I;
- empowering schools to use ICT as an effective tool for learning;
- developing communities of practice in ICT4I;
- empowering learners through their use of ICT.

These areas clearly map onto four of the UNCRPD (2006) propositions examined within the ICT4I project. However, the area of data collection and monitoring currently receives less emphasis in European countries. In response to this, a framework for monitoring key aspects of ICT4I policy has been proposed (presented in Annex 3 of the report).

The 2013 *Communication from the Commission* suggests that:

> *In addition to broadening access to education, wider use of new technology and open educational resources can contribute to alleviating costs for educational institutions and for students, especially among disadvantaged groups. This equity impact requires, however, sustained investment in educational infrastructures and human resources* (European Commission, 2013a, p. 3).

The findings of the ICT4I project suggest that for this equity impact to be achieved one other requirement must also be fulfilled – the ICT infrastructure must be genuinely accessible, based upon universal design principles. Open-access educational resources will only be truly open if they are designed to be accessible for all learners.

Emerging technologies present clear challenges, but also huge opportunities for widening access and participation in inclusive education. These opportunities are in line with the call from the European Union (EU) to allow: ‘All individuals to learn, Anywhere, Anytime, through Any device, with the support of Anyone’ (European Commission, 2013a, p. 3).

The effective use of ICT to support learning exemplifies good teaching for all learners. However, ICT4I requires a new pedagogy that uses ICT to empower all learners to make decisions about their learning and implement their decisions. ICT4I challenges all policy-makers and practitioners to adapt their thinking and then their ways of working in order to remove barriers and enable all learners to benefit from the educational opportunities that widely available, affordable, accessible ICT can offer.

1. EXAMINING ICT4I IN EUROPEAN COUNTRIES

This report presents the main findings from the Agency *Information and Communication Technology for Inclusion* (ICT4I) project and draws upon all sources of information developed during project activities. The report attempts to identify the critical factors that underpin the effective use of information and communication technology (ICT) in inclusive settings for all learners, but pays specific attention to learners with disabilities and special educational needs.

The aim of this report is to identify specific findings that will inform the work of decision-makers working within inclusive education. This target group includes national and regional level policy-makers for ICT in education and/or inclusive education, school leaders and ICT specialists who support schools in their work. However, the information and final project findings and outputs aim to be of interest to a wider audience, in particular specialist ICT support professionals working in the field of ICT for inclusion.

Annex 1 presents a glossary of key terms used in the report. A number of other project outputs accompany this report, including country reports on ICT4I, a review of European and international policy for ICT4I, a review of research literature and web-based tools presenting resources and examples of innovative practice in ICT4I. These are described in Annex 2: Further Information.

The report considers the challenges faced in using ICT in inclusive settings. It also discusses developments in the field and the ways that ICT can be used to support all learners, especially those with disabilities and special educational needs.

During initial project planning discussions, Agency country representatives identified three main areas for consideration in the ICT4I project. These included:

- providing an update on developments in countries since the 2001 Agency project on *ICT in Special Needs Education*;
- presenting current information on participating countries' policy and practice in using ICT to support learning and teaching in inclusive settings;
- building upon the main conclusions of the *ICTs in Education for People with Disabilities* practice review conducted jointly with the UNESCO Institute for Information Technologies in Education in 2010/2011 (UNESCO IITE and the Agency, 2011).

Information on these three areas was collected during 2012/2013 via a country survey and the project team conducted parallel desktop research. More details on the specific activities conducted during the project can be found in the overview of the project methodology (http://www.european-agency.org/agency-projects/ict4i/project-framework-and-methodology).

The findings presented here draw upon all project information sources. However, this document does not directly cite or reference specific country information, policy and research reviews, or policy/practice examples. All details of the specific evidence underpinning the project findings are presented in full in the extended electronic version of this report (available from: http://www.european-agency.org/agency-projects/ict4i/).

This e-publication (available in English only) uses this short report as a basis. It contains all key messages presented in this document, cross-referenced and directly hyperlinked to

the original sources of project evidence and/or examples of country policy or practice that are available on the project web area.

1.1 Rationale for the ICT4I project focus

The rationale for the ICT4I project is to provide an update on developments in member countries since the 2001 Agency work and to build on the main conclusions of the joint practice review on the use of ICTs in education for people with disabilities.

The project also provides information on current policy and practice in ICT for inclusion in the participating countries – Belgium (Flemish speaking community), Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Sweden, Switzerland, UK (England), UK (Northern Ireland), and UK (Scotland).

The practice review on the use of ICTs in education for people with disabilities focussed on the use of ICT as a policy imperative for all countries that have ratified the UNCRPD and optional protocol.

The Preamble to the UNCRPD recognises:

> … *the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling persons with disabilities to fully enjoy all human rights and fundamental freedoms* (United Nations, 2006, p. 1).

In addition, a number of general obligations, specific measures and articles relate to the importance of ICT for people with disabilities. These are described in full in the project policy review (available from: http://www.european-agency.org/agency-projects/ict4i/ict-for-inclusion-documents/policy-supporting-ict-for-inclusion.pdf).

Article 9 of the UNCRPD, on Accessibility, requires that obstacles and barriers to accessibility be identified and eliminated in all possible aspects of the life of a person with disabilities. This includes all formal and informal educational opportunities.

Two articles describing specific rights for people with disabilities also underpin discussions regarding the use of ICT in inclusive settings: Article 21: Freedom of expression and opinion, and access to information; and Article 24: Education, which includes the right to education, access to an inclusive education system at all levels and lifelong learning that offers reasonable accommodation to meet individual needs.

Furthermore, Article 26, focussing upon rehabilitation and health issues, and Article 29, focussing upon participation in political and public life, each refer to the importance of availability of assistive devices and new technologies.

The practice review on the use of ICTs in education for people with disabilities helped to identify five key themes within the UNCRPD in relation to the use of ICT in education: the *promotion of equity in educational opportunities at all levels* of lifelong learning; *access to appropriate ICT*, including assistive technologies to allow learners to reach their full potential; the importance of *training of educational staff* to make use of ICT in educational settings; *the promotion of research and development* into the availability and use of new ICT; and the *need for systematic data collection* to identify and then monitor the implementation of minimum standards for ICT in education for people with disabilities.

These themes were used as the basis for developing five key propositions for the ICT4I project:

1. ICT should be considered as a key tool for promoting equity in educational opportunities;
2. access to appropriate ICT should be considered an entitlement;
3. training of educational staff in the use of general and specialist ICT must be considered a priority area;
4. the promotion of ICT research and development requires a multi-stakeholder approach;
5. data collection and monitoring in the use of ICT in inclusion should be considered an area requiring attention at all levels of educational provision.

These five propositions served as a framework for the overall project information collection and analysis.

1.2 Concepts underpinning ICT4I

Within the ICT4I project, UNESCO's definition of inclusive education has been used. In this definition, inclusive education is:

> *an on-going process aimed at offering quality education for all while respecting diversity and the different needs and abilities, characteristics and learning expectations of the students and communities, eliminating all forms of discrimination* (United Nations Educational, Scientific and Cultural Organization/International Bureau of Education, 2008, p. 3).

Building upon this, an *inclusive education setting* is where a learner with a disability or special educational need follows education in a mainstream class with their non-disabled peers for the largest part of the school week.

The ICT4I project focuses on the use of *ICT to support learning opportunities for all learners,* but in particular learners who may be vulnerable to exclusion from educational opportunities, including those with disabilities or recognised as having special educational needs.

The UNCRPD defines a person with a disability as:

> … *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* (United Nations, 2006, p. 5).

Within the project, the term *learners with disabilities and special educational needs* is used. This terminology is used in recognition of the fact that in many European countries, learners with disabilities are one group of learners who may be legally recognised as having special educational needs, but other groups of learners may also be recognised under country legislation. The concept of special educational needs (SEN) is used to describe those learners who face either temporary or long-term barriers to learning and who do not make the same level of progress as their peers. Learners with SEN are therefore a wider group than those with disabilities and it is estimated in many countries that at any one time they may represent up to 20% of the school age population (European Agency, 2012a).

ICT for inclusion includes the use of any technology to support learning in inclusive settings. Such technology may include *mainstream technology* commercially available to anyone, such as laptops, tablets and peripherals, whiteboards and mobile phones, etc. It

may also include *assistive technologies* (AT) that compensate for a learner's particular difficulties or limitations in gaining access to ICT. AT may include medical aids (for example, mobility devices, aids to supporting hearing, etc.) and also learning aids, such as screen readers, alternative keyboards, augmentative and alternative communication devices and other specialised applications of technology.

While the project has focussed on the use of ICT to support inclusive education, *ICT is used in both special and inclusive educational settings*. Information provided by many of the participating countries and used to prepare this report often covers the use of mainstream ICT and specific AT in both inclusive and segregated settings.

