

Information and Communication Technology for Education in India and South Asia



Volume I Extended Summary

infoDev

PRICEWATERHOUSECOOPERS 

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Abbreviations

ADB	Asian Development Bank
AIOU	Allama Iqbal Open University
BANBEIS	Bureau of Educational Information and Statistics, Bangladesh
BBC	British Broadcasting Corporation
BBC AEP	BBC Afghan Education Projects
BCC	Bangladesh Computer Council
BIPS	Bhutan Information and Communication Technologies Policy and Strategy
BOU	Bangladesh Open University
BRAC	Bangladesh Rural Advancement Committee
CAL	Computer Aided Learning
CAPSD	Curriculum and Professional Support Services Division, Bhutan
CBSE	Central Board of Secondary Education, India
C-DAC	Centre for Development of Advanced Computing, India
CDC	Curriculum Development Centre, Maldives
CIDA	Canadian International Development Agency
COL	Commonwealth of Learning
DANIDA	Danish International Development Agency
DIT	Department of Information Technology, India
DOT	Department of Telecommunications, India
EDC	Educational Development Centre, Maldives
EDUSAT	Education Satellite
EPGI	Education Policy Guidelines & Instructions, Bhutan
ERNET	Education & Research Network
ERTV	Educational Radio and Television, Afghanistan
FOSS	Free and Open Source Software
GER	Gross Enrolment Rate
HLCIT	High Level Commission for Information Technology, Nepal
ICT	Information and Communication Technology
ICTA	Information and Communication Technology Agency, Sri Lanka
ICTI	ICT institute, Afghanistan
IGNOU	Indira Gandhi National Open University
IIT	Indian Institute of Technology
ITU	International Telecommunication Union
LAN	Local Area Network
MDGs	Millennium Development Goals

MIS	Management Information System
MoE	Ministry of Education
NAPITSE	National Policy for ICT in Education, Sri Lanka
NASTEC	National Science and Technology Commission
NCERT	National Council of Educational Research and Training, India
NCIT	National Centre for Information Technology, Maldives
NDLB	National Digital Library of Bhutan
NESP	National Education Strategic Plan, Afghanistan
NIC	National Informatics Center, India
NICTA	National ICT Council of Afghanistan
NICTE	National ICT Strategy for Education, Pakistan
NIE	National Institute of Education (NIE), Sri Lanka
NIOS	National Institute of Open Schooling, India
NRCFOSS	National Resource Centre for Free and Open Source Software, India
NUEPA	National University of Educational Planning and Administration, India
ODL	Open and Distance Learning
OLE	Open Learning Exchange
OUS	Open University of Sri Lanka
PPP	Public Private Partnerships
REACH	Radio Education for Afghan Children
RI-SOL	Relief International – Schools Online
RMSA	Rashtriya Madhyamik Shiksha Abhiyan
SLETP	Sri Lanka Environmental Television Project
SPIDER	Swedish Program for ICT in Developing Region
SSA	Sarva Shiksha Abhiyan (India)
UGC	University Grants Commission
UNDP	United nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
USOF	Universal Service Obligation Fund
VSAT	Very Small Aperture Terminal
VUP	Virtual University of Pakistan

About the Report

The Survey on Information and Communication Technology (ICT) for Education in India and South Asia was commissioned by *infoDev* to be undertaken by PricewaterhouseCoopers, India. The Survey is a third in the series after similar surveys for the African and Caribbean regions completed in 2008 and 2009 (<http://www.infodev.org/regionalsurveysofICT4E>). The main objective of the Survey is to create a consolidated source of information on the experiences of using ICTs for Education in the South Asian region, as a baseline for future work, and to provide a framework of reference for policy-makers.

The survey report is in five volumes, the first Volume is an extended summary which captures the main findings of the survey. Volume II is a series of Country Reports profiling the policy environment and major initiatives using ICTs for education for each of the eight South Asian countries – India, Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka, with a more detailed focus on India. Volume III is a set of Case Studies for India and Pakistan. For India the case studies include detailed studies of ICT initiatives in the education space in five states. For Pakistan the role of ICTs in Open and Distance Education and Teacher Education has been profiled as two case studies. Volume IV is a series of thematic papers that address key issues across the focus countries in an attempt to provide a horizontal, comparative view of the subject in the eight focus countries, with an emphasis on India. The fifth volume captures the details of the survey process including the research methodology, list of interviewees, details of meetings held etc. The five volumes are complemented by a web resource base at www.infodev.org/ICT4EinSouthAsia.

Structure of the Extended Summary

The Extended Summary consists of two sections. The first section provides a snapshot of each country in the South Asian region. This includes – (i) a broad background of the legal framework governing education and ICT in the country; (ii) an overview of the education and ICT scenario; (iii) relevant policy frameworks prevalent in the country and (iv) key insights gathered through the survey. The second section is a cross-country analysis of ICT in the education space, beginning with a comparative analysis of the key on-ground initiatives in the focus countries. This is followed by a discussion on common insights and constraints faced by the focus countries.

Report Limitations

There are several limitations of a project of this nature covering a wide geographical span and directed at a fast changing scenario:

- The Survey has primarily been based on secondary research and face to face or telephonic interviews and workshops with relevant stakeholders. It is thus not an exercise in primary data collection.
- While effort has been made to ensure that data collected covers all major initiatives, given the vastness of the geography and the dynamic nature of the use of ICTs, the initiatives outlined will be more illustrative than exhaustive.
- Effort has been made to present the most relevant and updated information, however because the field is rapidly evolving, the data represented here is 'current' at the time of the study i.e. June 2009 - June 2010.
- The Survey has focused more on Primary and Secondary Education, but has covered significant initiatives in tertiary education, vocational, non formal and mass education and distance education where these are significant for the region or the country.
- The purpose of the survey is to create a repository documenting initiatives using ICT in Education; in addition the survey will provide a basis for designing strategies for effective integration of ICT in Education, based on trends and experiences documented.
- While sophisticated content is being developed and deployed through cutting edge technologies in controlled environments, this survey will focus more on innovative ICT applications that have maximum impact on a large number of potential learners, and overcome significant delivery and quality constraints in the developing country context.

1. Country Snapshots

1.1 India

India is the seventh largest and second most populous country in the world. It is bordered by Pakistan, China, Nepal, Bhutan, Bangladesh and Myanmar. The Indian economy has been growing at a steady high pace for the past decade, with growth being supported by market reform, robust capital markets and sustained flow of FDI.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Human Resource Development	Providing policy framework, financial support and guidelines for the education sector	<ul style="list-style-type: none"> Department of School Education and Literacy Department of Higher Education
Ministry of Communications and Information Technology	Formulating, implementing and reviewing national policies pertaining to ICT	<ul style="list-style-type: none"> Department of Information Technology Department of Telecommunications

In India, policy framework, financial support and guidelines to ensure a national standard of education is provided by the Government of India through the Ministry of Human Resource Development (MHRD). The implementation of the policies and guidelines is primarily done at the state level through the various state level departments in the country. The MHRD functions through two departments, the Department of School Education and Literacy and the Department of Higher Education. The National Council of Educational Research and Training (NCERT) is an autonomous organization under the MHRD to assist the central as well as the state governments in implementing policies and programs pertaining to education, particularly school education. The Central Board of Secondary Education (CBSE) under the MHRD prepares the syllabus for schools and conducts board examinations for classes X and XII. The National University of Educational Planning and Administration (NUEPA) assists the MHRD with capacity building and research in planning and management of education.

The Department of Information Technology (DIT) in the Ministry of Communications and Information Technology (MCIT) is responsible for formulating, implementing and reviewing national policies pertaining to information technology. In terms of IT education and IT

enabled education, DIT is responsible for imparting ICT skills as well as encouraging the implementation of ICT in the teaching learning process. There are various autonomous organizations under DIT to assist it with its functioning such as the National Informatics Center (NIC) which provides network backbone and e-governance support and Centre for Development of Advanced Computing (C-DAC) which encompasses multilingual computing, free and open Software, education and training et cetera.

Department of Telecommunications (DOT) in the MCIT is responsible for policy formulation, licensing, coordinating, standardization and research and development of telecommunications in India. The Centre for Development of Telematics (C-DOT) is the telecom technology development centre for DOT

Education and ICT Scenario

Adult literacy rate in India is relatively high (70% for males and 48% for females) when compared to other countries in the South Asia region, but a strong gender disparity exists although not as severe as Afghanistan and Nepal. Primary Gross Enrolment Rate (GER) stands at 114% for males and 109% for females. This high percentage can be attributed to the government's commitment to ensure universalization of elementary education, for which it launched the flagship scheme, Sarva Shiksha Abhiyan (SSA). Secondary GER however is significantly lower at 59% for males and 49% for females indicating a near 50% drop at the secondary level. To address this issue and to ensure universalization of secondary education, the government has implemented the Rashtriya Madhyamik Shiksha Abhiyan (RMSA).

Sarva Shiksha Abhiyan (SSA)

Sarva Shiksha Abhiyan (SSA) is a flagship programme of the Government of India to support the states in creating, developing and strengthening the formal primary and upper primary school systems to achieve the goal of Universal Elementary Education. It is a partnership programme between the central and the state governments, which seeks to improve the performance of the school system through a community-owned approach. SSA is a time bound mission, with the objectives of ensuring Universalization of Education and bridging gender and social gaps by 2010

The SSA encourages states to use ICT and EDUSAT (Education Satellite) to provide distance education within states to supplement school education. Distance Education has been naturally chosen as a catalyst for expediting SSA. Further, the Management Information System (MIS) tool under SSA is a significant part of the project as it facilitates monitoring of the physical and financial parameters of the scheme. The system has District Level, State Level and Ministry Level modules.

The IT and Telecom sector in India has made significant progress. India is the second largest in Asia in terms of gross telephone subscribers (Annual Report 2007-08, DIT) and has a relatively high radio and television reach. The challenge for India lies in strengthening the ICT infrastructure in rural areas, particularly in terms of internet penetration and electrification.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in India:

Document	Date	Relevant Objectives
National Policy on Education	1992	<ul style="list-style-type: none"> • Exposure to computers and training to be part of professional education • Employing educational technology to spread information and train and re-train teachers
National Policy on ICT in School Education	2009 (Draft)	<ul style="list-style-type: none"> • ICT literacy and competency enhancement • ICT enabled teaching-learning process • Capacity Building of teachers • ICT infrastructure in schools • ICT for open and distance learning

The importance of using ICT for improving education has been emphasized for over a decade in India, right from 1992 the National Policy on Education emphasized using educational technology to improve the quality of education. In 2009, the government initiated a stakeholder dialogue on formulating a draft national policy for ICT in Education. This draft policy document proposes various delivery mechanisms to enable ICT literacy and provide ICT infrastructure to ensure ICT enabled teaching learning. It also articulates policies regarding ICT for capacity building, distance education and content development.

India also has a National Telecom Policy 1994 (revised in 1999) and a Broadband Policy 2004 which lays down policies and delivery mechanisms for telecommunication in India; however these policy documents have no particular reference to education. In the Indian states studied for the survey however, policies pertaining to ICT in education are usually stated in the IT policy documents. This holds true for Karnataka, West Bengal and Andhra Pradesh. In Delhi the government has issued an e-Governance Roadmap which outlines initiatives proposed by the education department to achieve ICT implementation goals. In Rajasthan, there is no distinct education component in the various IT Policy documents

however the government launched a unique public private partnership – the Rajasthan Education Initiative (REI) to modernize delivery mechanisms in education.

Key Insights

India is a vast geography with varying levels of development in different parts of the country, and therefore experiences of using ICTs for education across the country also reflect this diversity. While some interventions have been immensely successful in one area the same interventions in another part of the country have not succeeded. Through the case studies it is clear that states like Karnataka, Andhra Pradesh, and Delhi which have placed adequate importance on mainstreaming ICTs in the teaching learning processes and proactively initiated efforts to utilize ICTs for education have succeeded more than states that are simply looking to implement central government schemes and create IT labs for their schools.

A wide spectrum of initiatives exist in the country, radio and television (TV) are used to deliver innovative content. Given that radio and TV have a higher reach in the country, the use of these media can reach out to a majority of people deprived of education. At present the government provides dedicated educational channels on TV such as GyanDarshan I, II, and on the Radio such as Gyanvani. An increasing number of private educational channels such as Toppers, Tata Sky Fun Learning are also being broadcasted.

Gyan Darshan / Gyan Vani

An educational Television channel DD-Gyan Darshan has been set up by the national telecaster Doordarshan and Indira Gandhi National Open University (IGNOU) with assistance from the Ministry of Education and many educational software makers. It has four round the clock channels offering interesting and informative programs for school-going children, college students and youth seeking career opportunities.

Gyan Vani is an educational FM radio channel with day to day programs contributed by various ministries, educational institutions, NGO's and national level institutions such as IGNOU, NCERT, UGC, IIT's and open universities. Gyan Vani serves as a medium for niche listeners and for addressing local educational, developmental and socio-cultural requirements.

Delivery of education through TV and radio however has limited interactivity and lacks flexibility. With technological innovations, on demand options and interactive features, initiatives such as Tata Sky Fun Learning can overcome the constraints of using TV and radio. Traditional TV and radio programmes have also been used extensively in

supplementing distance education programmes in the country. With a recent update to the policy framework pertaining to community radio in India, the Ministry of Information and Broadcasting expects 5000 community radio stations to be established by 2012. These stations can be used to empower communities by spreading awareness on social issues.

Namma Dhwani

VOICES and MYRADA, two NGOs working towards using media for social change, together with UNESCO have initiated 'Namma Dhwani', India's first cable audio initiative, in 1999, in Budikote village, Kolar district, Karnataka. In the absence of legislation that allows for use of airwaves, the Namma Dhwani initiative uses audio cable connections to transmit information to the school and individual homes. The format of the programmes for the school consists of newspaper reading, local news, general knowledge, music, model lessons, and programmes about issues like dowry, environment preservation etc. Programmes for the general public are decided by the community themselves and include entertainment and information on locally relevant matters. More than 350 programmes have been cablecast so far.

The government has taken various steps to ensure the availability of basic infrastructure. The Kendriya Vidyalaya's and Jawahar Navodaya Vidyalayas, which are central government school systems under autonomous organizations of the government, have established computer labs and SMART schools (classrooms equipped with a wide range of ICT facilities such as computers and projectors, used to teach the curriculum). Infrastructure in terms of internet penetration and electrification still remains a major concern for India particularly in rural areas. National infrastructure building projects are ongoing like the Bharat Nirman Scheme, Universal Service Obligation Fund's commitment to providing rural connectivity as well as specific programmes like the Knowledge Network or Mission on ICTs for education.

There needs to be a greater focus on developing relevant content and applications and, using them to enhance learning across subjects, to ensure improvement in quality of education. There are no standards or guidelines available at a national level to develop or choose relevant content. Most content used in schools are developed by teachers themselves as a result there is no uniform content used. While content creation by the teachers and students themselves is a positive trend enabling ownership; one needs to weigh the pros and cons of not having a professional content development team who can involve teachers and faculty in the process. Off the shelf products which are available need have some scope for flexibility and customization to give a sense of ownership to users.

Free and Open Source Software (FOSS) has gained popularity in India, the country hosts one of the largest FOSS events in the world - FOSS.IN, an event that focuses on FOSS development and distribution.

Free and Open Source Software (FOSS) in Education

The Open Source community offers a database where educational institutions can tap the full potential of software available in the Open Source domain. This software which is available free of cost is developed, tested and upgraded by programmers and users on a regular basis. In April 2005, the Ministry of Communications and Information Technology, Government of India set up the National Resource Centre for Free and Open Source Software (NRCFOSS) in an effort to bridge the digital divide and strengthen the Indian software industry. NRCFOSS encompasses research and development, human resource development, networking and entrepreneurship development and it serves as a reference point for all FOSS related activities in the country. (<http://nrcfoss.org.in/>)

In India the adoption of open source solutions is primarily under the state governments. The IT@School project was initiated by the Government of Kerala in 2000 to provide ICT enabled education in the state and has achieved the status of the World's largest simultaneous deployment of FOSS based ICT education.

1.2 Afghanistan

The Islamic Republic of Afghanistan is located approximately in the center of Asia, bordered by Iran in the south and west, Pakistan in the south and east, Turkmenistan, Uzbekistan & Tajikistan in the north and China in the far north east. The economy of Afghanistan is recovering after the fall of the Taliban regime in 2001. There has been substantial development in the agriculture and service sector which has contributed to the economic recovery of the country.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Education	Formulating and implementing national policies and strategic plans for the education sector	
Ministry of Higher Education	Developing and enhancing the higher education sector	
Ministry of ICT	Implementing national level policies pertaining to ICT	<ul style="list-style-type: none"> • ICT Directorate • ICT Institute

The Ministry of Education (MoE) in Afghanistan formulates and implements national policies and strategic plans for the education sector. For the development and advancement of higher education, the government established the Ministry of Higher Education (MoHE), previously known as the Ministry of Higher and Vocational Education. A major focus for the two education ministries is professional, vocational and technical training. While MoE is responsible for technical-professional and vocational institutions, the Institutes of Pedagogy falls under the responsibility of MoHE.

The Ministry of Communications and Information Technology (MCIT) was established to implement the policies pertaining to ICT in Afghanistan. It also formulates strategic plans to accomplish its objectives. The ministry operates through various departments such as the ICT directorate, which handles ICT related issues, and the ICT institute (ICTI) which is responsible for developing professional human resource in the ICT arena.

Education and ICT Scenario

Up until the 1800s, education in Afghanistan was provided by the mullahs or Islamic teachers. This resulted in a near absence of female education. Following the fall of the Taliban in 2001, the interim government received substantial international aid to restore the education system. The process of rebuilding the system has been slow. The state of

female education still remains poor, it is estimated that only 18% of the female youth population is literate, the estimate for the female adult population is even lower. Gross enrolment rates indicate a 70% drop from primary school to secondary school.

Under the Taliban, internet was banned, even though efforts have been made to establish proper internet connectivity, the price of internet services remain high and is therefore accessible to a small section of the population. Mobile coverage reaches 70% of the population, by 2008 four mobile companies were operational in the country, however mobile usage is low. Afghanistan also has an extremely low PC penetration rate.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Afghanistan:

Document	Date	Relevant Objectives
National Education Strategic Plan (NESP)	2006 - 2010	<ul style="list-style-type: none"> • Use ICT for capacity building of teachers • Develop an Education Management System (EMIS)
ICT Policy	2003	<ul style="list-style-type: none"> • Incorporate ICT in the curricula at secondary and tertiary levels • Collaborate with foreign universities to develop ICT research and programs • Provide ICT infrastructure such as mobile ICT labs for schools • Use ICT to enhance distance learning

Apart from Bhutan, Afghanistan is the only country in the South Asian region to have an education sector plan in the ICT policy as well as a reference to using ICT in the education policy. The policy frameworks focus on capacity building in terms of training teachers and spreading ICT literacy amongst the youth.

Key Insights

In Afghanistan much of the efforts of various agencies have gone on radio and print based distance education in an attempt to improve literacy levels amongst the large segments of the population who are educationally disadvantaged (rural population and females). Examples of such initiatives include Educational Radio and Television (ERTV) and Radio Education for Afghan Children (REACH).

Educational Radio and Television (ERTV)

Educational Radio and Television (ERTV) was established in 1969 under the MoE with a mandate of raising public awareness, raising adult literacy levels and broadcasting educational programmes to schools. However due to the Soviet invasion in 1989 it needed major restructuring and rebuilding. Therefore, in 2001 the MoE requested the support of UNESCO to rebuild ERTV and extend its reach to deprived sections of society as well. ERTV is now equipped with computers, television and radio production equipment and internet facility. The ERTV project, funded by the Italian government had handed over more than 80 pieces of educational equipments to provide a new studio to ERTV, in order to develop educational broadcasting in Afghanistan. In 2005 the project enabled a dedicated channel for educational broadcasting. In 2010, the Government of Italy and UNESCO decided on yet another project – ‘Development of ERTV for audio-visual support to teacher-training in Afghanistan’, to enhance distance learning through audio-visual programmes.

Radio Education for Afghan Children (REACH)

Radio Education for Afghan Children (REACH) is an education initiative aimed at raising literacy levels of Afghan children who have been denied education due to conflict and war. The project is managed by the BBC Afghan Education Projects (BBC AEP) and funded by the UK Department of International Development, United Nations Children Fund (UNICEF) and the Canadian International Development Agency (CIDA). REACH focuses on broadcasting educational programs on the radio, these programs are not intended to replace formal schooling but educate the children on the ‘Afghan Life’. The programs are broadcasted on BBC World Service’s Persian and Pashto Services six days a week. One of the most popular soap opera broadcasted is “New home new life” which intermingles basic information with attractive story lines. Other programs include imaginative stories, riddles, numeracy games and advice for teenagers on various issues.

While such initiatives may be of great value to Afghanistan given the shortage of trained teachers it cannot be a permanent solution, other more interactive and effective ICT forms such as multimedia instructional material, internet etc will need to be explored eventually to improve teaching learning practices.

In order to build an ICT based society, donor agencies and the government will need to focus their efforts in re-building the IT and Telecom infrastructure destroyed due to the war. Efforts will need to be made in terms of human resource development, particularly

providing trained teachers, otherwise the large amount of money spent on building the infrastructure will not find optimal use.

In Afghanistan, role of multilateral and bilateral agencies such as the World Bank, ADB, UNESCO, UNDP, SIDA CIDA, USAID, the British Council and international NGOs is considered very important. An effective collaboration among these agencies can help in developing local/regional networks of education supported by appropriate technologies including ICT to address local and regional requirements in terms of capacity building and implementation of actual programs.

1.3 Bangladesh

The People's Republic of Bangladesh bordered by India, Myanmar and the Bay of Bengal, is one of the most densely populated countries in the world with a high incidence of poverty. Bangladesh is a developing nation with continuous domestic and international efforts to improve its economic condition.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Primary and Mass Education	Formulating policies and programmes, monitoring and evaluation and initiating legislative measures pertaining to primary and non-formal education	<ul style="list-style-type: none"> • Directorate of Primary Education • Bureau of Non-Formal Education • Compulsory Primary Education Implementation Monitoring Unit • National Academy for Primary Education
Ministry of Education	Formulating policies and implementing programmes pertaining to secondary, post secondary and higher education	<ul style="list-style-type: none"> • Directorate of Secondary and Higher Education • Directorate of Technical Education • Non-Governmental Teachers' Registration and Certification Authority
Ministry of Science and Information and Communication Technology	Providing policy framework and institutional mechanism for developing the ICT sector	<ul style="list-style-type: none"> • Bangladesh Computer Council • Bangladesh Council of Scientific and Industrial Research

In Bangladesh, the Ministry of Primary and Mass Education (MoPME) is responsible for formulating policies and programmes, monitoring and evaluation and initiating legislative measures pertaining to primary and non-formal education.

For secondary, post secondary and higher education, the Ministry of Education (MoE) is responsible for policy formulation and implementing programmes in Bangladesh. The MoE also oversees the administration and development of schools, colleges and institutes. To carry out its functions, the ministry consists of the Directorate of Secondary and Higher Education (DSHE) and the Directorate of Technical Education (DTE).

In 2002, the Ministry of Science and Technology in Bangladesh changed its name to Ministry of Science and Information and Communication Technology (MoSICT) as an effort to encompass the development of ICT. MoSICT is responsible for providing policy framework

and institutional mechanism for developing the ICT sector. In 1990, the ministry set up the Bangladesh Computer Council (BCC) to encourage and support ICT related activities in Bangladesh. The ministry also established the Bangladesh Council of Scientific and Industrial Research (BCSIR) to conduct research in the field of ICT for socio-economic development.

Education and ICT Scenario

Adult literacy levels in Bangladesh remain low (54% for males and 32% for females) with strong gender disparity. However Bangladesh has made significant progress in terms increasing access and gender equity at the primary level. Gross enrolment rates at the primary level rose from 90 percent in the late 1990's to 98 percent in 2003. Among the youth population, more women are literate than men. The MoPME took various initiatives to universalize primary education such as the establishment of the 1993 Compulsory Education Act which made the first five years of education free in all government schools. Secondary level enrolment rates, though increased over the years, remain low at 44 percent.

In 2009, the Prime Minister made a promise of a 'Digital Bangladesh'. The ICT sector has made steady progress with rapid growth in mobile telephony. Mobile coverage reaches 90 percent of the population though there is still scope to increase mobile usage. Despite having extremely affordable mobile services, internet costs for the country are high, this results in an extremely low internet usage rate. Another challenge for the ICT sector is the large digital divide prevalent in the country.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Bangladesh:

Document	Date	Relevant Objectives
National ICT Policy	2009	<ul style="list-style-type: none"> • Larger pipeline of ICT professionals • ICT literacy and access to schools • Social equity in using ICT • Building ICT infrastructure • Provide incentives for e-learning content development
Broadcasting and Operation Policy	2008	<ul style="list-style-type: none"> • Use radio technology to provide education

Bangladesh does not have any distinct ICT in education policy. The imperative to develop a national ICT policy largely comes from recognizing the need to develop adequate human resource to strengthen the ICT market. The first ICT Policy document of Bangladesh was formulated in 2002 and adopted by the government as the National ICT Policy in 2009. In reference to education, the National ICT Policy primarily focuses on producing trained ICT professionals by stressing the importance of ICT as a subject in the curriculum. The government has also formulated a draft National Education Policy in 2009 which aims at boosting literacy rates and modernizing *madrasahs* (schools with particular emphasis on religious studies) by emphasizing ICTs in the curricula.

Key Insights

Bangladesh can reap great benefits by integrating ICT in the education system since the country has one language and is densely populated. The extensive coverage of mobile network and other media can be leveraged to serve as a medium to deliver education. In this regard the Bangladesh Open University has used mobile, television and radio to supplement their print based course material.

Bangladesh Open University

Bangladesh Open University (BOU) was established in 1992 and to date it is the only public university in Bangladesh which imparts education through a distance learning mode. The University uses ICT to achieve its goal of reaching the masses and creating efficient and skilled manpower in the country. It functions through 12 regional resource centres, 6 schools and 1106 study centres. Student enrolment at BOU exceeds 300,000

Delivery of education at BOU depends largely on the print medium and the use of technology such as television, radio and audio cassettes is provided as a supplementary component of print based delivery (Hossain and Saddik). On average 13 television lectures and 16 radio lecture are aired per month, delivery of these lectures are carried out by BOU academics and subject specialists from other institutions (Alam and Islam). The use of contemporary technology such as e-mail, computer aided learning and teleconference which started only in 2000, still remains limited.

Bangladesh Virtual Classroom is a SPIDER (Swedish Program for ICT in Developing Region) funded project run by Orebro University (Sweden), Soft-Ed Limited (Bangladesh) and BOU. The objective of the Bangladesh Virtual Classroom is to test a method that would make the pre-recorded lessons delivered at BOU more interactive by using Short Messaging Services (SMS) along with perceived live telecast to create a virtual classroom.

Innovative solutions through these media forms have potential to be utilized more usefully for non-formal education as well as for support services in education.

In Bangladesh the more widespread use of ICTs has been in the non formal and continuing education sector. Learning centres such as Gonokendros (Union Librarians) by BRAC, and Village Computer and Internet project by Grameen Communications have been set up to impart informal education. These spaces serve as community centres in rural and underserved areas to provide access to informational and educational content, communication services as well as citizen services.

Gonokendros (Union Libraries)

The Continuing Education Program was introduced by Bangladesh Rural Advancement Committee (BRAC) in 1995 and was responsible for establishing Gonokendros (Union Libraries) which provide computer training for students at a low price. They also provide an access to reading materials for the rural population in an effort to increase the literacy levels amongst them. By December 2007, Gonokendros had organized computer training for over 20,000 people and are now being developed as information centers to ensure the participation of everyone, particularly women.

Village Computer and Internet Project (VCIP)

Grameen Communications is a not-for-profit Information Technology company which launched a pilot Village Computer and Internet Project (VCIP) in a district near the capital of Bangladesh. The primary objective of the program is to provide access to modern ICT services to rural areas. A major emphasis for VCIP is providing education at a low cost to the people in isolated regions. In this regard the program has provided computer lab facilities to schools and colleges, basic training courses in computers and educational programs for the children like learning of alphabets and words.

In Bangladesh, ICT efforts in formal education have been initiated with a perspective of having trained manpower for developing an ICT industry in the country. To that end most education initiatives focus on providing ICT as a subject at the secondary and higher secondary level. The scope of using ICT as an instructional aid to ensure quality education needs to be explored more extensively. While initiatives such as Relief International – Schools Online (RI-SOL) and Computer Aided Learning (CAL) by BRAC are positive steps in this regard, much of the focus is on human resource development for the IT industry.

1.4 Bhutan

Bhutan located at the eastern end of the Himalayas bordered by India and China has been undergoing rapid political and social changes. Ending centuries of direct monarchic rule, Bhutan held its first democratic elections in March 2008. Bhutan has a very small economy but it has grown rapidly in the past few years, with the growth rate in 2007 reaching 22.4%.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Education	Formulating policies, developing the curriculum and administrating basic, higher secondary, tertiary as well as continuing and non-formal education	<ul style="list-style-type: none"> • The Department of School Education • The Department of Adult and Higher Education • Dzongkha Development Authority • The Department of Youth Culture and Sports
Ministry of Information and Communication	Formulating and implementing policies pertaining to ICT	<ul style="list-style-type: none"> • Department of Information Technology and Telecom • Department of Information and Media

In Bhutan, the Ministry of Education (MoE) is responsible for policy planning, curriculum development and administration of basic, higher secondary, tertiary as well as continuing and non-formal education. Implementation of national policies set out by the MoE is the responsibility of each Dzongkhag (district) in Bhutan. For this purpose, every Dzongkhag employs Dzongkhag Education Officers (DEO). DEOs are also responsible for school construction and maintenance. The MoE has also established other departments to aid it in its functioning.

The Ministry of Information and Communications (MoIC), established in 2003, formulates and implements the policies pertaining to ICT in Bhutan. The Department of Information Technology and Telecom (DIT) under MoIC assists the ministry in formulating these ICT policies. It also acts as an interface between the government and the private sector to identify and fill gaps in terms of infrastructure, policy framework and application of ICTs. The MoIC has also established a separate department, the Department of Information and Media, to assist it in formulating and implementing policies to strengthen the media sector.

Education and ICT Scenario

The modern education system was introduced in Bhutan only in 1961 under the First Five Year Plan. Prior to this, education was provided primarily through the Buddhist monasteries. Bhutan has recently achieved its long time goal of Universal Primary Education. The gross enrolment ratio in primary education was about 115% in 2009. The overall survival rate in grades V and X has shown a marked increase from 2006 to 2009, with the average rate of survival at grade V being 93.6% in 2009 and for grade X, 77.6%. When compared to the rest of the focus countries, the government of Bhutan spends a high percentage of its GDP on education. The Education Development Project was initiated by the MoE, with funding support by the World Bank, to expand access and improve the quality of primary and secondary schools in Bhutan.

Bhutan is a late starter in the communications space, with the earliest efforts at introducing ICTs dating back to only early 1999-2000. Since then it has made tremendous progress in terms of television penetration. Bhutan Telecom has reduced telecommunications rates by almost 50 percent within two years. Internet charges have been reduced from \$30 for 15 hours of Internet time to \$18 since June 1999. It has also made dial up internet packages to schools free of cost. However Bhutan faces geo-demographic constraints in rolling out infrastructure due to its hilly terrain and scattered population, as a result computer penetration remains low in Bhutan.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Bhutan:

Document	Date	Relevant Objectives
26th Education Policy Guidelines and Instructions (EPGI - 2007)	2007	<ul style="list-style-type: none"> • Provide computers to all schools that have electricity supply • Ensure IT literacy for all students who complete basic education (class X)
Bhutan Information and Communications Technology Policy and Strategy (BIPS)	2004 (updated-2009)	<ul style="list-style-type: none"> • Expand ICT infrastructure to educational institutions • Develop adequate ICT literacy curriculum for schools • Share educational resources throughout Bhutan • Encourage adoption of open source software

in schools

Bhutan is one of the only countries in the South Asian region which has an education component in the ICT policy and an ICT component in the education policy. The focus however is on expanding ICT infrastructure to boost the ICT industry and to develop adequate IT literate human resource to serve this industry.

