



White Paper

Information & Communication Technologies (ICT) in Education for Development

Prepared by:
Brian Gutterman
Shareen Rahman
Jorge Supelano
Laura Thies
Mai Yang

Advisor:
Ambassador Rafat Mahdi





White Paper

Information & Communication Technologies (ICT) in Education for Development

Prepared by:
Brian Gutterman
Shareen Rahman
Jorge Supelano
Laura Thies
Mai Yang

Advisor:
Ambassador Rafat Mahdi

New York, July 2009

TABLE OF CONTENTS:

1.	INTRODUCTION.....	1
2.	ROLE AND IMPORTANCE OF ICT IN EDUCATION.....	2
2.1	Increased Access to Education through ICT.....	2
2.2	Improved Quality of Education through ICT.....	2
3.	CHALLENGES OF ICT IN EDUCATION.....	3
3.1	PROVIDING ACCESS TO ICTE.....	4
3.1.1	Brazil.....	4
3.1.2	Bangladesh.....	4
3.1.3	Azerbaijan.....	4
3.1.4	Malaysia.....	5
3.1.5	Uruguay.....	5
3.1.6	Rwanda.....	5
3.1.7	Mali.....	6
3.2	TEACHERS AND ICT.....	6
3.2.1	Sweden.....	7
3.2.2	Bangladesh.....	7
3.2.3	Malaysia.....	7
3.2.4	Rwanda.....	7
3.2.5	Mali.....	8
3.3	HIGH COSTS AND OTHER DIFFICULTIES IN THE TRANSITION TO ICTE.....	8
3.3.1	Namibia.....	9
3.3.2	Bangladesh.....	9
3.3.3	Malaysia.....	9
3.3.4	Uruguay.....	9
3.4	GOVERNMENT COOPERATION AND POLICY IMPLEMENTATION.....	10
3.4.1	Ghana.....	11

3.4.2.	Uruguay.....	11
3.4.3.	Malaysia.....	11
3.4.4.	Sweden.....	12
3.4.5.	Azerbaijan.....	12
3.4.6.	Mali.....	12
3.4.7.	Namibia.....	12
3.5	MONITORING AND EVALUATION.....	13
3.5.1.	Bangladesh.....	13
3.5.2.	Rwanda.....	14
4.	COMPARATIVE ANALYSIS AND LESSONS LEARNED.....	14
5.	MOBILE TECHNOLOGY AND ITS ROLE IN ICTE IN THE FUTURE.....	16
6.	RECOMMENDATIONS FOR IMPLEMENTATION OF ICT IN EDUCATION FOR DEVELOPMENT.....	16
6.1	For Access.....	16
6.2	For Teachers.....	17
6.3	For Cost.....	17
6.4	For Government and Policy Implementation.....	17
6.5	For Monitoring and Evaluation.....	18
	APPENDIX.....	19
	Figure 1.....	19
	Figure 2.....	20
	Figure 3.....	21
	Figure 4.....	24
	Figure 5.....	27
	Figure 6.....	30
	Figure 7.....	32
	GLOSSARY.....	33
	ENDNOTES.....	35

1. Introduction

Information and Communication Technologies (ICT) can be an extremely powerful enabler in efforts to bring positive and sustainable development to countries around the globe. Today, almost a full decade into the 21st century, we live amidst an unprecedented revolution in the advancement of ICT. We are also, however, surrounded by widespread poverty, and social and economic inequalities are the norm. Considered as a powerful tool to promote social and economic development, education has become a primary focus of the recently forged Information and Communication Technologies for Development (ICTD) community, especially in the Least Developed Countries. One way of ensuring equitable development targeted at the very poorest is through universal social protection, including education, health and income.¹ This paper aims to explain the current state of how ICT is being used in education and how it can better benefit current and future users.

The United Nations' Second and Third Millennium Development Goals (MDGs) are achieving universal primary education and promoting gender equality, respectively. The MDGs in education are defined in terms of participation and completion of primary education by all children and the elimination of gender discrimination in education.² ICT plays an important role in reaching these goals. Its ability to transcend time and space allows learning to take place 24 hours a day, 7 days a week. This contributes immensely to the inclusion of traditionally excluded populations such as girls and women, ethnic minorities, and persons with disabilities - groups previously marginalized due to cultural, social and geographical circumstances. For the female population in particular, their increased access to education has a huge impact on the society. Research by the United Kingdom Department for International Development has shown that a woman's income increases by 15% for each year that she receives additional education past the primary level.³

A major gap has always existed between affluent people living in developed societies with access to modern information technology and underprivileged people living in impoverished and rural communities in developing and least developed countries. Even today, an unequal adoption of technology excludes many from harvesting the fruits of the digital economy.⁴

While there is agreement that ICT can be a powerful tool for advancing education efforts going forward, the challenge we face today is turning the potential of Information and Communication Technologies for Education (ICTE) into reality with results. This is a tremendous challenge, compounded by the realistic fears that if not used properly, ICT can increase existing social and economic inequalities, particularly if access and use of ICTE is not equally available to everyone. Implementation of ICTE must be case specific and locally driven, or the development community may risk further isolating impoverished populations rather than promoting inclusion and social advancement. In addition to the dangers of further isolating already marginalized groups, evidence from ongoing projects around the world reveal that effective implementation of ICTE initiatives is extremely challenging. Imagine a remote village in Sub-Saharan Africa and some of the potential challenges to overcome when introducing ICTE to those living there. Is there adequate government support and funding for the projects? Is there infrastructure and connectivity for computers in the schools? Have the teachers ever used computers before and are they willing to adopt their teaching styles to do so? These are only a few of the many questions one would face when attempting to bring ICTE to areas that may not be as familiar with the concept.

The Global Alliance for ICT and Development (UNDESA-GAID), an initiative approved by the United Nations Secretary-General in 2006, was created to approach and overcome these challenges. UNDESA-GAID uses an inclusive, multi-stakeholder approach to tackle the various challenges in bringing ICT to the developing world,

including ICTE. Under UNDESA-GAID's supervision and in collaboration with their extensive network of experts in the ICTD field, this paper draws upon country case studies and their experiences with ICTE thus far.

In our research we have found that countries are beginning to realize the extraordinary potential of ICTE but are encountering tremendous challenges in bringing that same potential to life. First, we will discuss the role and importance of ICTE. Next, using examples from specific country case studies, we will address common challenges countries are facing in integrating ICTE and viable solutions attempted to overcome these challenges. Finally, this paper will present a list of policy recommendations to various stakeholders involved in ICTE to provide a roadmap for successful and transformative education development using ICT in the future.

2. Role and Importance of ICT in Education

A vibrant education sector is fundamental for developing human capital within countries. With an active and transformative education policy and a supportive infrastructure, the development of a knowledge-based population can apply itself to sustained and equitable growth. ICT can play a vital role in increasing access to education as well as providing better quality education. A study conducted by the International Institute for Communication and Development (IICD) indicated that 80% of its participants felt more aware and empowered by their exposure to ICT in education, and 60% stated that the process of teaching as well as learning were directly and positively affected by the use of ICT.⁵

2.1 Increased Access to Education through ICT

ICT is used worldwide to increase access to, and improve the relevance and quality of education. The unprecedented speed and general availability of information due to ICT extends educational opportunities to marginalized and vulnerable groups. ICT gives students and teachers new tools with which to learn and teach.

Geographical distance is no longer an obstacle to obtaining an education. It is no longer necessary for teachers and students to be in the same space, due to innovations of technologies such as teleconferencing and distance learning, which allow for synchronous learning.⁶ If given access and appropriate training in ICT, the Internet can also provide these groups with an abundance of online learning materials, covering a wide range of subjects that are up-to-date and produced by cutting-edge technologies. Thus, teachers and learners are no longer solely dependent on physical media such as printed textbooks which are often times outdated especially in the developing world. With today's technology, one even has the ability to access experts, professionals, and leaders in the field around the world at any given time.⁷

In addition, many world-leading conventional universities are now offering some of their academic courses through various ICTs for their distant learners and have established themselves as dual mode universities. Applications and processes of e-learning include web-based learning, computer-based learning, virtual classrooms, and digital collaboration, where content is delivered via the internet, intranet/extranet, audio/and or video tape, satellite TV and CD-ROM.⁸ Although many developing countries have begun to take initiatives to introduce virtual classrooms at their schools, the use of e-learning continues to be a challenge for the least developed countries.

2.2 Improved Quality of Education through ICT

ICT can enable teachers to transform their practices by providing them with improved educational content and more effective teaching methods. Continuous teacher training in updating and enhancing their methodologies is critical to effective education policy and practice to keep pace with the constant advancement of technology. Through online teaching resources and other interactive educational materials, teacher development can be greatly improved.

ICT can improve the learning process through the provision of more interactive educational materials that increase learner motivation and facilitate the acquisition of basic skills. The use of various multimedia devices such as television, videos and computer software can offer a more challenging and engaging learning environment for students of all ages.⁹

Twenty-first century education reform policy has been focused on a shift from the traditional teacher-centered pedagogy to more learner-centered methods. Active, collaborative learning environments facilitated by ICT contribute to the creation of a knowledge-based student population.¹⁰ In addition, ICT skills that come along with this shift in pedagogy are also useful for students hoping to transition into today's job market, which in many countries is increasingly demanding these skills. Developing a critical mass of knowledge workers with proficient ICT skills will greatly improve long term economic opportunities.

Education leadership, management and governance can also be improved through ICT by enhancing educational content development and supporting administrative processes in schools and other educational establishments. By supporting management and reforming administrative procedures more effectively, ICT would serve as an incentive for leaders and staff at all levels to institutionalize its use.¹¹

Clearly there is great potential for ICT to enhance education around the globe going forward. The purpose of the next section of this paper is to identify, address and consider some solutions to the primary challenges the development community faces in realizing this potential. Specific country studies were chosen to provide a wide range of perspectives on the realities of ICTE around the world. The primary focus is on the developing and least developed countries, including studies of countries from the African, Asian and Latin American regions. The paper will also consider examples from both an emerging economic power in Brazil, and a long-established leader in education policy and practice in Sweden. In doing so, we hope to give examples and provide insight and suggestions to anyone involved in the field of ICTE, regardless of where their work is being done.

3. Challenges of ICT in Education

Countries everywhere are facing similar challenges in implementing ICT in their education systems. Unfortunately, many local, national and regional government bodies are still not giving ICTE the attention and priority it deserves despite the benefits it brings. Providing basic access to ICT to young people living in either impoverished communities or rural locations often neglected by policy makers is one major challenge being faced. These areas oftentimes lack basic infrastructure such as classrooms, let alone Internet connectivity. The availability of quality teachers to apply ICT to the existing education systems is also in short supply. Bringing long-term, sustainable ICTE reform will also be costly and will challenge policymakers handling national budget allocations to make difficult decisions in how to allocate national monetary resources and foreign aid. Finally, shifting the existing focus from the traditional educational models in place, depending on the specific

country, to one that is ICT driven, will certainly not be easy. The following sections, using specific country examples, will discuss how these many challenges are being addressed, since learning from the experiences of others is necessary for policymakers hoping to successfully implement ICTE in the future.

3.1 Providing Access to ICTE

Today, citizens in many countries share a common problem in that they have been left behind when it comes to ICT connectivity, and have become part of a *digital divide*.¹² This gap exists where people have been divided by ICT in one way or another, but mostly between those in the middle and upper classes, and those who live below the poverty line or in rural areas. By bridging the gap between the various groups, countries can make significant progress in eliminating the social and economic inequalities that are detrimental for sustainable development.