Within the project ICT4I has been examined as an *eco-system* with two aspects:

- a *wide community of stakeholders,* including learners (with and without disabilities and special educational needs), parents and families, teachers, school leaders and teams, support professionals and IT professionals;
- *essential components within the ICT4I environment*, covering IT infrastructure, accessible mainstream ICT, assistive technology (AT) and accessible digital learning materials.

Examining the interactions between these stakeholders and environmental components is critical to understanding ICT4I as an overall system that has the potential to impact positively or negatively on the educational experiences of learners with disabilities and special educational needs.

2. IMPLEMENTING ICT4I

The International Telecommunication Union (ITU, 2013a) global survey on the use of ICT as an opportunity for disability-inclusive development, identifies a number of crucial policy challenges for the use of ICT in education:

- the extent of policy implementation and/or effective implementation strategies;
- access to ICT generally;
- the existence of policies that foster widespread availability of accessible ICT;
- the cost of assistive technologies;
- the availability of accessibility options within mainstream ICT devices.

This situation is reflected in the *Communication from the Commission*, which argues that:

> ***EU education is failing to keep pace with the digital society and economy****… Digital technologies are fully embedded in the way people interact, work and trade; yet they are not being fully exploited in education and training systems across Europe … 63% of nine year olds do not study at a 'highly digitally-equipped school' (with appropriate equipment, fast broadband and high 'connectivity'). While 70% of teachers in the EU recognize the importance of training in digital-supported ways of teaching and learning, only 20-25% of students are taught by digitally confident and supportive teachers. Most teachers use Information and Communication Technologies (ICT) mainly to prepare their teaching, rather than to work with students during lessons.* (European Commission, 2013a, p. 2).

These policy challenges are reflected in the overall project findings and the next section examines the related critical policy issues in more detail.

2.1 Policy issues relating to the key propositions underpinning ICT4I

For each of the five themes considered in the ICT4I project (and outlined in section 1.1), critical policy issues have been identified. These issues are discussed in the sections below.

A number of factors that impact on each policy issue are apparent. The presence or absence of these factors may have the following consequences:

- *If the factor is missing* from the ICT4I policy and practice system, then it reinforces the potential negative effects of the policy issue in question.
- *If the factor is present*, it addresses and reduces the potential negative effects of that policy issue.

2.1.1 ICT as a tool for promoting equity in educational opportunities

ICT is now widely recognised – by policy- and decision-makers, teachers, parents and learners themselves – as a flexible tool to support learning. The critical issue in promoting equity is ***bridging the digital divide, ensuring that all learners benefit from ICT as a tool for their learning****.*

The digital divide can be understood to encompass issues around the lack of availability of suitable ICT, unacceptable costs and technology affordability and/or limited accessibility features within ICT. Strategic action plans for ICT4I that take the issues of availability,

affordability and accessibility into full account are key factors in relation to addressing the digital divide.

Within the wider education system, the following factors impact upon the digital divide:

- digital literacy as a core competence that is compulsory for all teachers and learners and leads to recognised forms of ICT accreditation;
- ICT as a compulsory subject in the school curricula;
- ICT embedded in initial and in-service teacher training.

At the school level, it is important that school policies describe the actions they will take in relation to ICT in education. The following points are critical:

- the flexibility to allow schools to self-assess and then act upon their ICT hardware and software needs;
- the ability of schools to assess learners' ICT needs and preferences;
- the ability of schools to produce accessible digital learning content.

Finally, the way in which ICT is used as a tool to facilitate communication and co-operation within groups of learners, parents, teachers and professionals and also between these groups is important. However, the most significant factor in bridging the digital divide is the positive commitment of all stakeholders in education to using ICT to support all learners.

2.1.2 Access to appropriate ICT as an entitlement

ICT4I potentially covers many different policy sectors – national IT strategies, disability/anti-discrimination legislation, health/rehabilitation legislation, general and inclusive education, ICT in education. In terms of access as an entitlement, the critical issue is that **ICT4I must be seen as a cross-sectoral issue and be visible in all relevant policy fields.**

Another critical issue is how easily end users – learners and their families – are able to 'navigate' policy and procedures in order to access the support they require. The availability of accessible ICT for personal use in different formal and non-formal learning and social situations is a crucial factor for many learners and their families, as is the provision of support for learners to acquire the skills needed to use ICT in different ways.

Two important factors in supporting end users and schools in accessing appropriate and accessible ICT are:

- designated focal points with responsibility for monitoring ICT4I provision;
- networks of ICT4I support services to meet local level needs.

The rise of open-access digital materials that teachers can access as they need offers great potential. However, teachers must be supported in adapting such materials and making them accessible for all learners.

Access to appropriate ICT is an important first step for learners, but its appropriate use in the short and long term requires all stakeholders in the ICT4I eco-system to follow and apply accessibility criteria to the development of all hardware, software and learning materials. A widespread recognition of the fact that ICT4I is about all learners' entitlements must be linked to efforts to maximise the accessibility of all mainstream technology, enabling all learners to assess and accommodate their own ICT preferences.

2.1.3 Training of educational staff in the use of general and specialist ICT

All teachers require competences in general pedagogy, inclusive education, ICT and ICT4I, so ICT4I training for teachers must be considered in a cross-sectoral way. **The availability and take-up of comprehensive and integrated pathways of teacher training in ICT4I is a vital 'pre-condition' for any ICT4I initiative.**

A crucial factor is the availability of training pathways from initial teacher education through to specialist continuous professional development opportunities that support the development of general ICT and specific ICT4I competences for all teachers.

In addressing inequalities in access, the involvement of a wide range of partners in providing ICT4I training – higher education institutions (HEIs), specialist non-governmental organisations (NGOs), specialist support network staff – is an important factor. In all settings, ICT should also be used as a tool for delivering training in more flexible and effective ways with possibilities for teachers to identify and accommodate their own ICT4I training needs.

2.1.4 The promotion of ICT research and development

A policy issue facing all countries is **the gap between ICT4I-related research findings and evidence and classroom practice.**

Research into ICT4I can be a key tool for driving developments, but the focus of this research and the way it is conducted are critical if the theory-practice gap is to be closed.

Systematic research into the effective use of ICT for all learners, their families and the teachers who support them is useful in informing schools' work. However, for such research to have maximal impact, widespread stakeholder involvement is needed with partners from the IT industry, HEIs, NGOs and support services, etc., all contributing to research activities.

Crucially, end users – learners and their families and the professionals who work with them, teachers and school teams – must be actively involved as partners in research. Such research initiatives are likely to have most effect upon the work of schools in the short and long term.

To enable small-scale research projects to have wider impact, key findings and evidence from pilot initiatives must be shared and then implemented in other schools, regions, etc.

2.1.5 Data collection and monitoring the use of ICT

The availability of data – both qualitative and quantitative – for monitoring and informing policy and practice in ICT4I appears to pose challenges for many countries.

Only one country involved in the ICT4I project reported that there was systematic data collection relating to ICT4I at the national level. The majority of countries (just over 50%) reported data collection for monitoring ICT in education usage linked to specific programmes or initiatives, some of which do focus on ICT4I. However, far fewer countries (less that 30%) described national level systematic data collection for monitoring the use of ICT in education generally, while nearly a quarter of the countries involved in the project reported there was no formal data collection or monitoring of ICT use in education.

Despite international requirements for data that can be used for monitoring this field (i.e. the UNCRPD, 2006) and EU level initiatives promoting monitoring of national level

developments (e.g. the Digital Agenda Scoreboard), there appears to be a need for information that informs policy and practice in relation to monitoring:

- rights in terms of access and entitlements to the provision of appropriate support;
- effectiveness in terms of the whole ICT4I system, as well as effectiveness of key elements within it (i.e. the training of professionals).

Meaningful data in this area would effectively provide policy-makers and practitioners with information on learning outcomes, as well as inform them about the status of key areas of access, entitlement, training and research as well as challenges, progress and developments. Section 3.4 returns to this issue.

2.2 Integrated initiatives as a response to policy challenges

The 2013 *Communication from the Commission* suggests that:

> *Today's learners expect more personalization, collaboration and better links between formal and informal learning much of it being possible through digital-supported learning. However, between 50% and 80% of students in the EU never use digital textbooks, exercise software, broadcasts/podcasts, simulations or learning games. The EU lacks a critical mass of good quality educational content and applications in specific subjects and multiple languages as well as connected devices for all students and teachers. A new digital divide in the EU, between those who have access to innovative, technology-based education and those who do not, is on the rise as a consequence of this fragmentation of approaches and of markets*. (European Commission, 2013a, p. 2).

The findings from the ICT4I project suggest that the specific programmes and strategic initiatives that are reported to have had positive effects in addressing key policy challenges linked to ICT4I most often consider all five project themes: access, entitlement, training, research and monitoring.

The policy challenges of ICT4I cannot be addressed in isolation. A systemic approach that takes all aspects of policy and practice into account in a co-ordinated and coherent way is necessary at national, regional and school levels.