The Department of Information and Media has developed a draft Broadcasting Policy which contains a section on using media to support - formal education at schools and tertiary levels; and training by public and private sector institutions and organizations.

Key Insights

Bhutan is characterized by a unique environment for the development of an ICT-based society by way of a stable and vibrant government; small population; widespread knowledge of English; good telecom network in much of the urban areas; and, the Government's commitment to adopting ICT as a development tool.

However, lack of funds for significant ICT adoption in schools is cited as a significant problem. Funds need to be generated to provide ICT facilities to schools at all levels. Private sector participation in the information, communications space has become prominent and will continue to grow in the tenth year plan as the government gradually withdraws from service provisioning to focus on policy and regulatory roles. Public-private partnerships with the Singapore International Foundation (SIF), Healing the Divide, Government of India *et cetera* have been successfully implemented.

Chiphen Rigpel

The government of India has granted financial assistance to the Royal Government of Bhutan to implement the 'Chiphen Rigpel' (broadly meaning 'empowering society, enabling a nation') project. This project (initially called the Total Solutions Project) was initiated in 2010 and would be implemented over a period of five years in collaboration with Department of Information Technology and Telecom (DITT), Ministry of Information and Communications and National Institute of Information Technology (NIIT) India. The education component of the project is highlighted below:

- Implement teacher training programs to cover 5,000 teachers across Bhutan
- Equip all schools under IT@Schools with software and educational material
- Provide Computer Aided education services for effective student training
- Establish seven training centres, two colleges of education and five higher secondary schools to spread IT Literacy within the Kingdom of Bhutan

Singapore International Foundation

Singapore International Foundation (SIF), in collaboration with the Ministry of Education and Royal University of Bhutan, initiated the Bhutan W.I.R.E.D (Weaving InfoTech Resources in Education) to ensure IT employment in Bhutan's education system. The three year project (2008 to 2011) will also initiate four higher secondary schools and one lower secondary school. These schools will provide an opportunity for teachers to become ICT literate and to learn how to infuse ICT to enhance their lessons on various subjects. Teachers will also be encouraged to transfer their knowledge to their colleagues.

A major constraint for Bhutan is the lack of local content, but since local content development has been highlighted as one of the significant requirements for integrating the use of ICTs in education in Bhutan, the Department of Information Technology has initiated the Dzongkha Localization Project. Under this project, a beta version of Dzongkha Linux was released in 2006, and through it, local citizens can carry out simple desktop tasks and use word processing, spreadsheets and power-point in Dzongkha.

1.5 Maldives

The Republic of Maldives is formed by two chains of 26 atolls in the Indian Ocean. It is the smallest Asian country both in terms of population and area, further with an average ground level of only 1.5 meters above sea-level, Maldives is the lowest lying country in the world. The government of Maldives began the process of economic reform in 1989 by opening up the economy. Tourism is the largest industry in Maldives accounting for almost 28% of the GDP, fishing is the second largest industry.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Education	Formulating policies and monitoring their implementation	<ul style="list-style-type: none"> • Department of Higher Education • Department of Public Examination • Educational Development Centre • Centre for Continuing Education
Ministry of Civil Aviation and Communication	Enhancing science and technology as well as telecommunications	<ul style="list-style-type: none"> • National Centre for Information Technology

In Maldives, the Ministry of Education (MoE) is responsible for formulating policies and monitoring their implementation. The MoE has separate departments/divisions for school education, higher education and continuing education which assist the ministry in implementing policies and programmes. The Educational Development Centre (EDC) is the professional hub of the MoE and works towards curriculum development, educational material production, educational broadcasting and school construction and up-gradation. The EDC has an Education Technology Unit (ETU) which produces audio, video and multimedia programmes to support the national curriculum.

The Ministry of Civil Aviation and Communication is responsible for the advancement of science and technology as well as telecommunications in Maldives. The National Centre for Information Technology (NCIT) was established in 2003 to develop, promote and propagate information technology. NCIT has initiated various projects to accomplish its objectives such as the Information Technology Development Project.

Education and ICT Scenario

Maldives has the highest literacy rate and the lowest gender disparity level among the focus countries. It has achieved its Millennium Development Goal (MDG) of universal primary education with a hundred percent enrolment rate at the primary level. A significant achievement is that the country has been able to maintain a low drop out rate, resulting in a

high gross enrolment rate at the secondary level as well. The government of Maldives spends 8% of its GDP on education, this figure is high when compared to other countries in South Asia, where apart from Bhutan, expenditure on education usually ranges from 2% to 4% of GDP.

Maldives has a relatively higher ICT penetration level particularly in terms of computers, mobiles and televisions. It has achieved a near 100% mobile network coverage and nearly 90% of internet users use broadband internet connection. It is amongst the top ten economies that have gained most (114%) in value on the 'ICT access sub index' between 2002 and 2007 (International Telecommunication Union). The government hopes to ensure that each secondary school has a computer lab for learning purposes and that the schools have sufficient capacity to maintain and operate the computer lab effectively. Already the government has been able to provide 60 percent of secondary schools a computer lab and most schools have a technician and a computer teacher. However internet connectivity is extremely expensive, the price basket for internet service is USD 15 per month which is almost 85 percent more expensive than other South Asian regions.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Maldives:

Document	Date	Relevant Objectives
Seventh National Development Plan	2006- 2010	<ul style="list-style-type: none"> • Provide computer access to all students • Create larger pool of ICT professionals • Raise awareness and promote ICT • Ensure affordability of ICT services

The Seventh National Development Plan contains different sections for education, higher education and ICT. The education and higher education section focuses on strengthening and expanding educational opportunities to all children in Maldives. It very briefly mentions expanding the use ICTs in education and using media services to enhance the teaching learning process. The ICT section of the policy framework also articulates the use of ICT in education particularly in terms of providing infrastructure and developing adequate human resource for the ICT sector.

The recently released Strategic Action Plan (2009-2013) has a major focus on strengthening the ICT infrastructure and ensuring affordability of ICT services but it however has no particular reference to using ICT in education.

Key Insights

Maldives is an example of a country which can reap great benefits from ICT implementation particularly because of its geographical make up and the government initiatives. Inhabitants of the many islands and atolls are isolated from one another because of the distance and sea between them and physical travel is an expensive undertaking. ICT expansion can help them to virtually reduce the geographical separation and take advantage of the education and training facilities available in other islands particularly the capital Male’.

Transport cost in Maldives is high, therefore, for children who do not have access to quality schools in their island, receiving quality education becomes expensive. Apart from students, teachers also find it difficult to travel to other islands to upgrade their skills; nearly 80 percent of teacher-training costs are transport related. In response to this constraint, the Ministry of Education, Dhiraagu (National Telecom Service Provider) and UNICEF established Teacher Resource Centers (TRC) in 20 atolls in Maldives.

Teacher Resource Center

Each TRC is equipped with modern technology such as ‘smart board’ which is an interactive touch screen replacement for the traditional white board used in schools. The smart board also acts as a screen to enable students in different TRCs to see each other and discuss the curriculum. TRCs also include microwave relay and cable internet equipment. Teachers can use the TRCs to browse the internet and develop and download material for their lessons. Through the virtual learning environment developed for the Educational Development Centre by Cambridge International Examinations, up to 400 teachers can undergo training and interact with one another. The capital investment of this initiative was approximately US\$3.5 million.

Apart from transport costs being high in the country, Maldives also has exceptionally expensive internet access. This could be a major constraint in ensuring quality implementation of ICT in schools as computers are only useful for basic tools such as word and worksheets, internet could help students communicate and share ideas with students in other atolls. In this regard efforts will have to be made to introduce competition in the ICT industry.

Maldives can also take advantage of the high mobile and television reach to develop innovative programmes to deliver education to the masses, particularly those people living in less developed atolls.

1.6 Nepal

The Federal Democratic Republic of Nepal is bordered by the People's Republic of China and the Republic of India. The capital of the country and the largest metropolitan city in the country is Kathmandu. Nepal is highly diverse and has a rich geography. The country has eight out of the world's top ten mountains including Mount Everest.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Education	Formulating policies and plans for the educational sector	<ul style="list-style-type: none"> • Department of Education • National Centre for Educational Development • Curriculum Development Centre • Non-Formal Education Centre • Teacher Service Commission
Ministry of Science and Technology	Formulating, implementing and monitoring policies pertaining to science and technology	<ul style="list-style-type: none"> • National Information Technology Centre
Ministry of Information and Communications	Formulating and implementing the rules, regulations and policies pertaining to telecommunications, and broadcasting,	<ul style="list-style-type: none"> • Nepal Telecommunications Authority • Radio Broadcasting Development Committee

The Ministry of Education (MoE) in Nepal is responsible for formulating policies and plans for the educational sector. It manages and implements these policies through the various organizations/institutes established under it such as the Department of Education, National Centre for Educational Development, Curriculum Development Centre (CDC), Non-formal Education Centre and the Teacher Service Commission.

The National Information Technology Centre (NITC) under the Ministry of Science and Technology (MoST) implements the policies and plans on science and information technology in Nepal. It also has the responsibility to monitor and supervise these policies and regulate the activities of the centre.

The Ministry of Information and Communications (MoIC) was established with an objective of expanding the information and communication sector for social and economic development. MoIC formulates and implements the rules, regulations and policies

pertaining to postal services, telecommunications, broadcasting, press and film development.

Education and ICT Scenario

While the youth literacy rates have significantly improved in Nepal, adult literacy remains low particularly for females. It is estimated that only 28% of the adult female population is literate. Enrolment rates particularly in primary education have shown a marked growth, the net enrolment rate has reached 87.4%. The participation of girls has increased significantly during the tenth year plan. Some of the main constraints faced by the government in the development of education are lack of basic infrastructure, supply of teachers, wide disparity between community and private schools, passing rates et cetera.

For the ICT sector the vast digital and quality divide is a matter of concern for the policy makers. The telecommunications infrastructure is good in urban areas, and because it has been installed recently, it is mostly digital. However PC penetration in the country is low.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Nepal:

Document	Date	Relevant Objectives
IT Policy	2000	<ul style="list-style-type: none"> • Include computer education in the curriculum • Use IT to improve the quality of education • Computer knowledge to be made compulsory for teachers

The IT Policy 2000 primarily focuses on building Nepal as a knowledge-based society and making ICT facilities available to the public. Using ICT as an instructional aid has little mention in the policy framework. The MoE released a three year interim plan to strengthen the education sector, which briefly mentions improving teacher quality by enhancing their ICT skills. The MoE also released an Open and Distance Learning Policy documents which articulates the need to use innovative media forms in distance education.

Key Insights

Nepal has gained considerable experience through in community broadcasting. This experience may be leveraged so that convergent technologies can become the way forward in integrating ICTs at all levels.

As far as internet connectivity is concerned, given the difficult geographical terrain, instead of proceeding with traditional ways of building line-of-sight and terrestrial systems, and high-cost media infrastructure, a combination of wireless and satellite-based telecommunications with low-cost Very Small Aperture Terminal (VSAT) apparatus for downlink of data and images could be more effective in Nepal. Nepal Telecom (NT) has been expanding its ADSL service to more and more districts, and the rate charged by NT for connectivity is significantly lower than most other services for broadband connection. This has the potential to greatly improve connectivity especially in rural areas since NT already has nationwide infrastructure in place.

The Open Learning Exchange Nepal, has developed the most integrated ICT enablement programme for introducing ICTs in schools focusing on all aspects- hardware, networking and connectivity, content development (E Paath and E-Pustakalaya) and capacity building of teachers and administrators.

Open Learning Exchange

OLE is a non-profit organization, dedicated to improving the quality and access to the public education system in Nepal by developing freely accessible, open-source ICT-based educational teaching-learning materials that are available free of cost to all students in the system. To this end OLE has undertaken different initiatives in Nepal, some of these are outlined below:

Content Creation: OLE Nepal is engaged in creating content at two levels. The E-Paath consists of interactive learning modules, mapped to the topics in the curriculum as prescribed by the Curriculum Development Centre. E-Pustakalaya is an electronic library which is a repository of reference material for the students, consisting of full text documents, images, audio, video clips and software that are relevant for students

Capacity Building: OLE Nepal is committed to strengthening the government's capacity to implement ICT enabled learning in all schools and to make this sustainable at the school level. To that end it undertakes capacity building and training activities for all players in the system including government officials and teachers

If Nepal is to gear towards introducing ICT-based education delivery system in its classrooms, a clear and distinct comprehensive policy will be needed on what the education mechanism intends to achieve along with timeline and milestones. Various sporadic efforts by different state and non state actors to introduce different modules of ICT-based education and ICT education needs to be documented and studied to see what indigenously works best for Nepal.

1.7 Pakistan

Pakistan is officially known as the Islamic Republic of Pakistan. It has a coastline with the Arabic Sea and is bordered by Afghanistan, Iran, India, and China. Pakistan had a steady GDP growth rate of about 7% for several years until the mid 2000s; however with the recent downturn in the economy it has dropped to 4.7% in 2008. The economic structure of Pakistan has changed from an agricultural based economy to a strong service based economy.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Education	Developing the overall policy framework, curriculum, accreditation, and financial support for select research activities	<ul style="list-style-type: none"> Federal Directorate of Education
Ministry of Information Technology	Planning and coordinating projects and programmes pertaining to ICT	<ul style="list-style-type: none"> Electronic Government Directorate National Telecommunication Corporation Pakistan Computer Bureau
Ministry of Science and Technology	Formulating policies and supervising scientific and technological programmes	<ul style="list-style-type: none"> Pakistan Council for Science and Technology

Pakistan follows a decentralized system of education administration with all academic institutions being under the purview of respective provincial administrations while the Ministry of Education (MoE) has the responsibility of developing the overall policy framework, curriculum, accreditation, and financial support for select research activities. The Federal Directorate of Education under the MoE provides infrastructural facilities to the schools; it is also responsible for implementing the policies of the MoE.

The Ministry of Information Technology (MoIT) in Pakistan was established in 2002 to plan and coordinate the various projects and programmes in the field of information technology and telecommunications in the country. The major objectives of the ministry are to enable transformation to Electronic Government, provide impetus for the development of a Software Industry, build a state of art Infrastructure and develop a high qualified pool of Human Resource. The Government of Pakistan has also established the Ministry of Science and Technology (MoST), which formulates policies and supervises scientific and technological programmes in the country.

Education and ICT Scenario

Educational attainments in Pakistan are relatively low with an adult literacy rate of only 54% and a strong gender disparity. Enrolment rates for secondary education are also low, and only 2.9% of the relevant age group entering the University system. To improve the state of education, the Government of Pakistan initiated the Education Sector Reform (ESR) programme in 2001 with a seven fold objective amongst which was increasing literacy rates, reducing the gender disparity and increasing completion rates.

Pakistan like other developing countries in the region has witnessed significant growth in the ICT sector. It has a comparatively high internet usage rate, therefore in terms of infrastructure, it was understood that low levels of electrification, posed a more significant challenge for integrating ICTs in the education space, than low levels of connectivity. Mobile coverage is over 90% for the country, however PC penetration rate is significantly low.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Pakistan:

Document	Date	Relevant Objectives
National Information and Communications Technology Strategy for Education (NICTE)	2005	<ul style="list-style-type: none"> • Use ICT to extend the reach of education • Use ICT to improve quality of teachers • Use ICT to enhance student learning • Integrate ICT into the curriculum • Develop capacity at federal and state level education departments
National IT Policy	2000 (revised in 2008)	<ul style="list-style-type: none"> • Provide low cost computers and connectivity to educational institutes • Network all higher education institutes • Enhance Open and Distance Learning • Establish a national education intranet

Pakistan formulated the National Information and Communication Technology Strategy for Education (NICTE) through a consultative process in 2004-05. Among other benefits of ICT in the education space, the policy framework recognizes the importance of ICT both as a subject and as an instructional aid.

The National IT Policy emphasizes the need to develop an adequate IT and telecom infrastructure, a robust hardware and software industry and a qualified pool of human

resource. In terms of education, the policy framework focuses on strengthening the ICT infrastructure in schools and educational institutions.

Key Insights

At the policy level while the NICTE, stresses the use of ICT both as a subject and as a critical instructional aid, since its inception in 2005 it has not been the driving force behind any major initiative for introducing ICTs in the education sector. Most specific schemes on ICTs in the school education space have been initiated under the aegis of specific IT and education policies at the provincial level.

The Punjab IT Labs is the first project of its kind initiated by the Provincial government of Punjab. The project was completed in November 2009, equipping some 4'286 schools with PCs and where possible connectivity. On the other hand elite private school networks such as the Beaconhouse School system, which has around 141 schools in Pakistan with student enrolment of about 60,000 to 80,000 students, have worked towards integrating ICTs in the teaching learning process at all levels in their schools. However given the relatively high fee structure in these private institutions cost of ICTs is met by the school and students themselves, which is not a viable option for government schools.

As efforts are beginning to get underway to provide government schools with ICT facilities, it is important that ICTs are integrated as tools for improving teaching learning rather than focusing exclusively on a specific IT curriculum based approach.

Use of ICTs in Pakistan is well established in the higher education sector through the Open and Distance Learning systems such as Allama Iqbal Open University and the Virtual University.

Open and Distance Learning Systems

Distance Education in Pakistan is dominated by Allama Iqbal Open University (AIOU), Asia's first Open University which was established in 1974 with a mandate of providing educational opportunities to the masses and to those who could not leave their homes or their regular jobs. In 2000, the Government of Pakistan developed a new initiative – the Virtual University of Pakistan (VUP). VUP was established specifically to create more capacity in the system by leveraging modern information and communications technologies. Even though VUP used ICT to deliver education through a distance learning mode, it was not conceptualized as an “open” university since AIOU already served that market (PANdora Distance Education Guidebook). Together AIOU and VUP serve 750,000 students (with an annual growth rate of 14%) which is three times the student population of all other universities in Pakistan combined (Ansari and Saleem, 2010). Due to the efforts made by the government as well as private and non-government donors, enrolment in distance learning institutes has increased from 199,660 to 305,962 from 2005-06 to 2007-08 (Economic Survey 2008-09).

At the school level, very few large scale ICT initiatives are ongoing especially in the public/government school systems. The experience of running large ODL systems can be leveraged to establishing open schooling for the K- 12 level.

1.8 Sri Lanka

The Democratic Socialist Republic of Sri Lanka is an island country in the Indian Ocean located about 31 kilometers off the southern coast of India. The country is famous for the production and export of tea, coffee, coconuts, rubber and cinnamon, which are the key contributors to its GDP, along with tourism which is now recovering after Sri Lanka's long period of civil war which ended in 2009.

Legal Framework for ICT and Education

Ministry	Key Responsibilities	Departments/divisions
Ministry of Education	Implementing national educational policies	<ul style="list-style-type: none"> National Institute of Education Department of Examination
Ministry of Higher Education	Formulating policies, facilitating and assessing the higher education system, and providing training to the educational faculty	<ul style="list-style-type: none"> University Grants Commission
Ministry of Science and Technology	Formulating and implementing the policies pertaining to science and technology	<ul style="list-style-type: none"> National Science and Technology Commission

In Sri Lanka, the Ministry of Education (MoE) is responsible for implementing national educational policies. It functions through its various departments such as the National Institute of Education (NIE) which has the responsibility of developing the curricula and conducting research to enhance the education system in Sri Lanka. The Department of Information Technology under the NIE has initiated several projects to introduce IT in the curricula and to develop relevant software to assist teachers in the classrooms.

Sri Lanka has a distinct ministry – the Ministry of Higher Education (MoHE), to ensure the delivery of higher education as well as higher technological education. MoHE is tasked with the responsibility of formulating policies, facilitating and assessing the higher education system, and providing training to the educational faculty. MoHE is also the nodal ministry which allocates funds and other physical resources to universities and higher education institutes. The Government of Sri Lanka also established the National Education Commission to make recommendations on educational policies and Plans.

The Ministry of Science and Technology (also known as the Ministry of Technology and Research) formulates and implements the policies pertaining to science and technology. The Government of Sri Lanka also established the Information and Communication

Technology Agency (ICTA) which is the apex body for development of the ICT sector in Sri Lanka. ICTA is responsible for building connectivity infrastructure across the country, it has been formulating policies to enable reforms and restructuring in the educational framework.

Education and ICT Scenario

Sri Lanka's adult literacy rate is around 91% which is very high as compared to other developing countries and countries in South Asia. Comparatively, the Secondary Gross Enrolment Ratio, which stands at 88%, is also very high. As a commitment to further improve the quality of secondary education, the Government of Sri Lanka in collaboration with ADB initiated the Secondary Education Modernization Project (SEMP).

The penetration of ICTs in Sri Lanka has grown dramatically thanks to mobile with some 70 mobile phones per 100 people at the start of 2010 and an estimated 9 internet users per 100 (source: ITU).. Though one may find mushrooming computer vendors and training centers in Colombo and provincial capitals, there is little access to computers in Sri Lankan schools and colleges in rural areas. The initiation of the 'e-Sri Lanka' program and the declaration of 2009 as the year of ICT and English are however significant milestones in the government's long term plan to improve the quality of life of the people by leveraging the use of ICT.

Policy Framework

The table below briefly outlines the objectives of relevant national level policy documents in Sri Lanka:

Document	Status	Date	Relevant Objectives
National Policy on Information and Technology in School Education (NAPITSE)		2002	<ul style="list-style-type: none"> Introduce IT in the curricula for schools and teacher training institutes Improve the IT infrastructure in schools and in the community Increase IT penetration

The National Policy on Information and Technology in School Education (NAPITSE) had been framed by the government in order to impart ICT education to the younger generation. The NAPITSE is followed by a six-year strategic plan from 2002-2007. This action plan focuses on the use of IT in Education (learning and teaching) and the use of IT in the management of the education system.

A draft National ICT Policy has been placed before the government for approval through the National Science and Technology Commission (NASTEC) and the Ministry of Science and Technology. The draft policy framework primarily focuses on building the ICT sector.

Key Insights

Sri Lanka, unlike most other countries in the South Asian region, already has a strategic action plan. However this is not supported by a detailed implementation plan. As a result very little information is available on the success of the implementation of the action plan.

While government efforts at introducing ICTs in education are more focused at the secondary school level, non formal education programs and community awareness programmes through community learning centres called *Nensalas* and initiatives like Radio Kothmale are more widespread.

Kothmale Community Radio

The Kothmale Community Radio was implemented in Sri-Lanka by UNESCO in an effort to extend the benefits of ICT to rural people. The Kothmale radio station provides access to computers with dedicated internet connectivity. This project uses radio as an interface between community and Internet through “Radio Browse” model. Listeners of the radio channel request the broadcasters to surf the internet on their behalf and find information they require. This information is then relayed back to the listeners in the local language through the program by experts, for example if information on health was demanded, a doctor would be requested to explain and contextualize the information. The station also helps the community develop skills to develop their own websites. Since this radio was not owned and run by the community, there were issues regarding its sustenance.

Nensala Project

ICTA initiated the Nensala Community development Task force with the vision of spreading a thread of community learning across the rural areas of Sri Lanka. It has established 590 rural tele-centers or “Nensalas”. The Nenasala Community Development Task Force is set up to manage, conduct and supervise the centres. The Task Force caters to the Nensala operations such as communication development, setting up kiosks, development of the ICT skills and imparting ICT education in the school curriculum, monitoring and evaluation and capacity building through special training and guidance. Workshops are conducted to receive feedback and ensure proper functioning of the centres.

More emphasis is required on creating appropriate content in local languages and providing adequate training to teachers and students to enable them to integrate ICTs in their teaching learning practices.

2. Cross Country Analysis

2.1 Major Initiatives

Teacher Training

Most of the countries in the South Asia region have realized the need for training teachers in ICT and have launched various professional development initiatives. However, many of these training activities to date focus mainly on computer literacy instead of enabling teachers to integrate ICT in their day-to-day teaching activities and master the use of ICT as an effective tool to improve teaching and learning. For the South Asian region, apart from the UNESCO and other International agencies, there have been various government initiatives and NGO activities in generating awareness and providing quality Training for ICT in education. The major teacher training initiatives across the region are summarized in the table below:

India	Afghanistan	Bangladesh	Bhutan
Intel Teach Program Provides in-service and pre-service teacher training to help teachers integrate technology in the class room Reach: More than 570,000 teachers across 14 states.	Microsoft – Unlimited Potential Program Follows a train-the-trainer model to provide computer skills to the lowest strata of society	Computer Aided Learning (CAL) An initiative by BRAC to help teachers familiarize themselves with ICT and use it to improve their teaching skills	Support for Teacher Education Project Singapore International Foundation provided assistance to two teacher education institutes in developing an ICT enhanced curriculum as well as a selective ICT subject within the curriculum
Microsoft – ‘Project Shiksha’ Instills ICT skills required to enhance the teaching learning		RI-SOL, Intel Corporation and ECA Provides ICT skills and	Chiphen Rigpel The project aims to implement teacher training programs for 5,000 teachers. The

process. Reach: 200,000 government school teachers by June 2008		development training to teachers in Bangladesh	project will also establish two colleges of education to spread computer literacy
Indira Gandhi National Open University Provides a two year diploma course in primary education by using print material supplemented with radio and television programmes Reach: 9,000 teachers			

Maldives	Nepal	Pakistan	Sri Lanka
Teacher Resource Centres (TRC) TRCs have been established in 20 atolls equipped with ICT facilities. Through the virtual learning environment developed for the Education Development Centre, teachers can receive training through online courses at the centres	Teacher Education Project Nine primary teacher training institutes were provided with multimedia resource centres to complement the traditional delivery mode. A mobile training team was also formed to train teachers on using laptops and video equipment	Intel Teach Program Provides in-service and pre-service teacher training to help teachers integrate technology in the class room. More than 200,000 master teachers have been trained	Asia-Pacific Programme for Educational Innovation for Development (APEID) APEID in collaboration with various organizations has implemented three inter-related projects which aim to build the capacity of teachers and teacher educators to integrate ICT into teaching.
A Laptop for Every Teacher This scheme provides 500 laptops a year to teachers with	Open Learning Exchange (OLE) OLE provides teacher training	Pre - STEP (Pre-service Teacher Education Program) Under this project, an ICT course	Intel Teach Program Provides in-service programs for teachers in four provinces. The pre-service

the condition of paying monthly charges for a period of two years	and Training of Trainers (ToT) packages for the National Centre for Education Development (NCED) and the Curriculum Development Centre (CDC)	will be developed and piloted which aims at instilling technology aided teaching methodology skills	program was recently introduced in the National Colleges of Education (NCoE).
		ICT for Science Teachers Project The project aims at providing basic training programs for teachers to develop computer skills to enhance their professional competency	
		E-Teacher Project The project offers ICT training to teachers. The teachers can also learn how to integrate ICT into the classroom	

ICT Infrastructure in Schools

ICT as a subject in the curriculum and the corresponding establishment of computer laboratories is a key focus in the policy framework for all focus countries. As a result most of the initiatives taken by the government in the South Asian region invariably involve providing computer laboratories to schools particularly secondary and higher secondary schools. Many private and non government organizations, either independently or in collaboration with the government, have also been providing computer to schools. Apart from computers, some countries have succeeded in providing other ICT facilities to schools such as satellite broadcasting, video-conferencing and multi-media storage technology (CD-ROMs and DVDs). The initiatives to provide ICT infrastructure to schools across the region are summarized in the table below:

India	Afghanistan	Bangladesh	Bhutan
Sarva Shiksha Abhiyan (SSA) SSA in collaboration with IL&FS Education and Technology service limited is in the process of establishing computer labs equipped with computers, and printers in 200 schools in Bihar	Danish International Development Agency (DANIDA) DANIDA provides support in restructuring and developing the primary education sector by providing infrastructure to schools	Computer Aided Learning (CAL) BRAC provided ICT enhanced learning material to schools. The software was based on the national curriculum	ICTization of Schools Under this project 100 community primary schools were provided with two computers and a printer each to spread ICT literacy
ICT @ Schools Under this project, support was provided for procurement of computers, software and connectivity to government schools. SMART Classes were also set up in central government schools systems	One Laptop per Child (OLPC) The OLPC project has provided 5000 XO laptops to students. OLPC has also adapted the software to support the local language	TQI – SEP (Teacher Quality Improvement in Secondary Education Project) Under this project, the MoE with support from BRAC introduced 17 Mobile ICT labs containing laptops, cameras, multimedia projector etc to schools in remote areas. The project aims to cover 1000 schools by the end of the year	One Laptop per Child (OLPC) OLPC launched a pilot project under which it provided 270 XO laptops to community primary schools across the country
EduComp Solutions Ltd. EduComp partnered with state governments to provide infrastructural support and content to over 14,000 government schools		RI-SOL, Intel Corporation and ECA RI-SOL launched 47 Internet Learning Centres offering online communication tools to 10 districts to be used by schools and	Chiphen Rigpel This project aims to equip all schools under IT@Schools with software and educational material

		local college institutions	
One Laptop per Child (OLPC) After running a pilot project in a rural village, OLPC is committed to provide 250,000 XO laptops for 1,500 schools			
EduSat – Education Satellite EduSat facilities are being used by schools across the nation to provide high speed internet connectivity			

Maldives	Nepal	Pakistan	Sri Lanka
Access to computers for all schools To achieve policy goals the government aims to provide each secondary school with a computer lab. Till date 60% of secondary schools have been covered	Open Learning Exchange (OLE) Under the OLPC project under which it provided 4,400 laptops in 26 schools. By 2010 it hopes to extend this to 38 schools. OLE is also engaged in the creation of content and networking of schools	International Education and Research Network (iEARN) iEARN works with primary and secondary schools in Pakistan to provide ICT based educational programmes and learning material	One Laptop per Child (OLPC) OLPC project will deliver 1,300 XO laptops to students in Sri Lanka by 2010. Over 400 primary school children have already received XO laptops
	ICT Project 2000 Under this project, schools are provided 5-10 laptops with internet access. Future plans	Aga Khan Education Services (AKES) AKES works in Pakistan towards ICT dissemination in 187 schools.	Secondary Education Modernization Project (SEMP) SEMP with funding support from ADB will provide secondary schools with computer

	include providing telephone infrastructure and wireless transmission	Each school possesses 20 computers to introduce learner centered teaching methodology	facilities and multimedia units
		Beaconhouse School System This is a network of 141 schools across Pakistan which are equipped with computer labs. Computers are also used in resource rooms and libraries	SchoolNet Under this project the MoE and ADB will establish Wide Area Network to connect most secondary schools and related organizations
		E-Teacher Project The project offers ICT training to teachers. The teachers can also learn how to integrate ICT into the classroom	

ICT for Non-Formal Education

Although education is a basic human right, there are millions of people who for various reasons have missed out on the opportunity of formal schooling, thereby constraining them from basic literacy. In the South Asian countries Non Formal Education (NFE) was encouraged to address this critical aspect and to provide mass education to the large majority who were outside the ambit of the formal school system.