3.1.1 Brazil

Though considered by many to be an emerging economic powerhouse, Brazil continues to struggle with finding solutions to its existing social and economic inequalities. Rightfully, it has focused on education reform as the primary path to tackle the inequality problems that many other countries are facing around the world. It is a massive country geographically, which makes providing universal access to quality education very challenging. It also has a rapidly growing young population, compounding this problem. One way Brazil is overcoming this challenge is through implementation of various ICTE initiatives. Through such initiatives implemented in recent years, Brazil has made significant progress in expanding access to quality and transformative education to its most needy populations.¹³

Much of Brazil's recent achievements in improving student enrollment in schools and the quality of education can be credited to its commitment to ICTE. A special Secretariat for Distance Education was created in 1996 to implement ICT initiatives in the Education sector. One such initiative was ProInfo, a federally funded partnership between the Ministry of Education and state and municipal Secretaries of Education to integrate computers and communication technology into teaching and learning.¹⁴ ProInfo aims to distribute computers to public schools across the country and establish a network of teacher training and computer resource centers to train lab coordinators and teachers to ensure long-term success. The ProInfo program today continues to be a driving force in closing the digital divide in Brazil.

3.1.2 Bangladesh

In Bangladesh, a similar gap exists between the urban and rural populations. In 1999, the Bangladesh Rural Advancement Committee (BRAC) began an initiative to narrow the urban-rural ICT gap by creating community based ICT facilities in rural areas. BRAC has equipped 800 *Gonokendros* (multipurpose learning centers) in selected areas with computers (as of June 2008).¹⁵ The objectives of the *Gonokendros* are to increase access to reading materials to different sections of the rural community while also developing the community's reading habits and familiarizing them with ICT. The *Gonokendros* are also to be developed as information centers ensuring the participation of everyone, particularly women.

3.1.3 Azerbaijan

Azerbaijan initiated the Transnational-Eurasian Information Super Highway during the Baku Regional Ministerial Meeting held in November 2008. The Super Highway, by passing through the territories of Eastern Europe, the Commonwealth of Independent States, and Central Asia, will bridge the existing two developed

information networks between Western Europe and that of the countries of the Pacific. This project will contribute significantly to the development of a knowledge-based economy for all participating countries and to the overall socio-economic development for the whole region.¹⁶ The information superhighways constitute an interrelated combination of information, creativity, technology and people in order to electronically access, create, control and communicate information at any time and any place across the world.¹⁷

3.1.4 Malaysia

The government of Malaysia has also initiated several programs to assist with the progression of ICT usage and the bridge the digital divide. The Malaysian Smart School project involves Browser-based Teaching-Learning Materials for *Bahas Melayu* (official Malaysian language), English Language, Science and Mathematics, a computerized Smart School Management System, a Smart School Technology Infrastructure involving the use of ICT and non-ICT equipment, Local Area Networks for the pilot schools, and a virtual private network that connects the pilot schools, the Ministry's Data Center and the Ministry's Help Desk. This project also includes support services in the form of a centralized Help Desk and service centers throughout the country to provide maintenance and support as well as specialized services such as systems integration, project management, business process reengineering, and change management.¹⁸ This allows for a more cohesive and coordinated effort from the Ministry to local level in maintaining ICTE.

3.1.5 Uruguay

In contrast to the aforementioned countries, Uruguay's relatively flat geography and large concentration of population in and around the capital, Montevideo, has given the country a good basis for connectivity. However, the fact that the population outside of the capital is scattered across the country increases infrastructure costs. Plan CEIBAL (Educational Basic Connectivity for Online Learning) is being implemented in an effort to broaden access to infrastructure with a wireless network that would complement the fixed-line telephony of ANTEL, Uruguay's government-owned telecommunications company. Routinely, policymakers in Latin America have focused too much on a techno centric approach to improving access to ICT without really thinking through what they will be used for. They have also maintained a rather linear and simplistic view which focuses on satisfying basic needs before granting access to technology. However, Uruguay has taken a different approach, one that seeks to promote social inclusion through its ICT policies. As a result, Uruguay became the first country to commit to a large-scale nationwide deployment of the One Laptop Per Child (OLPC) initiative.¹⁹

Scheduled to be fully implemented by the end of 2009, Plan CEIBAL will provide one-to-one (1:1) computing to all public primary children from grades one through six as well as their teachers. Approximately 340,000 students and 16,000 teachers will own their own laptop, loaded with educational software and connected to the Internet.²⁰ It is important to highlight the successful managing of Plan CEIBAL whose responsibility lies on an interdisciplinary committee consisting of educators, engineers and managers, all who bring their own unique perspectives to the table. Also commendable is the way in which the deployment phases were organized. The government of Uruguay made it a priority to first reach out to rural villages and less urbanized areas of the country. The final deployment phase will take part in the Great Montevideo region.

3.1.6 Rwanda

In the case of Rwanda, a country finally beginning to emerge from a tragic period of prolonged conflict, as part of the government's efforts to infuse ICT into its administration, it has also included e-education. E-education is an initiative within the broader frameworks of Rwanda's Vision 2020 in reaching its MDGs. It seeks

to move away from traditional textbooks to an electronic format with broader access to information. It also has an objective to allow more input from ordinary citizens in the decision making process of its educational programming. The goal is to provide the population with expedited ICT knowledge. It requires at least one member in each household to acquire ICT skills, with which they will pass on to other family members. The country also has designs in which all Rwandans will be networked and equipped with standard ICT tools and trained facilitators by 2013.²¹

The Government of Rwanda (GoR) has received significant support from private donors willing to invest in its ICT programs, providing opportunities that will reach out to the wider population spectrum. ESRI Germany has granted GIS software to every secondary school, including the sponsorship of well trained professionals who help bring GIS to students and teachers. In addition, in order to reach its MDGs, the GoR has collaborated with One Laptop Per Child in implementing a five-year program to work with primary schools. This program has five principles geared towards 1) allowing children to have ownership of their own education and build ICT skills; 2) both the GoR and OLPC see children as having the ability to become the best teachers if saturated with the right tools and in this day and age, ICT is considered a most valuable tool; 3) exposure to ICT should begin at an early age (6-12 years old); 4) connection to the internet, and thus the outside world, should be readily available, and 5) this connection should be provided by a free and open source software that allows the computers to grow according to the child. OLPC has a goal to target 80% of primary school-age children within five years and has already implemented pilot programs in three districts where computers have been distributed.

3.1.7. Mali

Mali is one of the poorest countries in the world and ranks 173 in the e-Governance Readiness Report (See Figure 1). In 1999, the president at that time, Mr. Alpha Oumar Konaré, was one of the first advocates to give high priority to ICTD. His expectations were set too high though for a country with low foreign investment, little infrastructure, low institutional capacity, vast geographical distances, and little human resources. In order to connect especially the rural communities, it was decided together with IICD to set up tele-centers in every district in Mali, making the total number of tele-centers across the country to be 703.²² Through these centers, one could use computers with internet and e-mail access, telephones and fax machines. Due to the circumstances of the country, only 50 such centers had been set up by the end of 2007. These centers have proven to be extremely enriching for those communities, giving them access to vital information on education, as well as healthcare, civil rights and tax issues. It is important to spread this network in order to further empower the people and connect them across the nation, but the *Agence des Technologies de l'Information et de la Communication* (AGETIC), which is the government body responsible for ICT, may not be strong enough to sustain the centers on its own and to build up more.

3.2 Teachers and ICT

ICT can improve the quality of education and heighten teaching efficiency through pre-service training and programs that are relevant and responsive to the needs of the education system. This will allow teachers to have sufficient subject knowledge, a repertoire of teaching methodologies and strategies, professional development for lifelong learning. These programs will expose them to new modern channels of information, and will develop self-guided learning materials, placing more focus on learning rather than teaching. However, it is important to point out that ICT is used to enhance teaching styles, and should not replace the role of the teacher. ICT helps create structured and systematic teaching as well as better school manage-

ment and organization of ICT usage. Teachers should be provided with adequate and appropriate support in their classrooms, and be guided by professional standards that incorporate a code of conduct.²³

3.2.1. Sweden

Sweden, consistently a leader in the world of education reform and policy based on their high global rankings in both quantity (enrollment rates) and quality (test scores), was one of the first countries to commit to ICT integration into education. Their first step and top priority for ICTE was through teacher training. The Swedish School-net, which is now called the ICT for Pedagogues, acts as an information center, online library and news agency. It was created in 1994 by the Swedish Ministry of Education to provide services for teachers at all levels, and primarily serves as a guide for teachers when integrating ICT in education.²⁴

3.2.2. Bangladesh

In 2004, BRAC initiated the Computer Aided Learning (CAL) program in Bangladesh to improve the teacher's capacity to maintain learner's attention through interesting and interactive learning. CAL provided a platform for teachers to increase their understanding of the lessons, updating knowledge and becoming more familiar with modern computer technology. BRAC also developed software for English and Math based on the national curriculum. Soon after, it was introduced in a few schools. The teachers are not only given training, and technical support when necessary, but they are also provided with an opportunity to give feedback to ensure that the program is being utilized to its full capacity. The schools that have taken on this project are given infrastructural support including a computer, a multimedia projector with screen, and a two-hour capacity uninterruptible power supply (UPS).²⁵ CAL provides teachers with the means to continue improving their teaching skills at institutions as well as through public examinations at all levels by promoting knowledge defined learning, rather than relying on memorization of texts.

3.2.3. Malaysia

In Malaysia, a study conducted by the Universiti Sains Malaysia revealed that successful diffusion of ICT into the classroom may be due to perceived administrative and technical support on the use of technology,²⁶ but teachers lack the skills to properly integrate ICT into their classrooms. This study also revealed several other issues regarding the effectiveness of ICTE. In order for ICT to be effectively used in education, a sense of its value needs to exist as well as the expectation that its use will lead to success. Teachers' education requires instructional design, and a belief about computers needs to be present if all teachers are to use ICT in their classrooms. Classroom practices need to change in order for ICT to be fully effective, and attitudes of some who may be unwilling to move away from the traditional way of teaching, need to be taken into consideration when training teachers for ICT use. Several models of ICT training for teachers have been applied to teacher training programs. The Malaysian Ministry of Education uses the cascade model to train teachers. This model comprises of selected individuals who are trained to be ICT ready, who in turn, train others.

3.2.4. Rwanda

The Centre for Geographic Information Systems, for example, uses the Snowball dispersion model, in which schools train other schools and teachers support each other. Though Rwanda has been very proactive, it has a shortage of teachers. The teachers who are available require training in the maintenance of computers in the case that they break down. In addition, an issue that arises from Rwanda is that only well-trained teachers have enough confidence to actually use ICT as a teaching mechanism in the classroom.²⁷ Computers in Rwanda are still an emerging phenomenon and very few teachers actually have access to them. A

number of teachers are being trained in computer literacy programs in the use of their laptops, however, so that they are better equipped to help their students exposed to these laptops provided by OLPC and the Government of Rwanda. These workshops are provided by the Rwandan Regional ICT Training Centre (RITC) based at Kigali Institute of Science and Technology (KIST) and will help build confidence in order for teachers to incorporate ICT in the classroom.²⁸ The government still has a long way to go in regards to the retaining and recruiting of teachers. One way to do that may be the introduction of distance learning through ICT as well as increasing accessibility. As mentioned elsewhere in this paper, ICT is perceived as an emerging necessity to compete in the world, thus teachers may be more willing to embrace their positions and individuals may be more attracted to the field.

3.2.5. Mali

One of Mali's biggest teacher training programs is the *Programme de Formation Interactive des Enseignants par la Radio* (FIER), which is a training activity using radio and digital technologies that enables the Ministry of Education to bring the training directly into the communities. Participation of teachers will therefore increase, since no traveling is required, and new and improved skills are being taught that are more student-centered pedagogical techniques. The curriculum of these sessions will also provide tools for different subject matters like HIV/AIDS and gender equality. The outcome of FIER is an estimate of 15,200 trained teachers and 300 supervisors/principals across the entire nation.