3. RECENT DEVELOPMENTS AND FUTURE OPPORTUNITIES

It would be hard to over estimate developments in terms of rates of change or impact of information and communication technology since 2001. Sachs (2013) suggests that the information age is based on the fact that in the past decade, the technological capability to store and process data has doubled every two years due to microchip developments. This doubling effect will continue and will increasingly be linked to reduced costs in technological hardware and software.

The International Telecommunication Union (ITU, 2013b) estimates that 2.7 billion people – 40% of the world population – are on-line and 750 million households are connected to the internet. Between 2008 and 2012, fixed broadband prices have dropped by over 80% and there are now 2 billion mobile broadband subscriptions, but with 6.8 billion mobile/cellular subscriptions globally, this figure will rise. The ITU (2012) cites global research on the impact of broadband expansion and penetration on countries' economies, estimating that a 10% increase in national level broadband infrastructure expenditure leads to increases in GDP growth of between 0.25 and 1%.

The European Commission (2013b) reports that most European schools are internet-connected at least at a basic level (i.e. with a website, email for learners and teachers, a local area network, or virtual learning environment). In the countries that responded to the 2013 EU schools benchmarking survey, more than 90% of learners are in schools with broadband (offering between 2 and 30 Mbps on average).

In 2001, few professionals had heard of broadband; social networking was in its infancy and mobile computing was for a minority. Since 2001, the internet has become 'normalised' and commentators now refer to the rise of 'digital natives' – individuals who not only use personal technology to not only access information, but also personalise and use it for their own purposes in flexible ways.

This section will review the main findings and recommendations of the 2001 study, consider how far these findings are still current and then outline the future trends and developments that have been highlighted through the ICT4I project activities.

3.1 Key messages from the 2001 study

The Agency 1999–2001 *Information and Communication Technology in Special Needs Education* project presented a framework of recommendations for policy and practice at that time. The report also presented a number of overall conclusions, all focussed upon the central stakeholders in ICT and special needs education (SNE) – learners with special educational needs and their teachers. A clear understanding of ICT in SNE users' educational and technological needs was seen as the basis for the policy and infrastructure of ICT provision.

One of the crucial debates at that time was the **application of 'inclusive by design' principles,** that consider a diverse range of user needs at the outset of hardware or software design rather than adapting an existing product at a later stage. The principle of 'inclusive by design' should therefore be applied during the planning, development, implementation and evaluation of all ICT policies, provision and practice.

In order to build inclusive information societies, the project recommended that educational approaches and appropriate technology to meet the requirements of all users, including those who have special educational needs, be developed. It argued that access to **appropriate ICT could reduce inequalities in education** and that ICT could be a

powerful tool in supporting educational inclusion. However**, inequalities in education** could also be reinforced by the **inappropriate or limited access to ICT** faced by some pupils, including those with special educational needs.

A further key message was that **the principles of information accessibility for all should be applied** to all current and future learning and curricula materials. However, for the principles of 'inclusive by design' and accessible information to be achieved, **extended co-operation between stakeholders and more flexible forms of support for different groups** were required.

Finally, the argument for **a shift in focus of ICT in SNE policies and programmes** was presented. Previously the emphasis had been upon establishing the means (infrastructure in terms of equipment and expertise) to enable ICT to be effectively applied in SNE settings. The evidence from the 2001 study suggested that practitioners in the field were asking for the emphasis to be changed to the aims and goals of using ICT in SNE. Significantly, this shift in emphasis centred attention upon **using ICT to learn in different ways rather than merely learning to use ICT in different contexts**. ICT is only truly included in the curriculum for pupils with special educational needs when its full potential as a tool for learning is understood.

With the potential exception of the call for 'inclusive by design' approaches, the majority of the findings from the 2001 study did not call for new types of technological hardware or software. The main conclusions focussed upon the policy and practice issues surrounding access to and the application of existing technology for learning. The evidence from the ICT4I project suggests that these access and application issues are still relevant and require consideration within the current educational contexts of most European countries.

3.2 Policy and practice developments positively impacting upon ICT4I

A wide range of developments relating to ICT in education generally and ICT4I specifically can be identified through the ICT4I project activities. These developments are perceived as either already having had a positive impact on ICT4I, or as presenting opportunities for positive impact in the future. The developments can be grouped around six key areas of ICT4I policy and practice – legislation and policy; ICT infrastructure; training of professionals; empowering schools; communities of practice and empowering learners. These issues are highly inter-related and must be seen as facets of the ICT system that all require equal consideration when examining ICT4I policy and practice.

Specific developments covering these areas are presented below.

3.2.1 Legislation and policy focussing upon rights and entitlements

Comprehensive legislation – in line with European directives and the UNCRPD (2006) – that details rights for learners with disabilities and special educational needs, as well as entitlements to ICT, is acknowledged as a critical factor underpinning the development of all aspects of ICT4I. A number of key elements relating to legislation and policy that promotes rights and entitlement to ICT can be identified and these are described below.

ICT4I is a cross-sectoral issue that requires cross-referencing between different areas of legislation in order to ensure:

- that ICT4I is clearly visible as a horizontal issue in all relevant policies;
- that opportunities for cross-sector ICT4I initiatives (involving health, education bodies, etc.) are supported.

Consideration should be given to: national level IT strategy plans and programmes; disability legislation that specifies ICT entitlements; and general ICT in education policies and inclusive education policies.

The digital inclusion of all learners is the clear goal of legislation and policy that promotes rights and entitlements to ICT. Accessible and appropriate ICT is the necessary starting point for ensuring all learners have access to personalised learning opportunities using ICT. Specific factors to be considered within legislation include: equitable access to the information, skills, competences and equipment required by learners and the professionals that support them; entitlement to AT at school, home and during transition; AT assessment within formal SEN assessment procedures and structures; and monitoring mechanisms to ensure that entitlements are fulfilled.

Monitoring should focus on rights and entitlement issues and should ensure that inequalities in access to necessary ICT4I resources at regional or organisational levels are addressed. Monitoring should support the identification of approaches that are needed to respond to both national and local level needs.

Legislation and policy should outline and then lead to multi-faceted responses to ensuring digital access and inclusion for all learners. Long-term multi-level policy frameworks encompassing national, regional and organisational level action plans for ICT4I are necessary. Such action plans would be implemented in line with a national level co-ordination strategy to ensure that there is no overlap of efforts from different stakeholder groups or government entities.

National level ICT4I strategies require long-term financial support with the allocation of sufficient resources to enable continuous and cohesive access to an affordable, accessible ICT infrastructure. ICT4I action plans should be monitored in terms of their cost effectiveness in the short and long term.

Legislation and policy that promotes rights and entitlements to ICT necessarily involves end users and/or their representatives in decision-making processes. Policy frameworks and actions plans should be based upon multi-stakeholder discussion and agreement on roles and responsibilities. This stakeholder involvement should be accompanied by widespread and systematic awareness raising on the benefits of ICT4I for all learners, leading to a shared understanding among stakeholders that digital literacy is essential for long-term social participation, lifelong learning and employment.

Within all national, regional and organisational policies for ICT4I, key levers for promoting accessible ICT should be employed wherever possible. One such lever is public procurement. Public procurement at national, regional and organisational levels should incorporate accessibility as a criterion for use when obtaining ICT hardware, software and materials. Cross-sector protocols for accessible ICT provision can, in the short term, encourage IT developers and providers to apply universal design principles to their products and, in the longer term, contribute to ensuring all ICT in inclusive settings is accessible for any learner.

3.2.2 Ensuring an accessible and sustainable ICT4I infrastructure

An accessible ICT infrastructure provides the mainstream and specialist technology needed to meet all learners' needs. This means all components within the ICT4I infrastructure must be accessible. Three principles underpin the accessibility of any technology:

- Accessibility issues must be considered from the earliest point of the development process of any hardware or software.
- Accessibility is not just a technical issue; all aspects of design must be considered, including user interfaces and information layout.
- Support materials must provide relevant information on the technology's accessibility features and/or relevant technical specifications (after Becta, 2007).

The long-term sustainability of school level ICT infrastructures requires a number of policy actions to be implemented:

- develop schools' ICT infrastructure through capital investments in the short term;
- upgrade infrastructure to keep pace with and integrate with technological developments in the longer term;
- provide all learners with the necessary ICT and specialist AT for their personal use at home and school, during educational transition phases and in post-school placements;
- provide all teachers with the necessary IT for their personal use at home and school;
- support multi-stakeholder initiatives (e.g. public/private partnerships) for developing accessible ICT and learning materials to meet locally recognised needs.