NFE can address the diversified learning needs of pre-school children, out-of-school girls and boys, young people, and women and men in a changing society. NFE emerges in varied forms such as early childhood education, community learning centers (CLCs) for village people and urban dwellers, adult literacy classes, skills and vocational training in workplaces, distance education for those who live in remote

areas and continuing education for youth and adults. The initiatives to use ICT for NFE across the region are summarized in the table below:

India	Afghanistan	Bangladesh	Bhutan
Hole in the Wall Education Ltd. (HiWEL) NIIT and the International Finance Corporation have established computer kiosks in urban slum areas in an effort to promote literacy amongst underprivileged children in slums	Multipurpose Community Tele - Centres (MCT) Post offices in 12 provinces were upgraded to enable them to act as Multipurpose Tele-centres (MCT) offering a variety of ICT services such as computers, printers, modems etc.	Gonokendros (Union Libraries) BRAC introduced Gonokendros which provide computer training for students at a low price. They also provide access to reading materials for the rural population	Radio Browsing Programme UNESCO implemented radio browsing through the Bhutan Broadcasting Service where listeners ask experts to surf the internet on their behalf and transmit information in response to their requests
'Namma Dhwani' India's first cable audio initiative. It uses audio cable connections to transmit information to the school and individual homes. More than 350 programmes have been cablecast so far.	Educational Radio and Television (ERTV) ERTV was established with a mandate of raising public awareness, raising adult literacy levels and broadcasting educational programmes to schools.	Village Computer and Internet Project (VCIP) Grameen Communications launched this project to provide the rural community with access to ICT. The project also provided computer lab facilities, training in computers and educational programs for children to learn alphabets and words	
Literacy for a Billion This project was initiated by PlanetRead, a not-for-profit	Radio Education for Afghan Children (REACH) REACH uses the radio to		

<p>organization using Same Language Subtitling (SLS) on several song based TV programs to inculcate reading skills for the masses</p>	<p>broadcast informative and inspiring programs for children who have been deprived of education for various reasons</p>		
	<p>The Afghan School of Learning (AIL) AIL, a women led NGO initiates programs to create interactive pedagogical strategies to address education needs of Afghan women</p>		

Maldives	Nepal	Pakistan	Sri Lanka
<p>Multipurpose Community Tele-Centres (MTC) MTCs have been established which are equipped with a variety of ICT services. They are available to schools for students and teachers to upgrade their knowledge and skills. MTCs can also be used by professionals to expand their skills</p>	<p>E- Pustakalaya OLE developed E – Pustakalaya which is an electronic library consisting of books, images, audio, video clips and relevant software for students. It is available in schools as well as on the internet</p>	<p>Interactive Radio Instruction (IRI) Through IRI, USAID provided training and learning resources to teachers. It also launched the ‘Time for English’ series to provide English language lessons for primary students</p>	<p>Kothmale Community Radio The Kothmale project uses radio as an interface between community and internet through the ‘radio browse’ model. The programme discusses and contextualizes desired information in the local language</p>

	<p>Radio Sagarmatha This community radio - covers and discusses public issues, conducts training for public radio journalism and provides a venue for local ideas and culture. The School on Air project under it specifically targets students in government schools</p>	<p>Educational Television (ET) Viewing centres have been established equipped with televisions. These centres provide hardware video-based training (via internet, satellite, VCR/television or DVDs) to people in remote areas</p>	<p>Sri Lanka Environmental Television Project (SLEPT) SLEPT uses audio-visual and electronic media (television, video and internet) to raise awareness on environment and development issues. The project works with television broadcasters as well as video material users such as schools, universities, training institutes etc.</p>
	<p>Rural Information Centres Rural tele-centres are to be established to provide information on distance education, agriculture and telemedicine</p>		<p>Nensala Project Under this project Nensalas (tele-centres) have been established in an effort to spread a thread of community learning across rural areas. To date, some 590 centres have been established</p>

Open and Distance Learning

A few of the South Asian countries have a well established Open and Distance Learning (ODL) system at the higher education level. In India the benefits of an ODL system have also been extended at the school level. The imperative of developing an ODL system more or less came from recognition of the need to promote mass education. Historically, the ODL institutes were using traditional print supplemented with video and audio based programmes. However, more recently with the development of innovative and modern technology, these institutes have begun integrating video conferencing and other multimedia tools. Open and Distance Learning institutes across the focus countries have been categorized in the table below:

Country	ODL for School Education	ODL for Higher Education	Presence of 'Mega Universities' ¹
India	National Institute of Open Schooling (www.nios.ac.in/)	Indira Gandhi National Open University (www.ignou.ac.in/)	✓
Afghanistan	-	-	
Bangladesh	-	Bangladesh Open University (www.bou.edu.bd/)	✓
Bhutan	-	-	
Maldives	-	-	
Nepal	-	-	
Pakistan	-	Allama Iqbal Open University (www.aiou.edu.pk/)	✓
	-	Virtual University of Pakistan (www.vu.edu.pk/)	
Sri Lanka	-	Open University of Sri Lanka (www.ou.ac.lk/)	✓

¹ A Mega University is one in which the number of admissions exceeds one hundred thousand annually

2.2 Key Insights

Use of ICTs for Education in the South Asian countries can be viewed from two perspectives. The first is squarely placed in the 'development' discourse and broadly comes from an ICT for Development approach. In this approach technology is seen as a tool for achieving a set of goals that signify a certain state of development as historically understood. In this paradigm use of technology is advocated to reach the unreached, provide support to those who do not have access to quality hard infrastructure, quality teachers and quality educational resources. This includes use of ICTs for various non formal education programs, adult literacy, informational and educational services for farmers, fisherman etc and creating telecentres where citizens can have access to services and information.

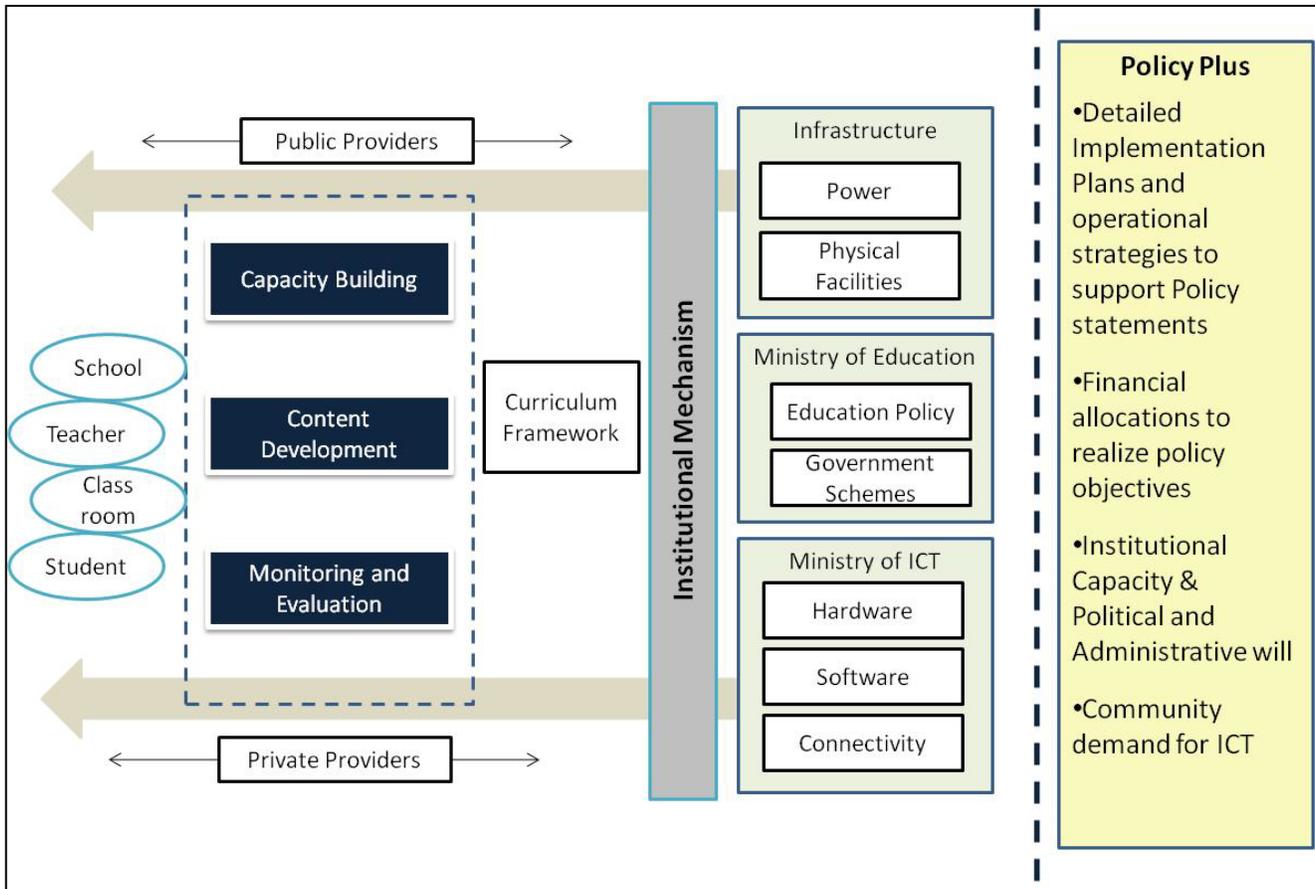
The second perspective is that of the e learning paradigm. The e learning paradigm is in effect a response to the needs of the so called emerging 'knowledge society', where ways of learning and applying that knowledge are changing at a fast pace. It reflects the requirements of 21st Century teaching learning skills. As remarked by Alvin Toffler- 'The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn' Thus the e learning paradigm sees technology as a platform for fundamental innovation in the way teaching-learning any where in the world is being undertaken. It focuses on creating more learner centric environments, replacing one way instructional model with collaborative learning models and knowledge creation and knowledge sharing

While this distinction can be largely theoretical, it is useful in allowing us to understand the complexity of the ways in which ICTs are being used in the education space in these countries. The use of ICTs in the education space in the South Asian countries is complex because it straddles both these perspectives- in certain environments ICTs provide a way to overcome existing gaps and in certain other environments ICTs provide a platform for fundamental innovation in existing pedagogical practices. Thus in the South Asian region a diversity of solutions is required that meet the needs of all levels and kinds of educational activities from non formal education, to awareness generation, to the use of state of the art technology for advanced e learning practices.

This Survey primarily sought to present a snapshot of the different kinds of initiatives in which ICTs are being used for Education in India and South Asia. Given the rapid changes in the field, the vast spectrum of initiatives using ICTs and the extremely contextual reasons for success or failure of ICT enabled educational initiatives, it is almost impossible to prescribe definite solutions, however through the course of the study several key insights emerge that may be useful in designing future projects and programmes. Some of these key insights are discussed here:

ICT for Education Ecosystem

In studying the various ICT for Education initiatives in the different focus countries, it emerged that initiatives are successful precisely because they are able to pull together many different elements in an organic and integrated manner, supported by a robust yet flexible policy framework. Very broadly a graphical depiction of what may be understood as an **ICT for Education Ecosystem** can be shown in the figure below.



Core infrastructure policies provide for electrification and physical facilities, the Ministry of Education has the responsibility for articulating the larger Education policy and the Ministry of ICT is responsible for putting in place a broad communications policy as also policies on developing hardware, software and connectivity. These policies may then be translated into initiatives and schemes by both public as well as private providers, through different mechanisms. Initiatives specific to ICT for Education would have several critical elements such as capacity building, content development and monitoring and evaluation strategies. These put together would then be geared

towards the student in his environment, ensuring that ICT initiatives actually result in improved teaching learning. In addition to these policy elements several critical factors like detailed implementation plans to operationalize policy statements, financial allocations, institutional capacity and also community demand for ICT are all essential to ensure that use of ICTs are effectively integrated in the education system. Any effort that does not focus on all these aspects in an integrated manner often was found to not yield requisite results.

ICT initiatives as a Platform for Innovation in Education

Through the survey it has also emerged that on many occasions the use of ICTs in the developing country context, is seen as a means to overcome some of the chronic system problems in the education system- like poorly trained teachers, high dropouts because of lack of motivation, and problems of pedagogy. In initiatives that are thought to be 'successful' use of ICT becomes, perhaps even unintentionally, an opportunity for pedagogical reform, new teaching learning practices, greater motivation for teachers and students and creating an egalitarian society. All of the above positive results can occur irrespective of ICT tools, but in the most successful initiatives using ICTs this is often seen to be the case. Education systems in the South Asian countries are typically slow to change and innovate and use of ICTs provide a useful platform for kick starting this innovation, if designed properly. The crux therefore is to design suitable initiatives that go far beyond setting up ICT labs where students learn Paint, Word etc and to integrate ICTs in the teaching learning practices. That is not to make the case that ICTs actually solve all these structural problems, but like e- governance initiatives in the region, they afford an opportunity for what is called 'process re-engineering' of outdated and outmoded practices. This aspect could be one of the strong motivations for introducing ICTs in the education space.

Aspiration for Information and Communication Technologies

Another significant understanding through this study has been that in the developing country context, demand for ICTs is an aspiration and governments in developing countries will have to answer this aspiration. In most interactions with stakeholders during the course of this study, as also in the schools that were visited amongst the students (and often the teachers as well) there was an enthusiasm to learn 'computers'. While this may not be representative of all learning spaces, but by and large there is a positive perception of 'Computers' being necessary to getting good jobs and succeeding in the current economic environment. The growth of IT as an industry in the region, led by the Indian experience has provided an avenue for boosting economic performance and providing employment to the youth. It is for this reason that almost all the countries in the region have put in place detailed IT policies, and established IT Ministries and Departments to provide impetus for the development of the information technology industry. Consequently in most countries introduction of ICTs in education began with the imperative of having a qualified pool of human resources in information technology. There is a greater focus on the incorporation of ICT as

a subject in the curriculum than on using ICT as an instructional aid to improve overall education quality. This has meant that the focus of ICT at the school level has quite often been IT Education based on a defined curriculum at the secondary and senior secondary level. However, to truly realize the benefits of ICTs in the education space governments and educational institutions will have to look beyond this approach to leverage ICTs for improving the over all teaching learning environment and practices.

Open and Distance Learning Systems

Open and Distance learning systems are well established in almost all the South Asian countries especially at the higher education level. Open Universities, schools and distance education programs like the Indira Gandhi National Open University and the National Institute of Open Schooling in India, Allama Iqbal Open University, in Pakistan, Bangladesh Open University, Sri Lanka Open University, were all historically set up in the newly independent nations of South Asia to promote mass education using traditional print, as well as video and radio based teaching learning materials. With the availability of new and emerging technologies these systems have begun to utilize the internet, CD Roms, video conferencing and other multimedia tools to provide more effective learning. While some newly established open learning institutions like the Virtual University in Pakistan rely almost entirely on technology to deliver quality education, some traditional distance education institutions have been unable to adequately leverage the opportunities made available through technology. Open and Distance Learning institutions enroll at present a vast number of students, (National Institute of Open Schooling India enrolls over 1.5 million students at the secondary and higher secondary level, Allama Iqbal Open University has over 1 million students) and a focus on improving the quality of teaching learning through adequately leveraging ICTs, would have a tremendous impact.

Further, given the evolution of teaching learning requirements in the 21st century, open learning systems have an opportunity to provide the answer to some of the most critical problems of our existing education model and must be adequately supported to focus on providing high quality education. The issue of perception is a significant concern in this regard, as open systems are often perceived to be of poorer quality than formal schools and universities. Governments and educational institutes need to undertake extensive re-branding efforts through ensuring high standard of quality, faculty, recognition of degrees from open systems domestically and internationally, partnerships with industry for placement of students, and other efforts to promote open learning systems as quality institutions.

Computer Laboratories and PC based education initiatives

Perhaps the most visible efforts to introduce ICTs in education across the countries in South Asia are focused on creating computer laboratories in schools especially at the secondary and higher secondary level. In almost all the IT policies and often in the Education policies of the focus

countries, introduction of IT as a subject in the curriculum and the corresponding establishment of computer laboratories is a key focus.

However Computer laboratories in government schools suffer from the following critical problems:

- Typically access for students is limited to one period of 45 minutes per week which is extremely inadequate
- Hardware and software maintenance is an area of enormous concern. Once the computer has a malfunction it takes weeks/months to repair the machine. (In the Schools that were visited for the Study even in urban and peri urban areas several computers were not functioning because of either hardware problems or because of virus attacks)
- Internet access for schools is limited, available internet speeds are very slow even in Kendriya and Navodaya Vidyalaya category of schools in India.
- Computers in the labs are being used only to learn basic IT literacy such as use of Word, Paint, creating documents etc
- Shortage of ICT trained teachers in other disciplines, computer illiteracy and indifference amongst subject teachers

At their worst these kinds of computer laboratories lie in disuse, with problems of maintenance and low interest or capacity amongst students and teachers to use them effectively. This is the case with many schemes for IT enablement in government schools in India and other South Asian countries. However at their best in select private schools (Beaconhouse Schools in Pakistan) these laboratories serve as resource centres providing an opportunity for students to use them effectively for enhancing their understanding of concepts and having access to an array of learning materials.

Therefore, laboratories per se might succeed or fail- the distinguishing factor is not the physical space of the laboratory but what is taught in these labs and how it is being taught. If the laboratory is used once a week by students for a 45 minute period where under the supervision of an 'IT Teacher' they learn about MS Word and Paint, the impact on learning will be negligible. Instead, if the computer lab becomes a resource centre where computers are used to teach concepts in other subjects as well, provide access to new learning material and allow students to collaborate on learning and sharing, the integration of ICTs is much more effective. Therefore, while creating computer laboratories may be a viable solution in South Asia because of limited resources for providing '1 to 1 Computing' and 'ubiquitous learning' spaces, it is at the level of the curriculum, content /capacity building and support services that governments and institutions need to focus, to ensure that the lab translates into a space for learning across the curriculum. An interesting example in this case is the Beaconhouse School System in Pakistan, where instead of having a specific IT curriculum the IT program is called 'Emerging Technologies Across Curricula'.

Therefore the debate about whether it should be lab based approach or a 1 to 1 computing approach, (that is perhaps going to be determined by innovation in technology, cost of devices etc) is less significant than the debate on how ICTs are being used and to teach what. In the lab model-availability of relevant content and capacity building of teachers to integrate technology in their teaching learning are two critical aspects. Care also needs to be taken that in such initiatives technical support for maintaining hardware and software is available especially in rural areas where often, once the computers break down it typically takes months for them to be restored. A call centre approach may be explored with defined SLAs for the maintenance and upkeep of the hardware and software.

In the large public school systems in South Asian countries, several models of operationalizing these laboratories have been used from laboratories where hardware and software is procured and installed by the government and the institution entirely, to initiatives in which the government outsources the setting up and running of these laboratories to private players. While large scale BOOT models for ICT enablement of schools often suffer because of lack of sustainability once the third party has finished its contractual obligations and installed hardware and content developed by it, initiatives where in-house expertise is sought to be developed (using Open Source or proprietary software) often lead to wastage of resources and the results are not commensurate with the effort being put in. A more detailed study of different models of IT enablement and their relative success in different environments needs to be undertaken and based on the context, different models need to be adopted.

Use of traditional media like Radios and TV

Use of traditional media like television and radio is concurrent with though more widespread than use of newer technologies like the internet and computers. Given that the reach of radio and television in all the focus countries is greater than most other technology options, radio and TV still present a viable option for delivery of educational content. At present most governments in South Asian countries provide dedicated educational channels on TV (Gyan Darshan I & II in India, Nenasana in Sri Lanka,), or educational programming on existing TV channels. Likewise the use of radio for delivering education content is widespread, and in some countries like Nepal (Radio Sagarmatha), Sri Lanka (Radio Kothmale) community radio has had some success in creating innovative models for providing educational messages and creating community awareness. In some countries private educational TV channels too have proliferated in the education space such as Toppers, Tata Sky Fun Learning etc in India. However there is no systematic study done on the impact of these programmes on student learning or the success of these educational channels.

The traditional TV and radio programmes have been a useful supplement to distance education programmes and self learning across the South Asian countries, however there are several disadvantages of these broadcasts in terms of lack of flexibility and limited interactivity. With the

new generation of technological innovations, on demand options and interactive features have been incorporated in some TV programmes and to a lesser extent in radio programs. Given the reach of TVs, and radios the relative low cost of hardware and installation, TV and radio will continue to play a role in technology enabled learning space in South Asian countries

Mobile Technology for Education

In most South Asian countries there is relatively high penetration of mobile phones and widespread network availability. While some pilot initiatives are underway to explore how effectively mobile technology can be used in the education space, in the existing scenario it was seen that use of mobile phones is predominant in informal education programmes such as for promoting adult literacy, disseminating information for farmers and fishermen, support services in education programs, and distance learning programmes. The typical uses of mobile phones include generating reminders, creating alerts, scheduling appointments, administrative support tasks such as retrieving MIS reports and other eGovernance initiatives etc. Given the limitation of the screen size and amount of data being exchanged; in their current commonly available models, mobile phones are not being utilized extensively in actual educational content delivery in formal education.

As this is a rapidly evolving scenario in terms of innovations in devices and options for connectivity and data exchange, some of these constraints might be overcome in the foreseeable future and therefore mobile technology remains a possible option to be leveraged in the education space.

ICTs in Non formal Education

Attempts to encourage full and effective participation in non-formal education now forms a central part of current educational and economic policymaking even in most developed countries – under the various banners of creating ‘learning ages’, ‘smart countries’ or ‘knowledge-based societies’. ICT has been viewed by many Governments as having profound and far-reaching implications for the ways in which to achieve these aims. Over the past thirty years, Non-Formal Education (NFE) initiatives in developing countries have effectively used Information and Communication Technologies (ICTs) for mass literacy campaigns, training of health workers, and capacity building under the rural community development projects. NFE has a critical role to play in reaching marginalized groups, and ICTs are a tool in the effective performance of this role. All the South Asian countries afford interesting examples of ways in which ICTs have been used for non formal education be it for adult literacy, for creating community awareness or for community empowerment and development. Community Multimedia Centres, Learning Centres and Telecentres are public spaces where community members can access information through computers, internet, radio or the telephone. Depending on the availability of relevant applications and useful knowledge for local communities, these initiatives have succeeded or failed in different environments. While in Nepal it is acknowledged that telecentres were not successful because of lack of relevant applications and content that was useful for the local communities, in India the

experience of Village Knowledge Centres created by a community organization like MS Swaminathan Research Foundation have been immensely successful.



NIIT, Hole-in-the-Wall Learning Stations

Content Development and Sharing of Content

In the context of all of the above insights it emerges through our study that perhaps the most significant attribute determining the success or failure of ICT initiatives in the education space is often contingent on the kind of content and the ability of the teachers and students to integrate technology in their teaching learning practices. Creating and having access to quality and relevant Open Educational Resources and using them judiciously is the single most important determinant of the impact technology will have on the learning achievements of students.

Content creation has to be democratized and made more responsive to the local context. While content creation by the teachers and students themselves is a positive trend enabling ownership; one needs to weigh the pros and cons of not having a professional content development team who can involve teachers and faculty in the process. Further a much larger range of content has to be available, and several models to facilitate this content generation need to be explored. There are no clear guidelines and/or standards for content development. There needs to be a balance between relative flexibility of the final users to decide on suitable content, and certain broad guidelines to assist them in judging the best possible solution while ensuring that certain minimum standards are maintained.

Another important aspect in content development is that creating high quality digital resources does not imply simply digitizing traditional print based content and using multimedia tools. Content of this nature has limited impact and often leads to wastage of limited resources. High quality instructional material should be created applying principles of learner centric approach, interactive, participatory and collaborative learning models. This requires technological, subject matter as well as pedagogical expertise.

Systematic Capacity Building

Capacity building of teachers and administrators is therefore increasingly being recognized in all the countries as critical to the success or failure of an initiative. Some of the most successful ICT for Education initiatives are targeted towards teacher education and training, Intel's Teach programme and Microsoft's Shiksha are noteworthy examples in this regard. If ICTs are to be integrated organically in the teaching learning process then teachers and supervisors at the school level, as well as administrators in government departments will have to be brought on board. The role of teachers as mentors and facilitators will be emphasized and teacher attitudes and apprehensions will also need to be taken into consideration.

2.3 Common Constraints

Most of the countries in the region face similar constraints: limited resources, poor infrastructure, weak implementation capacity of the government, lack of relevant and high quality content in local languages, poorly trained teachers, inadequate monitoring and evaluation strategies are some of the main constraints.

- Infrastructure remains a critical bottleneck in almost all the focus countries as of now. This includes both IT and non IT infrastructure. Low levels of electrification and frequent power outages are cited as by far the most significant problem for effective use of ICTs in education in non urban areas in all the focus countries. While internet connectivity is low at present across the South Asian countries, efforts are underway to improve the same. In urban areas private Internet Service Providers are competing for the market, for Educational institutions connectivity is either being offered at a subsidized rate or free of cost to government schools wherever possible. Funds from the Universal Service Obligation Funds are also being committed to providing true broadband right to the village level. Key constraints in developing adequate ICT infrastructure are:
 - Significant difference in access to connectivity & electricity between rural & urban areas
 - Lack of resources for maintenance and upkeep in rural areas
 - High cost of connectivity
 - Lack of institutional frameworks and robust implementation capacity
- However, adequate infrastructure is a necessary but not sufficient condition for effective use of ICTs for education and to that end the need to develop quality instructional materials and applications and to train teachers and students to effectively integrate ICTs in their teaching learning practices remains the most important aspect.

- There is a need to ensure integration between stated policy objectives in the ICT and Education policies and initiatives, and administrative capacity of Education departments on the ground.
- Monitoring and evaluation strategies are typically weakly articulated and implemented in most of the focus countries. Further existing monitoring and evaluation strategies in Education initiatives are mostly focused on program evaluation and EMIS type tools, instead of being based on evaluation of learning levels of students.

Inadequate emphasis on capacity building, sharp differences in access to education and gender inequity in use of ICTs are some of the other common constraints for all the countries in the region.

These are problems that we have found to be common across the South Asian countries with differences in degree. However each country in keeping with its geography, economy and history has different opportunities for overcoming these constraints.

Information and Communication Technology for Education in India and South Asia



Volume II Country Studies

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PRICEWATERHOUSECOOPERS 

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AACA	Afghan Aid Coordination Authority
ADB	Asian Development Bank
AIOU	Allama Iqbal Open University
BANBEIS	Bureau of Educational Information and Statistics, Bangladesh
BIPS	Bhutan Information and Communication Technologies Policy and Strategy
CAPSD	Curriculum and Professional Support Services Division, Bhutan
CIET	Central Institute of Education Technology, India
COL	Commonwealth of Learning
CSDMS	Centre for Science, Development and Media Studies, India
DANIDA	Danish International Development Agency
DFID	Department for International Development, UK
EDC	Education Development Centre
EDUSAT	Education Satellite, India
EMIS	Educational Management Information System
EPGI	Education Policy Guidelines & Instructions
ERNET	Education & Research Network
ERTV	Educational Radio and TV
HDI	Human Development Index
HLCIT	High Level Commission for Information Technology, Nepal
GER	Gross Enrolment Ratio
GESCI	Global e Schools Initiative
GIS	Geographical Information System
GOI	Government of India
ICT	Information and Communication Technology
ICTA	Communications Technology Agency
IGNOU	Indira Gandhi National Open University
ISTE	International Society for Technology in Education
LAN	Local Area Network
MERLOT	Multimedia Educational Resource for Learning & Online Teaching
MoE	Ministry of Education
MHRD	Ministry of Human Resource Development
NACTR	National Academy for Computer Training and Research
NAPITSE	National Policy for ICT in Education, Sri Lanka
NCERT	National Council of Educational Research & Training
NDLB	National Digital Library of Bhutan
NESP	National Education Strategic Plan
NICTA	National ICT Council of Afghanistan

NICTE	National ICT Strategy for Education, Pakistan
NIOS	National Institute of Open Schooling
NKN	National Knowledge Network
NPTEL	National Programme on Technology Enhanced Learning, India
OLE	Open Learning Exchange
PERN	Pakistan Education Research Network
PPP	Public Private Partnerships
PRSP	Poverty Reduction Strategy Paper
REACH	Radio Education for Afghan Children
RINSACA	Regional Informatics for South & Central Asia
ROT	Receive Only Terminals
SEMIS	School Education Management Information System
SIET	State Institutes of Educational Technology
SLETP	Sri Lanka Environmental Television Project
TIU	Technical Implementation Unit, Pakistan
UNDP	United nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VSAT	Very Small Aperture Terminal

About the Report

The Survey on ICTs for Education in India and South Asia was commissioned by *infoDev* to be undertaken by PricewaterhouseCoopers, India. The Survey is a third in the series after similar surveys for the African and Caribbean regions completed in 2008 and 2009. The main objective of the Survey is to create a consolidated source of information on the experiences of using ICTs for education in the South Asian region and to provide a framework of reference for policy-makers.

The survey report is in five volumes, the first Volume is an extended summary which captures the main findings of the survey. Volume II is a series of Country Studies profiling the policy environment and major initiatives using ICTs for education for each of the eight South Asian countries – India, Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka, with a more detailed focus on India. Volume III is a set of Case Studies for India and Pakistan. For India the case studies include detailed studies of ICT initiatives in the education space in five states. For Pakistan the role of ICTs in Open and Distance Education and Teacher Education has been profiled as two case studies. Volume IV is a series of thematic papers that address key issues across the focus countries in an attempt to provide a horizontal, comparative view of the subject in the eight focus countries, with an emphasis on India. The fifth volume captures the details of the survey process including the research methodology, list of interviewees, details of meetings held etc.

Structure of the Country Studies

This volume, Volume II of the Survey of ICTs for Education in India and South Asia, is a series of country studies on each of the eight countries in the South Asian region. Each country study begins with a broad background of the country, the education system, and the ICT scenario; it is then followed by a section on the policy framework and delivery mechanisms governing the use of ICTs in the education space. Following this section major education initiatives using ICTs in each country have been profiled. The initiatives profiled focus more on the use of ICTs at the primary and secondary levels of education and only briefly touch upon the significant interventions using technology at the tertiary level. The last two sections of each country study have a discussion on the major constraints in integrating ICTs in education and the key insights from each country study. The country studies begin with India and then proceed alphabetically.

Report Limitations

However, there are several limitations of a project of this nature covering a wide geographical span and directed at a fast changing scenario:

- The Survey has primarily been based on secondary research and face to face or telephonic interviews and workshops with relevant stakeholders. It is thus not an exercise in primary data collection.
- While effort has been made to ensure that data collected covers all major initiatives, given the vastness of the geography and the dynamic nature of the use of ICTs, the initiatives outlined will be more illustrative than exhaustive.

- Effort has been made to present the most relevant and updated information; however, because the field is rapidly evolving, the data represented here is “current” at the time of the study, that is, June 2009 to June 2010.
- The Survey has focused more on primary and secondary education but has covered significant initiatives in tertiary education, vocational, non-formal and mass education, and distance education where these are significant for the region or the country.
- The purpose of the survey is to create a repository documenting innovative initiatives using ICT in education; in addition, the survey will provide a basis for designing strategies for effective integration of ICT in education, based on trends and experiences documented.

1. India

India is the seventh largest and second most populous country in the world. It is bordered by Pakistan, the People's Republic of China, Nepal, Bhutan, Bangladesh, and Myanmar.



Figure 1: Map of India

Source: www.wikipedia.org; www.cia.gov

The Indian economy has been growing at a steady high pace for the past decade, with growth being supported by market reform, robust capital markets, and sustained flow of FDI. Structurally 54% of GDP is contributed by the Services sector, industry and agriculture contribute 29% and 17%, respectively. However, more than 60% of the population is dependent on agriculture and 25% of the people still live below the poverty line. Administratively India is divided into 28 States and 7 Union Territories, with more than 618 districts and is a functioning parliamentary democracy.