3.3 High Costs and Other Difficulties in the Transition to ICTE

As highlighted in the case of Rwanda above, one major obstacle for developing countries, is dealing with the financial costs of integrating ICT into education. Offering affordable ICT to underdeveloped regions remains a complex and difficult challenge. Assessing the costs related to Internet connectivity, for example, varies tremendously between countries and within the countries themselves. The disparities are dependent on a number of factors, including existing infrastructure, the nature of the Internet provider and the nature of the Internet technology. Oftentimes, government-owned telecommunication companies have failed in their efforts to provide affordable and efficient services. In their attempt to control national telephone networks, some governments have been reluctant to ensure a competitive market for communication services, which impedes better connectivity and sustainability. This has led sometimes to high levels of corruption and profiteering among state-owned telecom companies. Governments should consider reevaluating their licensing policies and initiate regulatory frameworks conducive to more cost-effective and enhanced choices for connection.²⁹

Any initiative, be it from the government, private sector or civil society, should make lobbying for more investments in computers a priority. Insufficient access to computers is one of the main obstacles for ICTE programs. This is particularly relevant for educational institutions located in rural areas where the school or training institution is the only access point for computers. Although this will require massive investments in the infrastructure, it is nevertheless essential in order to guarantee equal access and to overcome the digital divide.³⁰ Strong, sustainable partnerships between the government, private sector and civil society must be built to offset costs and mitigate the complexities of the integration of ICT in education systems. Good will, dedication and flexibility are necessary from all partners to ensure agreement and progress. Due to the high costs associated with ICT, investments must be carefully planned, finding creative ways of financing, and creating networks and synergies.³¹

Another critical issue with the integration of ICTE is the implementation of new technologies without having analyzed their appropriateness, applicability and impact on various environments and contexts. In most countries, particularly the least developed ones, they must learn from the experiences of others, but must also use technology to respond to their own needs and not just follow trends.³² It is necessary to focus on training teachers and instructors to use ICT to develop their own teaching materials and educational content. Considering that a majority of the online content available is in English, teachers and instructors, as well as outside developers need to make a meaningful effort to develop learning materials in local languages with appropriate and relevant content for local situations.

3.3.1. Namibia

SchoolNet Namibia, a non-profit civil society organization, offers an innovative option on affordable and sustainable access to ICT.³³ In a partnership with Telecom Namibia,³⁴ the XNet Development Trust³⁵ was created. It brings affordable bandwidth connectivity to several sectors in the country, including education, health and agriculture. USD \$2.05 million (USD) have been devoted by Telecom Namibia towards XNet which has decreased the flat-rate for schools for 24/7 Internet service to USD \$25 per month. Through this partnership, XNet is provided to all schools that participate in SchoolNet Namibia. Better-off schools in the system are encouraged to pay more than the monthly fee in order to help cover those schools which still cannot afford the costs. Furthermore, SchoolNet receives through Telecom Namibia a reduced rate on its national phone number 0700, through which educators can access the Internet for free.³⁶ More than 450 schools work with this phone service, and have received free hardware and technology training.³⁷

3.3.2. Bangladesh

Like other less developed countries, ICT infrastructure in Bangladesh is very weak. Along with the Bangladesh Telecommunications Company Limited (BTCL), many private companies such as Grameen Phone, Telekom Malaysia, British Telecom, and Aktel-TM International Limited are expanding their ICT services throughout the country. In 2006, the government also approved VOIP (Voice over Internet Protocol) in Bangladesh. Internet, e-mail and mobile phone access is dramatically expanding due to the gradual price decline by the competition among the private companies.³⁸

3.3.3. Malaysia

In an effort to contribute to a digital collection of literature and to develop learning materials appropriate for their students, the Ministry of Education in Malaysia has developed an Electronic Book Project. This is a device that stores electronic textbooks and links the user to the Internet. It is being run as a pilot project to see whether or not there can be improvements in teaching and learning inside the classroom. This project was created with the hope that it might come to replace traditional textbooks, alleviating the heavy burden on students having to carry them. The initial findings of the project revealed that the device does improve computer and technology knowledge and that students were more engaged in reading and learning, strengthening the process of teaching and learning through the use of ICT. In addition to providing electronic access to textbooks, this also encourages the community to become more aware of the environmental consequences of using traditional textbooks.³⁹

3.3.4. Uruguay

Likewise, the National Board of Education (ANEP) in Uruguay launched Uruguay Educa, an online educational portal promoting equal access among teachers, students and their families to the opportunities given

by ICT. The portal offers numerous tools for teachers to use in preparation for class, provides students with exercises, presentations, software and other resources to be used in conjunction with their homework assignments, and allows for anyone else with Internet access to take advantage of the abundance of information provided through the portal. Essentially, it assists in integrating ICT into the curriculum and improving the national education system, while generating opportunities for all Uruguayans to have access to the information, and to broaden their knowledge. *Uruguay Educa* is part of a larger network of regional education portals, the Latin American Education Portals Network (RELPE).⁴⁰

Several countries in the region have independently designed education portals that offer local educational contents in accordance to their national policies. The objective behind RELPE is to promote educational quality and equality to bridge the digital divide that affects the development of the region. By interchanging knowledge and expertise in the area of ICT in education, a great contribution would be made in lowering expenses in the development of materials as well as in increasing the amount of resources available to teachers and students across the region. RELPE could serve as an excellent model of regional cooperation in areas where language and cultural context are similar.⁴¹

3.4 Government Cooperation and Policy Implementation

Another challenge that has emerged is the lack of cooperation and coordination between national government policies and the use of ICT in educational systems. Many government ministries lack necessary ICT specialists, such as technicians, programmers, engineers and computer scientists. Those who are available may not understand or are ill-trained to undertake policy and strategic planning for the inclusion of learning purposes within an educational setting. Aside from the lack of staff, there are issues with not having the right tools and institutional infrastructure to address technology and educational issues dealing with learning and teaching.⁴² Government cooperation is necessary for ICT programs to be sustainable. Its cooperation is needed in order to support the education curriculum system, which is vital for the survival of ICTE.⁴³ In the attempt to re-evaluate the education curriculum of countries to include ICT, governments also have to consider the social context in which they are implementing this new phenomenon. The realities of individual countries should be considered and the availability of ICT should be made according to the needs and desires of the countries in order to facilitate appropriate learning and local ownership of knowledge.⁴⁴

Governments should adopt a coherent national policy framework, not just within the education field but also encompassing those of other ministries as they are seen as intertwined.⁴⁵ As mentioned above, the support and collaboration of the national government is necessary for the sustainability of ICT. National government policies must demonstrate political will and champion the integration of ICTE purposes. These policies must be in line with national development goals and frameworks. In countries where implementation capacity is weak and miss-use of resources can be a major problem, ICT can further enable the country to enhance its capacity building efforts and reduce the opportunity for corruption or allow the corruption to end.⁴⁶ In order for the government to reach its development goals and the goals of the international community which are reflected in the MDGs, it is imperative that the government curb corruption and increase the nation's capacity building and improve accountability and transparency. ICT can be a key enabler for these objectives.

Not only are national policies necessary, but the government also should assist in building organizational and institutional capacity to effectively deal with the complexities of integrating and implementing ICT. Organizational restructuring might be necessary from the highest levels of authority (Ministry of Education) down to local administrators. Ministries of Education need to reconsider how they institutionalize posi-

tions of responsibility for ICTE. The ICTE unit's roles relate directly to improvement of teaching and learning using ICT, and the mix of skills required differs substantially from that of a traditional IT unit, providing infrastructural systems support. A long-term vision on the integration of ICTE is a clear necessity to provide guidance and motivation to enthusiastic early adopters and other stakeholders. A vision is also crucial to actively plan for the deployment of ICT within the sector. In the longer term, the active participation of the government is essential to ensure the sector-wide introduction of ICTE. Government involvement is critical to source additional investments in the ICT infrastructure, to integrate ICT in the curriculum, and to facilitate the widespread diffusion of materials.⁴⁷

3.4.1. Ghana

In the early stages of ICT implementation, Ghana found difficulties in establishing a clear policy framework that would define the roles and responsibilities of all stakeholders involved and provide a sound blueprint for translating educational policy into practice. The lack of an effective policy framework led to an unmanageable implementation of ICT in the school systems. The inactivity of various ministries coupled with the lack of human resource capacity proved to be challenging obstacles for reform in the educational system.⁴⁸ Without a coherent strategy to fully integrate ICT tools into the classroom, ICT projects would not reach their full potential or remain sustainable on a large scale. Eventually, under the guidance and facilitation of the Global e-Schools and Communities Initiative (GeSCI), the Ministry of Education carried out a critical assessment of the existing utilization of ICTE to identify shortcomings as well as hindrances caused by the state of the educational system. GeSCI has helped the government of Ghana develop a National ICT in Education Policy based on the countries ICT for Accelerated Development (ICT4AD) Policy and its Education Strategic Plan 2003-2015.⁴⁹ With a national education policy in place to integrate ICTE, Ghana is better prepared to tackle the numerous infrastructural and logistical issues that inhibit any potential progress.

3.4.2. Uruguay

Political will is crucial for the successful integration of ICT and as demonstrated by the government of Uruguay, it proves to not only enhance the training necessary to improve education but it also ensures the country's ability to progress towards its national development goals. Acknowledging the importance of providing students and teachers with access to ICT as part of the curriculum, the Educational Connectivity Program (ECP) began as a direct initiative from the President of the Republic of Uruguay, in a joint effort with the ANEP and ANTEL. Financed with funds for technical assistance from the Japanese Government, and managed by the Inter-American Development Bank (IDB), the ECP was designed to provide Internet access to all public primary, secondary, tertiary and technical schools and to train teachers in the use of ICT and e-content that could be incorporated into their curriculum. Likewise, the ECP has demonstrated the potential that exists in multilateral partnerships between government, international organizations, and the private sector. The program has garnered the attention of neighboring countries as they seek to replicate its effectiveness and optimal use of resources available in addressing the problems stagnating their educational systems.⁵⁰

3.4.3. Malaysia

The government of Malaysia has been proactive in integrating ICT into its national policies. It has been very particular in the inclusion of ICT within the educational system, and has reconstructed its education curriculum to better complement the needs for ICT as an instruction as well as a learning tool.⁵¹ It has transformed its educational system in order to meet its Vision 2020 goals. Its vision of ICT as a means has been

formulated into three main policies for the inclusion of ICT in education. These policies allow students accessibility to ICT in order to reduce the digital gap between schools; allow for the use of ICT as a teaching and learning, taught as part of a subject and as a subject of its own; and allow for increased productivity, efficiency and effectiveness of management system. Their support and willingness to embrace ICTE has evolved into the Smart Schools mentioned above.

3.4.4. Sweden

Sweden has been a pioneer in embedding ICTE in its national education system. ITiS-IT in Schools, the Swedish national Action Plan for ICTE, was created through collaboration between The Swedish Ministry of Education and Science and the Swedish Parliament. The plan first established a commitment from the government to establishing ICTE in schools throughout the country, and then gave responsibility to uniquely implement the various ICTE initiatives to each local municipality so as to give each district and schools within those districts direct control to tend to their specific needs.

3.4.5. Azerbaijan

In 2007, the President of the Republic of Azerbaijan declared ICT as a priority sector of the economy and emphasized the importance of the use of ICT in all sectors of the economy including the education system. The State Program for Equipping Schools with Information Communication Technologies was successfully implemented. The work performed under the Program has resulted in ninety two percent of all schools having already been equipped with sufficient computers to reach a ratio of 1PC to 29 schoolchildren in Azerbaijan, and it is expected that by the end of 2012 all schools in Azerbaijan will have Internet access.⁵²

3.4.6. Mali

The government has recognized education as an important attribute to the country's development, making it a priority. It has increased the national budget for education from 26.62% in 2001 to 35% in 2008.⁵³ In 2005, the AGETIC was established by the Malian Government as the institution to oversee and research ICT development. Its duty is to build an empowering environment, which promotes the use of ICT for the formal as well as the informal sectors. Furthermore, it will also be used to develop ICT infrastructure that connects all communities, as well as improve education and capacity-building through ICT. Thus, by establishing a legal and statutory framework, it will help create a high quality governance and administrative intranet.