3.2.3 Improving professional training for ICT4I

The implementation of an accessible ICT4I infrastructure is not possible without an associated programme of professional education and training. A widespread strategic programme of training will:

- consider the training requirements of all professionals in the ICT4I eco-system, including teachers, school leaders, ICT support personnel, web administrators and IT and media professionals;
- be based on an agreed framework of inter-related professional competences in ICT and inclusion required by all professionals;
- cover different phases of professional training – initial, in-service and specialist professional development – linked to increasing the development of competence in the use of ICT;
- provide suitable training to support the use of ICT by parents/families in the home situation.

ICT4I training opportunities need to raise all professionals' awareness of accessible ICT as an entitlement for learners with disabilities and SEN and ensure professionals' commitment to developing their own digital literacy, as well as the digital competences of all learners.

Training programmes should aim for minimum standards of competence for all professionals, but also provide specialised training pathways for ICT4I support professionals who will enable schools, teachers, parents and learners to use accessible ICT more effectively.

3.2.4 Empowering schools to use ICT as an effective tool for learning

Across Europe, there are increasing demands on schools to work in new ways using ICT. These pressures are arising as a result of:

- wider societal factors, such as rising unemployment and increased skill demands for future employees;
- rapid developments in ICT in education such as on-line learning and mobile learning tools;
- the emergence of individual knowledge creation and publication via social media;
- increasing expectations for active learner participation and personalised learning approaches in education.

If school team members are to view ICT as a natural tool for supporting access and participation of all learners, the school ethos and culture needs to positively promote ICT4I practice. The role and work of school leaders in this respect can be seen as a key lever for success. A school leader's understanding of, attitude towards and vision for ICT4I is crucial in ensuring that teachers are effectively supported in their work with learners.

A school leader's vision needs to be effectively communicated to the school teaching team and wider school community. School development and action plans should cover the role of ICT in supporting learning generally, as well as the role and perceived impact of ICT4I in supporting all learners, including those with disabilities and special educational needs.

School leaders themselves must be effectively supported in their ICT4I work and three factors appear crucial in this respect:

- the provision of professional development opportunities for school leaders, focussing upon inclusive education generally and ICT4I specifically;
- increased opportunities for school teams to access and/or purchase flexible mainstream ICT and specialist AT that meets the individual learning needs they have identified;
- the provision of more extensive and flexible ICT4I support services to schools.

Effective ICT4I support schools will centre on different ICT educational resource centres that are locally organised to offer support to clusters of schools. ICT resource centres are able to provide schools with general ICT as well as specialist ICT4I expertise via teams of multi-disciplinary staff. In particular, resource centres offer:

- practical support in developing school level ICT4I infrastructures;
- specific advice and information on using mainstream technology;
- access to specialist technology and AT;
- adapted curricula materials and accessible electronic learning materials;
- support and guidance in using ICT as a pedagogical tool for all learners;
- specific support on using ICT for personalised learning approaches and approaches that use universal design for learning principles;
- possibilities for interaction and communication between teachers and specialist IT professionals (web developers, publishers, etc.);

- possibilities for interaction and communication – often using ICT – with other teachers and school teams also working with ICT4I.

A final area for further development is teachers' access to adapted curricula materials. Real developments can be seen in the availability of adapted learning materials. However, not all learning materials are suitable for all learners. It is important that teachers have the possibility and the right to revise learning materials and adapt them to learners' particular special needs, as well as share them with colleagues who may also wish to use them.

3.2.5 Developing communities of practice in ICT4I

Schools increasingly need to work within wider learning communities – involving a wider range of partners and fostering formal and informal networks that support their practice. Caldwell (2009) suggests that informal sharing of different forms of knowledge within a network of various professionals can be termed a community of practice. Communities of practice connect stakeholders who share a common interest and encourage the sharing of ideas, practice examples and ways of working, as well as the identification of common problems and solutions. ICT is a key tool for fostering communication between members of communities of practice.

Communities of practice do not necessarily require 'external' inputs; they can be self-sustaining based on the community membership. However, the findings from the ICT4I project suggest that a school's ability to act as a community of practice in relation to ICT4I can be effectively enhanced when there are opportunities for inputs from two sources: examples of innovative practice from other schools and involvement in research and development activities.

The usefulness of examples of innovative ICT4I practice appears to increase with wider audiences when the following factors are considered:

- *The focus for the example* – this may be on ICT, but other aspects can be important and informative for school teams. Examples that consider key issues, such as problems encountered, attitudinal and personal factors, the self-confidence of users and teacher attitudes to IT, may help by providing information from other contexts.
- *Applying ICT to effective teaching* – such as assessment for learning, personalisation, etc. Such examples may focus on the use of ICT as a learning tool for all learners. Innovative examples often challenge ways of thinking about accessibility and end users, possible uses of ICT, expectations for learning achievements, etc.
- *The roles and contributions of different stakeholders in ICT4I*. Examples presenting models for new ways of working between learners, teachers, parents and other professionals can raise awareness of possibilities for working within and between school teams.
- *Innovative uses of ICT to support access and equity for learners*. This may involve examining new combinations of IT, or the innovative use of mainstream technology. For examples to inform equity issues, the work considered must be based on inclusive principles and support the learning of a wide range of learners. Examples that are focussed upon specialist approaches have value, but it is limited in scope. In the long term, the innovative examples with the most potential impact are those that inform mainstream ICT4I practice.

Opportunities for school teams to access research information and contribute to research and development activities can support a school's efforts to work as a community of

practice, and will also contribute to the development of more focussed practical research activities.

Schools require access to research findings exploring ICT4I and increasingly recognise the value of national or regional repositories of research evidence. This finding also links with the issue of access to innovative examples of practice: schools benefit from co-ordinated and coherent information sources that present ICT4I research findings, accessible learning materials and resources and annotated examples of innovative practice, etc.

It is recognised that more wide-scale research is needed on the impact of ICT for learning. Schools can potentially benefit from opportunities to be actively involved in research focussing upon ICT4I issues that affect their work. Such input into research activity will ultimately lead to more research evidence on how ICT4I can directly and effectively support the work of schools.

ICT resource centres are seen to have a key role to play in supporting the development of school-based communities of practice in ICT4I. ICT resource centres can act as focal points for:

- establishing and facilitating contact between different schools and then supporting schools to work in clusters on using ICT in inclusive education;
- encouraging schools that are innovative in their use of ICT to act as 'role models' and centres of excellence in ICT4I, supporting other schools in their use of ICT;
- sharing national and international innovative examples of ICT4I practice;
- developing links and networking between schools and the local and wider research communities.

However, collaborative initiatives between various school-based, resource centre and research teams require long-term commitments as regards funding, resourcing, implementation and evaluation. Such commitments often require the support of policy- and decision-makers for ICT4I and long-term efforts in this area need to be outlined in national and regional ICT4I policy and strategy plans.

3.2.6 Empowering learners through their use of ICT

The ultimate goal of using ICT in inclusive education is to enable all learners to be empowered to use ICT to support their own learning. For learners to be empowered via their use of ICT in learning situations, appropriate ICT needs to be available when it is required and be fit for purpose in meeting personal learning needs. ICT that is fit for purpose is not only concerned with the technology that is available for a learner to use; crucially, it also considers how the learner is supported to use it in the best ways to meet their individual needs.

All learners – including those with disabilities and special educational needs – need support from teachers and other professionals so they can progress from their initial use of ICT to eventually become confident users of ICT to support their own learning. This requires learners to acquire developmental competences in using ICT. It also requires teachers to use structured ICT needs assessment procedures that identify individual learners' functional needs for particular ICT tools. Learners can then be supported to assess and manage their personal ICT access and assistive technology preferences.

For ICT to be used as an effective tool for personalising learning, teachers need to have a clear understanding of ICT's potential for fostering learning to learn (meta-cognition) strategies and active learning approaches. Parents and guardians are key players in supporting personalised learning approaches and the development of strategies for actively involving them in their child's learning. Supporting the use of ICT as a tool for parental interaction and communication with the teachers is an important task for school teams.

Learners increasingly have access to a far wider range and variety of digital learning material, at school and often at home. As a result of this, three responsibilities are emerging for school teams:

- *Ensuring learners' ICT safe use* (also called e-safety). Learners with disabilities and special educational needs are potentially vulnerable to internet misuse (for example, cyber-bullying). In addition, vulnerable learners are often those who find it hardest to access help in the form of support, guidance or resources for their ICT usage. Ensuring learners' e-safety involves incorporating safe ICT use issues into the wider teaching of emotional, social and digital literacy with all learners from an early age.
- *Making all learning material compliant with accessibility standards*. This involves ensuring that accessibility is seen as everyone's concern and all producers and authors of learning materials are trained and equipped to produce accessible material.
- *Integrating digital learning strategies into effective assessment, planning and teaching strategies*. This involves using accessible ICT as a tool for facilitating and enhancing co-operative teaching and learning approaches, peer-tutoring, collaborative problem solving and heterogeneous grouping for learning activities.