Some of the key demographic and economic indicators are given as follows:

Table 1: Key Demographics and Economic Indicators - India

Parameter	Value	Year
Population	1,169,016,000	2007
Gross domestic growth (million US \$)	1,141,346	2007
GDP per capita (US \$)	976.3	2007
Human development index ranking	134/182	2009
Population below poverty line	25%	2007

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

1.1. Background

The education system in India is administered by the Ministry of Human Resource Development at the center and the different Departments of Education at the state level. Education is a concurrent subject, which implies that Indian states and the federal government both have jurisdiction over the sector; although the Government of India provides the overall policy framework, financial support and guidelines to ensure a national standard of education, implementation is primarily done at the state level.

The government of India has been making significant progress in achieving the goals of universalization of elementary education. Since 2001, the government's flagship education scheme Sarva Shiksha Abhiyan (SSA), which was implemented in partnership with the state governments, has been successful in significantly increasing enrollments and reducing the gender gap in primary education. With the relative success of SSA, the government has now taken up universalization of secondary education in a mission mode through the implementation of the Rashtriya Madhyamik Shiksha Abhiyan. The passage of the "Right to Education" bill is another significant milestone in the task of ensuring equal access to quality basic education for all. The bill was passed by the parliament in August 2009, making education a fundamental right for every child in the country.

The reform agenda in education was given further impetus with the setting up of the National Knowledge Commission (NKC) in 2005, with the mandate of providing a blue print for reform of the educational sector in the context of the emerging knowledge society. The NKC recommendations outline a roadmap for strengthening the education system from school education to general higher and professional education, as well as skill development in India, with a focus on how to leverage available technologies to improve access and quality of education.

Some of the key education indicators for the Country are given as follows:

Table 2: Education Indicators - India

Education parameter		Value	Year
Adult literacy rate	Male	70.2	2000-2007
	Female	48.3	2000-2007
Youth literacy rate	Male	87	2000-2007
	Female	77	2000-2007
Gross enrollment ratio (%): Primary education	Male	114	2000-2007
	Female	109	2000-2007
Gross enrollment ratio (%): Secondary education	Male	59	2000-2007
	Female	49	2000-2007
Expenditure on education (% of GDP)		3.2	2003-2006

Source: www.unicef.org; www.cia.gov

The IT and telecom sector in India have made significant progress. India has more or less maintained its position in the ICT development index, ranking 118th in 2007 (International Telecommunication Union –Measuring the Information Society, 2009). It still has very limited bandwidth per Internet user and low home computer and Internet penetration rates. It is

surprising to see such a low Internet penetration rate particularly since the price basket for Internet services is low when compared with other countries in the region. This suggests that price of ICT services is not the main barrier to higher ICT levels; it is more likely due to limited ICT infrastructure or limited access to it.

Some of the key ICT indicators for the Country are given as follows:

Table 3: ICT Indicators - India

ICT parameters	Value	Year
Internet users (per 100)	6.9	2008
Internet subscribers (per 100)	1.09	2008
Broadband subscribers (per 100)	0.45	2008
Mobile coverage (%)	61	2007
Mobile subscribers (per 100)	20.8	2007
Personal computers (per 100)	3.17	2006–2007
Internet affordability (US \$/month)	6.6	2007
Mobile affordability (US\$/month)	2.5	2007
Radio subscribers (per 1000)	107.3	
Households with TV (%)	32	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

1.2. Policy Framework and Delivery Mechanism

The importance of using ICT for improving education has been emphasized for over a decade in India, right from 1992 the National Policy on Education emphasized using educational technology to improve the quality of education. ICT has also figured comprehensively in the norms for schooling recommended by the Central Advisory Board of Education, in its report on Universal Secondary Education, in 2005.

Consequently major government schemes have a component of funding allocated for using ICTs and focused initiatives such as the ICT @ Schools scheme are geared toward making opportunities available to students for developing their ICT skills at the school level. A glance at the Eleventh Five-Year Plan also reflects the importance of ICT in the education scenario of India. To harness the capacity of ICT in delivering educational services, a national ICT initiative, the National Knowledge Network has been launched based on the recommendation of the NKC, with the collaborative effort of the Ministry of Human Resource Development (MHRD), Department of IT and Department of Telecom, that will make its presence felt in 378 Universities and 18,064 colleges. The network will focus on digitization and networking of the educational institutions, making available bandwidth to facilitate collaborative research and knowledge sharing. Further, the National Mission on Education through ICTs launched by the MHRD aims to leverage ICTs to provide high-quality, personalized, and interactive knowledge modules over the Internet/intranet to all learners in higher education institutions, any time anywhere.

A coherent policy level framework for the use of ICTs in school education in India was recently initiated through a stakeholder dialogue on formulating a draft national policy for ICT in education,

led by the Ministry of Human Resource Development, Global e-Schools Initiative (GeSCI), and Centre for Science, Development and Media Studies (CSDMS). Based on feedback received a draft “National Policy on ICT in School Education” has now been published for comments and revision. In terms of ICT literacy for students, this draft policy document proposes implementing a programme for ICT literacy for all secondary schools, suggesting that all states develop an ICT literacy curriculum to instill basic as well as advanced ICT skills among secondary school students. At the higher secondary stage, the draft policy states that ICT-related elective courses will be offered in schools which will be taught by a postgraduate teacher with appropriate qualifications. To foster an environment of ICT-enabled teaching-learning, the draft policy states that competent teachers will be encouraged and given the resources to adopt ICT-enabled practices in teaching-learning. For this purpose, the transformation of classrooms into SMART classrooms (classrooms equipped with a wide range of ICT facilities including computers, projectors et cetera, used to teach the curriculum) will be catalyzed. As for ICT infrastructure, the draft policy states that each school will be equipped with at least one computer lab and a minimum of a 10:1 student computer ratio will be maintained. Policies regarding other ICT facilities and enabling infrastructure and their delivery mechanism have also been articulated in the draft policy document. There is also a focus on capacity building of teachers as well as state/district education department personnel and on using ICT for open and distance learning (ODL).

1.3. Initiatives

A large number of Initiatives using ICT at all levels of education are ongoing in India, some at a pilot stage while others are operating full scale in a large geography. While individual states in India have significant ICT-related interventions in their education systems, major initiatives operating at a national level in educational institutions are profiled here. Some of the major initiatives taken by the government are:

ICT @ Schools Scheme

The ICT @ Schools scheme was launched in 2004 with a view to provide opportunities to students to develop their ICT skills as well as use ICTs to aid the teaching learning process. Under this scheme, support is provided for procurement of computers, peripherals, software, connectivity, and so on. The scheme is currently being implemented in all states and union territories of India in government and government-aided secondary and higher secondary schools. The scheme also aims to set up SMART schools in Kendriya Vidyalayas and Navodaya Vidyalayas, both central government school systems, to act as “Technology Demonstrators” and to lead in diffusing ICT skills among students of neighboring schools. The scale of the project is demonstrated in the funds released by the government of India to the states from 2005 to 2008, which amounted to about INR 3.2 Billion (approximately USD 68 Million).

Sarva Shiksha Abhiyan

SSA is a flagship programme of the Government of India in partnership with the state governments to support the states in creating, developing, and strengthening the formal primary and upper

primary school systems. SSA is a time bound mission, with the objectives of ensuring Universalization of Education and bridging gender and social gaps by 2010. The SSA program is largely funded by the Government of India but is also supported by the World Bank, Department for International Development, and the European Community (EC) with the World Bank being the largest contributor.

The SSA encourages states to use ICT and the satellite EDUSAT (Education Satellite) to provide distance education within states to supplement school education. Distance education has been naturally chosen as a catalyst for expediting SSA. Further, the Management Information System tool under SSA is a significant part of the project as it facilitates monitoring of the physical and financial parameters of the scheme. The system has District Level, State Level, and Ministry Level modules. At each level, role-based access control is provided for different functions from entering relevant school level data to generating and reviewing consolidated school, district, and state level data. The basic MIS functionality has been supplemented in some states like Orissa and Uttar Pradesh by introducing features like GIS, Child Tracking, and so on. In 2007–08, the District Information System for Education was operational in all 624 districts in the country and collected information on 1.25 million institutions providing elementary education, with more than 5.61 million teachers.

Almost all the states in the country are implementing central schemes such as ICT @ Schools, SSA, Mission on Education through ICT and have significant number of students enrolled in open learning systems at the school and college levels. In addition to central schemes, states have their own major ICT-related initiatives in educational institutions.

Some examples of education initiatives using ICT in different states are:

“Chalta-Phirta Mobile Bus” is a bus fitted with a television screen and equipped with computers, multimedia facilities, a book library, blackboard and toys and is to go around the slum clusters of New Delhi where children do not have access to education. Each bus will have two teachers specially trained to educate children through books, computers, exhibits, films et cetera.

“Eklavya computer-aided self-learning” is an initiative in Chhatisgarh to provide fully animated multimedia software based on textbooks of classes 6 to 8, which has been loaded on touch screen computers and kept in the school corridors for easy access by children.

IL&FS Education and Technology Services Limited (IETS) is in the process of implementing IT solutions for SSA Bihar by setting up hardware, creating curriculum, introducing multimedia lessons, IT skills for teachers, and teacher training. IETS will also setup and maintain Computer Labs in 200 schools. Each lab will have computers, printers, UPS, generators, and computer teachers.

Universal Service Obligation Fund

Universal Service Obligation Fund (USOF) was established in India in 2002 under the Ministry of Communications and Information Technology, Department of Telecommunications. The fund is exclusively utilized for providing access to telegraph services, mobile services, and broadband connectivity to people in the remote and rural areas at affordable and reasonable prices. Funds are raised through a Universal Service Levy (USL), which is a percentage of the revenue earned by certain telecom service providers and through grants and loans provided by the central government. Since its inception USOF has initiated many projects to provide telecom infrastructure in rural areas; some of these projects are mentioned in the following:

Public Telecom and Information Services: USOF provides and maintains public access facilities such as Village Public Telephones (VPT) and Rural Community Phones (RCP) in village and rural areas. USOF has provided subsidy support toward providing/maintaining a VPT in every revenue village as per the Census 1991 and 2001. Subsidy support has also been provided for every village having a population of more than 2,000 and no existing PCO to install public telephones by way of RCPs. By 2008, USOF had facilitated 530,833 VPTs.

Individual Access: In terms of empowering individuals in rural areas, USOF has provided Rural Household Direct Exchange Lines (RDELs) to the rural population. It has also provided one time subsidy support to 9 million RDELs installed before April 2002 and 4.2 million installed after 2002.

Mobile Infrastructure: 7,871 mobile infrastructure sites spread across 500 districts and 28 states are being rolled out. This was by way of sharing subsidized passive infrastructure (tower, boundary wall et cetera) by three telecom service providers having their own subsidized active infrastructure. A second phase of this scheme is in the pipeline which aims at covering even more sparsely populated uncovered areas.

Broadband Connectivity: An agreement has been signed with BSNL where USOF will provide subsidy towards broadband connectivity from about 28,000 rural exchanges spread across the country.

USOF's commitment to extent the reach of telecommunication to rural areas in India can help the country overcome the prevalent digital divide and can enable stakeholders to deliver education to these underserved areas.

(http://164.100.9.221:8080/usof-cms/usof_roadmap.htm)

EDUSAT—Education Satellite

Indian Space Research Organization (ISRO) launched EDUSAT (Education Satellite), the first Indian satellite built exclusively for serving the educational sector. It was launched primarily to serve the need for an interactive satellite to enhance the distance education system in the country. Many projects have been initiated to impart education through the satellite.

The Virtual Classroom Technology on EDUSAT for Rural Schools (VICTERS) program is one such initiative. The program is an “IT @ School” project of the Kerala State Government envisioned to harness the EDUSAT satellite for training teachers, providing high-speed net connectivity to schools, and for implementing learning management solutions.

The Rajiv Gandhi Project for EDUSAT Supported Elementary Education (RGPEEE) is another initiative aimed at harnessing the benefits of EDUSAT; it is a collaborative project of Indira Gandhi National Open University (IGNOU), Ministry of Human Resource Development (MHRD), and ISRO. The project promotes the use of EDUSAT in enabling teachers to incorporate ICT in elementary education. It is operational in Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and Bihar.

Navodaya Vidyalaya Samiti

Navodaya Vidyalaya Samiti (NVS) is an autonomous organization under the Ministry of Human Resource Development, Department of Secondary & Higher Education Government of India. Its significance lies in providing quality education to the rural population who has been deprived of quality modern education typically available in urban areas. It is an attempt to realize the goal of setting up residential schools to bring out the best of rural talent envisaged in the National Policy on Education 1986. Each of these residential schools is known as Jawahar Navodaya Vidyalayas (JNV). NVS has integrated a number of ICT facilities in each of the 576 schools spread across the rural areas of the country.

Hardware and Connectivity

All schools are equipped with computer labs for students in class 6 and above. The computer-student ratio on an average is 1:12 across all schools. In addition to computer labs most schools have one “SMART” class, which is equipped with LCD televisions, projectors, Internet, and other multimedia facilities.

NVS envisions the need of 40 computers per school since the maximum number of students admitted per class is 40. This way every student gets to interact and use the computer on a one-on-one basis at least



Figure 2: Computer classroom of JNV

Source:PwC

once a day. However, due to financial constraints some schools have a fewer number of computers but a minimum of 20 computers is maintained.

Internet connectivity is supplied through VSAT (A Satellite Communication System) but is available for only 300 schools out of 576 schools. Since all JNV schools are located in rural areas, poor Internet connectivity is a major constraining factor for implementing ICT in schools. However, the schools that are located in the cities such as New Delhi do not face as many problems in terms of Internet connectivity.

“The procurement of hardware is relatively easy; the only constraint is the cost of maintenance. Even though all schools have an electrician for any minor repair, for all major ones the hardware companies are reluctant to travel to remote areas where JNV schools are typically located, on an average they take 6-8 days to visit the schools.”

M.S. Khanna, Joint Commissioner NVS

“Due to the geographic location of JNV schools another constraining factor is access to electricity. Some states like Bihar and Haryana have electricity for only 6-8 hours in a day, on some days Orissa doesn’t have access to electricity for 24 hours. Although some schools have a power back up, this is not a common feature in all schools due to financial constraints.”

M.S. Khanna, Joint Commissioner NVS

“JNV Mungeshpur has one computer lab with 40 computers, each class which contains 40 students have 2-3 periods (40 minutes each) per week to work in the computer labs. Children of younger ages (class 6 and 7) learn basic computer skills in these sessions, and as they progress to subsequent classes the sessions change from learning basic skills to using software to learn subjects such as Mathematics and English. Apart from the computer lab, the school also has one “Smart Class” containing an LCD Television, a computer, a projector and printers.”

Prit Singh, Principal JNV Mungeshpur

“Internet speed is very good, the only challenge we face is in terms of maintenance of the machines. It becomes difficult to get engineers to come and fix just one computer.”

D.K. Mehta, Physics teacher, JNV Mungeshpur

Software and Content

Since NVS has tie ups with various content development agencies, the cost of procurement of software is minimal. For example, Microsoft offers a 96% discount on its software. Other content development agencies collaborating with NVS include Oracle, Intel, and EduComp. Software is used

predominantly for teacher training and curriculum development (Intel publishes and develops content). Apart from collaborating with software companies some of the content used in the schools are also developed by the teachers. Therefore, there is no uniform software used in the schools.

“There is no standardization for educational software. Teachers decide what software they should use therefore it varies from school to school. Teachers are also given the freedom to develop and teach their own software since they have the best knowledge of the curriculum which needs to be taught. There is also no system of evaluating the software and its efficiency; however teachers are encouraged to provide feedback on the software and interact with each other to suggest the most relevant software.”

M.S. Khanna, Joint Commissioner NVS

“We are absolutely free to develop our own study plans by using programs such as Microsoft Power Point however a major constraint is the low quality of anti-virus installed in school computers, I spent weeks developing a study plan only to find that a virus had wiped out all data stored in the computer”

Sarita Govil, English teacher at JNV, Mungeshpur

“We use the internet for our class work but internet buffering is extremely slow, since each period is only for 40 minutes it is very difficult to complete any class work. The school should also teach more advanced programs for example the C++ software in the school computers is outdated, when I participated in a computer science exhibition I had to use a more updated version of the software which students from other schools were very familiar with.”

Science Student, JNV Mungeshpur

Teacher Training

NVS collaborates with a number of private companies to provide teacher training. Intel has been partnering with NVS for the last 10 years and has not only trained the teachers but principals of JNV schools as well. Oracle has trained teachers through distance/Web-based training. Microsoft has provided training for its own software.

“Cost of teacher training is high, even though Microsoft and Intel provide free of cost training it is costly and cumbersome to get all the teachers together. Since each and every teacher needs to be trained they rely on the Web to train teachers this leads to a lack of interaction between the teachers. There is also a lack of trained teachers for NVS schools as teacher salaries can not

compare to the competitive salaries received in the IT sector. Most qualified people would prefer to work for private companies as opposed to schools particularly schools in the rural areas which is where NVS schools are located.”

M.S. Khanna, Joint Commissioner NVS

“Even though the teacher training programs conducted by Intel and Microsoft have been extremely helpful, due to lack of resources teachers lose touch with the computer language. Most teachers do not have computers at home; even at school we have access to only a few computers.”

T.P. Singh, Geography teacher, JNV Mungeshpur

Financing

NVS is completely financed by the government. The main costs include teacher training and hardware procurement and maintenance; software is cheaper particularly due to the discounts offered by most companies. For the maintenance of hardware/software each school receives INR 1,00,000 (approximately USD 2,147) by NVS. As for the maintenance and installation of VSAT, which is provided through the Education and Research Network (ERNET), the government spends approximately INR 62 million (approximately USD 1.3 million) on all schools.

“The total cost on ICT last year was relatively lower than previous years where it has on an average been INR 750 million per year (approximately USD 16 million). The dip in total expenditure is probably owing to the fact that hardware has already been installed in most schools and this expenditure is not reoccurring.”

M.S. Khanna, Joint Commissioner NVS

JNV schools have also received many prestigious awards; a total of 13 schools received the Computer Literacy Excellence Award (CLEA) for 2005. The award which is sponsored by the Ministry of Communication and Information Technology is a INR 0.15 million (approximately USD 3,200) cash prize.

Kendriya Vidyalaya Sangathan

Like NVS, Kendriya Vidyalaya Sangathan (KVS) is also an autonomous organization of the Ministry of Human Resource Development; however, its aim is to cater to the educational needs of the children of transferable Central Government Employees including Defense Personnel and Para-Military forces by providing common programme of education. KVS is tasked with the responsibility of establishing and maintaining Kendriya Vidyalayas (Central Schools). At present, there are 978 KVs in India with one school each in Kathmandu, Moscow, and Tehran. Over the last 4 years KVS has made extensive efforts to promote ICTs in its schools.

Hardware and Connectivity

With the number of computers installed in KVs increasing by more than 27,000 in the last 4 years, each KVS is now able to maintain a Pupil:PC ratio of 25:1. Almost 97% of all KVs have a computer lab along with at least one ICT teacher. All computer labs have Internet access either via broadband or VSAT.

“Apart from computer integration almost all [KVS] schools have broadband connectivity. Each school has also created their own Web sites based on the guidelines provided by KVS.”

Somit Shrivastav, Education Officer—ICT Roadmap and Infrastructure, Kendriya Vidyalaya Sangathan

Content

As an autonomous body each Kendriya Vidyalaya is free to decide on the content to be used in the classrooms. Teachers are given the freedom to use content they deem suitable, with collaboration and training from software companies such as Oracle and Microsoft.

Teacher Training

Over the years KVS has been able to make effective use of ICT infrastructure installed in schools by empowering its teachers and developing their skills to help them use ICT in the teaching learning process. This has been made possible by interventions from Corporate Social Responsibility divisions of IT companies such as Microsoft Corporation, Intel Corporation, and Oracle. Besides training teachers, the companies have also created learning structures in the schools. A brief description of the interventions is mentioned in the following:

Project “Shiksha,” Microsoft

KVS has collaborated with Microsoft to implement Project “Shiksha” (literally meaning knowledge), which focuses on teacher training programs as well as monitoring the effectiveness of the training programs in the schools.

Teacher training under Project Shiksha aims at enabling teachers to use technology in the classroom; they are trained on using visual presentation of theories and concepts in the curriculum. The teachers are trained after school hours to ensure that the project does not interfere with the daily school routine. The training lasts for a period of 10 days by working 3–4 hours per day.

Microsoft has also supported KVS in introducing a subject in respect of information technology for all students from the 6th to the 10th standard. For evaluating the success of Project Shiksha, Microsoft intends to set up a quality review program. For this purpose, Microsoft along with a representative from KVS will make quarterly visits to schools participating in the teacher training program. The findings from this visit will be circulated to KVS headquarters and the concerned

Microsoft representatives.

Intel Education Initiatives

KVS has also signed an MoU with Intel in order to facilitate the integration of ICT in KVs. Intel's initiatives are aimed at using "ICT as part of the curriculum." As a first step, Intel organized Principal Leadership Forums for 750 KV Principals. Through these forums Intel gave them an insight into understanding how technology integration in the classroom can positively impact student learning. For the KVs that have been classified as "SMART" schools by the MHRD, Intel provided guidance to the principals and teachers on how to use the ICT facilities for various institutional processes (both school systems and the teaching/learning process).

Professional Development Programs were also conducted by Intel through the Intel Teach Program. The aim of the program was to enable in-service teachers to effectively integrate technology to enhance student learning, use technology to support Project-Based Learning, and to encourage active inquiry and Higher Order Thinking skills among the students. Intel also provided online resources from where lesson plans can be freely downloaded. In terms of curriculum, Intel has supported KVS in introducing a new ICT subject in the curriculum for students and teachers of grades 6 and 7.

"Under the program 506 'Master Teachers' or 'Resource Persons' have undergone the 50 hour training program. These resource persons have in turn trained other teachers of the school or neighboring KV's" (Somit Shrivastav, Education Officer—ICT Roadmap and Infrastructure).

Think.com, Oracle

KVS collaborated with Oracle to introduce think.com in its schools. At Think.com, students can create their own Web pages, work on projects, and interact with children in other parts of the world. Oracle also provides a series of refresher and training courses available through face-to-face as well as online programmes.

Following a successful Think.com pilot project in 25 KVs in October 2004, KVS decided to rollout Oracle's Think.com initiative to more than 900 of its schools. Oracle initially trained master trainers selected by KVS who then trained schools administrators and other teachers and students in the schools.

Financing

According to Somit Shrivastav (Education Officer—ICT Roadmap and Infrastructure), all KVs are financed by the government through KVS; however, in terms of ICT, the KVs are self-financed, that

is, they use the funds obtained through admission fees. In case if these funds fall short KVS provides additional funds for that quarter.

National Institute of Open Schooling

The National Institute of Open Schooling (NIOS), formerly known as the National Open School, was set up in 1989 in pursuance of the policy focus in the National Education Policy 1986 on open learning. The NIOS is partly funded by the government and is responsible for providing education to all those who are not able to attend the formal school system. In addition to providing the regular range of school subjects, the NIOS also provides vocational and community-oriented courses. The NIOS has the authority to conduct and certify examinations for secondary levels, and its certification is recognized by all universities in India.

A total of 371,625 students out of which 30% were girls enrolled in all National Open Schools across the country in the academic year 2008–09. New Delhi has the highest enrollment rate contributing to 27% of the total rate. NIOS has made significant progress in universalizing education; almost 20% of the students at NIOS are schedule castes or scheduled tribes. ICT is being used as a major strategy toward “Reaching the Un-reached” and management of NIOS.

At the secondary and senior secondary level, NIOS provides a wide range of subjects and a flexible self-paced learning system. Learning strategies include learning through printed self-instructional material, audio listening and viewing video programmes, Personal Contact Programme (PCP), and Tutor Marked Assignments (TMA). Audio and video are significant components of the education dissemination system at NIOS as these programs complement and supplement the other channels of learning. NIOS has produced 242 video programmes and 260 audio programmes, which are made available to NIOS Study Centers all over the country. NIOS learners can take these programmes for rent from centers close to them. Some of the educational video programmes are telecast on the national Doordarshan channel while the audio programmes are broadcasted on the radio.

NIOS is planning to utilize EDUSAT for live interactive sessions in a phased manner. In the first phase, the NIOS studio will be connected to 11 regional centers, which would be expanded to 100 study centers in the second phase. This is an effort to facilitate direct face-to-face interaction between the learners and the teaching community.

In 2005, NIOS started an ICT-based On-Demand Examination (ODE) Testing Center at the secondary level at its headquarters in New Delhi. The ODE system aims at creating a system in which examinations are independent of timeframe and students can give examinations as per their wish and preparation. ODE testing centers are equipped with computers, which randomly generate questions out of an already developed question bank. With the success of ODE at the secondary level, NIOS started ODE at the senior secondary level as well in 2007. ODE is conducted every month four times a week and the results are declared in the following month on the NIOS Web site.

NIOS has also introduced an Online Admission facility through the NIOS On-Line (Ni-On) Project to facilitate the learners in registering themselves for the courses. It also has the facility of

computerized result declaration and a variety of online courses ranging from traditionally academic to vocational studies.

NIOS has collaborated with Cisco to offer Cisco Networking Academy Programs in 10 accredited vocational institutes. The program focuses on teaching students how to design, build, and maintain computer networks. Cisco will provide PC hardware and other IT essentials, Web-based course materials, 24-hour technical support, and nominate a representative to aid in the implementation of the program. NIOS plans to scale this program in 100 accredited vocational institutes.

Indira Gandhi National Open University

The IGNOU is a higher education institution; as an open education provider, it has been at the vanguard of developing and maintaining standards in open learning in India and is a significant milestone in any discussion on the use of technology for education. The University was established in 1985 by an Act of Parliament with the dual responsibilities of (i) enhancing access and equity to higher education through distance mode and (ii) promoting, coordinating, and determining standards in open learning and distance education systems. Since then, the IGNOU has undergone rapid expansion and emerged as an international institution in the field of ODL. The University offers various academic programs through an Open and Distant Learning mode. The Electronic Media Production Centre (EMPC) at IGNOU is responsible for production, dissemination, and transmission of educational software; it develops audio-video programs to supplement the courseware of IGNOU. EMPC coordinates the following:

- Gyan Darshan: A fully digital 24 hour exclusive Educational TV channel.
- Gyan Vani: Stations which relay programmes contributed by the government, NGOs, state open universities, governmental institutions et cetera.
- Teleconferencing: One-way video and two-way audio teleconferencing facility.
- Interactive Radio Counseling: A one-hour live phone-in counseling program offered on 188 All India Radio stations every Sunday.
- Education Research and Training (ERT): ERT unit of EMPC is engaged in developing academic programs, conducting research and training related to media and communication.

To discharge its second responsibility of coordinating and maintaining standards in ODL systems, IGNOU through the Distance Education Council (DEC) extends technical and financial support to Open and Distance Education Institutes (ODIs) for development of technological infrastructure, institutional reform, professional development and training, student support services, computerization, and networking for improvement of quality of education. The DEC also performs a regulatory function with respect to ensuring minimum standards in ODL systems throughout the country.

Gyan Darshan/Gyan Vani

An educational television channel DD-Gyan Darshan has been set up by the national telecaster Doordarshan and IGNOU with assistance from the Ministry of Education (MoE) and many educational software makers. It has four round-the-clock channels offering interesting and

informative programs for school-going children, college students, and youth seeking career opportunities.

Gyan Vani is an educational FM radio channel with day to day programs contributed by various Ministries, educational institutions, NGOs, and national level institutions such as IGNOU, NCERT, UGC, IITs, and open universities. Gyan Vani serves as a medium for niche listeners and for addressing local educational, developmental, and sociocultural requirements.

National Knowledge Network

The National Mission on Education through ICT, launched in 2009, aims to leverage ICTs for enhancing the teaching learning experience of learners. A high-speed digital broadband network, the National Knowledge Network, is envisaged for interconnecting the country's major research and educational institutions, colleges, and universities. A structured empowered committee will be in charge of coordinating the activities of creation and implementation of the content, application, and establishment of the network. The Mission has two major components: content generation and providing connectivity, including last mile connectivity for students and institutions. On the content generation front, a wiki style collaborative platform under the supervision of content advisory committees is envisaged. Renowned institutions and educators will be part of the content generation effort and different activities in respective areas of excellence may be coordinated by them. Existing resources like the National Program of Technology Enhanced Learning (NPTEL) and the Multimedia Educational Resource for Learning & Online Teaching (MERLOT) could contribute to this exercise. In the Eleventh Five-Year Plan, an amount of INR 46 billion (approximately USD 0.9 billion) has been assigned for the Mission with a budget provision of INR 5 billion (approximately USD 0.1 million) for the financial year 2008–09.

Sakshat Portal

The Sakshat Portal launched by the MHRD in 2006 is a single window portal for all education-related needs of students, teachers, and lifelong learners. It provides a range of services from informational services like details of scholarships, tests, educational resources, as well as interactive services like a discussion forum, one-on-one sessions with teachers, career counseling, and video conferencing facility. Content development for each subject was entrusted to a Content Advisory Committee (CAC) consisting of representatives from institutions like IGNOU, Delhi University, KVS, NVS, NIOS, and NCERT, as well as prominent academicians in the field.

Free and Open Source Software (FOSS) in Education

The Open Source community offers a database where educational institutions can tap the full potential of software available in the Open Source domain. This software which is available free of cost is developed, tested and upgraded by programmers and users on a regular basis. India annually hosts one of the largest Free and Open Source Software (FOSS) events in the world – FOSS.IN, an event that focuses on FOSS development and contribution. In April 2005, the Ministry of Communications and Information Technology, Government of India set up the National Resource Centre for Free and Open Source Software (NRCFOSS) in an effort to bridge the digital divide and strengthen the Indian software industry. NRCFOSS encompasses Research & Development, Human Resource Development, Networking & Entrepreneurship development and it serves as a reference point for all FOSS related activities in the country. (<http://nrcfoss.org.in/>)

In India the adoption of open source solutions is primarily under the state governments. The IT@School project was initiated by the Government of Kerala in 2000 to provide ICT enabled education in the state. Since its inception, the project has implemented ICT enabled education in over 8000 schools in the state, with a focus on capacity building of teachers and students. In 2004, a customized GNU/Linux version called IT@Schools GNU/Linux was developed by the Free Software Foundation of India (FSF) and Kerala State IT Mission (KSITM). The Society of Alternative Computing and Employment (SPACE) was tasked with its installation and distribution. Within 2 years most of the schools conducted practical examinations on FOSS platform and SPACE customized the software to enable teachers to collate marks and grades.

The backbone of the project is its strong network of 200 Master Trainers and 5,600 School IT Co-ordinators (SITCs) in the state. Some of the significant features of the project include:

- World's largest simultaneous deployment of FOSS (Free and Open Source Software) based ICT education
- Extensive 7 Continuous Capacity building programmes for Teachers and Students
- Infrastructure Up-gradation of schools under ICT scheme
- Broadband internet connectivity to all schools in the state, norms for usage by ensuring safe & secure browsing
- Hardware Clinics- first of its kind to repair damaged computers and to upgrade the hardware in schools
- Unique scheme for electrification of classrooms to fuel ICT enabled education.
- ICT based Content Development for teachers and students
- E-Governance Initiatives in General Education department
- School Wiki – to promote collaborative content development & local language computing (www.schoolwiki.in)
- EDUSAT initiatives in the state including ViCTERS educational channel

Media Lab Asia

Media Lab Asia (MLAsia) has been set up by the Department of Information Technology, Government of India, as a not-for-profit Research & Development organization. Its administrative headquarters is in Mumbai; however, the project will be scaled to other parts of Asia as well. MLAsia works with academic and R&D institutions, industries, NGOs, and the Government to develop relevant technology and culturally appropriate solutions for the common man. Many projects undertaken in the areas of ICT for village livelihood generation, healthcare education, empowerment of the disabled, and rural connectivity are now undergoing test deployment and are being made ready for national/large-scale deployment.