3.4.7. Namibia

Another great example of successful government cooperation and policy implementation is Namibia. Until the last couple of years, when several organizations and projects were developed, ICTE had been almost non-existent. Because the concept was fairly new to Namibia, there had been no advisory on the implementation of ICTE. Several different platforms were used to develop training programs; connectivity and technical support had not yet emerged; and the Ministry of Education did not have the ability to oversee and ensure that these projects and organizations were working towards the Ministry's educational goals. In 2004, the Education Steering Committee was created with the help of ministry officials, ICT project managers, and NGOs. Its responsibilities are to oversee implementation of education policy focused on ICTE and to create a comprehensive framework for the implementation of ICT across the education sector. Nine key components make up a framework of four sectors:

Sector One

- (1) educational objectives

Sector Two

- (2) project management

Sector Three

- (3) infrastructure readiness and platform development
- (4) curriculum development
- (5) content availability
- (6) training and usage support
- (7) educational management
- (8) maintenance and technical support

Sector Four

- (9) comprehensive monitoring and evaluation.

The strength of this framework is its concentration on actions rather than on institutions, and can therefore be used at all levels (See Figure 7).⁵⁴

3.5 Monitoring and Evaluation

Often overlooked by policy makers, monitoring and evaluating projects within a given country is critical to ensure that these respective projects are both making the intended impact and will be sustainable in the long run. Appropriate indicators must be identified for every ICTE project that can be monitored in order to effectively track progress. Stakeholders at all levels must be part of this process to ensure transparency and to avoid potentially corruptive practices throughout the projects.

A collaborative effort is underway in Africa that is doing just that. Together with Aptivate, a UK-based NGO providing IT services for international development, Camfed, a NGO improving girls' education in Zimbabwe, Zambia, Ghana and Tanzania, has tested the efficiency and quality of personal digital assistants (PDAs) as a tool for monitoring and evaluation.⁵⁵ This method is extremely time efficient. Data can be calculated within hours rather than weeks and through its ability to connect to the internet it can be transmitted directly from the worker in the field to the headquarter. PDAs not only improve the quality of the surveys and the procedure but also the reliability of the outcome through a more consistent data collection. The cost of this technology might seem high at the beginning, but one needs to take into consideration that the cost of paper is eliminated and that the device is re-usable, enabling the user to change and create new surveys on the go. Through devices such as this one, stakeholders can carefully monitor progress to ensure that projects remain productive and sustainable for use by many generations in the future.

3.5.1. Bangladesh

In 2009, the Prime Minister of Bangladesh made a promise of a *digital Bangladesh* to the citizens. In order to ensure that the government is able to keep track and undertake the task of digitalizing the country by

providing access to ICT for all, an activist organization, Jagoree, will develop its own metrics of *digital Bangladesh* and keep tab of change, making policy recommendations as they deem necessary. Although the government has its own Implementation, Monitoring and Evaluation Division (IMED), it must also introduce its own mechanism since it may become challenging for IMED to keep track of.⁵⁶

The government must realize that this is a collaborative effort, where NGOs, the private sector as well as grassroots organizations are key stakeholders. The Prime Minister's Office, under the leadership of the Prime Minister herself, established an ICT Task Force with representatives from all major ICT stakeholders, including the private sector and industry. One of the key objectives of this program is to provide capacity development to e-governance aimed at strengthening skills and competencies to ensure implementation of ICT projects. This includes assuming appropriate roles and responsibilities in project initiation, knowledge advisory support to projects, quality assurance and monitoring of progress and evaluation of results during implementation, and in defining the exit strategy.⁵⁷

3.5.2. Rwanda

The OPLC pilot program in Rwanda was evaluated with the aim of establishing whether students who were given laptops during the pilot program have benefited from them and also whether their learning has improved in any way.⁵⁸ The findings showed that students have benefited from exposure to these computers. Since students are able to take the computers home, they are able to teach their parents and family members and because of that they see them as very important. The survey also reveals that more student exposure to ICT will only be beneficial to all. It would be interesting, however, to know what students are using the computers for or how they are being taught with them in the schools, something that did not seem to be discussed in the survey.

An issue that did arise from the survey, however, was that students are learning how to use these computers much faster than teachers. Teachers had been trained in basic computer skills in order to ready themselves for the disbursement of the computers, but a second phase of teacher training is scheduled to take place after disbursement of computers to future schools. As mentioned above, constant teacher training in ICT is necessary so the learning process is not compromised. The government and private investors should ensure that teachers receive training on a consistent basis so that they do not lose confidence in their abilities to use ICT.

4. Comparative Analysis and Lessons Learned

ICT is evolving at an unprecedented rate, making it impossible for developing countries to keep up with all of the newest advancements available in the area of education. Successfully implementing a single initiative is hard enough already because of all the challenges that have been discussed thus far. This is why it is important for developing countries to learn from one another when it comes to ICTE. It takes innovative and sometimes extraordinary actions from both the public and private sectors to overcome the challenges we have described already, and these sorts of actions can be replicated by other countries to keep up in the development race. If and when a country is able to overcome all of these challenges and is finally ready to move forward with a project of some sort, they can follow thriving models from other countries that have proven to be successful.

When it comes to increasing access to ICT in the education sector and bridging the digital divide, countries can look to initiatives such as the Transnational – Eurasian Information Super Highway. While this is certainly an ambitious plan which will take time, effort and funding, an intra-regional collaboration of this sort is absolutely essential for long-term success. Large scale connectivity efforts will require these sorts of partnerships, as infrastructure such as phone lines will inevitably have to be built across borders. One reason why the African continent has fallen behind in connectivity efforts is the lack of cooperation and coordination amongst the countries. Currently, wide-scale connectivity efforts in Africa are concentrating on coastal countries through undersea fiber optic cables. If the governments of land-locked, bordering countries such as Ethiopia, Kenya and Tanzania, for example, were able to work together on something like an information superhighway, it would lessen the burden on the individual countries, and the benefits would be shared by everyone.

Dedicated teachers will always be the backbone of any successful ICTE initiative. Without teachers who are willing to learn about ICT and adapt their own teaching methods to integrate technology into the curriculum, ICTE initiatives will not work. One project that has led to success in this area that we have seen throughout our research has been the development of an online resource center that both trains and provides critical information for teachers. Advanced online resource centers such as the Swedish School-net or basic workshops like the ones given by the Rwandan Regional ICT Training Centre (RITC), are crucial for overcoming the challenge of creating a knowledgeable and committed group of teachers that can make ICTE work on the local level. The model of providing teachers with resources and relevant training on ICT is one that should be replicated by every developing country.

The challenge of the high costs of ICTE is strongest in poorer African nations like Sudan, Chad or Rwanda, among others. These countries are constantly battling for tax revenues, which are extremely limited, and are directly competing for any available foreign aid. Private companies oftentimes collaborate with governments in mutually beneficial financial relationships at the expense of the people. Corruption is high because of the scarcity of resources and the widespread instability of the various governing institutions. Namibia would be a good model for these countries to look at in terms of affordable ICTE. It provides reasonable access through a collaborative partnership between its government and Telecom Namibia, which is a partnership that focuses on offering connectivity to schools, encouraging better-off schools to pay more in order to help cover the costs of the poorer ones.

Effective leadership from a country's most powerful political actors is essential for any successful ICTE initiative. The challenge of garnering adequate government support and cooperation is something that is holding back many countries in the South American region when it comes to ICTE development. Many of the countries there have an abundance of natural resources but the funds that they generate are often misused or unevenly distributed. These countries might look into the Uruguayan model whose government has shown tremendous political will and dedication in integrating ICT into their education sector. In the Uruguayan case, the leadership came from the very top as the Head of State started the Educational Connectivity Program initiative that has become a successful, collaborative effort that is bringing ICT access and teacher training to its schools. Countries around the world may not agree on a single way in which governments should run their respective nations. They are all, however, trying to achieve similar social and economic development goals. Thus it is indispensable that they learn from one another when it comes to the implementation of ICTE, which can immediately stimulate their education sectors, and develops the young people that will be the basis for future economic growth.

5. Mobile Technology and its Role in ICTE in the Future

Successful applications of radio, television and computer technology to education in recent years have been discussed thus far in this paper because they provide the most concrete examples of sustainable and successful ICTE coming from the developing world. Looking ahead however, ICTE experts and practitioners in the field are predicting that mobile phones will be the next transformative device in the field of education. High end mobile devices today are rivaling small computers in regards to their capacity and computing power. For practical ICTE use in developing countries though, it is the availability and affordability of today's mobile devices that are creating the biggest opportunities. The private sector is continually increasing distribution and lowering costs to allow just about anyone to purchase a mobile phone. In January of 2009 alone, India gained more than 15 million new mobile phone subscribers.⁵⁹

In terms of their usage in ICTE, mobile phones provide education policy makers with an unprecedented tool for distance learning. Mobile devices extend desktop-based online learning into the mobile and wireless environment, allowing students with personal mobile phones to access educational materials from anywhere at anytime. Mobile technology also gives teachers a new means of education delivery, and allows them to connect with their students at anytime. Teachers in rural areas can interact with experts in developed countries in real-time using a basic mobile phone. The applications of "m-education" are endless and will continue to evolve as more and more people acquire and learn to use mobile phones in the future.

6. Recommendations for Implementation of ICT in Education for Development

What the experiences of countries pursuing ICTE have taught us thus far is that while there is tremendous potential for broad ranging improvements across many sectors of education through the use of ICT, the road will certainly not be easy. It will take a continued commitment from all stakeholders involved to make any kind of substantial and sustainable change. It is our hope that the following recommendations, intended for all stakeholders involved in bringing ICTE to countries around the world, will provide a roadmap for long term success in bringing ICTE to children around the world.⁶⁰ A key to success is to adopt a comprehensive, end-to-end, systematic approach, with a phased and learn-as-you-go implementation that can be adjusted to adapt to the specific needs and a changing environment.

6.1 For Access

6.1.1 Special consideration should be given to ICT connectivity and accessibility for educational purposes. Bandwidth and spectrum of radio and television wavelengths should be allocated for education. Planning for connectivity infrastructure and regulations should promote and facilitate educational use of ICT. The trends towards convergence and new mobile platforms for internet-connectivity need to be fully exploited through innovative policies and partnerships that can help lower cost and expand access.

6.1.2 Central and regional digital libraries and resource centers should be developed which can serve institutions in their respective regions. Access to international library resources, research databases, and journals should be arranged for the regional resource centers on behalf of institutions in the region.

6.1.3 Regional networks of collaboration among countries where language and cultural context are similar could serve as a platform to promote educational quality and equality in an effort to bridge the digital divide. Greater exchange and collaboration in the production and management of educational resources would

lower expenses in the development of materials as well as increase the amount of educational content available to teachers and students across the region.

6.1.4 Public and Private sector education stakeholders must continue to explore the applications of mobile technology in the education sector. It is essential that the ongoing proliferation of mobile devices throughout the developing world collaborates with the education sector to effectively put to good use the mobile phones that so many young students in developing countries have today.

6.2 For Teachers

6.2.1 It is necessary to focus on training teachers and instructors to use ICT to develop their own teaching support materials. This approach assures ownership by teachers and instructors and enhances the usability of products. Many projects still focus on using materials for teachers and students that have been developed externally. However, such materials often fall short of providing appropriate or relevant content for the local situation.

6.2.2 Teachers should work together with both public and private sector stakeholders to establish networks that support them in their transition to ICT-based education. Online knowledge sharing networks to facilitate this process need to be established for use by teachers at all levels.

6.3 For Cost

6.3.1 Any initiative, be it from government, private sector or civil society, should make lobbying for more investments in computers a priority. Insufficient access to computers is one of the main obstacles in ICT for education programs. This is particularly relevant for educational institutions located in rural areas where the school or training institution is the only access point for computers. Although this will require massive investments in the infrastructure, it is nevertheless essential in order to guarantee equal access and overcome the digital divide.

6.3.2 International agencies such as the UNDP, the World Bank, among others, should work together along with the local governments of grant-receiving countries to establish a global framework to deal with emerging issues of the digital divide due to the new Internet economy.