The use of ICT to support Universal Design for Learning (UDL; see Center for Applied Special Technology, 2011) is increasingly attracting attention. UDL is an approach to using accessible ICT for individualising learning tools and opportunities in order to provide:

- *multiple means of representation* to give learners different ways of gaining information and knowledge;
- *multiple means of expression* to give learners alternative ways of demonstrating what they know;
- *multiple means of engagement* to gain learner interest, motivate them to learn and present learning challenges.

For ICT4I to be truly effective as a tool for supporting personalisation in learning, teachers, parents and wider school teams must have high expectations for the academic and social achievements of all learners. High expectations for all learners' achievements must underpin all aspects of policy and practice for ICT4I.

3.3 Future opportunities for ICT4I

The World Summit on the Information Society (WSIS) *+10 Review Event*, February 2013, debated the issue of the 'educational revolution' that is happening globally as a result of open access to learning opportunities via accessible ICT. The *Communication from the Commission* expands upon this idea and argues that:

> *The potential benefits of the digital revolution in education are multiple: individuals can easily seek and acquire knowledge from sources other than their teachers and institutions, often for free; new groups of learners can be reached because learning is no longer confined to specific classroom timetables or methods and can be personalised; new education providers emerge; teachers may easily share and create content with colleagues and learners from different countries; and a much wider range of educational resources can be accessed. Open technologies allow* ***All individuals to learn, Anywhere, Anytime, through Any device, with the support of Anyone***. (European Commission, 2013a, p. 3)

The findings of the ICT4I project certainly support these assertions. Emerging technologies present clear challenges, but also huge opportunities for widening access and participation in education.

The impact of Massive Open On-line Courses (MOOCs) upon education generally and inclusive education specifically is relatively unknown as yet. To ensure they achieve their full potential, MOOCs must be accessible in terms of their user interfaces and platforms, as well as material and content. However the potential for MOOCs to comply with accessibility standards – such as Web Content Accessibility Guidelines – and therefore open up access to learning opportunities to the widest range of learners is recognised.

Across Europe there are challenges in ensuring that all groups within the educational publishing eco-system follow recognised accessibility standards – from commercial publishers to individual classroom teachers. The potential for anyone to be a producer of learning material via ICT creates the need to ensure that everyone becomes a producer of *accessible* learning material.

Mandate 376: European Accessibility Requirements for Public Procurement of Products and Services in the ICT Domain is currently being revised and is due to be updated and adopted in January 2014. This document lists standards that should be included in all ICT procurement processes, including those covering the production of publicly funded educational material.

Opportunities can be seen in new developments within digital publishing; in particular in relation to EPUB3, which has in-built internationally recognised accessibility standards. E-publications developed by learners, teachers or commercial publishers using EPUB3 offer the potential for 'reading with eyes, ears or fingers' in an integrated way via synchronised text-to-speech and video options.

Access to a wider range of electronic resources, on-line information and content for teachers and learners provides numerous opportunities, but raises new issues for publishers relating to categorisation, tagging and meta data to make searching more efficient for users.

Arguably, the development of wireless-based cloud computing and mobile technology use in schools will lead to the greatest opportunity for change and development in teaching practice. However, the infrastructure for personalised 1-to-1 computing using mobile devices – for example via Bring Your Own Device (BYOD) initiatives – must be developed with the principles of universal design embedded from the outset. In addition, schools must be prepared for its introduction via specific training for teachers and other professionals and the provision of key skills and competences for learning via mobile ICT for all learners.

The 2013 *Communication from the Commission* suggests that:

> *In addition to broadening access to education, wider use of new technology and open educational resources can contribute to alleviating costs for educational institutions and for students, especially among disadvantaged groups. This equity impact requires, however, sustained investment in educational infrastructures and human resources.* (European Commission, 2013a, p. 3)

The findings of the ICT4I project suggest that, in order to achieve equity, the ICT infrastructure must be genuinely accessible, based upon universal design principles. Open-access educational resources will only be truly open if they are designed to be accessible for all learners.

Increasingly across European countries, all schools are required to follow wider public accessibility legislation and directives, with no exceptions. There has been extensive work on ICT accessibility standards in numerous different contexts. Many of these standards are directly applicable to different educational situations and contexts. However, there is a need for more guidance within IT and educational policies on applying these existing standards to the work of decision-makers, schools, teachers and the professionals who support them (European Agency, 2012b).

A potential challenge for future ICT4I policy implementation will be to monitor compliance with these standards in order to ensure that the rights and entitlements of learners with disabilities and special educational needs are being met. School level policies and action plans for ICT4I are necessary as a tool for ensuring learners' entitlement to accessible ICT. Specific objectives for ICT4I can be used as success criteria in monitoring the implementation of school improvement plans.

3.4 Monitoring ICT4I developments

The areas where developments impacting upon ICT4I can be identified (as outlined in section 3.2 above) clearly map onto four of the UNCRPD (2006) key propositions examined within the ICT4I project: ICT as a tool for promoting equity, access to appropriate ICT as an entitlement, the training of educational staff, the promotion of research that takes a user-involved approach.

However, data collection and monitoring is an area that currently receives less emphasis in European countries. The conclusions of the Agency's 2001 report on ICT in SNE argued that there was a need for more data on progress resulting from policies. The ICT4I project findings indicate that this is still relevant and that there are still challenges in relation to monitoring policy and practice for ICT4I.

The *Communication from the Commission* calls for more evidence-based policies and argues there is a need for countries to: 'Develop measuring tools and indicators to monitor more closely the integration of ICT in teaching and training institutions' (European Commission, 2013a, p. 13).

The ICT4I project findings suggest that data collection on the use of ICT for teaching and learning increasingly covers a wide range of aspects, but it rarely leads to information on the use of accessible technologies in classrooms. Generally, it can be argued that information on monitoring the use of ICT for inclusion is limited and where available, the impact of ICT upon inclusion has to be inferred rather than it being explicitly stated.

The ICT4I project activities indicate the need for practical tools decision-makers can use to monitor:

- the effectiveness of ICT4I policies, including usage, effects and outcomes data;

- schools' ICT4I work, including frameworks of indicators to audit and then monitor levels of stakeholder confidence in using ICT, as well as learners' competences and ICT achievements;
- specific aspects of ICT4I provision, such as ICT training, or the provision, use and effectiveness of assistive technology.

In response to this perceived need, a framework for monitoring key aspects of ICT4I policy has been developed. This framework is presented in Annex 3.

The ICT4I Policy Monitoring Framework draws upon all of the findings of the ICT4I project and builds upon schema for data collection proposed in previous work (UNESCO 2009; European Agency 2009, 2011a). The goal of the proposed framework is to outline an agenda for initial auditing and then monitoring the implementation of a system-based, multi-level policy for ICT4I.

The specific aims of the framework are to provide a basis for information collection that:

- guides the overall collection of relevant baseline data for ICT4I policy benchmarking and monitoring purposes;
- clearly identifies the areas that need to be monitored in relation to identifying ICT4I progress and developments, issues and problems to be addressed;
- leads to the identification of approaches that effectively respond to organisational, local and national level ICT4I needs by monitoring achievements at these levels over time.

The ICT4I Policy Monitoring Framework is not a final product; rather it is intended to be used as a stimulus for discussion and a means to further promote the monitoring of ICT4I developments in European countries.

CONCLUDING COMMENTS

In today's knowledge society, access to appropriate ICT must be viewed as a human rights issue. In various policy arenas – the European Union, WSIS and the United Nations organisations – ICT is recognised as being integral to many aspects of citizens' lives and its importance as a tool for promoting wider social inclusion must be emphasised.

When used effectively, ICT can enable inclusive education within and across schools and support schools' work as learning communities. ICT has the potential to reinforce respect for diversity as a step towards learning across whole communities.

Access to ICT that supports inclusion requires widely available, affordable and accessible technology. It also requires access to appropriately adapted and accessible curricula materials that offer all learners equitable learning opportunities.

Digital exclusion is a complex issue that impacts upon the educational and wider social experiences of far more people than those recognised as having disabilities and/or special educational needs. Access and support in using accessible mainstream and specialist assistive technology that reduces digital exclusion requires a systemic approach to policy and practice that engages all relevant stakeholders.

The overall findings of the ICT4I project indicate that there are four potential levers that should be further exploited in attempts to address digital exclusion:

- public procurement at national, regional and organisational levels that incorporates accessibility as a criterion for use when obtaining ICT hardware, software and digital learning materials;
- a widespread programme of training for all stakeholders in the ICT4I eco-system, including parents, teachers, school leaders, ICT support personnel, web administrators and IT and media professionals;
- school level policies and action plans for ICT4I that are compliant with national level policies and are effectively monitored so as to inform the wider implementation of ICT4I;
- supporting a school leader's understanding of, positive attitudes towards and vision for ICT4I.

These four factors require further action, examination and study in the short and long term.