Some of the key education-related projects undertaken by MLAsia are:

Gyanpedia is an interactive portal for collating, organizing, and circulating contents generated in schools in India through a single open web platform. The initiative with support from the Digital Empowerment Foundation (DEF) aims to give a boost to nationwide e-learning and e-education efforts. It has online presence of over 50,000 students and covers 10 States.

Virtual Laboratories for Life Science Experiments: MLAsia in collaboration with Centre for Development of Advanced Computing (C-DAC) has developed 40 Virtual Life Sciences Experiments, which use multimedia technology to simulate a virtual classroom environment. These virtual classrooms are available on CDs and multimedia cards for mobiles.

Many other small-scale initiatives are being piloted in collaboration with Indian Institute of Technology and other research organizations in different states of the country.

In addition to Media Lab, organizations like C-DAC and the National Informatics Centre (NIC) have been developing products and services to improve access to ICT services at all levels of the government.

ICTs are also being used extensively for education in India through the pioneering efforts of some private players and NGOs, some of these are outlined in the following:

National Institute of Information Technology

National Institute of Information Technology (NIIT) is a global IT solutions company, which offers training programs to students and professionals. It aims to use ICT to transform the teaching-learning process into a more interactive and efficient process. NIIT's training programs are based on the concept that "You don't have to be an engineer to excel in the IT industry."

With NIIT's vision that computer education can be delivered to schools through collaboration between the State Governments and NIIT, the "Build-Operate-Transfer Model" was initiated. Under this initiative, computer education for class 6 to 9 was handed over to NIIT for a period of 5 years after which the school would continue providing training without further assistance. During this period NIIT was also entrusted with the responsibility of training teachers. Within 45 days 3,500 schools were equipped with computers.

NIIT has also set up "Minimally Invasive Education Kiosks" all over the country. This initiative is conducted under Hole-in-the-Wall Education Ltd. (HiWEL), which is a joint venture between NIIT and the International Finance Corporation (a part of the World Bank Group) aimed at promoting literacy among underprivileged children of the slums. NIIT first experimented with Minimally Invasive Education Kiosk in a slum in Delhi to discover whether students in slum and rural areas could learn through these education kiosks or "learning stations." In 2000, after noticing positive results, they set up 30 Learning Stations in a resettlement colony with the help of the Government of Delhi. Currently, there are more than 300 learning stations across the country. HiWEL has also been awarded the coveted "Digital Opportunity Award" for its groundbreaking work in spreading computer literacy and improving the quality of education at the grassroot levels, by the World Information Technology and Services Alliance (WITSA).

Since NIIT could not offer extra curricular activities such as debating, sports et cetera, they formulated the NIIT + University concept known as GNIIT (Graduate from NIIT). NIIT would provide a four semester (2 year) technical training course to students already enrolled in a State University. They would also provide a one-year work placement for students to gain professional experience in the industry; for this one year they will receive a stipend, which would cover the entire fees for the two-year NIIT course. At the end of four years, students become graduates of an Indian University, acquire an NIIT professional diploma in Network-Centered Computing, and gain hands on experience in the industry. Till date, GNIIT has provided 15,000 people with professional practice with more than 5,000 companies.

Azim Premji Foundation's Computer-Aided Learning Program

Azim Premji Foundation is a not-for-profit organization, which works in the area of elementary education in rural areas. In 2002, it initiated the Computer-Aided Learning program (CALP) to harness the potential of computer technology for education. Under this program, the foundation along with the government has set up Computer-Aided Learning Centers (CALC) to improve academic learning levels, attract out of school children, provide child centric education to retain students, and reduce absenteeism of teachers and students. While the government provides computers and required hardware to schools to establish these centers, Azim Premji Foundation provides syllabus-based bi/trilingual multimedia contents. The program has covered approximately 16,000 schools across 14 states in the country.

Intel Education Initiative

The mission of the Intel Education Initiative is to improve teaching and learning through the effective use of technology in classrooms. Intel has been active in India since 1999 when it

collaborated with NVS. They have primarily focused on joint initiatives with the government at the central, state, and local levels. Ever since its inception in India, it has trained more than 570,000 teachers from 14 state governments. It has also focused on building technology literacy and 21st century skills for youth living in rural communities who have little or no access to technology. Intel carries out its objectives through a portfolio of programs:

Intel Teach Program (In-service Program)

The Intel Teach Program is a professional development program that helps classroom teachers integrate technology to enhance student learning. The program follows the “Train the Trainer Model” where the teacher learns how, when, and where to incorporate technology into his/her lesson plans. Teachers are also taught how to create assessment tools and align lesson plans with provincial learning outcomes.

The teach program also includes the training of school administrators and principals on effective ICT implementation. For this purpose, Intel organizes Principal Leadership Forums. These forums are intended to give leaders an opportunity to understand how technology integration in the classroom can impact student learning. After the forum, the principals are encouraged to motivate teachers to get trained to enhance student learning using technology. The Intel Teach Program portfolio includes both face-to-face training and online resources and tools.

Intel Teach Program (Pre-service Program)

The Intel Teach Pre-service Program aims to empower the faculty in teacher education institutions to train their students with the knowledge, skills, and attitudes required to integrate technology-supported project-based learning into the future classroom. During the training, pre-service teachers are taught how to integrate technology in their classroom processes.

Project “Shiksha,” Microsoft

Microsoft in collaboration with government bodies, schools, and other stakeholders initiated Project “shiksha” in an effort to accelerate computer literacy for teachers and students across government schools. The project will deliver affordable software solutions and comprehensive training for students and teachers. By 2008, Microsoft had signed MoU’s with 10 states for 11 academies offering a variety of educational software and training programs, which will update teachers on how to integrate computers in classrooms. By June 2008, more than 200,000 government school teachers and 10 million students had received IT training. Project “Shiksha” was awarded the Skoch Award in 2006, which is given for exceptional work done in the educational sector by IT companies.

Digital Empowerment Foundation

Digital Empowerment Foundation (DEF) is a not-for-profit organization dedicated to bridging the digital divide by providing consultancy services to the government and corporate in providing ICT facilities to rural areas. It therefore serves as platform for stakeholders including the government, private companies, and NGOs to bring forth their knowledge and expertise to the rural population who live on the edge of information and economic benefit through innovative interventions of ICT tools and digital media. Human resource at DEF includes 72 ICT experts and professionals dedicated to fulfill the objectives of the foundation.

In terms of digital content, in 2008, DEF launched the D-content Web site (www.dcontent.in), which is a thinking platform for various stakeholders to express their views and concerns on digital technology and content matters. D-content's news magazines are available online as well as in the form of printed magazines. With support from Media Lab Asia, DEF also launched Gyanpedia, India's first multilingual e-content platform for the learning community. It aims at facilitating educational content sharing and exchange to bolster e-learning and e-education. It has aggregated digital content from 7 states, 7 languages, and 7 classes (6th-12th) with students and teachers from over 300 schools contributing to its content. In its future plans, Gyanpedia aims at expanding its resource base by covering a total of 5,000 schools. The content offered by Gyanpedia can be accessed by the teaching learning community through their website www.gyanpedia.in/

In October 2004, DEF in partnership with World Summit Award, Government of India, and various other stakeholders launched the "Manthan Award," which is an initiative to recognize the best practices in e-content and creativity in India. After four years of its inception, it expanded its operations to cover all the SAARC countries.

DEF has also initiated numerous other projects and has been providing consulting services in terms of digital content, e-governance, community radio et cetera to various stakeholders. (<http://defindia.net/>)

Centre for Science, Development and Media Studies

Centre for Science, Development and Media Studies (CSDMS) is a Non-Governmental Organization that has been involved in the field of development research. It is committed to developing solutions for underprivileged societies through the use of ICT (both advanced technology as well as more traditional ones such as print) and Geographic Information systems (GIS). The various activities under CSDMS involve research in the field of ICT and GIS, undertaking developing projects in Geo-ICT, creating a platform for knowledge sharing, organizing globally renowned conferences, and capacity building through training programs. In the education space, CSDMS has partnered with GeSCI in coordinating, facilitating and implementing the policy formulation process for the “National Policy on ICT in Education” draft. Through “Digital Learning” and “e-India,” CSDMS has created a platform to bring stakeholders together to exchange ideas and gain knowledge regarding the potential of using ICT in the education system. **Digital Learning** is a monthly education magazine which focuses on current trends, perspectives, researchers, discussions, and initiatives of various countries of the world in the field of ICT and education. Digital learning content is made available to the public through three modes; an interactive Web site (www.digitallearning.in/) with news, interviews, resources, and articles updated daily; a monthly print magazine and a weekly email newsletter. Every year CSDMS organizes the **eINDIA** conference which is an international conference and exhibition aimed at creating a platform to facilitate a multi-stakeholder partnership as well as professional networking among governments, industry, academia and civil society organizations of different countries in the field of ICT for development. Key speakers for the conference include many experts in the field of ICT and development including education experts, in 2009 key speakers from the education sector included the Joint Secretary, Ministry of Human Resource Development; Vice Chancellor, Indira Gandhi National Open University; Secretary, Department of Higher and Technical Education; Joint Secretary, E-learning Group MCIT and Secretary, Secondary Education Government of Andhra Pradesh. Details of past and future conferences are available on the eINDIA website www.eindia.net.in/

(<http://www.csdms.in/>)

Community Radio

Up until 2006, only well-established educational institutes were granted the license to set up campus Community Radio Stations (CRS) in India. The government recently updated their policy guidelines to allow even NGOs such as the civil society and voluntary organizations to receive the license to set up CRS. The growth in community radio stations since then has been slow. The government had anticipated that within a few years of the policy change India would witness the establishment of 4,000–5,000 community radio stations; however, there are only 19 community radio stations established so far (Ministry of Information and Broadcasting, CRS status-at-a-glance). One of the reasons for the slow growth in the establishment of CRS is that the process of acquiring a license to set up the stations takes over a year since it goes through the approval of many ministries.

The Ministry of Information and Broadcasting is however optimistic about the future growth of CRS and expects 5,000 CRS to start functioning by 2012. They have envisaged a need to organize workshops to spread awareness of community radio and to encourage NGOs and other voluntary organizations to set up community radio stations. During the year 2009–10, the Ministry of Information and Broadcasting organized 2-day state level consultations for 10 states in India. (www.mib.nic.in/)

Educomp Solutions Limited

Educomp Solutions Limited is one of the largest education services companies in India. Educomp offers a range of education services and products from multimedia content and SMART classes, to programs in vocational education and training, for both private as well as government schools.

Through its EDUReach programme it has partnered with State and Central Government agencies, Ministries of IT and HRD, and Governments of other countries in order to bridge the digital divide. Educomp has partnered with fourteen State Governments, namely Government of Assam, Karnataka, Orissa, Tripura, Gujarat, Uttar Pradesh, West Bengal, Tamil Nadu, Haryana, Jharkhand, Rajasthan, Punjab, Chhattisgarh, and Andhra Pradesh, covering over 14,000 government schools and benefiting 7.7 million students studying in government schools in India. Educomp programmes provide implementation support for infrastructure creation, teacher training, and content development.

Content is created in local languages in most of these projects and is based on a combination of computer literacy and curriculum-based content. Some of the programs offered by Educomp include:

- Multimedia Curriculum Content in Regional Languages
- Computer Education Programme
- Teacher Training: Technology-Aided Learning (TAL), Pedagogy & Cognitive Learning Issues
- Professional Development Program for Educators

- Educomp Tele-Education Network

Several other initiatives are ongoing at different levels of education which are doing pioneering work in developing innovative technology-based solutions from content development, to delivery; a brief mention of these initiatives is made in the following table:

Table 4: Other ICT in Education Initiatives - India

Name	Initiative	Geography	Further Information
Education Development Center (in partnership with USAID)	Technology Tools for Teaching and Training (dot-EDU T4): dot-EDU T4 has created interactive, multimedia tools in audio, video, and software formats to provide pedagogical training and support for teachers as well as subject specific instruction directly to students focusing on girls and other vulnerable populations	Madhya Pradesh, Bihar, Karnataka, Rajasthan, Chhattisgarh, Jharkhand, and Delhi	http://idd.edc.org/T4India
Education & Research Network, ERNET	ERNET was set up with assistance from UNDP as the premier education and research network in India interconnecting major institutes of higher learning in India. At present ERNET is largest nationwide terrestrial and satellite network with point of presence located at the premiere educational and research institutions in major cities of the country. ERNET aims not only to provide connectivity, but to meet the entire needs of the educational and research institutions by hosting and providing relevant information to their users. Research and Development and Training are integral parts of ERNET activities.		
National Library and Information Services Infrastructure for scholarly	The National Library and Information Services Infrastructure for scholarly content (N-LIST) is proposed to be built around electronic resources subscribed by	All India	

content(N-LIST)	the UGC-INFONET Digital Library Consortium for the universities and the INDEST-AICTE Consortium for technical institutions (IITs, IISc, and NITs). The project envisages providing access to electronic resources to Universities, technical Institutions & Colleges		
Information and Library Network INFLIBNET, and Developing Library Network, DELNET	Information and Library Network and DELNET are computer communication networks for linking libraries and information centers in universities, deemed to be universities, colleges, UGC information centers, institutions of national importance, R&D institutions, etc in order to promote resource sharing among libraries in India	All India	http://www.inflibnet.ac.in/ http://delnet.nic.in/
National Programme on Technology Enhanced Learning (NPTEL)	A collaborative effort of seven Indian Institutes of Technology (IITs) and the Indian Institute of Science IISc Bangalore, NPTEL aims to enhance the quality of engineering education in the country by developing curriculum-based video and Web courses. In the first phase of the project, supplementary content for 129 Web courses and 110 courses in video format in engineering/science and humanities have been developed.	All India	http://nptel.iitm.ac.in/
Multimedia Educational Resource for Learning and Online Teaching (MERLOT)	MERLOT is a free and open resource designed primarily for faculty and students of higher education. It provides a platform for peer reviewed online teaching and learning materials and allows sharing advice and expertise about education with experts.	All India	http://www.merlot.org/

<p>Manthan Awards for e Content</p>	<p>Manthan Awards launched by the Digital Empowerment Foundation in partnership with World Summit Award and American India Foundation in 2004, is an initiative to reward and recognize innovative e-content in the Development sector. Organizations and initiatives producing innovative content in sectors like health, education, government, livelihoods generation etc are recognized and felicitated. It has recently expanded its scope to include initiatives from all South Asian countries.</p>	<p>Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka</p>	<p>http://www.manthanaward.org/</p>
<p>GeSCI</p>	<p>GeSCI is a nonprofit and non commercial organization that works with the goal of providing assistance to government in the strategic implementation of ICTs in education. GeSCI follows a demand driven, collaborative and comprehensive approach to ensure a seamless improvement in the teaching standards, thereby transforming education and empowering communities. It has taken up initiatives based on strong partnership and close collaboration. The services provided by this organization works closely for shaping plans and designing policies, building capacities within the MoE, and utilizing ICT cost effectively to achieve educational objectives.</p>	<p>All India</p>	<p>www.gesci.org</p>
<p>Commonwealth of Learning (COL)</p>	<p>COL is an intergovernmental agency dedicated to promoting and delivering distance education and open learning. In developing countries it supports governments to improve access to quality education. COL is voluntarily funded by the</p>	<p>All India</p>	<p>www.col.org</p>

	<p>Commonwealth countries and India is third major donor after United Kingdom and Canada. The organization has focused its attention on activities in developing instructional materials, telecommunication technology, training and information service. COL has located its Educational Media Center for Asia (CEMCA) in India and Joint Secretary in charge of Distance Learning is a member of the Advisory Council of CEMCA.</p>	
<p>Same Language Subtitling for Literacy</p>	<p>PlanetRead is a not-for-profit organization dedicated to reading and literacy development around the world which was originally created around the idea of Same Language Subtitling (SLS). SLS is the idea of subtitling song-based programs on television in the “same” language as the audio. Since India is a country of 600 million television viewers and a deep-rooted passion for film songs, PlanetRead saw an opportunity to use SLS to rapidly transform hundred of millions of early-literates into reading people by making reading a part of their everyday entertainment. This lead to the establishment of the Literacy for a Billion project which has been implementing SLS on several song-based TV programs on Doordashan, India’s national broadcaster for the last ten years.</p>	<p>All India</p>
<p>One Laptop Per Child (OLPC)</p>	<p>In India, OLPC ran a pilot project in a rural village near Mumbai in which every child was given a laptop; the project was then expanded to several other schools in different parts of the country. In 2009, the</p>	<p>Bangalore, New Delhi, Maharashtra http://www.olpcindia.net/ http://www.olpc.in/</p>

government of India placed an order for 250,000 XO laptops for 1,500 schools.

1.4. Constraints

India faces a number of unresolved issues and challenges for the adoption of ICT particularly in the education sector. Some of these issues are discussed in the following:

Low Literacy Level: Literacy levels in India are low, even those deemed to be literate are perhaps not competent enough to receive IT education. Educational standards would need to be raised before the citizens can become digitally literate.

Technophobia: To increase digital literacy levels among students and teachers, steps will need to be taken to overcome their technophobia. Teachers are typically wary of technology; this is the case for not only teachers in the rural areas but for those in urban areas as well. Unless teachers realize that training will help them rather than pose a threat to their jobs they will continue to remain hesitant. The first step therefore is to get the teachers on board. Raising awareness, about use of ICT in education and improving their teaching efficiency could help in developing positive attitude toward the use of ICT in education among teachers.

Monitoring and Evaluation: The penetration of hardware (computers) is fairly high in most schools as it is easy to install, however the level of usage is debatable; this is because there is no auditing or monitoring system to see whether students are actually using these computers.

Guidelines for Procuring Content: There are also no clear guidelines available for procuring quality content. Identifying quality content is a common constraint for schools looking to use ICT-enabled teaching learning practices.

Institutional fragmentation: Curriculum decisions, infrastructure decisions, content decisions, policy making, and policy implementation are all taken up by different bodies at different levels. Some harmonization/coordination is required.

Other constraints faced by India include linguistic diversity and income disparity. The digital divide in the country is so acute that it becomes difficult for the policy-makers to frame universal policies to be implemented.

1.5. Insights

India is a vast geography with varying levels of development in different parts of the country, and therefore, experiences of using ICTs for education across the country also reflect this diversity. At all levels, from infrastructure availability to availability of trained faculty, there is tremendous variation between urban and rural areas, developed and less developed states, and access for

economically and socially weaker sections vis-à-vis the more wealthy in the country. While some interventions have been immensely successful in one area, the same interventions in another part of the country have not succeeded. The most significant insight through this study has been that a whole spectrum of solutions using ICTs in the education space is required in India. This can range from initiatives using community radio for non-formal education through general community mobilization and awareness creation in rural areas to the state-of-the-art technology-enabled learning spaces and other advanced e learning practices in select schools.

While a small niche of elite private schools have access to the most advanced offerings of ICT-enabled education in the market, the bulk of government schools and poorer private schools face severe disadvantages in terms of infrastructure and capacity. Government's efforts will have to be focused toward this vast majority

India has a certain amount of basic infrastructure in place by way of access to hardware and connectivity; there needs to be a greater focus on developing relevant content and applications and using them to enhance learning across subjects to ensure improvement in quality of education. Content creation has to be democratized and made more responsive to the local context. While content creation by the teachers and students themselves is a positive trend enabling ownership, one needs to weigh the pros and cons of not having a professional content development team who can involve teachers and faculty in the process. On the other hand, large scale BOOT models for ICT enablement of schools often suffer because of lack of sustainability once the third party has finished its contractual obligations and installed hardware and content developed by it. A more detailed study of different models of content development and their relative success in India needs to be undertaken and based on the different environments, different models need to be adopted.

Off the shelf products also need to have some scope for flexibility and customization to give a sense of ownership to users. Further a much larger range of content has to be available, and several models to facilitate this content generation need to be explored. There are no clear guidelines and/or standards for content development at the national level, leaving individual institutions and state governments to choose, often without clear basis of judgment. There needs to be a balance between relative flexibility of the final users to decide on suitable content, and certain broad guidelines to assist them in judging the best possible solution while ensuring that certain minimum standards are maintained.

While the National Policy for ICT in Education is under formulation, there is an acute fragmentation of responsibility at all levels when implementing any ICT intervention, which often leads to dilution and lack of accountability. There is a need to coordinate the plethora of initiatives using ICT for education under a clear framework and guidelines to enable seamless integration of ICTs in education. Instead of focusing on one or two elements such as hardware or teacher training, an entire ecosystem for ICT-enabled learning needs to be created for which several aspects need to come together (refer Volume IV, Thematic Essays, Essay on Policy Coherence). Further, as state governments are the primary authority responsible for implementation of educational programmes, it is at the state level that a clear focus on utilizing ICTs effectively in the education space needs to be prioritized. Through the case studies, it is clear that states like Karnataka, Andhra Pradesh, and Delhi, which have placed adequate importance on mainstreaming ICTs in the teaching

learning processes and proactively initiated efforts to utilize ICTs for education, have succeeded more than states that are simply looking to implement central government schemes and create IT labs for their schools.

Infrastructure remains a key concern in rural areas, especially low Internet penetration and low levels of electrification are significant issues that need to be addressed at a system-wide level. National infrastructure building projects are ongoing like the Bharat Nirman Scheme, USOF's commitment to providing rural connectivity as well as specific programmes like the Knowledge Network or Mission on ICTs for education. These need to be effectively implemented and subsequently utilized at all levels.

While mobile phones have become almost ubiquitous in most parts of the country, their role in education per se is still evolving in India. Informal education and support services in education and distance learning programmes are making use of mobile phones for generating reminders, alerts, and scheduling, but given the limitation of the screen size and amount of data being exchanged, in their current commonly available models, mobile phones are not being utilized extensively in actual educational content delivery in formal education.

Relatively higher radio and TV reach provides an opportunity to deliver innovative content through these media. At present, the government provides dedicated educational channels on TV such as GyanDarshan I, II, and on the Radio such as Gyanvani. Private educational TV channels too have proliferated such as Toppers, Tata Sky Fun Learning, and so on; however, there is no systematic study done on the impact of these programmes on student learning or the success of these channels themselves. The traditional TV and radio programmes have been a useful supplement to distance education programmes and self-learning; however there are several disadvantages of these broadcasts in terms of lack of flexibility and limited interactivity. With the new generation of technological innovations, on demand options and interactive features have been incorporated in some programmes such as the Tata Sky's Active series. Tata Sky in collaboration with the British Council has launched the Active English channel, which is geared toward helping housewives in India learn conversational English including vocabulary and pronunciation from their homes. There are interactive features to choose from, including tutorials, exercises, and self-study modules. The medium of instruction at present is Hindi and content has been developed in partnership with the British Council. Given the reach of TVs, the relative low cost of installing a complete DTH package today (approximately 55 USD for the hardware, installation, and activation and an additional 5 USD as monthly subscription), this option can be explored more thoroughly.

The experience with the open education system so far has convinced policy-makers in the government at both the center and state levels that use of ICT in education has great potential to supplement the formal education system and to provide quality education to large segments of population through cost-effective, open, and flexible manner. Open education systems are initiated in most of the states; however, their development is at different levels. ICT needs to be used by both the formal and open systems as a common tool to provide quality education to masses because now education has been accepted as constitutional right of every individual in the country.

While states like Andhra Pradesh, Gujarat, and Karnataka are fairly advanced in their usage of ICT in the field of education, several other states lag far behind and may not even possess basic Web sites for government departments. Thus ICT uptake in education is fairly uneven in the country. As part of the current project, case studies of four states in India, Delhi, Karnataka, Rajasthan, and West Bengal have been taken up for detailed study. *(Refer to Volume II: Case Studies)*

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Links to Initiatives

Government Links

- National knowledge Commission: www.knowledgecommission.gov.in/
- Sarva Siksha Abhiyaan: www.ssa.nic.in/
- Sakshat Portal: www.sakshat.ac.in/
- Media Lab Asia: www.medialabasia.in/

Schools and Education Institutions

- National Institute Of Open Schooling (NIOS): www.nios.ac.in/
- Indira Gandhi National Open University(IGNOU): www.ignou.ac.in/
- Kendriya Vidyalaya Sangathan (KVS): www.kvsangathan.nic.in/
- Navodaya Vidyalaya Samiti: www.navodaya.nic.in

Private Companies

- Microsoft: www.microsoft.com/india/education/pil/shiksha
- Oracle: www.oracle.com/global/in/pressroom/think_project.html
- National Institute of Information Technology (NIIT): www.niit.com
- Intel Education Initiative: www.intel.com/education/in/
- Cisco Education Initiative: www.cisco.com/web/IN/
- Educomp Solutions Limited: www.educomp.com

Non Government Organizations

- Azim Premji Foundation: www.azimpremjifoundation.org/html/
- Digital Empowerment Foundation (DEF): www.defindia.net/
- Centre for Science, Development and Media Studies: www.csdms.in/

2. Afghanistan

The Islamic Republic of Afghanistan is located approximately in the center of Asia, bordered by Iran in the south and west, Pakistan in the south and east, Turkmenistan, Uzbekistan, and Tajikistan in the north, and China in the far north east.



Figure 3: Map of Afghanistan

Source: www.wikipedia.org; www.cia.gov

It is spread over a region of 652,090 sq. km and has a population of around 27,145,000 with a population density of around 41.6 per sq. km. The city of Kabul is the capital of Afghanistan.

The economy of Afghanistan is recovering after the fall of the Taliban regime in 2001. There has been substantial development in the agriculture and service sector, which has contributed to the economic recovery of the country. The real GDP growth exceeded 7% in 2008; however, despite the growth the country is still poor and largely dependent on donors for foreign aid.

Some of the key demographic and economic indicators for Afghanistan are given as follows:

Table 5: Key Demographics and Economic Indicators - Afghanistan

Parameter	Value	Year
Population	27,145,000	2007
Gross domestic growth (million US \$)	9,359	2007
GDP per capita (US \$)	344.8	2007
Human development index ranking	181/182	2009
Population below poverty line	53%	2003

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

2.1. Background

During the reign of Mohammad Zahir Shah who ruled Afghanistan from 1933 to 1973, 90% of Afghanistan's population was literate. Following the overthrow of the Taliban in 2001, the Interim government received substantial international aid to restore the education system. The process of rebuilding the education system has been slow with continuing instability and the targeting of educational institutions by extremists.

In 2006, the estimated percentage of illiterate men was 57% and the same figure for women was 87. In 2008, around 800,000 new students were enrolled in schools in Afghanistan. About 40% of the newly enrolled students are girls. The total number of students has increased to 5.7 million of which 35% are girls. Still, half of Afghanistan's school-age children are estimated to be out of schools with significant gender and provincial disparities. The number of teachers has grown seven-fold but only 22% meet the minimum qualifications of grade 14 and only 28% are female teachers, located primarily in urban areas. In the last five years, curriculum development has concentrated on the first six years of school; however, there is no new curriculum for secondary schools. Although more than 3,500 schools have been built only 25% of schools have buildings. Thousands of communities have no easy access to schools. In 2006–07, education (primary and secondary) received 19% of the operating budget, 4.3% of the core development budget, and 7% of the total core and external, operating, and development budget.

With the reopening of Kabul University in 2002, some 24,000 students are enrolled in the University. In the early 2000s, the rehabilitation of five other universities progressed very slowly. Although seven universities were operating in 2007, only a total of 22,700 students were active in higher education.

Some of the key education indicators are shown as follows:

Table 6: Education Indicators - Afghanistan

Education parameter		Value	Year
Adult literacy rate	Male	43.1	2000–2007
	Female	12.6	2000–2007
Youth literacy rate	Male	49	2000–2007
	Female	18	2000–2007
Gross enrollment ratio (%): Primary education	Male	126	2000–2007
	Female	75	2000–2007
Gross enrollment ratio (%): Secondary education	Male	28	2000–2007
	Female	9	2000–2007
Expenditure on education (% of GDP)		NA	2003–2006

Source: www.unicef.org; www.cia.gov

To develop ICT policy for the country, the Afghan government had been in consultation with the UNDP. The major objective of the policy had been to promote the overall development of the society and reap the benefits of ICT. Education has been recognized as an important aspect for social

development and one of the key focus areas to initiate educational and developmental programs was to set up adequate infrastructural facilities.

Afghanistan had an estimated 50,000 main line telephones and 600,000 cellular phones in 2004. Mobile phones were introduced in Afghanistan in 2001 and it became the principal means of communication very soon, which virtually stopped the expansion of main line telephone network. Around 3.2 million mobile phone subscriptions were active in 2006. By 2008 four mobile phone companies were operational. Plans call for the establishment of a unified countrywide mobile phone network based on code division multiple access technology, in cooperation with U.S. and Chinese companies.

The Afghan Aid Coordination Authority had been successful in providing proper Internet connectivity to major ministries and aid agencies; however, the cost of Internet service is high compared with other South Asian countries. The number of citizens with Internet connection has increased substantially from 2000 to 2008, multiplying an estimated 1,000 to 580,000.

Some of the key ICT indicators for Afghanistan are given as follows:

Table 7: ICT Parameters - Afghanistan

ICT parameters	Value	Year
Internet users (per 100)	1.9	2008
Internet subscribers (per 100)	0.24	2008
Broadband subscribers (per 100)		2008
Mobile coverage (%)	72	2007
Mobile subscribers (per 100)	29.03	2007
Personal computers (per 100)	0.32	2006–2007
Internet affordability (US \$/month)	24	2007
Mobile affordability (US\$/month)	5.6	2007
Radio subscribers (per 1000)	5.5	
Households with TV (%)	6.2	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

2.2. Policy Framework and Delivery Mechanism

The MoE has formulated a National Education Strategic Plan 2006–10, which outlines the vision for the education system in Afghanistan. ICT is recognized as an enabler of a social and economic discourse that works toward enhancing economic activities and promoting social welfare. The National Telecommunications Policy issued in July 2002 and Telecommunications Development Strategy issued in October 2002 are the two key ICT policies of Afghanistan.

The policies identified challenges, issues, and processes for developing and implementing a national ICT policy for Afghanistan. The policies highlight that ICT needs to be utilized in such a way that it enables Afghanistan to be a part of the global information society and at the same time preserve its rich historical and cultural heritage.

The successful implementation of ICT can help to promote national goals, achieve a tolerant socioeconomic atmosphere in Afghanistan. It can also support the governmental policies of rebuilding social welfare, generating employment, establishing a dynamic and growing private sector, eradicating poverty, and initiate programs and policies for the emancipation of the under privileged groups. Building communications infrastructure has been the prerogative of these policies.

The need to establish ICT for the successful promotion of education was realized with the development of a draft ICT policy paper with the help of UNDP in the year 2003. The policy highlighted the fact that the scope of ICT is critical in countries like Afghanistan, which have a large section of the population living in rural areas, and a sizable segment of the population (including women) without access to education. The government has planned to take certain initiatives through the Ministry of Communication, in order to address these specific socioeconomic predicaments.

- Resources should be mobilized to purchase ICT equipment and educational materials. Technological connectivity and infrastructural facilities in educational institutes can be enhanced through the judicious utilization of the resources.
- The MoE should be assisted by the MoC to develop ICT curricula at both secondary and tertiary level in order to encourage and generate participation in courses like Computer science, multimedia, communications, and engineering.
- It is important to impart specific skills to the teachers and trainers in ICT-related subjects. The MoC should be supported for initiating such train-the-trainer programs.
- Opportunities for exposure to technology should be created for the students located in remote areas. Initiating Mobile Internet units to visit various schools, setting up networking academies that supports the institute to design, build and maintain computer networks, and developing telecenters that would remain operational during and after the school hours can act as an effective mechanism for enhancing technology specific skills for the students.
- Work toward the preparation and official international adoption of official computer-based fonts applicable to the educational and business languages of Afghanistan.
- To ensure the implementation of ICT at the administrative level it is important to cooperate with the public agencies, through which the civil servants can be trained in ICT skills and applications.
- Public access to information and opportunities can be enhanced through educational radio program; distribution of written materials where appropriate; and establishment of kiosks at public locations (such as airports, ministry departments, and so on).
- Mutually beneficial opportunities should be identified for both the public and private sector in order to utilize ICT as a tool for achieving developmental goals for the country.