6.3.3 IT companies from developed countries such as the U.S., should work with local organizations, including schools, universities, government agencies, community service organizations, nonprofits, and small businesses, to implement and train local people in new technologies, and help in implementation through innovative partnerships that can harness complementary resources and technology solutions to overcome obstacles.

6.4 For Government and Policy Implementation

6.4.1 Sustainable partnerships between the government, private sector and civil society must be built to offset costs and mitigate the complexities of the integration of ICT in education. Good will, dedication and flexibility are necessary from all partners to ensure agreement and progress. Due to high costs, investment made must be strategic after careful planning, finding creative ways of financing, and creating networks and synergies.

6.4.2 National policies need to be aligned with policies on education. Though private institutions and civil society can implement their own programs, they will not be sustainable without the support of the national government. It seems, thus far in the research, that for ICT to be effective in education, ICT programs require the support of the national government.

6.4.3 A coherent national policy on ICT in education is a necessity in order for successful ICT integration and capacity building. Governments must demonstrate political will and must champion the integration of ICTs to improve education and training in line with national development goals and frameworks. Government involvement is critical to source additional investments in ICT infrastructure, to integrate ICT in the curriculum, and to facilitate the widespread diffusion of materials.

6.4.4 Governments should consider reevaluating their licensing policies and initiate regulatory frameworks conducive to more cost-effective and enhanced choices for connection. A fair, competitive market can reduce costs and provide more efficient services. By providing incentives to private sector investment, affordable Internet connectivity would be possible in rural areas and other isolated regions.

6.4.5 In countries where government capacity is weak, increased efforts are needed from all stakeholders to curb corruption and increase the nation's capacity, accountability and transparency. With the misappropriation of funds, any limited resources that may be earmarked to support ICT in education may never be allocated to the intended efforts.

6.5 For Monitoring and Evaluation

6.5.1 Stakeholders working on ICTE implementation at all levels must closely monitor the progress of their projects to ensure that they are progressing and sustainable.

Appendix

E-Governance Readiness 2005		
Country	World Rank	Index 2005
Azerbaijan	101	0.3773
Bangladesh	162	0.1762
Brazil	33	0.5981
Ghana	133	0.2866
Malaysia	43	0.5706
Mali	173	0.0925
Namibia	111	0.3411
Rwanda	143	0.253
Sweden	3	0.8983
Uruguay	49	0.5387

Source: United Nations Department of Economic and Social Affairs. Global E-Government Readiness Report 2005. (United Nations. 2005) <http://unpan1.un.org/intradoc/groups/public/documents/un/unpan021888.pdf>

Figure 1

KAM 2008 - Knowledge Assessment Matrix, The World Bank										
		Internet Access in Schools (1-7), 2007	Mobile Phones per 1,000 People, 2006	Computers per 1,000 People, 2005	International In- ternet Bandwidth (bits per person), 2005	Internet Us- ers per 1000 People, 2006	Price Basket for Internet (US\$ per month), 2005	Availability of e-Government Services (1-7), 2006	ICT Expenditure as % of GDP, 2006"	
Azerbaijan	actual	3.1	390	20	28.61	100	9.99	3.23	n/a	
	normalized	3.79	4.14	3.04	3.97	4.14	8.36	3.91	n/a	
Bangladesh	actual	1.8	120	20	0.4	0	24.01	1.62	2.7	
	normalized	0.56	1.64	3.04	0.37	0.5	3.93	0.26	0.93	
Brazil	actual	3.3	530	160	149.25	230	25.98	5.07	6.4	
	normalized	4.6	4.86	6.81	5.81	6.36	3.36	8.26	6.27	
Ghana	actual	3.1	230	10	7.61	30	23.56	n/a	n/a	
	normalized	3.79	2.86	1.88	2.87	1.93	4.14	n/a	n/a	
Malaysia	actual	5	750	220	128.26	430	7.39	5.33	6.8	
	normalized	7.9	6.36	7.39	5.74	7.93	9.29	8.78	7.07	
Mali	actual	2.6	130	0	1.92	10	28.42	2.77	n/a	
	normalized	2.42	1.86	0.65	1.69	1.21	2.86	2.52	n/a	
Namibia	actual	2.7	250	120	4.48	40	48.7	2.5	n/a	
	normalized	2.66	3.14	6.09	2.28	2.21	1.21	1.83	n/a	
Rwanda	actual	n/a	30	0	1.19	10	30.13	n/a	n/a	
	normalized	n/a	0.5	0.65	1.03	1.21	2.64	n/a	n/a	
Sweden	actual	6.3	1,060.00	840	17,530.71	770	19.23	5.65	7.2	
	normalized	9.92	8.5	9.71	9.78	9.86	5.21	9.57	7.47	
Uruguay	actual	3.3	700	140	462	230	23.87	3.89	7.8	
	normalized	4.6	5.93	6.67	6.69	6.36	4	6	8.13	

"Internet access is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether

""Internet access in schools"" in their country is (1= very limited, 7 = pervasive-most children have frequent access).

Source: The World Bank. Knowledge Assessment Matrix (KAM) database. <http://info.worldbank.org/etools/kam2005/index.htm>

Figure 2

Human Development Report 2007/2008											
MONITORING HUMAN DEVELOPMENT: ENLARGING PEOPLE'S CHOICES ...											
Indicators		Sweden	Uruguay	Malaysia	Brazil	Azerbaijan	Namibia	Ghana	Bangladesh	Rwanda	Mali
Adult literacy rate (% aged 15 and older)	1995-2005a	.j	96.8	88.7	88.6	98.8	85	57.9	47.5	64.9	24
Youth literacy rate, female (% aged 15-24)	2005a	..	99	97.3	97.9	99.9	93.5	65.5	60.3	76.9	16.9
Youth literacy rate (ratio of female rate to male rate)	2005a	..	1.01	1	1.02	1	1.03	0.86	0.9	0.98	0.52
Education index		0.978	0.942	0.839	0.883	0.882	0.783	0.555	0.503	0.602	0.282
Population lacking functional literacy skills (% aged 16-65)	1994-2003b	7.5k	..	..	..	..	..	..	..	..	..
Public expenditure on education	1991	7.1	2.5	5.1	..	7.7	7.9	..	1.5	..	..
(% of GDP)	2002-05c	7.4	2.6	6.2	4.4	2.5	6.9	5.4	2.5	3.8	4.3
Public expenditure on education (% of total government expenditure)	1991	13.8	16.6	18	..	24.7	..	..	10.3	..	..
	2002-05c	12.9	7.9	25.2	10.9	19.6	21l	..	14.2	12.2	14.8
Current public expenditure on education, pre-primary and primary	1991d	48	36	34	..	..	..	..	..	..	..
(as % of all levels)	2002-05c,d	34	42m,l	30	41	25m	60m,l	39	38m	55	50m,l
Current public expenditure on education, secondary	1991d	20	29	35	..	..	..	..	..	..	..
(% of all levels)	2002-05c,d	38	38m,l	35	40	56m	29m,l	42	48	11	34m,l
Youth literacy rate	1985-1995e	..	98.6	95.6	..	..	88.1	..	44.7	74.9	..
(% aged 15-24)	1995-2005f	..	98.6	97.2	96.8	99.9	92.3	70.7	63.6	77.6	..
Net primary enrolment rate	1991	100	91	..	85	89	..	54n	..	66	21n
(%)	2005	96	93n,o	95o	95o	85	72	65	94n,o	74n	51
Net secondary enrolment rate	1991g	85	..	..	17	..	..	..	..	7	5n
(%)	2005g	99	..	76o	78o	78	39	37n	44o	..	..
Children reaching grade 5	1991	100	97	97	73	..	62	80	..	60	70n
(% of grade1 students)	2004	..	91o	98o	..	..	86	63o	65o	46o	87
Cellular subscribers	1990h	54	0	5	(.)	0	0	0	0	0	0
(per 1,000 people)	2005h	935	333	771	462	267	244	129	63	32	64
Internet users	1990	6	0	0	0	0	0	0	0	0	0
(per 1,000 people)	2005	764	193	435	195	81	37p	18	3	6	4
Research and development expenditure (% of GDP)	2000-2005	3.74	0.263972382	0.691491695	0.980334335	0.301550855	..	..	0.620895376	..	..
Public expenditure on education	1991	7.1	2.5	5.1	..	7.7	7.9	..	1.5	..	..
(% of GDP)	2002-05i	7.4	2.6	6.2	4.4	2.5	6.9	5.4	2.5	3.8	4.3

Figure 3

Notes for Figure 3:

- a. Data refer to national literacy estimates from censuses or surveys conducted between 1995 and 2005, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution. For more details, see <http://www.uis.unesco.org/>.
- b. Based on scoring at level 1 on the prose literacy scale of the IALS. Data refer to the most recent year available during the period specified.
- c. Data refer to the most recent year available during the period specified.
- d. Expenditures by level may not sum to 100 as a result of rounding or the omission of expenditures not allocated by level.
- e. Data refer to national literacy estimates from censuses or surveys conducted between 1985 and 1994, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution. For more details, see <http://www.uis.unesco.org/>.
- f. Data refer to national literacy estimates from censuses or surveys conducted between 1995 and 2005, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution. For more details, see <http://www.uis.unesco.org/>.
- g. Enrolment rates for the most recent years are based on the new International Standard Classification of Education, adopted in 1997 (UNESCO (United Nations Educational, Scientific and Cultural Organization). 1997. *International Standard Classification of Education 1997*. Paris. [http://www.uis.unesco.org/TEMPLATE/pdf/iscd/ISCED_A.pdf]. Accessed August 2007), and so may not be strictly comparable with those for 1991.
- h. Telephone mainlines and cellular subscribers combined form an indicator for MDG 8; see Index to Millennium Development Goal Indicators in the indicator tables.
- i. Data refer to the most recent year available during the period specified.
- j. For purposes of calculating the HDI, a value of 99.0% was applied.
- k. Based on OECD (Organisation for Economic Co-operation and Development) and Statistics Canada. 2000. *Literacy in the Information age. Final Report on the International Adult Literacy Survey*. OECD Publishing. Paris. Data refer to the most recent year available during the period specified.
- l. Data refer to an earlier year than that specified (in the period 1999 to 2001).
- m. National or UNESCO Institute for Statistics estimate.
- n. National or UNESCO Institute for Statistics estimate.
- o. Data refer to an earlier year than that specified.
- p. Data refer to 2004.

Sources for Figure 3:

- column 1: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal, unless otherwise specified.
- column 2: calculated on the basis of data in columns 3 and 4.
- column 3: OECD (Organisation for Economic Co-operation and Development) and Statistics Canada. 2005. *Learning a Living by Earning Skills: First Results of the Adult Literacy and Life Skills Survey*. OECD Publishing. Paris, unless otherwise specified.
- column 4: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.
- column 5: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 6: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 7: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 8: calculated on the basis of data on public expenditure on pre-primary and primary levels of education from UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 9: calculated on the basis of data on public expenditure on pre-primary and primary levels of education from UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 10: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 11: calculated on the basis of data on public expenditure on secondary and post-secondary non-tertiary levels of education from UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 12: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 13: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 14: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal, unless otherwise specified.

column 15: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal, unless otherwise specified.

column 16: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal, unless otherwise specified.

column 17: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal, unless otherwise specified.

column 18: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal, unless otherwise specified.

column 19: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal, unless otherwise specified.

column 20: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, D.C.; aggregates calculated for HDRO by the World Bank.

column 21: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, D.C.; aggregates calculated for HDRO by the World Bank.

column 22: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, D.C.; aggregates calculated for HDRO by the World Bank.

column 23: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, D.C.; aggregates calculated for HDRO by the World Bank.

column 24: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, D.C.; aggregates calculated for HDRO by the World Bank.

column 25: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

column 26: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007b. Correspondence on education expenditure data. April. Montreal.