Throughout the ICT4I project, a recurring message is that the successful use of ICT to support the educational inclusion of learners with disabilities and special educational needs has positive effects for all learners. This is reflected in the ITU report that argues that: 'investments in accessibility also introduce benefits for wider groups of the population' (2013a, p. 14).

The effective use of ICT to support learning exemplifies good teaching practice for all learners. However, it must be recognised that ICT4I requires a new pedagogy for learning, based upon using ICT to empower all learners to make decisions about their learning and then be able to implement their choices and decisions.

Implementing ICT4I involves 'disruptive change' (Sachs, 2013) for all stakeholders. ICT4I necessarily challenges all policy-makers and practitioners to adapt their thinking and then their ways of working in order to remove barriers and enable all learners to benefit from the educational opportunities that ICT can offer.

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ANNEX 1: GLOSSARY

Accessibility – Article 9 of the UN Convention defines accessibility as follows: 'To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas.' (http://www.un.org/disabilities/documents/convention/convoptprot-e.pdf)

Accessible information – within the ICT4I project accessible information is understood as information provided in formats which allow every learner to access its content 'on an equal basis with others'. (http://www.un.org/disabilities/documents/convention/convoptprot-e.pdf)

Alternative/Augmentative Communication (ACC) – extra ways of helping people who find it hard to communicate by speech or writing to communicate more easily. This can include signing and gesture (unaided systems) or books and special computers (aided systems). (International Society of Augmentative and Alternative Communication, http://www.isaac-online.org/en/aac/what_is.html)

Assistive technologies (ATs) – 'adaptive devices that enable people with special needs to access all manner of technical products and services. ATs cover a whole range of ICTs, from customised keyboards and speech recognition software to Braille computer displays and closed captioning systems for TV.' (http://ec.europa.eu/information_society/activities/einclusion/policy/accessibility/assist_tech/index_en.htm)

The British Assistive Technology Association (BATA) states that 'AT is any item, equipment, hardware, software, product or service which maintains, increases or improves the functional capabilities of individuals of any age, especially those with disabilities, and enables them more easily to communicate, learn, enjoy and live better, more independent lives.' (http://www.bataonline.org/further-assistive-technology-definition)

Cloud-based solutions/Cloud services – cloud services are delivered via the Internet from locations remote from the end user and their institution. (http://iite.unesco.org/pics/publications/en/files/3214674.pdf)

Design for all – a design approach to products and services, aiming to make them usable for as many people as possible. (http://www.european-agency.org/publications/ereports/ICTs-in-Education-for-People-With-Disabilities/ICTs-in-Education-for-people-with-disabilities.pdf)

Design for all 'is used to describe a design philosophy targeting the use of products, services and systems by as many people as possible without the need for adaptation'. Design for All is design for human diversity, social inclusion and equality (EIDD Stockholm Declaration, 2004 – http://www.designforalleurope.org/Design-for-All/EIDD-Documents/Stockholm-Declaration/).

Digital – (as in digital content, digital devices, digital resources, digital technology) – essentially, another word for computers and computer technology. (Computers store and process information by converting it all to single-figure numbers – digits.) (http://unesdoc.unesco.org/images/0021/002134/213475E.pdf)

Digital divide – refers to 'the gap between those who can benefit from digital technology and those who cannot'. (http://www.digitaldivide.org/digital-divide/digital-divide-defined/digital-divide-defined/)

Digital literacy – basic computer skills such as being able to do word-processing or go on-line. (1) Refers to 'the skills required to achieve digital competence. It is underpinned by basic skills in ICT and the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.' (http://www.europarl.europa.eu/registre/docs_autres_institutions/commission_europeenne/sec/2008/2629/COM_SEC(2008)2629_EN.pdf)

Emerging technologies – 'tools, concepts, innovations, and advancements utilized in diverse educational settings to serve varied education-related purposes' … these are 'potentially disruptive, not yet fully understood, and not yet fully researched'. (http://www.icde.org/filestore/News/2004-2010/2010/G.Veletsianose-bookEmergingTechnologies.pdf)

Information – within the i-access project the term 'information' is extended to information in any given format – print or electronic, audio or visual – and is also extended to communication and interaction to cover, for example, the possibility of contacting an organisation to get relevant information. The project focus is on information relevant for lifelong learning. However, the recommendations of the i-access project are equally valuable for any form of information provision. (http://www.european-agency.org/agency-projects/i-access/i-access-files/i-access-report.pdf)

Information Communication Technology (ICT) – 'consists of all technical means used to handle information and aid communication, including both computer and network hardware as well as necessary software. In other words, ICT consists of IT as well as telephony, broadcast media, and all types of audio and video processing and transmission.' (http://foldoc.org/Information+and+Communication+Technology) Information and Communication Technology, which means computers, mobile phones, digital cameras, satellite navigations systems, electronic instruments and data recorders, radio, television, computer networks, satellite systems … almost anything which handles and communicates information electronically. ICT includes both the hardware (the equipment) and the software (the computer programs in the equipment). (http://unesdoc.unesco.org/images/0021/002134/213475E.pdf)

Information Society – 'a society in which the creation, distribution and treatment of information have become the most significant economic and cultural activities … The information Society is considered as a necessary previous step to build Knowledge Societies.'
(http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/ifap/ifap_template.pdf)

Knowledge Societies – Knowledge societies according to UNESCO means societies in which people have the capabilities not just to acquire information but also to transform it into knowledge and understanding, which empowers them to enhance their livelihoods and contribute to the social and economic development of their societies. (UNESCO, 2010. *Towards Inclusive Knowledge Societies. A review of UNESCO's action in implementing the WSIS outcomes*. http://unesdoc.unesco.org/images/0018/001878/187832e.pdf)

Learning platforms – 'an integrated set of interactive online services that provide teachers, learners, parents and others involved in education with information, tools and resources to support and enhance educational delivery and management. It is not a single 'off the shelf' product but a collection of tools and services designed to support teaching,

learning, management and administration.' (http://dera.ioe.ac.uk/1485/1/becta_2010_useoflearningplatforms_report.pdf)

Mobile technologies – 'Mobiles enable ubiquitous access to information, social networks, tools for learning and productivity, and much more. Mobile devices continue to evolve, but it is the increased access to affordable and reliable networks that is driving this technology now. Mobiles are capable computing devices in their own right — and they are increasingly a user's first choice for Internet access.' (http://www.nmc.org/pdf/2011-Horizon-Report.pdf)

Personalised learning – aims to promote learner-focussed educational opportunities through learner self-regulation, meta-cognitive strategies and learner-teacher discourse. The voice of the learner is critical in shaping all teaching strategies. Personalisation also involves working more closely with parents and families to address any support requirements in a more holistic way and constructively engages teachers and learners in goal-oriented assessment.

Personalisation is not 'individualisation of learning', which is essentially a teacher driven action. Learner participation and involvement in decision-making is crucial to distinguishing between the two approaches. (http://www.european-agency.org/agency-projects/ra4al/synthesis-report)

Technology – often used as another word for ICT, although strictly speaking 'technology' can mean almost any type of tool or applied knowledge. For example, pencil and paper, slates, blackboards and whiteboards are all types of writing technology. (http://unesdoc.unesco.org/images/0021/002134/213475E.pdf)

Universal Design – the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design. 'Universal Design' shall not exclude assistive devices for particular groups of people with disabilities where this is needed. (http://www.un.org/disabilities/documents/convention/convoptprot-e.pdf)

Universal Design for Learning – an approach to addressing the diversity of learner needs by suggesting flexible goals, methods, materials, and assessment processes that support educators to meet varied needs. Curricula created using UDL are designed from the outset to meet the needs of all learners. A UDL framework incorporates flexible design of learning situations with customisable options, which allow all learners to progress from their own, individual starting points. (http://www.udlcenter.org/aboutudl)

A more extensive glossary of terms used in the ICT4I project is available from: http://www.european-agency.org/agency-projects/ict4i/ict4i-glossary

ANNEX 2: FURTHER INFORMATION

Project web area

More details on the ICT4I project, as well as all of the project materials and outputs, can be downloaded from the dedicated ICT4I project web area. These include:

- individual country reports describing policy and practice in the countries participating in the ICT4I project: http://www.european-agency.org/agency-projects/ict4i/ict4i-country-reports
- the review of European and international policy for supporting ICT4I, in particular recent Council of Ministers statements and resolutions in relation to ICT: http://www.european-agency.org/agency-projects/ict4i/ict-for-inclusion-documents/policy-supporting-ict-for-inclusion.pdf
- a review of research literature relating to the use of ICT in inclusive education, covering international sources (such as UNESCO and Organisation for Economic Co-operation and Development work), as well as European and national level information from the participating countries: http://www.european-agency.org/agency-projects/ict4i/ict-for-inclusion-documents/ICT4I-Research-Literature-Review.pdf
- an on-line searchable web area of national resources for ICT4I, presenting innovative examples and research abstracts relating to the main project themes: http://www.european-agency.org/agency-projects/ict4i/
- an on-line collation of links to existing resources and databases of information from organisations working at the international and European levels: http://www.european-agency.org/agency-projects/ict4i/international-resources
- a comprehensive glossary of terms used in the project: http://www.european-agency.org/agency-projects/ict4i/ict4i-glossary

Project framework and methodology

The Project Framework and Methodology describes the overall methodology used in the Information Communication Technology for Inclusion (ICT4I) project. This overview has been drafted to accompany all other ICT4I project outputs. The aim is to describe the conceptual framework, as well as the main features of and parameters for the project and provide an overview of the methods used for information collection and subsequent analysis.