(<http://www.mcit.gov.af/Documents/PoliciesandLaws/Afghanistan%20ICT%20Policy-english.pdf>)

2.3. Initiatives

To achieve the national ICT plans and strategies outlined in the National ICT Policy, the Ministry of Communication and Information Technology has taken an initiative to launch the National ICT

Council of Afghanistan (NICTA), which is responsible for coordinating national ICT initiatives and policies. The council will ensure close collaboration among the government, the private and not-for-profit organizations, the civil society, and more broadly the international community. The Government of Afghanistan as well as other international donors have taken up many initiatives to improve the quality of education through ICT; some major initiatives are outlined in the following:

Afghanistan Higher Education Portal

The Global Learning Portal (GLP) is an open source networking platform for teachers, institutions, and education activities throughout the world. In May 2009, they signed an MoU with the Afghanistan Ministry of Higher Education (MoHE) in an effort to empower teachers, learners, and communities to improve education access and quality. Under the MoU, GLP will empower the Afghanistan Higher Education Project (sponsored by USAID) by initiating the Afghanistan Higher Education Portal (HEP), which will provide technical assistance, learning resources, and networking tools for faculty members in Afghanistan. The Portal will be supported by faculty members from various institutes and will provide daily online discussions, facilitate exchange of information, and share workshop information and material. The portal has scope for English, Dari, and Pashto. It also supports various activities such as providing online forms, enhancing English language skills, and promoting initiatives of professional development.

Educational Radio and Television

Educational Radio and Television (ERTV) was established in 1969 under the MoE with a mandate of raising public awareness, raising adult literacy levels, and broadcasting educational programmes to schools. However, due to the Soviet invasion in 1989 it needed major restructuring and rebuilding. Therefore, in 2001, the MoE requested the support of UNESCO to rebuild ERTV and extend its reach to deprived sections of society as well. ERTV is now equipped with computers, television and radio production equipment, and Internet facility. The ERTV project, funded by the Italian government had handed over more than 80 pieces of educational equipments to provide a new studio to ERTV, in order to develop educational broadcasting in Afghanistan. In 2005, the project enabled a dedicated channel for educational broadcasting. In 2010, the Government of Italy and UNESCO decided on yet another project “Development of ERTV for audio-visual support to teacher-training in Afghanistan” to enhance distance learning through audio-visual programmes.

Radio Education for Afghan Children

Radio Education for Afghan Children (REACH) is an education initiative aimed at raising literacy levels of Afghan children who have been denied education due to conflict and war. The project is managed by the BBC Afghan Education Projects (BBC AEP) and funded by the UK Department of International Development, United Nations Children Fund (UNICEF), and the Canadian International Development Agency (CIDA). REACH focuses on broadcasting educational programs on the radio; these programs are not intended to replace formal schooling but educate the children on the “Afghan Life.” The programs are broadcasted on BBC World Service’s Persian and Pashto Services six days a week. One of the most popular soap opera broadcasted is “New home new life,”

which intermingles basic information with attractive story lines. Other programs include imaginative stories, riddles, numeracy games, and advice for teenagers on various issues.

Multipurpose Community Telecenters

In order to ensure equitable ICT access to the rural and urban communities, the Government of Afghanistan in collaboration with the Government of India, International Telecommunication Union (ITU), and Universal Postal Union upgraded post offices in 12 provinces in Afghanistan to enable them to act as Multipurpose Community Telecentres (MCT) offering a variety of ICT services. These centers are equipped with computers, printers, modems, and generators and are interconnected through the existing Government Communication Network (GCN) to facilitate data exchange. The center will also provide advice on how to use the products, access to experts and consultants, current information from colleges and universities, training, and information databases. One of the key objectives of this initiative is to work toward the dissemination of information. It will also work as a platform for exchanging information and best practices. Setting up social networks is an innovative way of deploying knowledge and education. This has a larger reach for the poor and deprived, who can have easy access to Internet education through such a community-based set up.

One Laptop per Child

The One Laptop per Child (OLPC) project was launched in Afghanistan in 2008 through a PPP model involving the MoE, MoCIT, USAID's Afghanistan Small and Medium Enterprise Development (ASMED) and telecom development company – Roshan. Under the first phase of the project, XO laptops were distributed to students of select schools. Teachers from these schools also received the laptops along with a four day training programme. Each XO laptop was pre-installed with the standard national curriculum books along with other manuals, guides, health information, local directory and so on. The laptops also have access to word processor, email and internet browser. All the core activities on the laptop can be accessed through both the national languages – Dari and Pashto. Till 2009, 396 laptops were distributed to Istiqlal High School in Jalalabad covering grades IV to VI.

The project is now on the second phase under which four schools (including two 'all girl schools') in Kabul will be equipped with a total of 2000 XO laptops. OLPC Afghanistan has also collaborated with Master Teachers by Satellite for Afghanistan (MTSA) and Afghan Film to develop educational games for the XO laptop. The game will focus on literacy and numeracy in the first phase.

Teacher Training programs

The introduction of ICT into teacher's training program had been one of the key drivers for the successful implementation of ICT in the educational blueprint. Training the teachers is a cornerstone for bringing a revolutionary change in the education system. Various teachers training program had been organized in order to meet the growing demand of technically skilled faculty to facilitate a modern and updated delivery mode of learning. Crash courses are held on a regular basis for the trainers. With the effective establishment of HEP, the trainers can join the forum and

share their thoughts. Collaborative online training for the teachers is also organized, so that the trainers are competent enough to use ICT in classrooms. Workshops are held in order to discuss various pedagogical matters to ensure effective implementation of ICT. Multimodal training is enhanced through such trainings. Some of the major teacher training projects in Afghanistan are highlighted as follows:

- The ICT Capacity Building Project (Phase II) with the help of UNDP and MoCIT aims at building advanced ICT capacity in the country. The CISCO networking Academy program is a key venture of this project, which will enable students to benefit from educational opportunities and streamline the ICT initiatives. This included establishment of testing centers in educational institutions and enhanced participation of students through enrollment in various ICT-enabled workshops. The academies are driving their initiatives to address the problem of a huge gender and digital gap by upgrading the female participation rate in educational programs.
- Denmark is providing support in restructuring and developing the primary education subsector in Afghanistan. The Danish International Development Agency, DANIDA's support will focus on teacher development and training programs, curriculum restructuring and providing physical infrastructure, rehabilitation and construction of schools and development of school mapping.
- Microsoft's Unlimited Potential program with support from UNDP aims at providing computer skills and education to the lowest strata of the society. Through the train-the-trainer program under the Microsoft Unlimited Potential program, basic curriculum support and training has been provided for the Community Technology and Learning Centers (CTLs).

Role of NGOs in bringing educational reform:

Various NGOs had worked toward the restructuring of the Afghan education system through the implementation of ICT policies. Few among them are the University of Afghanistan, Afghan American University, Kardan University, Bakhtar University, Aryana University, Afghan Pooshesh Training Institute, and ICT Institute (ICTI) Kabul. Different Learning centers had been set up in order to provide multimodal education.

The Afghan Institute of Learning is a women-led NGO that uses a various interactive and creative pedagogical strategies to meet the health and education needs of Afghan women, children, and communities and provides ICT training at its IT centers.

The Afghan School Project is a group of Canadian and Afghan volunteers working to provide funding and support to education in Afghanistan. The focus of this group is on educating women and creating employment opportunities for them.

1.4. Constraints

If we look at the ICT sector, particularly its use in the improvement of education, a lot of gaps can be seen which needs to be filled by initiatives from the government and the private sector. Some of the

potential challenges faced by the government in integrating ICT in education are outlined as follows:

Lack of Infrastructure: The key constraint of the current education system is the lack of infrastructure such as buildings and qualified teachers. A large number of schools were destroyed during the war and a number of qualified teachers fled the country, took jobs outside of education, worked in refugee camps or have been killed. In 2003 it was estimated that 4,350 new teachers need to be recruited and trained each year to achieve an enrolment rate of 85% within 10 years (ADB). The cost involved in such an expansion can be overwhelming for an economy like Afghanistan.

High Cost of Internet: Under the Taliban Internet was banned; even though efforts were made to establish proper Internet connectivity after the overthrow of the Taliban regime, the price of Internet services remains high and accessible to only a small section of the population.

Linguistic Constraints: To increase the familiarity and awareness of ICT in the general population, the government will either have to ensure that people are able to understand and manipulate information available in the English language or provide them information in their local languages. This could prove to be extremely costly and tedious as new software will have to be developed for the two common mother tongues spoken by the people in Afghanistan.

ICT Literacy at Administration Level: The lack of capable and ICT literate administrators who can monitor the rebuilding initiatives of international donor organizations and governments is a serious concern. It is important for the people in the administration level to be proficient enough to participate and provide input as well as manage the necessary groundwork and field reports. The capacity building in ICT will ensure a streamlined and efficient way of managing the ICT initiatives.

1.5. Insights

Afghanistan has been subjected to 23 years of civil war and political and social instability. Innovative and cost-effective methods will need to be employed for economic and social restructuring; the use of ICT can therefore be a critical factor in ensuring that the country's workforce is skilled and prepared to meet the challenges of such a reformation. To build an ICT-based society donor agencies, the government will need to focus their efforts in re-building the IT and Telecom infrastructure destroyed due to the war. Efforts will need to be made in terms of human resource development, particularly providing trained teachers, otherwise the large amount of money spent on building the infrastructure will not find optimal use.

In case of Afghanistan, role of multilateral and bilateral agencies such as the World Bank, Asian Developmental Bank (ADB), UNESCO, UNDP, SIDA CIDA, USAID, the British Council, and international NGOs is considered very important. An effective collaboration among these agencies can help in developing local/regional networks of education supported by appropriate technologies including ICT to address local and regional requirements in terms of capacity building and implementation of actual programs. These agencies can effectively use their links in regional

countries to establish collaboration in the areas of curriculum and textbook sharing as well as in teacher training. Content development is another focus area that needs to be addressed; software should support the use of Dari and Pashtu languages.

Much of the efforts of various agencies has gone on radio and print-based distance education in an attempt to improve literacy levels among the large segments of the population who are educationally disadvantaged (rural population and females). While this may be of great value to Afghanistan given the shortage of trained teachers, it cannot be a permanent solution; other more interactive and effective ICT forms such as the Internet will need to be explored eventually. Proper policy planning and implementation and an effective streamlining of the communication system can bring about effective changes in ICT implementation in the country.

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Links to Initiatives

Government Links

- National ICT Council of Afghanistan (NICTA): www.mcit.gov.af/Documents/RunningProjects/ictcouncil.pdf
- Educational Radio and Television (ERTV): www.ertv.edu.af/homeenglish.htm
- Afghanistan Higher Education Portal (HEP): www.hep.glp.net/

Private Companies

- Cisco Education Initiative: www.nsrc.org/ASIA/AF/20060300-Cisco-USAID-UNDP.pdf
- Microsoft's Unlimited Potential Programme: www.microsoft.com/presspass/features/2004/jan04/01-23undpprojects.msp
- BBC – Radio Education for Afghan Children (REACH): www.bbc.co.uk/worldservice/people/highlights/010711_reach.shtml

Non Government Organizations

- The Afghan Institute of Learning (AIL): www.afghaninstituteoflearning.org/
- The Afghan School Project Group: www.theafghanschool.org/

Other Important Links

- One Laptop per Child, Afghanistan: www.wiki.laptop.org/go/OLPC_Afghanistan; www.olpc.af/

3. Bangladesh

The People's Republic of Bangladesh bordered by India, Myanmar, and Bay of Bengal is one of the most densely populated countries in the world with a high incidence of poverty.



Figure 4: Map of Bangladesh

Source: www.wikipedia.org; www.cia.gov

Bangladesh is a developing nation with continuous domestic and international efforts to improve its economic condition. According to the gradation by the International Monetary Fund, Bangladesh ranked as the 48th largest economy in the world in 2008. More than half the GDP is contributed by the service sector, while around two third of the population is employed in the agriculture sector. Some of the key economic and demographic indicators are given as follows:

Table 8: Key Demographics and Economic Indicators - Bangladesh

Parameter	Value	Year
Population	158,665,000	2007
Gross domestic growth (million US \$)	67876	2007
GDP per capita (US \$)	427.8	2007
Human development index ranking	146/182	2009
Population below poverty line	45%	2004

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

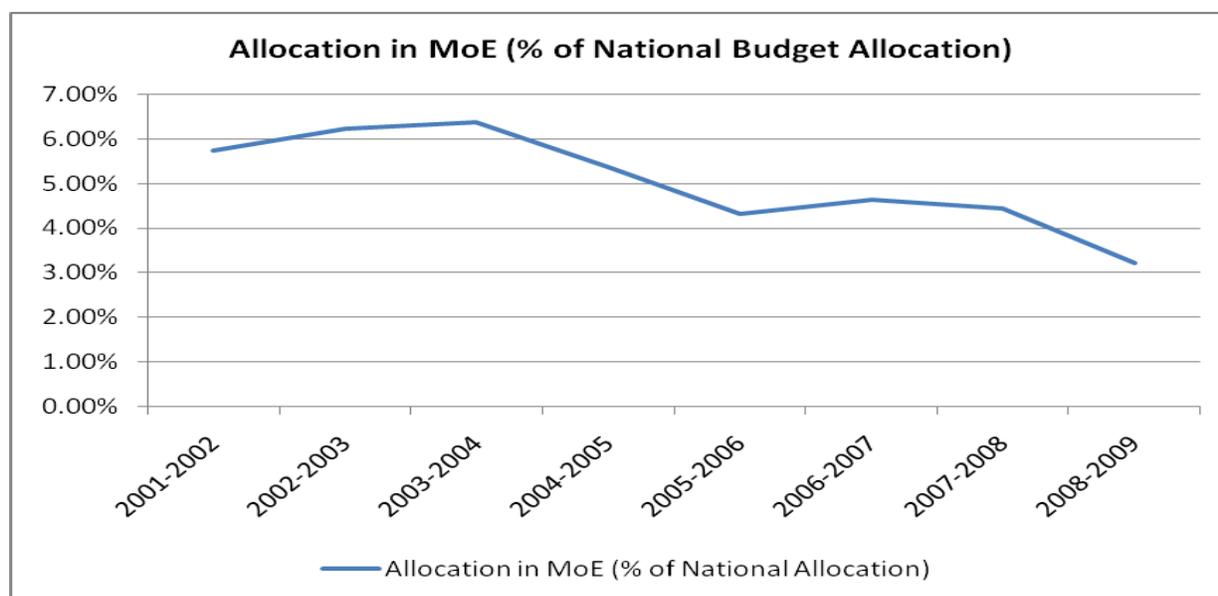
3.1. Background

The primary education system in Bangladesh is managed by the Ministry of Primary and Mass Education, whereas the MoE is responsible for secondary and postsecondary higher education. Both Ministries operate through their various directorates and supporting departments. The government is looking at implementing ICT initiatives to revolutionize the education system. With

the successful implementation of ICT in the education system, the government can look at a greater participation of the country in the global information society. It is hoped that ICT will impact the access, cost-effectiveness, and quality of the education system too. The increasing digital divide needs to be addressed by the uniform and well-administered implementation of ICT. The demographical picture that shows a relatively lower participation of the female population in the ICT education process also needs to be revised through initiatives and programs.

Bangladesh Bureau of Educational Information and Statistics (BANBEIS) is the organization responsible for collection, compilation, and dissemination of educational information and statistics at various levels and types of education. This organization is the main organ of the MoE responsible for collection and publication of educational data and statistics. It functions as the Education Management Information System (EMIS) of the Ministry. It is also the National Coordinator of RINSACA (Regional Informatics for South & Central Asia).

The allocation of budget to the MoE as a percentage of total national development budget was 5.73% in the year 2001–02. In the year 2003–04, it was 6.37% and has been gradually decreasing since then. In the year 2008–09, it has come down to 3.22% excluding Taka 163.17 crore (approximately 0.2 million dollars) as block allocation under MoE. The following graph shows the percentage of budget allocated to MoE in last 9 years:



Bangladesh has made significant progress, especially with regard to increasing access and gender equity, both at the primary and secondary levels. Gross enrollment rates at the primary level rose from 90% in the late 1990s to 98% in 2003, while the enrollment rates at the secondary level rose to 44%. Gender parity in access to primary and secondary education has also been achieved to an extent. These achievements are particularly spectacular when compared to countries in the South Asia region and other countries at similar levels of per capita income.

Some of the key education indicators for the country are given as follows:

Table 9: Key Education Indicators of - Bangladesh

Education parameter		Value	Year
Adult literacy rate	Male	53.9	2000–2007
	Female	31.8	2000–2007
Youth literacy rate	Male	71	2000–2007
	Female	73	2000–2007
Gross enrollment ratio (%): Primary education	Male	101	2000–2007
	Female	105	2000–2007
Gross enrollment ratio (%): Secondary education	Male	43	2000–2007
	Female	45	2000–2007
Expenditure on education (% of GDP)		2.7	2003–2006

Source: www.unicef.org; www.cia.gov

The ICT industry in Bangladesh has been making steady progress with rapid growth in mobile telephony and Internet usage. The Ministry of Science Information and Communication Technology is tasked with the responsibility of providing the policy framework and institutional mechanism for the development of a robust ICT sector in the country. Further, the Bangladesh Computer Council (BCC), set up by the Ministry in 1990, is an autonomous body responsible for encouraging and providing support for ICT-related activities in Bangladesh. Some of the key ICT-related indicators for the country are given as follows:

Table 10: ICT Indicators - Bangladesh

ICT parameters	Value	Year
Internet users (per 100)	0.3	2008
Internet subscribers (per 100)	0.1	2008
Broadband subscribers (per 100)	0.03	2008
Mobile coverage (%)	90	2007
Mobile subscribers (per 100)	21.7	2007
Personal computers (per 100)	2.42	2006–2007
Internet affordability (US \$/month)	22.1	2007
Mobile affordability (US\$/month)	2.6	2007
Radio subscribers (per 1000)	42.6	
Households with TV (%)	22.9	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

3.2. Policy Framework and Delivery Mechanism

The Government of Bangladesh in an effort to harness the power of ICT formulated its National ICT Policy in year 2002. A revised National ICT Policy was passed in 2009. The National ICT Policy 2009 has incorporated all the components of the National ICT Policy 2002 in a more structured manner. And has includee of planned action items in conformity with policies and strategies. To ensure the successful implementation of the revised National ICT Policy, the review committee took into cognizance the government's declared intentions in the Poverty Reduction Strategy Paper and other national policy documents to align the revised ICT policy with the national goals as

envisioned in the documents. The goal of following a pyramidal structure with the vision placed at the apex and the other linked parameters in the subsequent stratas were decided in the revised policy of 2009. Some of the specific policy statements relevant to education are stated below:

- Assess skills of ICT professionals and meet gaps with targeted training programmes to overcome the short-term skills shortage in the ICT industry and adopt continuing education and professional skills assessment and enhancement programmes
- Encourage closer collaboration between academia and industry to align curriculum with market needs
- Establish an ICT Center of Excellence with necessary long-term funding to teach and conduct research in advanced ICTs
- Enhance the quality and reach of education at all levels with a special focus on Mathematics, Science, and English
- Boost use of ICT tools in all levels of education, including ECDP, mass literacy, and lifelong learning
- Ensure access to education and research for people with disabilities and special needs using ICT tools
- Establish multimedia institutes
- Initiate diploma and trade courses to enable ICT capacity building for teachers. Teacher training institutes to be empowered with ICT capacity to meet the challenges
- Create reliable and accessible national databases
- Promote the use of ICT for the purpose of training in the public sector
- Initiate development of a sizable resource of globally competitive ICT professionals in order to meet local and global market requirements
- Administer the successful enactment of laws and regulations that conform to World Trade Organization stipulations to allow for consistent ICT growth
- Promote distance education, set up institutes and infrastructure for e-learning training programs
- Develop seamless telecommunication network for the unhindered implementation of ICT policy
- Ensure public access to information through setting up of kiosks. Encourage the participation of private sector for ICT implementation
- Work toward setting up a Ministry of ICT, by merging MOSICT and MOPT. The “Science” part from MOSICT can be transferred to MoE and be renamed as the Ministry of Education and Science. BTRC should be brought under the Ministry of ICT
- Create an e-Education Cell for coordinating and mainstreaming ICTs in education system

Some of the specific ICT in education objectives of the Government along with strategies proposed to achieve these objectives are given below:

ICT-Trained and Qualified Teachers

The government of Bangladesh has identified the shortage of trained and qualified teachers as a key constraint and therefore proposes to leverage ICT tools for imparting effective teachers’ training

programmes and mitigating the shortage of good quality teachers. The following strategy is proposed:

- Provide incentives/special loans/performance-based grants to teachers to acquire ICT tools
- Install computers, LAN, reliable Internet connectivity with reasonable speed, and multimedia teacher training content for all primary and secondary Teachers' Training Colleges
- Ensure that the teachers of higher secondary level and secondary level ICT courses are at least IT graduates and IT diplomas, respectively
- Provide special incentive for IT teachers in cities to go to regional colleges on short-term deputation and also provide special privilege for local ICT teachers to stay in their home districts

ICT access to all schools

Besides providing qualified ICT teachers, the government also realizes the importance of providing ICT access to all schools to familiarize students with modern ICT technology. To implement this policy, the government proposes to:

- Install computers, Internet connectivity, and appropriate multimedia educational content for every primary, secondary, and higher secondary school, accessible to each student; include solar energy panels if necessary
- Create a Model School as an Information Access Center with ICT facilities in each union, so that all other adjacent school students can use that facility

Bridging the Digital Divide

An immediate priority for the government is to bridge the digital divide and minimize economic disparity for lower income groups, ethnic minorities, women, and individuals with special needs. In this regard, the government has formulated certain policies to ensure equitable ICT access to students belonging to these groups and the following strategies have been proposed

- Develop special ICT literacy and training programmes for ethnic minorities
- Arrange Internet connectivity up to all villages of the country
- Ensuring subsidized pricing for Internet connectivity to primary and secondary educational institutions and TVET programmes
- Promote the use of standard Bangla keyboard for people with special needs

Larger Pipeline of ICT Professionals

The government proposes to encourage closer collaboration between academia and the ICT industry to align curriculum with market needs. Policies will be implemented to extend the reach of ICT literacy throughout the country by incorporating ICT courses in secondary and tertiary education. A redesigning of the secondary and higher secondary syllabus will take place at regular intervals based on the needs of an inclusive and cost-effective knowledge society.

As for the current ICT professionals, an "ICT Professional and Skill Enhancement Programme" will be initiated, which would assess the skills of ICT professionals and meet gaps with targeted training programmes to overcome the short-term skills shortage in the ICT industry. To provide an incentive for companies to invest in training of their HR, the Ministry of Science and Information

and Communication Technology (MoSICT) would reimburse 50% of training costs for ICT professionals.

Bangladesh's commitment to education has been clearly stated in its constitution and development plans with education being given the highest priority in the public sector investments. Education sector allocations are currently about 2.3% of GDP and 14% of total government expenditure. At the primary level, MoPME is supported by a multidonor group through the Primary Education Development Program II (PEDP II), which aims to strengthen educational access, quality, and efficiency.

MoE is aiming to move toward a devolved system of governance within the current administrative structure. In this system, the central government will be responsible for formulating policies, financing, setting quality standards, and monitoring and evaluation, while lower levels of government will be responsible for administering the system. MoE is empowering officials at the district and upazila levels to take greater responsibility in monitoring school performance and ensure public disclosure of information (e.g., SSC passing rates, teacher absenteeism, class sizes) related to school quality.

The necessity to improve quality of education by leveraging technology is also articulated by the different Education Commissions set up by the Government of Bangladesh. The Mohammad Moniruzzaman Mia Commission-2003, which submitted its report in March 2004, reiterated that there was no alternative to using modern technology for improving quality of primary and secondary education. In this regard, a dedicated TV channel has been proposed. It is recommended that distance education through TV could be introduced for pre-primary and continuous education.

Another significant step as regards policy framework for ICTs for education has been the adoption of the Community Radio Installation, Broadcasting & Operation Policy 2008, by the Ministry of Information. This policy provides a framework for extensive use of radio technology to provide education and support to communities that may not have access to regular schooling or other Internet or telephone resources.

3.3. Initiatives

In the government sector, some initiatives have been taken for ICT-enabled education and computer-aided education at all levels including primary schools. In 2009, the Prime Minister made a promise of a *Digital Bangladesh* to the citizens by providing access to ICT for all. Bangladesh has also seen many initiatives by donor agencies and non-government organizations such as BRAC (Bangladesh Rural Advancement Committee) and Grameen Bank, particularly in the field of ICT human capacity building. Some of the key initiatives using ICT for education are outlined as follows:

In-Service Secondary Teacher Training Programme

In an effort to harness the use of ICT to improve the quality of the ADB funded Teaching Quality Improvement in Secondary Education Project (TQI-SEP), two subject trainers, a training coordinator, and a cluster of 10 schools were equipped with "smartphones"(phones equipped with

features such as video playback, speakerphone, three-way calling capabilities, email access and so on). These smartphones were to be used by 20 Bangla and mathematics teachers in the 10 schools. The phones were intended to enhance communication, motivation, and multimedia delivery. Trainees used SMS to reply to assessment questions and teleconferencing facilities were used to communicate with the trainers.

Gonokendros (Union Libraries)

The Continuing Education Program was introduced by BRAC in 1995 and was responsible for establishing Gonokendros (Union Libraries), which provide computer training for students at a low price. They also provide an access to reading materials for the rural population in an effort to increase the literacy levels among them. By December 2007, Gonokendros had organized computer training for more than 20,000 people and are now being developed as information centers to ensure the participation of everyone, particularly women.

Computer-Aided Learning

In 2004, BRAC initiated the CALP with an aim to provide interesting and interactive learning materials for teachers to use in the classroom. The software developed is based on the national curriculum and is intended to improve teachers' classroom skills by improving their capacity to maintain student's attention and to help students grasp difficult concepts by providing useful visualizations. CAL also trains teachers on using computers and on using the technology to expand their own knowledge

Under the TQI-SEP supported by BRAC, the MoE established Mobile ICT Labs in 2010. Each Mobile ICT Lab contains five laptops, five wireless Internet modems, two digital cameras, multimedia projector, webcam and various other e-learning enabling facilities. These Mobile ICT Labs will move around in 17 cars through remote areas in Bangladesh introducing an e-learning system to teachers and students in one thousand schools by the end of the year.

Grameen Communications

Grameen Communications is a not-for-profit Information Technology company which launched a pilot Village Computer and Internet Project (VCIP) in a district near the capital of Bangladesh. The primary objective of the program is to provide access to modern ICT services to rural areas. A major emphasis for VCIP is providing education at a low cost to the people in isolated regions. In this regard, the program has provided computer lab facilities to schools and colleges, basic training courses in computers, and educational programs for the children like learning of alphabets and words.

Grameen Communications has also initiated various other programmes in Bangladesh. The Global Communication Center, which is the R&D wing of the company, works toward producing and promoting ICT technologies to improve health care, education, and business in the country.

Bangladesh Open University

Bangladesh Open University (BOU) was established in 1992 and till date it is the only public university in Bangladesh, which imparts education through a distance learning mode. The University uses ICT to achieve its goal of reaching the masses and creating efficient and skilled manpower in the country. It functions through 12 Regional Resource Centres, 6 schools, and 1,106 Study Centres. It recently became a member of the mega-universities with student enrollment exceeding 300,000 (Hossain and Saddik).

Delivery of education at BOU depends largely on the print medium and the use of technology such as television broadcast, radio and audio cassettes is provided as a supplementary component of print based delivery (Hossain and Saddik). On an average 13 Television lectures and 16 Radio lecture are aired per month, delivery of these lectures are carried out by BOU academics and subject specialists from other institutions (Alam and Islam). The use of contemporary technology such as e-mail, computer-aided learning, and teleconference, which started only in 2000, still remains limited.

Bangladesh Virtual Classroom is a SPIDER (Swedish Program for ICT in Developing Region) funded project run by Orebro University (Sweden), Soft-Ed Limited (Bangladesh) and Bangladesh Open University (BOU). It focuses on using electronic means to provide education to rural areas of Bangladesh. The objective of the Bangladesh Virtual Classroom is to test a method that would make the pre-recorded lessons delivered at BOU more interactive. The proposed project will use Short Messaging Services (SMS) along with perceived live telecast to create a virtual classroom.

Relief International—Schools Online

Relief International—Schools online (RI-SOL) is a US-based International NGO, which has been working in Bangladesh's education sector to integrate ICT in classroom learning and teaching. Under the Global Connections and Exchange Project, RI-SOL has launched 47 Internet Learning Centers offering a variety of ICT. These learning centers are operating in rural and semiurban areas in 10 districts of Bangladesh and are also open to neighboring schools, colleges, local institutions, and surrounding communities.

In May 2009, RI-SOL collaborated with Intel Corporation and the U.S. State Department Educational and Cultural Affairs Bureau (ECA) in an effort to provide ICT skills and development training to teachers in Bangladesh. Intel's teaching and learning programs and RI-SOL school-based online learning modules will be available for schools to improve the capacity of the teachers. This collaboration also aims at encouraging interactive linkages between U.S. and Bangladeshi schools.

3.4. Constraints

Despite the number of initiatives taken up by the government and international donor agencies to improve education through ICT, literacy levels in Bangladesh still remain low and stagnant. Some of the key constraints in the application of ICT for education are outlined as follows:

High Cost of Internet: Internet is becoming more popular but is affordable to only a small urban section of the population. It is extremely expensive in rural areas where the need for distance education is the most. As a result the country will have to rely on more traditional communication means such as radio and television, which have higher penetration, and also focus on developing relevant quality content for these formats.

ICT Infrastructure: ICT infrastructure in schools still remains poor with limited Internet access. It is estimated that only 2.2 per 100 people have access to personal computers (World Bank). This could be a major constraint in ensuring quality implementation of ICT in education.

Lack of Qualified Teachers: There is a lack of qualified teachers particularly in lower and higher secondary schools (45% and 33%, respectively). There is also a shortage of ICT trained teachers; this can be attributed to the fact that the policy framework for ICT encourages IT graduates to join the ICT industry to ensure a larger pipeline of ICT professionals and as a result there is no incentive scheme for them to teach at school levels.

3.5. Insights

Bangladesh can reap great benefits by integrating ICT in the education system since the country has one language and is densely populated. The challenge faced by Bangladesh, like many developing countries is overcoming the extensive digital divide. Implementation of ICT would need to be carefully rolled out since, if ICT services are not affordable or accessible to rural areas, ICT expansion could increase the existing urban-rural IT gap.

The ICT policy framework for Bangladesh focuses on capacity building in terms of infrastructure and developing human resources; for example, the government creates a venture capital fund for young ICT graduates to establish startup ICT companies; ICT training companies are given incentives to increase the number of ICT professionals. As a result a large number of software companies have sprung up over the last decade and the number of science and mathematics graduates has also increased. While this is a positive step for the ICT industry in general, the potential of ICT in education has had little attention. It would be beneficial if Bangladesh could take advantage of the exponential growth in ICT training institutes to cater to the shortage of teachers. ICT graduates will have to receive proper incentives to join academics rather than software companies.

The Bangladesh Telecom Regulatory Commission was set up as an independent body in 2001. Even though competition has increased in the telecom space in recent years, further efforts will have to be made to reduce telecommunication costs and improve its efficiency.