Human Development Report 2007/2008		MONITORING HUMAN DEVELOPMENT: ENLARGING PEOPLE'S CHOICES ...										
Human development index			Sweden	Uruguay	Malaysia	Brazil	Azerbaijan	Namibia	Ghana	Bangladesh	Rwanda	Mali
Indicators												
Unemployment rate Total (% of labour force)	2006	7		..	..	..	..	..	..	..	..	..
Unemployment rate Female (% of male rate)	2006	103		..	..	..	..	..	..	..	..	..
Youth unemployment rate, total (% of labour force aged 15-24)	2006 ^a	21.3		..	..	..	..	..	..	..	..	..
Youth unemployment rate (female rate as % of male rate)	2006	102		..	..	..	..	..	..	..	..	..
Long-term unemployment, women (% of total unemployment)	2006	12.2		..	..	..	..	..	..	..	..	..
Long-term unemployment, men (% of total unemployment)	2006	16.1		..	..	..	..	..	..	..	..	..
Gender-related development index (GDI) rank	2005	5	45	57	57	59	86	107	116	120	139	150
Gender-related development index (GDI) value	2005	0.955	0.849	0.802	0.798	0.743	0.645	0.549	0.539	0.45	0.371	
Adult literacy rate, female (% aged 15 and older)	2005 ^b	..e	97.3	85.4	88.8	98.2 ^f	83.5	49.8	40.8	59.8	15.9	
Adult literacy rate, male (% aged 15 and older)	2005 ^b	..e	96.2	92	88.4	99.5 ^f	86.8	66.4	53.9	71.4	32.7	
Combined gross enrolment ratio for primary, secondary and tertiary education, female (%)	2005 ^c	100 ^f	95 ^g	77 ^g	89 ^g	66	66	48	56 ^g	51	31	
Combined gross enrolment ratio for primary, secondary and tertiary education, male (%)	2005 ^c	91 ^f	83 ^g	72 ^g	86 ^g	68	63	53	56 ^g	51	42	
Estimated earned income, female (PPP US\$)	2005 ^d	29,044	7,203 ^h	5,751	6,204	3,960 ^h	5,527 ^h	2,056 ^h	1,282 ^h	1,031 ^h	833 ^h	
Estimated earned income, male (PPP US\$)	2005 ^d	36,059	12,890 ^h	15,861	10,664	6,137 ^h	9,679 ^h	2,893 ^h	2,792 ^h	1,392 ^h	1,234 ^h	
Gender empowerment measure (GEM) rank		2	59	65	70	..	36	..	81	..	..	..

Figure 4

Notes for Figure 4:

- a. The age range may be 16-24 for some countries.
- b. Data refer to national literacy estimates from censuses or surveys conducted between 1995 and 2005, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution. For more details, see <http://www.uis.unesco.org/>.
- c. Data for some countries may refer to national or UNESCO Institute for Statistics estimates. For details, see <http://www.uis.unesco.org/>.
- d. Because of the lack of gender-disaggregated income data, female and male earned income are crudely estimated on the basis of data on the ratio of the female nonagricultural wage to the male nonagricultural wage, the female and male shares of the economically active population, the total female and male population and GDP per capita in PPP US\$ (see Technical note 1). The wage ratios used in this calculation are based on data for the most recent year available between 1996 and 2005.
- e. For the purposes of calculating the GDI, a value of 99.0 % was applied.
- f. For the purpose of calculating the GDI, the female and male values appearing in this table were scaled downward to reflect the maximum values for adult literacy (99%), gross enrolment ratios (100%), and GDP per capita (40,000 (PPP US\$)). For more details, see Technical note 1.
- g. Data refer to an earlier year than that specified.
- h. No wage data are available. For the purposes of calculating the estimated female and male earned income, a value of 0.75 was used for the ratio of the female nonagricultural wage to the male nonagricultural wage.

Sources for Figure 4:

column 1: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 2: calculated on the basis of data on male and female unemployment rates from OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 3: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 4: calculated on the basis of data on male and female unemployment rates from OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 5: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 6: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 7: determined on the basis of the GDI values in column 2.

column 8: calculated on the basis of data in columns 3–10; see Technical note 1 for details.

column 9: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 10: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 11: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 12: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 13: calculated on the basis of data on GDP per capita (PPP US\$) and population data from World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, DC., unless otherwise specified; data on wages from ILO (International Labour Organization). 2007b. LABORSTA Database. Geneva. [<http://laborsta.ilo.org>]. Accessed April 2007.; data on the economically active population from ILO. (International Labour Organization). 2005. Key Indicators of the Labour Market. Fourth edition. CD-ROM. Geneva.

column 14: calculated on the basis of data on GDP per capita (PPP US\$) and population data from World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, DC., unless otherwise specified; data on wages from ILO (International Labour Organization). 2007b. LABORSTA Database. Geneva. [<http://laborsta.ilo.org>]. Accessed April 2007.; data on the economically active population from ILO. (International Labour Organization). 2005. Key Indicators of the Labour Market. Fourth edition. CD-ROM. Geneva.

column 15: determined on the basis of GEM values in column 2.

Human Development Report 2007/2008											
Human development index		MONITORING HUMAN DEVELOPMENT: ENLARGING PEOPLE'S CHOICES . . .									
Indicators		Sweden	Uruguay	Malaysia	Brazil	Azerbaijan	Namibia	Ghana	Bangladesh	Rwanda	Mali
Gender-related development index (GDI) rank	2005	5	45	57	59	86	107	116	120	139	150
Gender-related development index (GDI) value	2005	0.955	0.849	0.802	0.798	0.743	0.645	0.549	0.539	0.45	0.371
Adult literacy rate, female (% aged 15 and older)	2005 ^b	.. ^e	97.3	85.4	88.8	98.2 ^f	83.5	49.8	40.8	59.8	15.9
Adult literacy rate, male (% aged 15 and older)	2005 ^b	.. ^e	96.2	92	88.4	99.5 ^f	86.8	66.4	53.9	71.4	32.7
Combined gross enrolment ratio for primary, secondary and tertiary education, female (%)	2005 ^c	100 ^f	95 ^g	77 ^g	89 ^g	66	66	48	56 ^g	51	31
Combined gross enrolment ratio for primary, secondary and tertiary education, male (%)	2005 ^c	91 ^f	83 ^g	72 ^g	86 ^g	68	63	53	56 ^g	51	42
Estimated earned income, female (PPP US\$)	2005 ^d	29,044	7,203 ^h	5,751	6,204	3,960 ^h	5,527 ^h	2,056 ^h	1,282 ^h	1,031 ^h	833 ^h
Estimated earned income, male (PPP US\$)	2005 ^d	36,059	12,890 ^h	15,861	10,664	6,137 ^h	9,679 ^h	2,893 ^h	2,792 ^h	1,392 ^h	1,234 ^h
Gender empowerment measure (GEM) rank		2	59	65	70	..	36	..	81	..	..

Figure 5

Notes for Figure 5:

- a. The age range may be 16-24 for some countries.
- b. Data refer to national literacy estimates from censuses or surveys conducted between 1995 and 2005, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution. For more details, see <http://www.uis.unesco.org/>.
- c. Data for some countries may refer to national or UNESCO Institute for Statistics estimates. For details, see <http://www.uis.unesco.org/>.
- d. Because of the lack of gender-disaggregated income data, female and male earned income are crudely estimated on the basis of data on the ratio of the female nonagricultural wage to the male nonagricultural wage, the female and male shares of the economically active population, the total female and male population and GDP per capita in PPP US\$ (see Technical note 1). The wage ratios used in this calculation are based on data for the most recent year available between 1996 and 2005.
- e. For the purposes of calculating the GDI, a value of 99.0 % was applied.
- f. For the purpose of calculating the GDI, the female and male values appearing in this table were scaled downward to reflect the maximum values for adult literacy (99%), gross enrolment ratios (100%), and GDP per capita (40,000 (PPP US\$)). For more details, see Technical note 1.
- g. Data refer to an earlier year than that specified.
- h. No wage data are available. For the purposes of calculating the estimated female and male earned income, a value of 0.75 was used for the ratio of the female nonagricultural wage to the male nonagricultural wage.

Sources for Figure 5:

column 1: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 2: calculated on the basis of data on male and female unemployment rates from OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 3: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 4: calculated on the basis of data on male and female unemployment rates from OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 5: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 6: OECD (Organisation for Economic Co-operation and Development). 2007. OECD Main Economic Indicators. Paris. [<http://www.oecd.org/statsportal/>]. Accessed July 2007.

column 7: determined on the basis of the GDI values in column 2.

column 8: calculated on the basis of data in columns 3–10; see Technical note 1 for details.

column 9: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 10: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 11: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 12: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 13: calculated on the basis of data on GDP per capita (PPP US\$) and population data from World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, DC., unless otherwise specified; data on wages from ILO (International Labour Organization). 2007b. LABORSTA Database. Geneva. [<http://laborsta.ilo.org>]. Accessed April 2007.; data on the economically active population from ILO. (International Labour Organization). 2005. Key Indicators of the Labour Market. Fourth edition. CD-ROM. Geneva.

column 14: calculated on the basis of data on GDP per capita (PPP US\$) and population data from World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, DC., unless otherwise specified; data on wages from ILO (International Labour Organization). 2007b. LABORSTA Database. Geneva. [<http://laborsta.ilo.org>]. Accessed April 2007.; data on the economically active population from ILO. (International Labour Organization). 2005. Key Indicators of the Labour Market. Fourth edition. CD-ROM. Geneva.

column 15: determined on the basis of GEM values in column 2.

Human Development Report 2007/2008											
Human development index		MONITORING HUMAN DEVELOPMENT: ENLARGING PEOPLE'S CHOICES . . .									
Indicators		Sweden	Uruguay	Malaysia	Brazil	Azerbaijan	Namibia	Ghana	Bangladesh	Rwanda	Mali
Gender empowerment measure (GEM) rank		2	59	65	70	..	36	..	81	..	..
Gender empowerment measure (GEM) value		0.906	0.525	0.504	0.49	..	0.623	..	0.379	..	..
Seats in parliament (%) held by women	a	47.3	10.8	13.1	9.3	11.3	26.9	10.9	15.1	45.3	10.2
Adult literacy rate, female (% aged 15 and older)	2005 b	..	97.3	85.4	88.8	98.2	83.5	49.8	40.8	59.8	15.9
Adult literacy rate (ratio of female rate to male ate)	2005 b	..	1.01	0.93	1	0.99	0.96	0.75	0.76	0.84	0.49
Youth literacy rate, female (% aged 15-24)	2005 b	..	99	97.3	97.9	99.9	93.5	65.5	60.3	76.9	16.9
Youth literacy rate (ratio of female rate to male rate)	2005 b	..	1.01	1	1.02	1	1.03	0.86	0.9	0.98	0.52
Net primary enrolment rate, female (%)	2005 c,d	96	93 g,h	95 h	95 h	84	74	65	96 g,h	75 g	45
Net primary enrolment rate (ratio of female rate to male rate)	2005 c,d	1	1.01 g,h	1 h	1 h	0.98	1.07	0.99	1.03 g,h	1.04 g	0.81
Gross primary enrolment ratio, female (%)	2005 d,e	97	108 h	96 h	135 h	95	100	87	111 h	121 g	59
Gross primary enrolment ratio (ratio of female ratio to male ratio)	d,e	1	0.98 h	1 h	0.93 h	0.98	1.01	0.96	1.03 h	1.02 g	0.8
Gross secondary enrolment ratio, female (%)	2005 d,e	103	113 h	81 h	111 h	81	60	40 g	48 h	13 g	18 g
Gross secondary enrolment ratio (ratio of female ratio to male ratio)	2005 d,e	1	1.16 h	1.14 h	1.1 h	0.96	1.15	0.85 g	1.03 h	0.89 g	0.62 g

Figure 6

Notes for figure 6:

- a. Data are as of 31 May 2007, unless otherwise specified. Where there are lower and upper houses, data refer to the weighted average of women's shares of seats in both houses.
- b. Data refer to national literacy estimates from censuses or surveys conducted between 1995 and 2005, unless otherwise specified. Due to differences in methodology and timeliness of underlying data, comparisons across countries and over time should be made with caution. For more details, see <http://www.uis.unesco.org/>.
- c. The net enrolment rate is the number of pupils of the theoretical school-age group for a given level of education level who are enrolled in that level, expressed as a percentage of the total population in that age group.
- d. Data for some countries may refer to national or UNESCO Institute for Statistics estimates. For more details, see <http://www.uis.unesco.org/>.
- e. The gross enrolment ratio is the total number of pupils or students enrolled in a given level of education, regardless of age, expressed as a percentage of the population in the theoretical age group for the same level of education. For the tertiary level, the population used is the five-year age group following on from the secondary school leaving age. Gross enrolment ratios in excess of 100 indicate that there are pupils or students outside the theoretical age group who are enrolled in that level of education.
- f. In 2004, the number of seats in parliament was raised from 300 to 345, with the additional 45 seats reserved for women. These reserved seats were filled in September and October 2005, being allocated to political parties in proportion to their share of the national vote received in the 2001 election.
- g. National or UNESCO Institute for Statistics estimate.
- h. Data refer to an earlier year than that specified.