The Project Framework and Methodology is available in electronic format from: http://www.european-agency.org/agency-projects/ict4i/project-framework-and-methodology

ICT for Inclusion e-publication

All of the project information, key findings and recommendations presented in the ICT4I project synthesis report have been cross-referenced and linked to the original sources of evidence collected via all project activities, covering the country reports, project policy and research reviews, policy and practice examples, resources and research abstracts.

This more extensive resource is available as an accessible e-publication (in English only), downloadable from: http://www.european-agency.org/agency-projects/ict4i/

ANNEX 3: ICT4I POLICY MONITORING FRAMEWORK

The ICT4I Policy Monitoring Framework has been developed in an attempt to address a concern emerging from the ICT4I project activities – the need to monitor support provided to learners, teachers and schools in order to ensure a coherent system of ICT4I policy and provision in the short and long term.

The framework presented here should be considered as a tool for supporting the different phases of policy delivery: auditing the current situation; ensuring essential pre-requisites for policy implementation are in place; implementing the strategic actions linked to the policy objectives; monitoring all policy implementation activities; and disseminating information on the outcomes of the policy implementation. The phases can be seen as cyclical, as monitoring and dissemination actions necessarily lead to further auditing actions and so forth.

The ICT4I Policy Monitoring Framework provides an outline structure for countries to discuss, adapt and develop for their own data collection for policy auditing and benchmarking, monitoring and evaluation purposes. The framework has the potential to be further developed within individual country contexts in order to:

- ensure that all learners' rights in relation to ICT access are met; and
- examine the effectiveness of systems of provision for ICT4I.

The framework considers all aspects of infrastructures for ICT4I. It presents a possible response to the UNCRPD key proposition calling for data collection and monitoring relating to the use of ICT as a tool for promoting equity, access to appropriate ICT as an entitlement, the training of educational staff and the promotion of ICT research and development. These four issues are continuous themes underpinning the overall content of the Policy Monitoring Framework.

The framework considers the issues highlighted in the project as developments having most impact upon ICT4I policy and practice (please refer to section 3.2 of this report).

The framework covers different levels of the education system that impact on the educational experiences of learners with disabilities and special educational needs – individual learner, teacher/classroom, school, regional and national levels. Although the framework has been prepared as a generic tool covering all levels of the ICT4I system, it can potentially also be used for policy monitoring work at one or more specific levels.

This multi-level framework is in line with current and previous work on effective data collection for inclusive education, (Organisation for Economic Co-operation and Development, 2007; Ebersold, 2011; European Agency, 2011b; World Health Organization/World Bank, 2011; UNESCO/G3ict, in press).

The ICT4I Policy Monitoring Framework is based upon three premises:

(i) The need to involve all relevant stakeholders in policy monitoring

- Key stakeholders and partners in data collection processes (organisations, researchers, etc.) must be identified in order for participatory data collection procedures involving learners, their families and representatives to be identified and used.
- The relevant stakeholders must be engaged in agreeing on an action plan with milestones for policy monitoring and evaluation. This will include agreeing the focus

of quantitative, input-focussed data collection (e.g. application of accessibility standards, procurement figures, etc.) and qualitative data collection, exploring process and outcome issues.

(ii) The need to collect different types of data and information for policy monitoring purposes

- Data that is limited to simple quantitative measures does not inform policy evaluation on its own. There is a need to collect quantitative and qualitative data informing debates regarding the outcomes and/or benefits of accessible ICT provision. Qualitative as well as quantitative data should be available on inputs, as well as processes and outcomes relating to the use of ICT in inclusive education.
- The collection of structured information on innovative examples of impact in using ICT in inclusive education can act as a useful inspiration for educational organisations and professionals.

(iii) The need to cross-reference different sources of data collection methods and findings

- A framework of data collection procedures that examines learners' rights, as well as system effectiveness issues, must be developed in order to monitor the impact of ICT4I for learners, teachers and schools.
- For this to be achieved, there is a need to cross-reference specific data collection relating to ICT4I to other areas of national and/or international data collection procedures in order to avoid overlap of efforts and ensure compliance with data collection requirements. A starting point is the identification of existing data, as well as gaps and areas of missing information.
- There is great potential for the use of ICT as a tool for collecting different types of data and information for policy monitoring purposes.

The ICT4I Policy Monitoring Framework is intended to provide a practical tool for considering longer-term information collection that can be integrated into existing digital policies and fits into wider ICT policy initiatives.

The framework is based on a structure of inter-related and mutually supportive policy goals, objectives and actions:

- *ICT4I policy goals* – that describe the broad intentions of an ICT4I policy.
- *Policy objectives to be met* – that highlight the specific targets that must be achieved in line with the policy goals. The overall effectiveness of the implementation of any ICT4I policy will be judged against the achievement of the stated policy objectives.
- *Policy actions to be monitored* – that detail the specific actions that will act as levers and potentially have the most impact in terms of promoting desired changes and developments.

In the grid below, the identified policy actions for monitoring have been phrased in a way that supports simple monitoring, using metrics that indicate the degree of policy action completion – for example: Full/Partial/None.

By using a simple metric, the extent to which each policy action has been completed can be assessed and recorded. However, the wording and example metric described here are presented as examples for discussion and it is recognised that countries may have existing metrics that can be applied to the suggested policy actions.

The framework document comprises a simple grid that can be adapted to different national or regional contexts. To support country discussions and policy monitoring development work, the text in the grid is non-copyright material and is intended for policy-makers and practitioners to develop and modify as needed to meet their specific country requirements.

On the Agency website, editable electronic versions of the ICT4I Policy Monitoring Framework in all Agency member country languages are available to download and re-purpose, as long as a reference to the original source is given: http://www.european-agency.org/agency-projects/ict4i

ICT4I POLICY MONITORING FRAMEWORK

1. ICT4I policy goal for the learner level: all learners are able to effectively use ICT in their learning in inclusive settings	
Policy objectives to be met	***Policy actions to be monitored in terms of the extent to which …***
1.1 ICT is used as a tool for supporting the participation of learners with disabilities and special educational needs in inclusive settings	1.1a There is widespread awareness raising on the importance of ICT as a tool for supporting the participation of learners with disabilities and special educational needs in inclusive settings 1.1b Local situation analyses on the availability of appropriate ICT and associated resources have been conducted 1.1c The potential impact of the barriers to the use of ICT (learning needs, gender, social or geographic isolation and/or socio-economic factors) in determining ICT resource allocation in inclusive education has been evaluated by all relevant stakeholders 1.1d Minimum standards detailing the availability of and access to ICT tools, services and content have been identified and agreed upon by all stakeholders
1.2 ICT is used to support personalised learning approaches for learners with disabilities and special educational needs in inclusive settings	1.2a Structured ICT 'needs assessment' procedures have been developed that identify individual learners' functional needs for particular ICT tools 1.2b All learners have opportunities to self-assess and manage their personal ICT access and assistive technology preferences 1.2c The ICT needs of learners who require additional support are identified in collaboration with parents and/or guardians who can help learners to communicate their preferences 1.2d Learners with disabilities and special educational needs are supported in developmental ways so that they are enabled, capable, and then confident users of ICT 1.2e The use of ICT is written into any individual education plan or similar planning document for learners who have them
1.3 Learners' experience of general and specific ICT availability at school, home and upon transition to other educational sectors is seamless, with no gaps or differing levels of provision	1.3a ICT to support an individual's learning is available within schools and is available/transferable to different home, social, educational and lifelong learning contexts 1.3b ICT transition plans to support the availability of necessary ICT across moves between educational settings have been developed and implemented 1.3c Mechanisms for cross-sector co-operation and working to ensure equitable access to ICT across home, social and educational contexts have been developed and implemented