The opportunity provided by extensive coverage of mobile network and relative affordability of mobile services (very expensive internet) should be leveraged for designing innovative solutions through these media. This may be more usefully utilized for non formal education as well as support services in education. Further TV and Radio networks may be utilized to a greater extent to deliver educational content, given the high population density and greater penetration of these media.

3.6. Select Bibliography

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- T.M Barkatullah, 2008. "ICT Human Capacity Building." Bangladesh Computer Council. www.unapcict.org/ecohub/.../ict-human...bangladesh/at.../attachment1.
- "BRAC Education Programme, BEP 2004-2009" by Anne Ryan, James Jennings Jill White, Mar 2007; www.connect-bangladesh.org/cb

Links to Initiatives

Government Links

- Bangladesh Computer Council (BCC): www.bcc.net.bd/
- Bangladesh Bureau of Educational Information and Statistics (BANBEIS): www.banbeis.gov.bd/

Schools and Education Institutions

- National Academy for Primary Education: <http://www.nape.gov.bd/>
- Bangladesh Open University: www.bou.edu.bd/

Private Companies

- Soft – Ed Limited: www.softedltd.com/

Non Government Organizations

- Bangladesh Rural Advancement Committee (BRAC): www.brac.net/
- Grameen Communications: www.grameencommunications.com/

Other Important Links

- Relief International – Schools Online (RI-SOL): www.connect-bangladesh.org/component/option,com_frontpage/Itemid,1/
- Swedish Program for ICT in Developing Region (SPIDER) – Bangladesh Virtual Classroom: www.spidercenter.org/news/virtual-classroom-bangladesh

4. Bhutan

Bhutan located at the eastern end of the Himalayas bordered by India and the People's Republic of China has been undergoing rapid political and social changes. Ending centuries of direct monarchic rule, Bhutan held its first democratic elections in March 2008. The new democratic system consists of an upper and a lower house; the latter forming the 47 seat National Assembly. Administratively, Bhutan is divided into four administrative zones called Dzongdey, which are further subdivided into districts, subdistricts, and villages. There are in all 20 districts or Dzongkhags in Bhutan.



Figure 5: Map of Bhutan

Source: www.wikipedia.org; www.cia.gov

Bhutan has a very small economy, but it has grown rapidly in the past few years, with the growth rate in 2007 reaching 22.4%. Bhutan's economy is primarily based on agriculture, forestry, tourism, and the sale of hydroelectric power, with more than 80% of the population dependent on agriculture.

Some of the key demographic and economic indicators are given as follows:

Table 11: Key Demographic and Economic Indicators - Bhutan

Parameter	Value	Year
Population	658,000	2007
Gross domestic growth (million US \$)	1305	2007
GDP per capita (US \$)	1981.8	2007
Human development index ranking	132/182	2009
Population below poverty line	31.70%	2005

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

4.1. Background

The modern education system was introduced in Bhutan only in 1961 under the First Five-Year Plan. Prior to this, education was provided primarily through the Buddhist monasteries. During the First Five-Year Plan some 108 schools were opened and around 15,000 students were enrolled. Over the next four decades, the government expanded the modern education system from about 11 schools prior to the First Five-Year Plan in 1961 to 556 schools and institutes in 2009, spanning from community primary schools to tertiary institutes.

With the expansion in the education system, the total enrollment of students in Bhutan at all levels of general education and tertiary education has risen to 169,313 as of March 2009. Increased awareness about the value of education and the government's commitment to provide basic education to all is responsible for the increasing enrollments. The government of Bhutan provides 11 years of free basic education up till grade X after which students may complete their general education in classes XI and XII or they may join vocational training institutes and enter the job market. At the tertiary level, students may enroll for a degree or a diploma in an institute under the Royal University of Bhutan.

Bhutan has recently achieved its long time goal of Universal Primary Education. The gross enrollment ratio in primary education was about 115% in 2009. The overall survival rate in grades V and X has shown a marked increase from 2006 to 2009, with the average rate of survival at grade V being 93.6% in 2009 and for grade X, 77.6%. Further, more girls were likely to advance to grades 5 and 10 than boys. Nevertheless, Bhutan needs to continue improving quality of primary education, raise learning and test scores of pupils, and achieve full gender equality in primary education.

From 2002 to 2006, students attending secondary schools increased by 37%. A similar increase in numbers is expected from 2007 to 2012. The rapid growth of the education system presents several challenges:

- **Training of teachers:** Urban schools are generally overcrowded with 45 students per class while the rural schools suffer from a shortage of teachers.
- **Inadequate resources** for achieving universal primary education and for expanding secondary education.
- **Weak institutional capacity** at the central, district, and school levels to effectively manage growth of primary and secondary education systems.

Some of the key education indicators are given as follows:

Table 12: Education Parameters - Bhutan

Parameter		Value	Year
Adult literacy rate	Male	60	2000–2007
	Female	34	2000–2007
Youth literacy rate	Male	83	2000–2007
	Female	73	2000–2007
Gross enrollment ratio (%): Primary education	Male	103	2000–2007
	Female	101	2000–2007
Gross enrollment ratio (%): Secondary education	Male	51	2000–2007
	Female	46	2000–2007
Expenditure on education (% of GDP)		7	2003–2006

Source: www.unicef.org; www.cia.gov

According to the Asia-Pacific Development Information Program (APDIP, ICT Profile Bhutan), Internet and television were first introduced in 1999 in Bhutan. Bhutan Telecom has reduced telecommunications rates by almost 50% within two years. Internet charges have been reduced from \$30 for 15 hours of Internet time to \$18 since June 1999.

Some of the key ICT indicators are given as follows:

Table 13: ICT Indicators - Bhutan

ICT parameters	Value	Year
Internet users (per 100)	5.8	2008
Internet subscribers (per 100)	0.87	2008
Broadband subscribers (per 100)	0.3	2008
Mobile coverage (%)	21	2007
Mobile subscribers (per 100)	22.1	2007
Personal computers (per 100)	0.6	2006–2007
Internet affordability (US \$/month)	15.1	2007
Mobile affordability (US\$/month)	3.9	2007
Radio subscribers (per 1000)	16.5	
Households with TV (%)	57.7	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

4.2. Policy Framework and Delivery Mechanism

The MoE is responsible for policy planning, curriculum development, and administration of basic, higher secondary, tertiary as well as continuing and non-formal education in the country. The government of Bhutan recognizes the opportunity offered by ICTs for improving access and quality of education provided, given Bhutan's rapidly expanding education sector as well as its difficult geographical terrain. Further knowledge of ICTs is seen as crucial to integrate Bhutan into the global knowledge society, a process it has carefully embarked upon after years of isolation. The 26th Education Policy Guidelines & Instructions (EPGI-2007) state the aim of the Government to

make all those who complete basic education (i.e., class X) IT literate. To that end since April 2007, Bhutan Telecom has made all dial up Internet packages to schools free of cost. Therefore, all schools with computer and Internet facilities are urged to introduce relevant IT programmes for students and encourage the use of computers and Internet for learning especially after school hours and during the weekends, when the facilities are often underutilized and students have ample time to practise and learn. Along this line, the Curriculum and Professional Support Services Division (CAPSD) has developed a standard IT literacy framework, which schools are urged to use to initiate and carry out IT literacy programmes.

The Ministry of Information and Communications of Bhutan was established in 2003, followed closely by the initiation of an ICT policy process. Informed by Bhutan's Vision 2020 strategy paper, the development of the Bhutan Information and Communications Technology Policy and Strategies (BIPS) involved multiple stakeholders from government, semi-government, and private sectors.

The strategy focuses on the need to ensure awareness of ICT and the development of appropriate ICT skills at all levels to provide a boost to the domestic ICT industry. Steps to achieve this goal include the prioritization of ICT skills in recruitment for the public and private sector; the establishment of an ICT "Center of Excellence" through which partnerships with educational and international institutions will be formed and research and development carried out; the expansion of ICT institutes and training opportunities to all regions; the integration of ICT into basic education; and the implementation of a national awareness-raising campaign of the benefits of ICT.

BIPS 2004 (updated in 2009) highlights the need to create appropriate curriculum for ICT as a subject based on market needs, as well as curriculum for general ICT Literacy and competency for all school students. The strategies described in the BIPS pertaining to education are as follows:

- Develop a plan for a countrywide connectivity to ICT infrastructure, including schools, Geog centers and villages
- Identify educational partners in Center of Excellence
- Identify and establish linkages with international institutions
- Create curriculum for skills required in the market
- Ensure infrastructure for middle and high schools
- Develop an adequate ICT literacy curriculum for schools
- Establish e-learning nodes in all kiosks and telecentres
- Share educational resources throughout Bhutan

4.3. Initiatives

The MoE along with international donor agencies and other development partners is undertaking many initiatives to improve the quality of education, using new teaching methods, introducing technology in teaching/learning and so on. Some of the major initiatives using ICT applications for education are outlined as follows:

Radio Browsing Programme

Bhutan's tough terrain is a major challenge for communication. Radio in Bhutan reaches 90% of the population and thus proves to be an outstanding medium of education and awareness. Furthermore, low literacy rates and low electric grid coverage add to the effectiveness of radio as a mode of communication in the country. Bhutan Broadcasting Services is the national public service broadcaster providing radio and television services across the kingdom. The main objective of Bhutan Broadcasting System is to inform, educate, and entertain the citizen of Bhutan. Its FM radio covers all 20 Dzongkhags.

In 1997, the MoE launched a weekly radio programme called "Education calling Teachers" through which they aimed to spread awareness regarding new and innovative teaching techniques to teachers. The program also shared information regarding the MoE such as policy framework and guidelines set by them. However, in 2007, the programme was taken off air as a convenient time slot was not available.

In 2000, UNESCO suggested the idea of Radio Browsing where listeners ask experts to surf the Internet on their behalf and transmit information in response to their requests.

National Digital Library of Bhutan

Currently, a number of cultural agencies have begun to harness ICTs to assist in the preservation and promotion of culture, by building databases of cultural artifacts, or using digital video to record village rituals. However, these efforts are general disparate, un-coordinated and have limited outside access, which restricts their ability to promote Bhutanese culture.

The Bhutan Digital Library will assist in the coordination of these efforts, and enable Bhutanese individuals and communities to represent their traditions and perspectives domestically and internationally. This project aims to help arrange many of the existing cultural materials, as well as to document some of the aspects of Bhutanese life and traditions, which are not available at the moment, and allow people to access it from anywhere in Bhutan and throughout the world.

Bhutan "Support for Teacher Education" Project

In Bhutan, the two teacher education institutes, Paro College of Education and Samste College of Education, did not have the potential to teach computer skills to all trainees. The Singapore International Foundation provided assistance in developing an ICT-enhanced curriculum for teachers. The first phase was to equip all teachers with ICT skills and to help them prepare instructional materials. The second phase was to develop and launch a new selective ICT subject within the Bachelor of Education programme. The project aimed at encouraging teachers to move away from conventional teaching methods and adopt ICT in the teaching learning process.

ICTization of Schools

A 100 community primary schools were provided with two computers and a printer each, with free Internet facilities for a year where feasible. One teacher in each of these schools was trained in basic computing skills. This has helped in creating awareness among the primary schools especially in the rural areas.

Local Content Development and Dzongkha Localization

Local content development has been highlighted as one of the significant requirements for integrating the use of ICTs in Education in Bhutan. In this regard, the Department of Information Technology has initiated the Dzongkha Localization Project. Under this project, a beta version of Dzongkha Linux was released in 2006, through which local citizens can carry out simple desktop tasks and use word processing, spreadsheets, and PowerPoint in Dzongkha.

The OLPC Project

The One Laptop per Child (OLPC) project was recently launched in Bhutan in a pilot location with about 50 XO laptops being provided to students of Kuzhungchen community primary school in Kabjisa near Thimphu and 220 XO laptops to students of the remaining 24 community primary schools spread across the country. The XO laptop would be a useful tool to provide access to students in remote rural areas to the vast library of global information on the Internet, thereby empowering them for their own education by making learning an interactive and fun experience. The laptop has applications on animations, mathematics, language, word processing, and so on, that will enable students to learn concepts in a meaningful way. The project has been identified as a priority by the communications department and will target only rural community primary schools.

Several key constraints have been identified in the scaling up of this initiative such as high cost of funding, lack of reliable Internet in most locations, lack of electricity, and so on. However, the Bhutanese government with the support of donors like the telecommunications union and UNICEF is hopeful of making the project financially viable and a success.

Education Development Project

Under the Education Development Project, the World Bank lends financial support to the MoE in Bhutan to expand access to primary and secondary education and improve educational quality in schools in Bhutan. Funds received through this project are used to construct primary and secondary schools through out Bhutan. In terms of providing infrastructure to enable the integration of ICT in schools, under this project 20 schools were equipped with 20 computers each.

Healing the Divide

Healing the Divide (HTD) is a New York-based Non-Government Organization addressing various social issues in developing economies. In Bhutan, they partnered with the Royal Government of Bhutan to bring technological interventions in the education system. HTD provided teacher training, student training, and maintenance training to build a foundation for ICT-enabled teaching learning. Apart from providing training and ICT equipment in schools, they also enabled a local network between schools to enhance the education system.

Singapore International Foundation

Singapore International Foundation, in collaboration with the MoE and Royal University of Bhutan, initiated the Bhutan W.I.R.E.D (Weaving InfoTech Resources in Education) to ensure IT employment in Bhutan's education system. The three year project (2008–11) will also initiate four higher secondary schools and one lower secondary school. These schools will provide an

opportunity for teachers to become ICT literate and to learn how to infuse ICT to enhance their lessons on various subjects. Teachers will also be encouraged to transfer their knowledge to their colleagues.

Chiphen Riggel

The government of India has granted financial assistance to the Royal Government of Bhutan to implement the “Chiphen Riggel” (broadly meaning “empowering society, enabling a nation”) project. This project (initially called the Total Solutions Project) was initiated in 2010 and would be implemented over a period of five years in collaboration with Department of Information Technology and Telecom (DITT), Ministry of Information and Communications, and NIIT India. The education component of the project is highlighted as follows:

- Implement teacher training programs to cover 5,000 teachers across Bhutan
- Equip all schools under IT @ Schools with software and educational material
- Provide Computer Aided education services for effective student training
- Establish seven training centers, two colleges of education and five higher secondary schools to spread IT Literacy within the Kingdom of Bhutan

Furthermore, the project also aims to facilitate the implementation of 261 learning stations and community information centers.

4.4. Constraints

Bhutan has come a long way since the time that the ‘modern’ education system was introduced in the country. In order to further increase access to education and improve the quality of education Bhutan can leverage the use of ICT in their education system. While efforts have been made in this regard by donor agencies, NGOs and the government, certain constraining factors limit its usage. Some of these factors are discussed below:

High Capital Investment: Due to the rugged geographical terrain and dispersed settlement pattern, rolling out ICT to serve the entire population requires high capital investment. Furthermore since the country is landlocked, installation of ICT becomes an extremely expensive undertaking.

Lack of ICT Professionals: Since there is a lack of ICT professionals, limited local content is available. If efforts are made to increase the pool of ICT skilled manpower, professionals will be available to create appropriate applications and content in the local language.

Low ICT Literacy: Due to slow proliferation of ICT into institutions, schools and communities, most citizens do not have access to computers and other ICT facilities and therefore are not ICT literate.

4.5. Insights

Bhutan is a late starter in the communications space, with the earliest efforts at introducing TV or other forms of information and communications technologies, dating back to only early 1999-2000. It is therefore positioned to reap the advantages of a late starter in the technology space by not having any legacy systems, having manageable amounts of data, access to relatively more cost effective technologies and opportunities for adoption of new (and open) standards. In addition, Bhutan is characterized by a unique environment for development of an ICT-based society by way of a stable and vibrant government; small population; widespread knowledge of English; good telecom network in much of the urban areas; and the Government's commitment to adopting ICT as a development tool.

Lack of funds for significant ICT adoption in schools is cited as a significant problem. Funds need to be generated to provide ICT facilities to schools at all levels. Private sector participation in the information, communications space has become prominent and will continue to grow in the tenth year plan as the government gradually withdraws from service provisioning to focus on policy and regulatory roles. Public-private partnerships have been successfully implemented and such collaborations will continue in the near future.

Of the 512 total schools and institutions in Bhutan, high speed leased line internet access is available in about 100 Secondary and Higher Secondary schools. Further Bhutan Telecom the national Service Provider provides an educational concession to schools for establishing connectivity. Given that the number of institutions to be covered are small in number, a focus on providing adequate ICT infrastructure to all schools should be prioritized.

4.6. Select Bibliography

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- “PAN Asia Networking Prospectus 2006-2011” ,2006 , International Development Research Centre www.idrc.ca/uploads/user-S/12047394031prospectus_final.pdf
- National report on the development of education: www.ibe.unesco.org/International/ICE47/English/Natreps/reports/bhutan.pdf
- Singapore International Foundation – support for teacher education project: [www.unescobkk.org/fileadmin/user_upload/ict/e-books/Teacher Education Case Studies/Bhutan Support for Teacher Education Project.pdf](http://www.unescobkk.org/fileadmin/user_upload/ict/e-books/Teacher_Education_Case_Studies/Bhutan_Support_for_Teacher_Education_Project.pdf)

Links to Initiatives

Government Links

- The ‘Chiphpen Rigpel’ project: www.bhutan.gov.bt/government/newsDetail.php?id=1627

Private Companies

- Microsoft – Unlimited Potential E-centres: www.bhutanstudies.org.bt/admin/pubFiles/M-10.pdf

Non Government Organizations

- Singapore International Foundation: www.sif.org.sg/
- Healing the Divide (HTD): www.healingthedivide.org/

Other Important Links

- Bhutan Broadcasting Service: www.bbs.com.bt/
- Bhutan Digital Library: www.library.gov.bt/
- One Laptop per Child, Bhutan: wiki.laptop.org/go/OLPC_Bhutan
- UNESCO – radio browsing: www.unescobkk.org/education/ict/themes/non-formal-education/regional-and-country-examples/bhutan/

5. Maldives

The Republic of Maldives is formed by two chains of 26 atolls in the Indian Ocean. The largest city and the administrative division of Maldives is in the city of Malé. Maldives has several geographically distinguishing features compared to the other countries in the region; it is the smallest Asian country both in terms of population and area, further with an average ground level of 1.5 meters from sea, Maldives is the lowest lying country in the world.

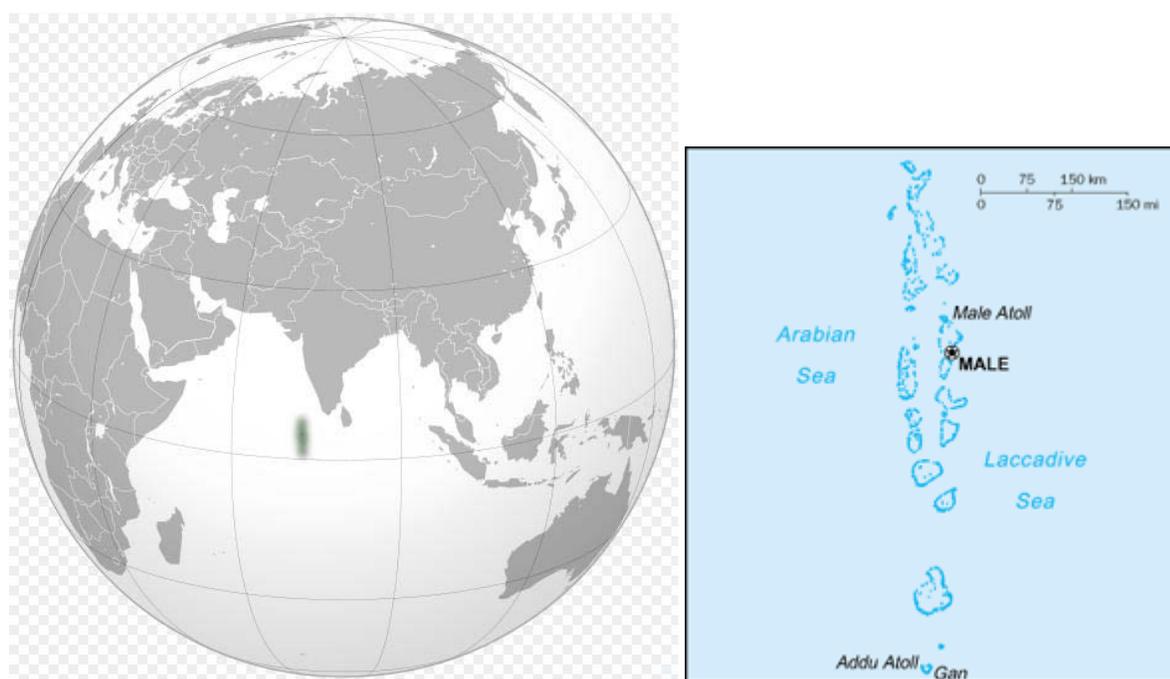


Figure 6: Map of Maldives

Source: www.wikipedia.org; www.cia.gov

The government of Maldives began the process of economic reform in 1989 by opening up the economy. Tourism is the largest industry in Maldives accounting for almost 28% of the GDP; fishing is the second largest industry. Agriculture and manufacturing have a lesser role in the economy of the country.

Some of the key demographic and economic indicators are given as follows:

Table 14: Key Demographic and Economic Indicators - Maldives

Parameter	Value	Year
Population	306,000	2007
Gross domestic growth (million US \$)	1,055	2007
GDP per capita (US \$)	3453.7	2007
Human development index ranking	95/182	2009
Population below poverty line	21%	2004

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

5.1. Background

The MoE is responsible for the overall administration of the education system in Maldives. There are a total of about 230 schools run primarily by the government, offering education at primary, secondary, and higher secondary levels. The MoE recognizes the opportunity provided by ICT in the education sector and to that end has initiated several schemes including making available one laptop for every teacher. Further, the Ministry has a distinct IT Services division under it which is responsible for planning and managing effective use of ICT, creating adequate ICT infrastructure, providing technical support for developing EMIS, and other applications across the sector and also maintaining the MoE Web site.

The Ministry of Civil Aviation and Communication is responsible for pacing up the process of integrating ICT into education. It has worked toward establishing community-based telecentres in every inhabited island to help bridge the digital divide, to facilitate e-government, and empower the islanders to take the opportunities available through ICT connectivity.

Some of the key education indicators are given as follows:

Table 15: Education Parameters - Maldives

Education parameter		Value	Year
Adult literacy rate	Male	97.1	2000–2007
	Female	97.3	2000–2007
Youth literacy rate	Male	98	2000–2007
	Female	98	2000–2007
Gross enrollment ratio (%): Primary education	Male	118	2000–2007
	Female	114	2000–2007
Gross enrollment ratio (%): Secondary education	Male	80	2000–2007
	Female	86	2000–2007
Expenditure on education (% of GDP)		8	2003–2006

Source: www.unicef.org; www.cia.gov

Since 2001, both the government and the private sector in Maldives have exerted significant efforts to develop the ICT sector and to strengthen related institutions in order to modernize the country. The government of Maldives adopted an accelerated ICT development policy when it launched its first Telecommunications Policy in 2001.

There is considerable inequality in terms of access to ICT appliances and connectivity in Maldives. There is a problem of connectivity between islanders because of the distance between the islands. Most islands are economically dependent on the capital, Male', and people must travel by boat for many hours to get there. Traveling from different parts to fetch the ICT services is an expensive undertaking. Further, as there is less travel between islands, local trade and small businesses have little information about the available resources, products, services, and needs in other atolls and islands. Telephone calls between the islands are expensive. Internet connectivity is not readily available in the islands and even in Male' Internet prices can reach up to US\$ 3 an hour.

Some of the key ICT indicators for the country are given as follows:

Table 16: ICT Parameters - Maldives

ICT parameters	Value	Year
Internet users (per 100)	23.5	2008
Internet subscribers (per 100)	5.86	2008
Broadband subscribers (per 100)	5.15	2008
Mobile coverage (%)	103	2007
Mobile subscribers (per 100)	103	2007
Personal computers (per 100)	20.08	2006–2007
Internet affordability (US \$/month)	51	2007
Mobile affordability (US\$/month)	4	2007
Radio subscribers (per 1000)	100	
Households with TV (%)	92	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

5.2. Policy Framework and Delivery Mechanism

Maldives has achieved more than 80% penetration in terms of telephone and Internet penetration; this figure is relatively high compared to other South Asian countries. It is also among the top ten economies that have gained most (114%) in value on the “ICT access sub index” between 2002 and 2007 (International Telecommunication Union). This upward trend in ICT penetration can be attributed to the fact that the Government of Maldives appreciates and considers ICT a pivotal factor for a developing economy. An entire section in the Seventh National Development Plan by the Ministry of Planning and National Development is dedicated to expanding current ICT levels. Some of the key ICT policies pertaining to education in the Seventh National Development Plan are given below:

Access to Computers for All Students: To overcome “technophobia” among the children of Maldives, computers are made easily available to them in schools where they can use the computers to communicate with other students and teachers, gather information through the World Wide Web and conduct research for other courses taught at school.

Larger Pool of ICT Professionals: The government envisages a need to develop adequate human resources to match the market demand for ICT. Capacity building is given importance in this regard.

The Government of Maldives recently released the Strategic Action Plan (2009-2013) which also focuses on strengthening the ICT industry. To that extent it articulates policies and plans required to expand the ICT infrastructure and ensure affordability of ICT services to all citizens.

5.3. Initiatives

The Government of Maldives has taken several initiatives to expand the current level of ICT access and awareness. Outlined in the following are some of the key initiatives related to the use of ICT in education.

Teacher Resource Center

Transport cost in Maldives is high; therefore, for children who do not have access to quality schools in their island, receiving quality education becomes expensive. Apart from students, teachers also find it difficult to travel to other islands to upgrade their skills; nearly 80% of teacher training costs are transport related. In response to this constraint, the MoE, Dhiraagu (National Telecom Service Provider), and UNICEF established Teacher Resource Centers (TRC) in 20 atolls in Maldives. Each TRC is equipped with modern technology such as “smart board” which is an interactive touch screen replacement for the traditional white board used in schools. The smart board also acts as a screen to enable students in different TRCs to see each other and discuss the curriculum. TRCs also include microwave relay and cable Internet equipment. Teachers can use the TRCs to browse the Internet and develop and download material for their lessons. Through the virtual learning environment developed for the Educational Development Centre by Cambridge International Examinations, up to 400 teachers can undergo training and interact with one another. The capital investment of this initiative was approximately \$ 3.5 million.

Electrical costs have soared in the Maldives in the wake of global fuel price hikes—compounded by the very high cost of fuel transportation to remote islands in the archipelago. We attempted to build photovoltaic renewable energy sources into the design of each TRC but the capital costs proved to be three times more expensive than the equivalent ten year operating costs using conventional diesel powered island power sources. Further innovation in the renewable energy sector should lead to diminished costs and this warrants serious further investigation as the recurrent power costs are a vulnerable element in the sustainability equation.

The choice of microwave relay for Internet services over VSAT link alternatives was made due to the high standard of service back-up offered by the Dhiraagu service provider. Line of site and range issues were carefully considered in the choice and siting of TRC units and relay antennas.

Ken Maskall, Special Advisor Asia-Pacific Shared Service Centre, UNICEF

Multipurpose Community Telecenter

To bridge the digital-divide and empower the islanders to take the opportunities available through ICT connectivity, MTC will be established which will be fully equipped with a variety of ICT services such as telephones, fax, voice mail, Internet, TV, and radio. MTC's could also be used by students to

access ICT services that are not available at school or by professionals who wish to expand their skills using online training programs.

Virtual University for Small States

The MoE has decided to participate in the Virtual University for Small States initiative, the invitation for which was extended by “The Commonwealth of Learning.” The benefit of the Virtual University is that participants would be able to take courses conducted in the universities of the Commonwealth nations through the Internet without paying any fees. Virtual University can help achieve the country’s goal of equitable access to all students, young and continuing adults.

A laptop for every Teacher

The main objective of this scheme is to provide opportunity and support to educate teachers and to instill teaching skills by means of utilizing resources of modern technology. Under this scheme a laptop will be provided to all teachers working as permanent teachers under the civil service, with the condition of paying a monthly charge in order to cover full cost of laptop within a two-year period. In this scheme, 500 laptops are to be provided each year.

Digitally Empowered Development in the Island Communities of Maldives

The purpose of this partnership project between MCST and the United Nations Development Programme (UNDP) is to empower and strengthen island communities by sharing knowledge and information among islands through a community portal. It will provide information about products and services of the islands to a much wider audience by establishing a community portal and Web sites in the local language, Dhivehi, as well as English. The project will give national and international exposure to local businesses, enhance access to markets and create awareness of ICT to improve their social and economical life. The project is an add-on to the National ICT Policy Project.

5.4. Constraints

A number of positive steps have been taken to implement ICT in education, however for further expansion and growth of the economy the government needs to identify and overcome all obstacles that hinder the efficient utilization of ICT in education. Some of the potential constraints are mentioned in the following:

Lack of competent teachers: There is a need to upgrade the skills and competencies of the teachers, only three faculty members have a doctorate qualification and 62% of the teachers have qualifications of either a first degree or less (UNESCO). There is a lack of motivation and technophobia among teachers. Steps will need to be taken to improve their IT and Internet skills before doing the same for students.

Exceptionally Expensive Internet Access: The price basket for Internet service is USD 15 per month which is almost 85% more expensive than other South Asian regions. While schools can

afford to install computers, the high cost of Internet access will discourage them from providing students with Internet facilities. This could be a major constraint in ensuring quality implementation of ICT in schools as computers are only useful for basic tools such as word and worksheets, Internet could help students communicate and share ideas with students in other atolls particularly since transport costs are high.

Income Disparity and Language: Income disparity remains high in Maldives particularly between the capital and distant islands. If equal access to ICT services is not insured, the income gap could widen considerably. Another challenge could be language difficulties since most ICT-related software and contents are in English, even though Maldives has English language in primary and secondary schools, Dhivehi still remains the local language.

5.5. Insights

Maldives is an example of a country which can reap great benefits from ICT implementation particularly because of its geographical make up and the government initiatives. Inhabitants of the many islands and atolls are isolated from one another because of the distance and sea between them and physical travel is an expensive undertaking. ICT expansion can help them to virtually reduce the geographical separation and take advantage of the education and training facilities available in other islands particularly the capital Male’.

ICT expansion has definitely been an integral part of the policy framework in Maldives; significant improvement has been seen in terms of its penetration and usage. Maldives has been able to achieve high literacy rates and has also accomplished its commitments as per the Millennium Development Goal of Universal Primary Education with a 100% enrollment rate in the primary sector. The challenge lies in harnessing ICT in education, particularly in training and motivating teachers to use ICT services. The establishment of Teacher Resource Centers is definitely a positive step toward expanding skills of teachers although more centers need to be established and more courses to be tailored for the capacity building of the trainers.

There is also a need to strengthen the delivery mechanism for policies pertaining to reduction of ICT costs; in this regard efforts will have to be made to introduce competition in the ICT industry. Maldives can gain enormous benefits by focusing on content development and curricular reform for overall improvements in the quality of education since the basic infrastructure is already in place

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www.moe.gov.mv/downloads/aid_to_pre-school.pdf. Male’, Maldives: Ministry of Education
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- “Millennium Development Goals, Maldives Country Report.” 2007.
www.planning.gov.mv/en/content/view/82/34/Male’, Maldives: Ministry of Planning and National Development.
- Multipurpose Community Tele-centres (MCT) Project, Government of Maldives;
www.unescobkk.org/education/ict/themes/non-formal-education/regional-and-country-examples/maldives/
- Guidebook for the establishment of multi-purpose community tele-centres In the Maldives;
www.ncit.gov.mv/downloads/Guidebook.pdf

Links to Initiatives

Government Links

- Educational Development Centre: www.edc.edu.mv/
- Maldives School Statistics 2007: www.moe.gov.mv/statistics/school_statistics_2007.pdf

Schools and Education Institutions

- Maldives College of Higher Education: www.mhce.edu.mv/

Other Important Links

- UNESCO – Teacher Resource Centres:
www.portal.unesco.org/geography/en/files/10906/12353684495Maldives/Maldives
- Maldives Teacher Resource: www.edconline.edu.mv/
- Common Wealth of Learning (COL) – Virtual University for Small States:
www.col.org/progServ/programmes/Pages/VUSSC.aspx
- Education Development Centre – Maldives Teacher Resource: www.edconline.edu.mv/

6. Nepal

Nepal is officially known as the Federal Democratic Republic of Nepal. It is bordered by the People's Republic of China and Republic of India. The capital of the country and the largest metropolitan city in the country is Kathmandu.