Sources for Figure 6:

column 1: determined on the basis of GEM values in column 2.

column 2: calculated on the basis of data in columns 3-6; see Technical note 1 for details.

column 3: calculated on the basis of data on parliamentary seats from IPU (Inter-Parliamentary Union). 2007c. Parline Database. Geneva. [www.ipu.org]. Accessed June 2007.

column 4: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 5: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 6: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 7: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Correspondence on adult and youth literacy rates. May. Montreal.

column 8: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 9: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 10: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 11: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 12: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

column 13: UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007c. Correspondence on gross and net enrolment ratios, children reaching grade 5 and tertiary education. April. Montreal.

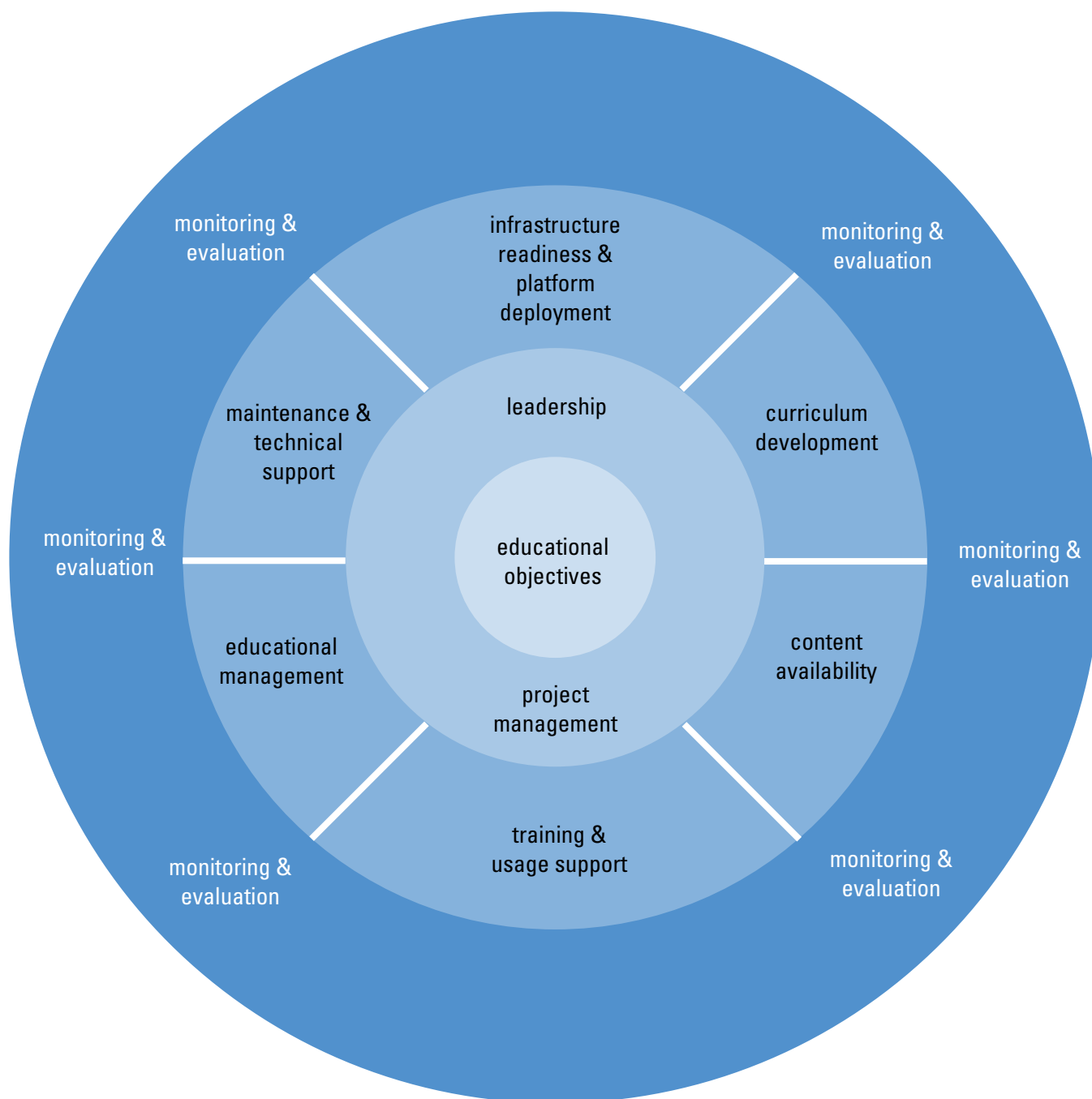


Figure 7

Glossary ⁶¹

Asymmetric Digital Subscriber Line (ADSL): A high-speed digital telephone connection that operates over an existing copper telephone line, allowing the same line to be used for voice calls. ADSL lines offer transmission speeds of at least 512 Kbps, but nowadays usually in the range 1 Mbps to 8 Mbps, and are used mainly for Internet access. The term asymmetric is used because the data flows more quickly from the telephone exchange to the user than from the user to the exchange. The term symmetric is used for connections where the data flows at the same speed in both directions, which is essential for accessing websites where there is a high degree of interactivity.

Asynchronous: “Not at the same time.” Often used to refer to communication by email or via a discussion list, where the recipients of the email or the participants in the discussion do not have to be present at the same time and can respond at their own convenience. A feature of asynchronous learning is that the teachers and learners do not have to be present at their computers at the same time.

Bandwidth: The amount of data that can be sent from one computer to another through a particular connection in a certain amount of time. The higher the bandwidth, the greater the amount of information that can be transmitted in a given time. Bandwidth is usually measured in kilobits per second (Kbps) or megabits per second (Mbps). High bandwidth channels are referred to as broadband which typically means 1.5/2.0 Mbps or higher.

Blackboard: A commercial virtual learning environment package, i.e. a software package that integrates online communications software with content software enabling teachers to create courses that are delivered partially or entirely via the Web. Courses using Blackboard might be mainly text-based, but can be enhanced with images, audio and video.

Broadband: A general term used to describe a high-speed connection to the Internet. Connection speed is usually measured in Kbps and Mbps. Typically, a home user will have a broadband connection using an ADSL telephone line running at 512Kbps to 8Mbps. Educational institutions ideally need a symmetric connection of at least 8Mbps to ensure smooth trouble-free connections to the Internet when large numbers of students are accessing the Internet all at once.

Digital Divide: Refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access information and communication technologies and to their use of the Internet for a wide variety of activities. The digital divide reflects various differences among and within countries.

Distance Learning: A form of learning that takes place where the teachers and the students are in physically separate locations. Distance learning can be either asynchronous or synchronous. Traditional distance learning includes the mailing of printed materials, correspondence between teachers and students in writing, contact by telephone, and radio and television broadcasts. More recently, distance learning has included E-learning.

E-learning: E-learning is learning that is enabled or supported by the use of digital tools and content. It typically involves some form of interactivity, which may include online interaction between the learner and their teacher or peers. E-learning opportunities are usually accessed via the Internet, though other technologies such as CD-ROM are also used.

Information and Communications Technology (ICT): Consists of the hardware, software, networks, and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services.

Knowledge economy: Refers to the use of knowledge to produce economic benefits. The phrase came to prominence in New Zealand in the mid-to late-1990s as a way of referring to the manner in which various high-technology businesses, especially computer software, telecommunications and virtual services, as well as educational and research institutions, can contribute to a country's economy.

Portal: A Web page, website or service that acts as link or entrance to other websites on the Internet. Typically, a portal includes an annotated catalogue of websites and may also include a search engine, email facilities, a forum and other services, e.g. the Latin American Education Portals Network (RELPE).

Spectrum Management: The spectrum or range of radio frequencies available for communication, industrial, and other uses. Frequency bands or segments are assigned to various categories of users for specific purposes, such as commercial radio and television, terrestrial microwave links, satellites, and police. National regulatory agencies monitor the occupancy of the radio spectrum and allocate frequencies to individual users or a group of users so as to enable a large number of services to operate within specified limits of interference.

Synchronous: "At the same time." Often used to refer to communication in a chat room or via videoconferencing, where the participants have to be present at their computers at the same time.

Videoconferencing: A computer-based communications system that allows a group of computer users at different locations to conduct a virtual conference in which the participants can see and hear one another as if they were in the same room participating in a real conference.

Wi-Fi: Also known as wireless networking, Wi-Fi is a way of transmitting information without cables that is reasonably fast and is often used for laptop computers within a business or a university or school campus instead of a Local Area Network (LAN) that uses cable connections. Wi-Fi systems use high frequency radio signals to transmit and receive data over distances of several hundred feet.

WiMAX: An abbreviation for Worldwide Interoperability for Microwave Access, WiMAX is a wireless digital communications system that is intended for wireless "metropolitan area networks." WiMAX can provide broadband wireless access up to 30 miles (50 km) for fixed stations, and 3-10 miles (5-15 km) for mobile stations. In contrast, Wi-Fi is limited in most cases to only 100 - 300 feet (30 - 100m).

Endnotes

- ¹ HelpAge International, *MDGs Must Target Poorest Say Older People* (London: HelpAge International, 2005), <http://www.helpage.org/Resources/Policyreports> (accessed March 7, 2009).
- ² Manzoor Ahmed, "Education in Bangladesh: The Vision for 2025," *Journal of Bangladesh Studies* 9, No. 1, (2007): 1-14.
- ³ CamFed, "FAQs: How can securing female education break the cycle of poverty in Africa?" <http://uk.camfed.org/about/faqs.html> (accessed March 7, 2009).
- ⁴ Jiwan Giri, "Digital Divide: Exploring National and International Approaches to Bridge the Digital Divide and Formulating a Strategic Model That Can Be Implemented in Developing Countries" (presented at ICT and Development for Computer Association of Nepal IT Conference, Kathmandu, Nepal, January 26-27, 2002), <http://www.icasit.org/ddnepal.pdf> (accessed March 7, 2009).
- ⁵ International Institute for Communication and Development, *ICTs for Education: Impact and Lessons Learned from IICD-Supported Activities* (The Hague: IICD, 2007), <http://www.iicd.org/files/icts-for-education.pdf> (accessed March 14, 2009).
- ⁶ Victoria L. Tinio, *ICT in Education* (New York: UNDP-APDIP, 2003).
- ⁷ Ibid.
- ⁸ Tofazzal Islam and Abu Sadeque Selim, "Current Status and Prospects of E-learning in the Promotion of Distance Education in Bangladesh," *Turkish Online Journal of Distance Education* 7, no.1, (January 2006), <http://tojde.anadolu.edu.tr/tojde21/articles/islam.htm> (accessed April 11, 2009).
- ⁹ Wadi Haddad and Sonia Jurich, "ICT for Education: Potential and Potency," in *Technologies for Education: Potentials, Parameters, and Prospects*, eds. Wadi Haddad and A. Drexler (Washington, D.C.: Academy for Educational Development), 28-40.
- ¹⁰ Tinio, *ICT in Education*, 9-10.
- ¹¹ Haddad and Jurich, "ICT for Education: Potential and Potency," 38-39.
- ¹² The Ministry of Communication and Information Technologies of the Republic of Azerbaijan, *Information and Communication Technologies for Sustainable Development*.
- ¹³ Cristina Kiomi Mori, "Brazilian Digital Inclusion Public Policy: Achievements and Challenges," *The Journal of Community Informatics* 3, no. 3 (2007).
- ¹⁴ Governo do Brasil, "ProInfo: Programa Nacional de Informatica na Educacao," 2006, <http://www.inclusaodigital.gov.br/inclusao/links-outros-programas/proinfo-programa-nacional-de-informatica-na-educacao/> (accessed March 11, 2009).
- ¹⁵ Mohammad Ali, *ASPBAE Research on Information and Communication Technology* (Mumbai: Asian South Pacific Bureau of Adult Education, 2003), http://portal.unesco.org/education/en/file_download.php/1bb1630e3ed7c4a90ca0eec2f15c7a7cICT+EDUCATION+CASE+STUDY.pdf (accessed March 4, 2009).