2. ICT4I policy goal for the teacher/classroom level: all teachers are able to effectively use ICT to support learning in inclusive settings	
Policy objectives to be met	***Policy actions to be monitored in terms of the extent to which …***
2.1 Teachers' attitudinal barriers to the use of technology and/or inclusive education are acknowledged and addressed via appropriate training	2.1a All teachers and the professionals supporting them are involved in identifying priorities for ICT4I capacity building, including identifying professional standards, training priorities and effective support mechanisms 2.1b A comprehensive programme of ICT4I training for all teachers has been developed that covers initial education as well as continuing professional development programmes 2.1c Within any training programme, there are coherent links between specific training in the use of ICT and AT and general training in inclusive education 2.1d Tools for monitoring the effectiveness of ICT4I training have been developed and implemented
2.2 Teachers are effectively supported in their general use of ICT to support learning, as well as the specific use of AT	2.2a Specific training is available for all teachers in using learner-centred teaching methods that are supported by ICT 2.2b Specific training is available for all teachers in maximising the use of accessibility features in mainstream ICT tools 2.2c Appropriate curricular materials are available to support teachers in their use of ICT to support learning 2.2d Appropriate technology-based tools are available to support teachers in their use of assessment for learning approaches
2.3 Teachers are effectively supported in their use of ICT as a tool for personalised learning in inclusive settings	2.3a Specific training is available for all teachers in identifying learners' ICT preferences and then supporting learners' to self-assess and self-accommodate their ICT access preferences 2.3b Specific training is available for all teachers in taking personalised learning approaches supported by the use of ICT 2.3c Appropriate curricular materials are available to support teachers in their use of personalised learning approaches using ICT

3. ICT4I policy goal for the school level: all schools are able to implement and maintain an effective, sustainable ICT4I infrastructure	
Policy objectives to be met	***Policy actions to be monitored in terms of the extent to which …***
3.1 Schools have access to an effective and sustainable ICT infrastructure	3.1a All schools have ICT4I policies and strategic action plans that are in alignment with the national ICT4I policy 3.1b All schools benchmark and then monitor their use of ICT to support all learners 3.1c All school level strategic action plans for ICT4I are adequately funded via recognised regional or national level mechanisms 3.1d All schools follow recognised minimum standards for ICT accessibility, including web accessibility, learner e-safety and open-access content
3.2 Schools and all professionals working within them are effectively enabled to use ICT to widen participation and increase learning opportunities for learners with disabilities and special educational needs	3.2a All schools have access to and make use of inter-disciplinary support structures for ICT4I 3.2b All schools have access to different forms of digital curricula, content and materials that can be modified to meet the demands of specific learning situations 3.2c All schools teams are supported to develop their own accessible digital curricula materials that provide: physical access; sensory access; cognitive access for learners with a wide range of needs 3.2d All schools teams are provided with clear and coherent guidelines on how to ensure standardised, high-stakes assessment procedures (such as formal examinations) can be made more inclusive through the use of ICT
3.3 Schools leaders are enabled to promote the use of ICT to support learning in inclusive education settings	3.3a All schools leaders are supported in understanding their role in inclusive education and viewing diversity in the classroom as an opportunity problem for learning 3.3b All schools leaders have access to inter-disciplinary support in enacting a vision for and managing the process of using ICT to support inclusive education

4. ICT4I policy goal for the regional/national level: the ICT4I infrastructure at national and/or regional level is able to effectively support the work of all schools and teachers working in inclusive settings	
Policy objectives to be met	***Policy actions to be monitored in terms of the extent to which …***
4.1 All stakeholders see ICT4I as a tool to widen participation and increase educational opportunities for all learners, including those with disabilities and special educational needs	4.1a All stakeholders in the ICT sector and inclusive education see access to appropriate ICT and ATs as a human rights issue 4.1b All stakeholders understand that accessible ICTs can be used to widen participation and increase educational opportunity for learners with disabilities and special educational needs 4.1c Awareness-raising campaigns that have the explicit aim of developing positive attitudes towards disability, learning difficulties and special needs have been developed and implemented with policy-makers and all key stakeholders in the ICT4I eco-system 4.1d Awareness-raising campaigns on the added value of ICT for learning and the wider societal benefits of accessible ICT in terms of better facilities for all learners, not just those with disabilities and special educational needs, have been developed and implemented 4.1e Clear and comprehensive information has been provided on the availability of accessible ICTs to meet specific learning needs across all educational sectors 4.1f There is a shared approach that uses the same language and is based on consensus around the concepts of ICT4I for all stakeholders 4.1g There is shared understanding among key stakeholders regarding the required elements for an effective ICT4I infrastructure
4.2 There is an agreed trans-sectoral policy for ICT4I at national level	4.2a National and local level audits to identify priority areas for policy development and capacity building have been undertaken 4.2b There is agreement among policy-makers, researchers, educational professionals and users on the definition of key concepts (such as accessible ICT or inclusive education) used within any ICT4I policy 4.2c There are established mechanisms for learners with disabilities and special educational needs, their parents and representatives groups to contribute to policy-related debates at local, regional and national levels 4.2d A cross-sectoral ICT4I policy has been developed that covers: roles and responsibilities, provision and support structures, universal design approaches, inter-operability guidelines, accessibility standards and procurement guidelines 4.2e All ICT4I policy objectives and actions are reflected in other policy directives (for general education, inclusive education and use of ICT in education) and the policy content is cross-referenced with all other relevant policies in order to ensure coherent policy implementation 4.2f A strategy to communicate the ICT4I policy effectively to all

	stakeholders has been developed and implemented 4.2g The systems of accountability – including methods for systematic policy impact evaluation – linked to the ICT4I policy and its implementation have been discussed with and agreed upon by all stakeholders 4.2h Universal Design principles and requirements for applying accessibility standards have been promoted in the ICT4I suppliers' eco-system 4.2i Minimum standards for the provision of ICT accessibility tools across all educational sectors have been specified within the ICT4I policy 4.2j A procurement framework agreement at national level has been developed that is guided by universal design principles 4.2k A national resource database of accessible ICT procurement possibilities (products, accredited vendors, etc.) has been established and promoted 4.4l All service providers responsible for delivering educational and/or ICT-related services have been made aware of their responsibilities and act in compliance with the ICT4I policy
4.3 There is an effective infrastructure for ICT4I across all educational, home and social settings	4.3a There is seamless provision of accessible ICT across all educational sectors as well as home situations; AT available in one educational context is available within the home situation, as well as upon transition to other educational sectors 4.3b An effective ICT4I infrastructure – incorporating needs assessments, procurement, installation, maintenance, training and support – that promotes innovation in inclusive education practice at organisational levels has been established within all educational settings 4.3c The overall framework of ICT4I provision is fit-for-purpose, affordable and sustainable in the long term 4.3d All schools follow an agreed approach in applying accessibility standards and procurement guidelines 4.3e Formal links have been established between the training of teachers and the training of librarians; media and information personnel; ICT providers; IT professionals and web masters; administrators and AT support personnel to ensure a shared approach that uses the same language and concepts 4.3f All professional trainers involved in the ICT4I eco-system have been provided with training in the use of ICT generally and accessible ICT specifically 4.3g Training in the use of accessible ICT4I provided for parents, families, caregivers or representatives of learners with disabilities and special educational needs is in parallel with the training given to teachers 4.3h Experienced users of accessible ICT have been supported in acting as role models of good practice for other learners, educators and ICT professionals 4.3i Extensive access to wider educational resources (such as libraries), distance learning opportunities, inclusive learning tools, content and support for learners, their families and representatives in all formal and informal learning situations has

	been supported 4.3j Local level capacity-building initiatives to promote the development of ICT4I have been supported
4.4 There is effective on-going dialogue and consultation involving all stakeholders in the ICT4I eco-system	4.4a On-going active dialogue and consultation has been established with main stakeholders: learners with disabilities and special educational needs, their parents, families and advocates, as well as representatives from civil society and the ICT4I eco-system 4.4b Mechanisms have been established for learners with disabilities and special educational needs to have their voices heard within all educational contexts 4.4c The individual and collective responsibilities of stakeholders have been made clear and communicated in a coherent and effective way 4.4d Support has been made available for stakeholder-led initiatives to promote: the sharing of assistive technology resources across different end-user groups; access to community-based, informal learning opportunities; increased access to public learning resources and distance learning opportunities 4.4e Schools have been supported to be innovative in using technology to support communication with different stakeholders in inclusive education
4.5 There is support for research and development initiatives that take 'user-involved' as well as 'user-centred' approaches and lead to new accessible ICT tools that are applicable to all learners, including those with disabilities and special educational needs	4.5a In co-operation with all key stakeholders, a comprehensive research and development programme has been developed that considers all aspects of ICT4I policy and its impact in the medium and long term 4.5b Adequate funding from national and/or international sources to support the research programme has been secured 4.5c Minimum standards for accessing financial support for research – including the need for 'user-involved' as well as 'user-centred' approaches and the need for research to focus upon the development of technology and its application to personalised learning in inclusive education – have been identified 4.5d Key partners in research and development – industry, community representatives – have been actively engaged with the research community 4.5e Research initiatives take account of lifelong learning contexts and do not solely focus upon schools 4.5f Open-access databases/knowledge centres of research initiatives, findings and outcomes relating to the use of ICT in different educational contexts have been established

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