- ¹⁶ The Ministry of Communication and Information Technologies of the Republic of Azerbaijan, *Information and Communication Technologies for Sustainable Development*.
- ¹⁷ Baku Declaration on Transnational-Eurasian Information Super Highway, <http://unpan1.un.org/intradoc/groups/public/documents/GAID/UNPAN033008.pdf> (accessed April 11, 2009).
- ¹⁸ UNESCO, "Case Study One on ICT Integration into Education in Malaysia: The Malaysian Smart School Project," www2.unescobkk.org/education/ict/resources/JFIT/schoolnet/case_studies/Malaysia_ICT.doc (accessed March 14, 2009); Azian Abdullah, "Deconstructing Secondary Education: The Malaysian Smart School Initiative" (presented at 10th SEAMEO INNOTECH International Conference, Quezon City, Philippines, November 15-17, 2006), www.seameo-innotech.org/ic06/download/Azian%20Abdullah%20-%20full%20paper.doc (accessed March 14, 2009).
- ¹⁹ Ana Laura Rivoir, "Uruguay Country Report," *Global Information Society Watch*, 2008, http://www.gesci.org/files/docman/OLPC_Case-Studies.pdf (accessed March 18, 2009); UNESCO, *CEIBAL en la sociedad del siglo XXI* (Montevideo: UNESCO, 2008).
- ²⁰ Mary Hooker and Roxanna Bassi, *OLPC Regional Case Studies: Asia, Africa, Europe and Latin America* (Dublin: Global e-Schools and Communities Initiative, 2008).
- ²¹ Republic of Rwanda, Ministry of Education, "Inauguration of One Laptop Per Child in Rwanda," September 2008, <http://www.mineduc.gov.rw/spip.php?article349> www.mineduc.gov.rw/spip.php?article349 (accessed March 11, 2009).
- ²² International Institute for Communication and Development, "Building Telecentres for the Future," December 17, 2007, <http://www.iicd.org/articles/building-telecentres-for-the-future/> (accessed March 21, 2009).
- ²³ Alexey Semenov, *Information and Communication Technologies in Schools: A Handbook for Teachers* (Paris: UNESCO, 2005).
- ²⁴ Implementation of "Education & Training 2010" Work Programme. Working Group C, "ICT In Education and Training". European Commission: Directorate-General for Education and Culture.
- ²⁵ E-Asia, "ICT and Education: A BRAC Approach," November 2008, <http://www.e-asia.org/2008/SpeakersData/Browse/ICT-abstract-Malaysia-BRAC.pdf> (accessed March 11, 2009).
- ²⁶ Nor Azilah Ngah and Mona Masood, "Development of ICT instructional Materials Based on Needs Identified by Malaysia Secondary School Teachers" (proceedings of the 2006 Informing Science and IT Education Joint Conference, Greater Manchester, England, June 25-28, 2006), <http://informingscience.org/proceedings/InSITE2006/ProcNgah164.pdf> (accessed March 15, 2009).
- ²⁷ Martina Forster, "Experiences from Rwandan secondary schools using GIS" (presented at the ESRI Education User Conference 2008, San Diego, USA, August 2-5, 2008), http://proceedings.esri.com/library/userconf/educ08/educ/papers/pap_1119.pdf (accessed March 25, 2009).

- ²⁸ Rwanda Development Gateway, "Teachers graduate in computer literacy," August 12, 2008, http://www.rwandagateway.org/article.php3?id_article=9755&var_recherche=one+laptop+per+child (accessed March 25, 2009).
- ²⁹ G.M. Muwanga, "High Cost of Internet Connectivity in Africa: How Do We Achieve Mobile Telephony Success Story?" (presented at the 5th Pan-Commonwealth Forum on Open Learning, London, England, July 13-17, 2008), http://www.wikieducator.org/images/f/f3/PID_289.pdf (accessed March 15, 2009).
- ³⁰ International Institute for Communication and Development, *ICTs for Education: Impact and Lessons Learned from IICD-Supported Activities*, 9.
- ³¹ Patti Swarts, "Perspectives on ICT4E in the Developing World," Global e-Schools and Community Initiatives, <http://www.gesci.org> (accessed March 1, 2009), 7.
- ³² Patti Swarts, "Main Issues, Possible Solutions and Opportunities for ICTs," Global e-Schools and Community Initiatives, <http://www.gesci.org> (accessed March 1, 2009), 2.
- ³³ SchoolNet Namibia. <http://www.schoolnet.na/news/index1.html> (accessed April 5, 2009).
- ³⁴ Telecom Namibia. www.telecom.na (accessed April 5, 2009).
- ³⁵ Republic of Namibia, Ministry of Education, "Development Partners," 2008, <http://www.mec.gov.na/ministryOfEducation/partners.htm> (accessed April 5, 2009).
- ³⁶ Glen Farrell, Shafika Isaacs, and Michael Trucano, eds. *Survey of ICT in Education in Africa (Volume 2): 53 Country Reports* (Washington, D.C.: infoDev/World Bank, 2007).
- ³⁷ Daniel, John. Mackintosh, Wayne West, Paul. *Exploring the role of ICTs in addressing educational needs*. (Commonwealth Education Partnerships. 2008), http://www.cedol.org/cgi-bin/items.cgi?_rm=display_blob&_data=200809031343315479 (accessed May 9, 2009).
- ³⁸ Islam and Selim, "Current Status and Prospects of E-learning in the Promotion of Distance Education in Bangladesh."
- ³⁹ Foong-Mae Chan, "ICT in Malaysian schools: Policy and strategies" (presented at Workshop on the Promotion of ICT in Education to Narrow the Digital Divide, Tokyo, Japan, October 15-22, 2002), <http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan011288.pdf> (accessed March 25, 2009).
- ⁴⁰ Uruguay National Board of Education, "Gaceta ANEP: Indicadores Economicos, Sociales y Educativos," November 2008, <http://www.oei.es/pdf2/GacetaANEP06.pdf> (accessed April 5, 2009).
- ⁴¹ Bonnie Bracey and Terry Culver, eds., *Harnessing the Potential of ICT for Education: A Multistakeholder Approach* (New York: UNICT Task Force, 2005), 207-208.
- ⁴² Swarts, "Main Issues, Possible Solutions and Opportunities for ICTs," 4.

- ⁴³ Robert B Kozma, "Comparative Analysis of Policies for ICT in Education," in *International Handbook of Information Technology in Primary and Secondary*, eds. Joke Voogt and Gerald Knezek, vol. 20 of *Springer International Handbooks of Education*. (New York: Springer Publishing, 2008), 1083-1096. For further reading: Moses Atezah Mbangwana, "Introduction of ICT in Schools and Classrooms in Cameroon," in *ICT and Changing Mindsets in Education*, eds. K. Toure, T.M.S. Tchombe, and T. Karsenti (Bamako, Mali: ERNWACA, 2008).
- ⁴⁴ K. Toure, M.L. Diarra, T. Karsenti, and S. Tchameni-Ngamo, "Reflections on Cultural Imperialism and Pedagogical Possibilities Emerging from Youth Encounters with Internet in Africa" in *ICT and Changing Mindsets in Education*, eds. K. Toure, T.M.S. Tchombe, and T. Karsenti (Bamako, Mali: ERNWACA, 2008).
- ⁴⁵ Kozma, "Comparative Analysis of Policies for ICT in Education."
- ⁴⁶ Muwanga, "High Cost of Internet Connectivity in Africa: How Do We Achieve Mobile Telephony Success Story?"
- ⁴⁷ International Institute for Communication and Development, ICTs for Education: *Impact and Lessons Learned from IICD-Supported Activities*, 53.
- ⁴⁸ Obed Mfum-Mensah, "Computers in Ghanaian Secondary Schools: Where Does Equality Come In?" *Current Issues in Comparative Education* 6, no. 1 (December 2003): 46, <http://www.tc.columbia.edu/cICE/Archives/6.1/61mfummensah.pdf> (accessed March 13, 2009).
- ⁴⁹ Global e-Schools and Communities Initiative, "Ghana Country Programme," http://www.gesci.org/index.php?option=com_content&task=view&id=27&Itemid=33 (accessed April 5, 2009); Republic of Ghana, Ministry of Education, "National ICT in Education Policy," 2007, <http://www.moess.gov.gh/ict.htm> (accessed March 13, 2009).
- ⁵⁰ Bracey and Culver, eds., *Harnessing the Potential of ICT for Education: A Multistakeholder Approach*, 236-237; Presidencia de la Republica Oriental del Uruguay, "Uruguay en Red: Programa de Conectividad Educativa," 2003, <http://www.presidencia.gub.uy/mem2003/URUGENRED.pdf> (accessed March 10, 2009).
- ⁵¹ Chan, "ICT in Malaysian schools: Policy and strategies."
- ⁵² The Ministry of Communication and Information Technologies of the Republic of Azerbaijan, *Information and Communication Technologies for Sustainable Development*.
- ⁵³ Integrated Regional Information Networks, "Mali: Still a Long Way to Go to Meet Adult Literacy Targets," April 17, 2008, <http://www.irinnews.org/Report.aspx?ReportId=77803> (accessed May 1, 2009).
- ⁵⁴ Alfred Ilukena, "ICT Policy for Education: A Tale of Two Countries," *Digital Learning* 2, no. 9, (September 2006), <http://www.digitallearning.in/sept06/coverstory.asp> (accessed March 29, 2009).
- ⁵⁵ Aptivate, "CamFed PDA Study," 2008, <http://www.aptivate.org/Projects.CamFedPDASTudy.html> (accessed April 18, 2009).
- ⁵⁶ Mridul Chowdhury, "Digital Bangladesh: Going Beyond the Rhetoric," *The Daily Star*, February 1, 2009, <http://www.thedailystar.net/newDesign/news-details.php?nid=73748> (accessed April 25, 2009).

⁵⁷ UNDP Bangladesh, "Access to Information Programme," January 2007,
http://www.undp.org.bd/projects/proj_detail.php?pid=31 (accessed April 25, 2009).

⁵⁸ Rwanda Development Gateway, "One laptop per child pilot project evaluated," August 29, 2008,
http://www.rwandagateway.org/article.php3?id_article=9883&var_recherche=monitoring+and+evaluation+of+ict (accessed April 25, 2009).

⁵⁹ <http://trendsniff.com/2009/02/22/mobile-subscribers-china-india-2009/>

⁶⁰ The following recommendations are based on research gathered from Global e-Schools and Communities Initiatives, *infoDev*, and the International Institute for Communication and Development, as well as the country case studies presented throughout the paper.

⁶¹ The definition for the terms have been taken from the following sources: Glossary of ICT Terminology:
http://www.ict4it.org/en/en_glossary.htm#GlossA
 World Bank ICT Glossary Guide:
<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/0,,contentMDK:21035032~menuPK:2888320~pagePK:210058~piPK:210062~theSitePK:282823,00.html>
infoDev: <http://www.ictregulationtoolkit.org/en/Publication.3353.html>
WiMAX.com: <http://www.wimax.com/education>