Nepal is highly diverse and has a rich geography. The country has eight out of the world's top ten mountains including the Mount Everest.

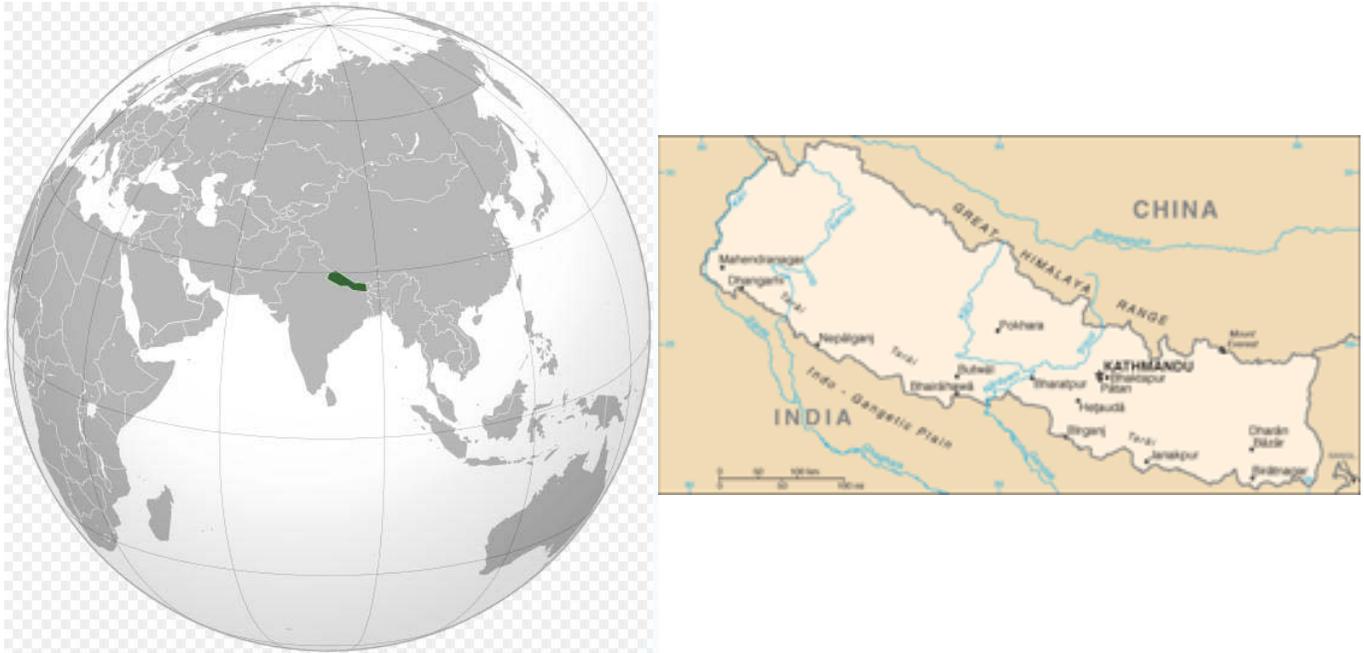


Figure 7: Map of Nepal

Source: www.wikipedia.org; www.cia.gov

Agriculture accounts for around 40% of Nepal's GDP, services comprise 41%, and industry around 22%. Almost 75% of the citizens are employed in agriculture. The spectacular landscape and the diverse culture has been a driving force in the area of tourism in the country.

Some of the key demographic and economic indicators are given as follows:

Table 17: Key Demographic and Economic Indicators - Nepal

Parameter	Value	Year
Population	28,196,000	2007
Gross domestic growth (million US \$)	11,815	2007
GDP per capita (US \$)	419	2007
Human development index ranking	144/182	2009
Population below poverty line	30.90%	2004

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

6.1. Background

The MoE coordinates education activities throughout Nepal and is responsible for educational planning and management, as well as improving service delivery systems across the country. The Department of Secondary Education (which includes the department for primary education) has a goal of building a pool of human resources familiar with the national tradition, culture, and social environment in daily life; aware of scientific issues; creative, cooperative, and industrious; and able to contribute to economic development. To bridge the vast gulf of gender disparity, EFA (Education for All) has formulated policies that will try to eradicate the gender and social discrimination, will work toward the improvement of women's literacy status. Further to this, the Government of Nepal has initiated the Secondary Education Support Programme (SSRP) and the School Sector Reform Programme (SSRP).

SSRP document produced by MoE gives a policy level directive to consolidate grade 1-8 as primary level education and grade 9-12 as secondary level education among other government agendas to improve education system in Nepal. The SSRP document also mentions ICT in education or ICT based education, albeit briefly, but it fails to provide any direction whatsoever on what should be the plan and how the education mechanism should address the issue. Due to lack in policy level directive, sporadic efforts can be seen around the country, primarily in private schools where resources mobilization for such type of education delivery is relatively manageable but has been largely limited to providing students with "computer education" and not education delivery by integrating ICT in daily teaching learning process.

Rabi Karmacharya, Executive Director, Open Learning Exchange, Nepal

There are two types of schools in the country: Community Schools (depend on government grant) and Institutional Schools (organized either as a non-profit trust or as a company). A third type of schools is the schools run by the local people enthusiastic to have a school in their localities. This group does not receive regular government grants and most of them do not have any other sustainable financial source. The public and local schools lack the basic infrastructure to sustain ICT-based educational facilities. But the private institutions can boast of meaningful incorporation of computer courses in their curriculum. The education structure includes Primary, Lower Secondary, Secondary and Higher Secondary and Tertiary education. Primary schooling is for five years (grades 1-5). Lower secondary includes grades 6-8. Grades 9 and 10 are attached to secondary. Higher secondary education comprises grades 11 and 12 as extension of the school education.

The net enrollment of rate of students has reached 87.4%. The participation of girls has increased significantly during the tenth year plan. Although there has been increase in the number of students enrolled for primary education, there are nearly 12.6% of children in the relevant age group still deprived of primary education. The main constraints faced by the MoE in the development of education are the lack of basic infrastructure, supply of teachers, wide disparity between community, and private school passing rates.

Some of the key education indicators are as follows:

Table 18: Education Indicators - Nepal

Education parameter		Value	Year
Adult literacy rate	Male	62.7	2000–2007
	Female	27.6	2000–2007
Youth literacy rate	Male	85	2000–2007
	Female	73	2000–2007
Gross enrollment ratio (%): Primary education	Male	129	2000–2007
	Female	123	2000–2007
Gross enrollment ratio (%): Secondary education	Male	46	2000–2007
	Female	41	2000–2007
Expenditure on education (% of GDP)		3.4	2003–2006

Source: www.unicef.org; www.cia.gov

The vast digital and quality divide is a matter of concern for the policy-makers. In order to achieve a synchronized growth, it is important to implement ICT-based education at every stratum. The telecommunications infrastructure is good in urban areas, and because it has been installed recently, it is mostly digital. Though the use of ICTs in public administration and government is limited, its potential for driving development and economic growth has prompted the Ministry of Science and Technology to include strategies in its ICT policy of 2000 to further develop its use in the public sector.

The liberalization of the telecom sector has paced up economic growth as well as expedited improvement in the ICT services. There are currently 39 licensed ISPs, of which 32 are operating in the Kathmandu valley.

Some of the key ICT indicators are given as follows:

Table 19: ICT Indicators - Nepal

ICT parameters	Value	Year
Internet users (per 100)	1.4	2008
Internet subscribers (per 100)	0.28	2008
Broadband subscribers (per 100)	0.04	2008
Mobile coverage (%)	10	2007
Mobile subscribers (per 100)	11.6	2007
Personal computers (per 100)	0.49	2006–2007
Internet affordability (US \$/month)	8	2007
Mobile affordability (US\$/month)	2.1	2007
Radio subscribers (per 1000)	30.3	
Households with TV (%)	13.1	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

6.2. Policy Framework and Delivery Mechanism

The Information Technology Policy of Nepal, 2000, aims to build a knowledge-based society. It has been framed with an objective of making ICTs accessible to the general public and to provide employment in the ICT sector. Specific strategies are framed keeping in mind the objective of establishing a knowledge-based society and keeping the education sector abreast with the newest technology. Some of the strategy articulations are as under:

- Computer education to be incorporated in the academic curriculum, restructuring the course and education structure
- Accord high priority to research, development and extension of IT with participation of private sectors
- ICT to be spread to the rural areas
- Availability and accessibility of ICT education to be enhanced

Up-skilling of a large section of the population and bringing out measures of capacity building is a prime concern for the policy-makers.

- Incentives should be provided to poor and meritorious students from rural areas to pursue higher education in IT
- Computer education for all by 2010 is the present catchword
- Public secondary schools will have computer education as an optional subject
- Computer knowledge will be made compulsory for teachers as part of pre-service and in-service training

A High Level Commission for Information Technology (HLCIT) was formed under the chairmanship of the Prime Minister of Nepal in 2003 with an objective of providing strategic direction and guidance to the policy framing bodies of the Government. This body had been responsible for analyzing the feedback and success of the implemented policies.

The government is working toward crystallizing strategies and policies that provide enough opportunities for the private sector to participate. With the healthy intervention of the private sector, there would be provision for better infrastructural facilities. The private sector investment would also help in bridging the vast digital gulf in the rural and urban areas.

Nepal is behind its regional neighbors in spending on education, IT education specially. The policy addresses this issue and also emphasizes distance learning. The set up for distance learning is created in a scientific way, keeping in mind the various pedagogical models. The coursewares are created in order to suit the delivery method of virtual classroom training. The government had been working toward inventing models specific to ICT education in collaboration with various international organizations. The media had played an important role in popularizing such initiatives. The course contents are localized for the consumption of a larger population.

6.3. Initiatives

Various initiatives have been taken and formulated to successfully enable ICT in the education machinery of the country. Some of those are:

- Private sector is encouraged to produce middle-level manpower in the IT sector and also toward research and development.
- Institutions offering graduate and postgraduate courses of international standard on computer science and computer engineering will be encouraged and supported

Radio Sagarmatha

This is South-Asia's first community radio. A radio-browse model, it broadcasts internet over the radio. People in villages are explained the benefits of ICT. Many website owners and people from all walks of life were interviewed and their experiences with Information Technology were broadcasted. **The School on air a project** was a major initiative targeting the children in government schools (classes IX and X) to help them prepare for their examinations. It also broadcasted specialized episodes to guide and counsel school teachers. The **Radio Teaching Program** is another educational programme. Promotional events are undertaken to create awareness among the masses about the radio teaching programs.

Open Learning Exchange:

Open Learning Exchange (OLE) is a nonprofit organization, dedicated to improving the quality and access to the public education system in Nepal by developing freely accessible, open-source ICT-based educational teaching-learning materials that are available free of cost to all students in the system. The OLE Nepal's approach to OLPC is unique in that distribution of laptops is considered only one aspect of their approach, and there is equal emphasis on creating relevant local and English language content for students; training and supporting teachers to allow them to own the initiative, and providing a networked environment where schools are interconnected through an intranet and subsequently also internet. To this end OLE has undertaken different initiatives in Nepal, some of these are outlined as follows:

OLPC Pilot: The OLE Nepal launched a two phase pilot for the One Laptop per Child initiative in April 2008. With the completion of the second phase around 4,400 laptops are available in 26 schools in 6 districts in Nepal. By May 2010 the initiative would have expanded to 38 schools in 8 districts. The OLE Nepal implemented this initiative in the districts with the help of government officials and other partner organizations. OLE is also engaged in conducting detailed impact analysis studies comparing student achievements in OLPC schools and control schools, and it is expected that on completion of this phase the project might be scaled up across the country in a phased manner. One of the most critical aspects of OLPC initiative is Teacher's Training. When the laptops are provided to the schools, the teachers are provided with a training programme for a period of 11 days. For the first 7 days, the teachers are brought together at a residential campus and are trained on aspects of technology and pedagogy. The next 4 days, they are made to take real

classes in the schools under the guidance of the supervisor where they apply the methods learnt in the trainings.

E-Paath and E Pustakalaya: OLE Nepal is engaged in creating content at two levels. The E Paath consists of interactive learning modules, mapped to the topics in the curriculum as prescribed by the Curriculum Development Centre (CDC). A six member team consisting of subject matter experts from the CDC work closely with the OLE Nepal developers to create these interactive learning activities. This software, which includes multimedia elements such as text, audio, video, and animations, is then used by teachers and students to understand concepts as prescribed in the curriculum. The content contains lessons, exercises, as well as assessment tools to enable teachers to teach and evaluate students.

E- Pustakalaya is an electronic library which is a repository of reference material for the students, consisting of full text documents, images audio, video clips and software that are relevant for students. E Pustakalaya deploys a user interface that allows children to navigate, search and link different documents including reference materials, course related content, magazine and newspaper content etc. Students can download the content as well as read it online. Each of the schools in the OLPC pilot have a copy of the e Pustakalaya hosted on their servers, allowing students and teachers at the pilot schools to access the material through their school network. The repository is also accessible on the Internet to other users at <http://www.pustakalaya.org>.

Content creation in the E-Pustakalaya is an ongoing activity and OLE Nepal has collaborated with several national and international organizations to source materials, these include Room to Read, Rato Bangala Foundation, Madan Puraskar Library, Save the Children, World Education, E-Learning for Kids, and Azim Premji Foundation. OLE Nepal continues to work with other organizations to supplement this database.

Network and Infrastructure Building: The OLE Nepal aims to interconnect all schools to each other and to repositories through an intranet and eventually also provide Internet connectivity. To that end at present all schools in the OLPC pilot are connected through an intranet to each other and the OLE Nepal central server in Kathmandu. Internet connectivity is also made available wherever possible through service providers. In each school a server is provided, with copies of the E-Pustakalaya and E-Paath, and each school server in turn is connected to access points in each classroom with network cable. This allows students to wirelessly access content from the server in their classrooms. OLE Nepal also provided support to enable schools to set up this network and the wiring.

OLE Nepal is committed to strengthening the government's capacity to implement ICT-enabled learning in all schools and to make this sustainable at the school level. To that end it undertakes capacity building and training activities for all players in the system including government officials and teachers. OLE Nepal has been providing capacity building support through teacher training and Training of Trainers (ToT) packages for National Center for Education Development (NCED) and the Curriculum Development Center (CDC). In addition, an OLPC lab has been set up in the

Department of Education, which replicates the network/server infrastructure at the pilot schools, allowing the government officials to gain expertise in the operation of the network.

ICT Project 2000

The ICT Project 2000 was initiated to bridge the digital divide by providing computer, connection and training to schools. Under this project, participating schools are provided with five to ten computers with internet access and one teacher from each school is trained on using the computer and the software installed. The school then offers free computer and IT training to its student during schools hours and is open to the community during non-school hours.

Rural Information Centers

The government and various international organizations are collaborating in deployment of ICT for rural development through the establishment of rural telecentres. Its one of the focus area is providing useful information for pro-poor development. These telecentres would provide information on distance learning, telemedicine and agriculture information.

Rural Information Gateway

A Rural Information Gateway for Internet users in rural Nepal is also being set up as a portal that provides information primarily in Nepali to rural users on key issues including health, education and agriculture. It would also provide mapping of existing telecentres with their profiles, along with general resources for setting up telecentres. The portal recognizes that since significant number of telecentres have shut down, a portal that provides information on best practices and different models for setting up telecentres might prove useful in reviving the concept.

Teacher Education project

ADB funded the project aimed at assisting the government to improve the quality and efficiency in basic education through better-qualified teachers. Nine primary teacher training institutes were provided with multimedia resource centers. To complement the usual teaching training material, the study provided a laptop and digital video recorder each to mobile teams. The mobile training team provided standard teacher training and also utilized video equipment and laptops in ways that suited needs of trainees. The evaluation suggested that video learning was a good way to improve quality of teacher.

6.4. Constraints

The use of ICT in development of Nepal is crucial. But there are a number of challenges that hinder the path of IT growth in the country.

Geographical Terrain: Given the difficult geographical terrain setting up ICT infrastructure is a considerable technical and financial challenge

Lack of IT Professionals: There is a lack of IT professionals and qualified teachers, who are trained in ICT-based instruction and learning.

Budgetary Constraints: A large portion of the population lives below poverty line. Thus, poverty alleviation becomes government's priority. There is inadequate allocation of budget in innovation and sharing of IT.

6.5. Insights

Nepal has gained considerable experience in community broadcasting, enhanced by the use of ICTs. This experience may be leveraged so that convergent technologies can become the way forward in integrating ICTs at all levels.

As far as Internet connectivity is concerned, instead of proceeding with traditional ways of building line-of-sight and terrestrial systems and high-cost media infrastructure, a combination of wireless and satellite-based telecommunications with low-cost Very Small Aperture Terminal (VSAT) apparatus for downlink of data and images could be more effective in Nepal. Nepal Telecom (NT) has been expanding its ADSL service to more and more districts, and the rate charged by NT for connectivity is significantly lower than most other services for broadband connection. This has the potential to greatly improve connectivity especially in rural areas since NT already has nationwide infrastructure in place.

If Nepal is to gear towards introducing ICT-based education delivery system in its classrooms, a clear and distinct comprehensive policy will be needed on what the education mechanism intends to achieve along with timeline and milestones. Various sporadic efforts by different state and non state actors to introduce different modules of ICT-based education and ICT education needs to be documented and studied to see what indigenously works best for Nepal.

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Links to Initiatives

Government Links

- National Centre for Educational Development: www.nced.gov.np/
- Curriculum Development Centre: www.moescdc.gov.np/intro2.php
- Non Formal Education Centre: www.nfec.gov.np/
- National Information Technology Centre: <http://nitc.gov.np/>
- Nepal Telecommunications Authority: www.nta.gov.np/en/index.php
- Radio Broadcasting Development Authority: www.radionepal.org

Non Government Organizations

- Open Learning Exchange (OLE), Nepal: www.olenepal.org/

Other Important Links

- Radio Sagarmatha: www.radiosagarmatha.org/
- Nepal Wireless Networking Project: www.nepalwireless.net/
- E-Pustakalaya: www.pustakalaya.org
- Computer Association of Nepal: www.can.org.np/

7. Pakistan

Pakistan is officially known as the Islamic Republic of Pakistan. It has a coastline with the Arabic Sea and is bordered by Afghanistan, Iran, India, and China.



Figure 8: Map of Pakistan

Source: www.wikipedia.org; www.cia.gov

Pakistan had a steady GDP growth rate of about 7% for several years until the mid 2000s; however, with the recent downturn in the economy it has dropped to 4.7% in 2008. The economic structure of Pakistan has changed from an agriculture-based economy to a strong service-based economy. Agriculture now accounts for roughly 20% of the GDP, whereas service sector accounts for 53% of the GDP.

Some of the key demographic and economic indicators are given as follows:

Table 20: Key Demographic and Economic Indicators - Pakistan

Parameter	Value	Year
Population	163,902,000	2007
Gross domestic growth (million US \$)	163,290	2007
GDP per capita (US \$)	996.3	2007
Human development index ranking	141/182	2009
Population below poverty line	24%	2005

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

7.1. Background

Pakistan follows a decentralized system of education administration with all academic institutions being under the purview of respective provincial administrations while the Federal government has the responsibility of developing the overall policy framework, curriculum, accreditation, and financial support for select research activities. Education reform has been high on the government's agenda and the review process for the National Education Policy 1998–2010 was initiated in 2005, with the setting up of the policy review team to undertake the revision exercise. The new Education Policy 2009 is a culmination of that process. The policy recognizes several key constraints in the current education system including weak governance of the system, low resource commitment, and the lack of a uniform national education system resulting in uneven quality and parallel systems of education that are not available equally to all strata of society. The policy also stresses the importance of leveraging ICT to improve quality and access at all levels. Pakistan is one of the few countries in the South Asian region to formulate a specific National ICT Strategy for Education in 2005, which will be discussed in detail in the next section

However, educational attainments are low with an adult literacy rate of only 54% (female literacy at 40%), and schools plagued with problems of weak infrastructure, geographical disparity, and uneven quality resulting in a high incidence of dropouts at all levels, with only 2.9% of the relevant age group entering the University system. Some of the key education indicators for the country are given as follows:

Table 21: Education Parameters - Pakistan

Education parameter		Value	Year
Adult literacy rate	Male	63	2000–2007
	Female	36	2000–2007
Youth literacy rate	Male	80	2000–2007
	Female	60	2000–2007
Gross enrollment ratio (%): Primary education	Male	94	2000–2007
	Female	74	2000–2007
Gross enrollment ratio (%): Secondary education	Male	34	2000–2007
	Female	26	2000–2007
Expenditure on education (% of GDP)		2.6	2003–2006

Source: UNICEF, www.unicef.org; CIA Fact book www.cia.gov

Pakistan like other developing countries in the region has witnessed significant growth in the ICT sector. ICT is seen as a key potential driver of socioeconomic development, wealth generation and redistribution, and creation of new jobs. A separate Ministry of Information Technology was created in November 2002, with the aim of building Pakistan's information technology competency in the 21st century. Previously, all IT- and telecom-related issues were the responsibility of the Information Technology and Telecommunications division under the Ministry of Science & Technology. The major objectives of the Ministry of IT are to enable transformation to Electronic Government, provide impetus for the development of a Software Industry, build a state-of-art

Infrastructure and develop, a high qualitative pool of Human Resource. Some of the key ICT-related indicators for the country are as follows:

Table 22: ICT Indicators - Pakistan

ICT parameters	Value	Year
Internet users (per 100)	10.4	2008
Internet subscribers (per 100)	2.09	2008
Broadband subscribers (per 100)	0.09	2008
Mobile coverage (%)	90	2007
Mobile subscribers (per 100)	38.7	2007
Personal computers (per 100)	0.46	2006–2007
Internet affordability (US \$/month)	9.4	2007
Mobile affordability (US\$/month)	2.4	2007
Radio subscribers (per 1000)	83.1	
Households with TV (%)	46.5	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

7.2. Policy Framework and Delivery Mechanism

With literacy and enrollment rates being low in Pakistan, the government saw the need to adopt a more innovative, scalable, and cost-effective solution in meeting Pakistan's educational goals set out in the National Education Policy. In this regard, the MoE, in collaboration with the Educational Sector Reform Assistance (ESRA) programme by the United States Agency for International Development (USAID), the ministry of Information Technology (MoIT), and the provincial education departments formulated the "National Information and Communications Technology (NICTE) Strategy for Education in Pakistan." The elements/policies outlined in the NICTE strategy and its action recommendations are given in the following:

Use ICT to Extend the Reach of Educational Opportunities

The government proposes to use ICT where educational opportunities are limited due to geophysical problems, lack of schools, Context-Based Differences (children with special needs), and other differences such as gender, age, financial status, and so on. The following approaches are proposed

- Enhance ODL by equipping community centers with televisions and computers having Internet facilities.
- Establish viewing centers with televisions where they are otherwise not widely available and combine the hardware with ODL approaches to ensure that educational programmes are available in remote areas in the form of video-based training.
- Use Interactive Radio Instruction (IRI), which combines radio broadcasts with active learning techniques for students where qualified teachers are not available. IRI can also be used to aid teachers practice interactive and innovative techniques in classrooms.

- Computer-Assisted Instruction (CAI): Offer computer-based training either in ODL format or locally, via standalone applications. CAI can be used to allow teachers and students to network and learn from peers in different geographic locations.
- Integrate ICT tools, which will help students with special needs, into all public and private schools. ICT tools should also be used to overcome gender bias, age, financial status, and other social or cultural factors, which impede access to quality educational services.

Apply ICT to Strengthen the Quality of Teaching and Educational Management

The government proposes to use ICT to enhance teaching quality by supporting and reinforcing the use of innovative teaching practices. Teachers will learn ICT skills as well as how to integrate it into the teaching system. To enforce this, the government will take the following steps:

- Facilitate an environment for continuous learning by providing teachers with access to ongoing professional development through IRI, ODL, and online resources
- Support teachers in applying technology in a learner-centered context by modeling lessons in live classroom situations that other educators can hear or observe via radio or through taped/broadcasted television modules.
- Provide content knowledge and curriculum support by providing Internet access/CD ROM-based software to schools, professional development centers, and teacher training institutions to help pre-and in-service teachers expand their content knowledge.
- Provide teachers and educators with ICT tools that enable them to produce their own materials in local or regional languages.
- Use ICT for professional networking, mentoring, and monitoring by supporting teachers to create an archived body of knowledge that others can access.

Employ ICT to Enhance Student Learning

The government envisages that ICT can enable teachers to improve pedagogy by providing the framework to create a constructivist learner-centered environment. It can also help students' access self-paced learning. The following methodology will be implemented:

- Upgrade the current curricula to integrate ICT in primary, secondary, and vocational education
- Use ICT to supplement, enhance, or provide access to content particularly when textbooks and supplementary materials are scarce. This can be ensured by providing CD ROM-based content and Web-based activities to access digital resources and online collections that might otherwise be unavailable. Also by providing radio/audio and TV/video programs to present content in an interactive manner
- Use ICT to adopt more authentic ways to evaluate students work
- Use ICT to change pedagogical methods by giving students freedom to interact with ICT in ways that promotes creativity and problem-solving

Element 4: Develop Complementary Approaches to Using ICT in Education

The government believes that to achieve the strategic goal of mainstreaming ICT into the educational system, ICT should not only be used in service of educational goals but should also be treated as a school subject. To develop skills required to use ICT tools effectively the government will take the following steps:

- Support students to become technically literate; they must learn how to use ICT to find, create, present, and communicate information
- Integrate ICT tools into classrooms so that their use becomes part of the learning process in all subject areas

Build on the Current Experience of Existing and Successful ICT Programmes

The government proposes to keep abreast with current developments in ICT for education on an ongoing basis. The models of success in developing countries with an infrastructure comparable to that of Pakistan would be of particular importance. The following strategy is proposed:

- Take a systematic approach to researching models of ICT use in education, both in terms of success stories and problems encountered.
- To study, expand upon, or partner with the numerous ongoing ICT in education efforts such as Pakistan Education and Research Network (PERN), Adult Basic Education Society (ABES) et cetera.
- Foster a progressive attitude toward pilot-testing new ideas. Support innovation, seek opportunities to expand, and replicate existing projects. Also support schools and community centers by providing grants to upscale current projects.

Develop Capacity at the Federal and Provincial Department of Educational Levels

The government envisages the need to ensure proper planning, management, support and monitoring, and evaluation of ICT initiatives by organizing ongoing efforts to ensure capacity building at the Federal and Provincial Levels and creating an external body which advises the MoE on the cause of ICT in education.

- Establish a Technical Implementation Unit (TIU) for ICT in education. The TIU will develop the technical planning, monitoring and evaluation capacity of policy-makers, planners and administrators at national, provincial, district, and school levels. It will also liaise with teacher training institutes, oversee the implementation of the NCIT Strategy, and support the overall monitoring of education through the national EMIS
- Establish a National ICT in Education council to assist the nation's efforts to leverage technology for improving education.

The Ministry of IT in Pakistan has taken several measures to promote the development of the ICT sector. In 2000, the National IT Policy of Pakistan was formulated, which places emphasis on the need to develop adequate IT and telecom infrastructure, a robust software and hardware industry, as well as qualified human resources to provide a spurt to this sector. The National Policy on IT in

Pakistan has emphasized the importance of IT vis-à-vis education; some of the relevant provisions made in the Policy with respect to education are:

- Launch a scheme for providing low-priced computers and Internet connectivity to universities, colleges, and schools through a public-private sector initiative.
- Network all universities, engineering and medical colleges, and institutions of higher learning in the country for improved quality of education.
- Set up electronic libraries to ensure economical and equitable access to world information.
- Encourage educational facilities to computerize their registration, examinations, accounting, and other activities.
- Encourage educational facilities to adopt computer assisted learning and other IT tools to aid in the teaching process.
- Establish virtual classroom education programs, using online, Internet and/or video facilities, to provide distance learning to a large number of individuals.
- Establish a national educational intranet (linked to the Internet) to enable sharing, among educational institutions, of electronic libraries of teaching and research materials and faculty.

In 2008, the Government of Pakistan initiated a broad-based consultative process to revise the national IT policy for the next five years. In addition about PKR 2.36 billion (approximately USD 27 million) of Universal Service Fund (USOF) have been committed for rural telecom and broadband projects in un-served areas of Pakistan. The USOF has agreements with leading service providers to provide telephony and broadband services to remote areas. Under the agreement in the Rural Telecom project, telephony services will be provided to 648 un-served Mauzas to serve a population of around half a million and in the Broadband project, broadband connections will be provided in 11 districts (38 small towns) of Southern Punjab, in addition to establishing 27 Educational Broadband Centers in high schools, colleges, and libraries plus 121 Community Broadband Centers. The Government of Pakistan has also committed to set aside a certain portion of the revenues generated through the expansion of the telecom sector mainly toward research and development in the field of ICT and to enable that a National ICT R&D Fund has been created. The ICT R&D Fund has undertaken initiatives in R&D through Industry-Academia partnerships, human resource development through scholarships and training programs, development of e-learning and evaluation systems, and promoting of local content development activities. Thus a robust policy framework is emerging in Pakistan for the sustained application of ICTs in the education sector.

7.3. Initiatives

Several major initiatives have been undertaken by the Government, and international agencies. These initiatives have had varying levels of success. Some of the key initiatives are outlined in the following:

Allama Iqbal Open University

Allama Iqbal Open University (AIU) as a distance education provider has been able to supplement traditional methods of teaching with the use of ICT to reach a larger section of the population. While the University is part of the MoE and Higher Education Commission system, and follows the

prescribed curriculum, the differentiator for AIOU is its teaching methodology and its ability to reach out to a large potential student base. It does so by leveraging information communication technology tools by way of quality audio and video programs, which are regularly broadcast on the radio and television and also sent to students in the form of audio and video cassettes. The University is also in the process of leveraging satellite and Internet technology to improve distance education.

These achievements are reflected in the increased enrollments; AIOU is the largest university in the country with a course enrollment of 1,806,214 (2004–05); it offers about 950 courses (2004–05) and functions through 9 regional campuses, 23 regional centers, and 90 part-time regional coordinating offices. Very significantly AIOU is also the largest teacher education institution in Pakistan with an average enrollment of one million students. It has a fully functional student database with networking facilities for exchange of data and information between the main campus and regional centers. Further, the AIOU has planned several ICT-focused initiatives as part of its future strategy; some of these are as follows:

- Technology delivered Distance Education (Japan International Cooperation Agency (JICA)-Supported Projects)
- Center for National Curriculum Studies
 - 24 English Language Teaching Programs for Radio/TV delivery sponsored by USAID.
 - Science/Computer Science, Web-delivered Courses.
- FM Radio Broadcast License granted by Pakistan Electronic Media Regulatory Authority (PEMRA). Frequency allocation and procurement of equipment under process.
- Information and Communication Technology (ICT) in education

(The initiative is covered in more detail in the Pakistan Case Study)

Pakistan Education and Research Network

PERN is a dedicated research and education network funded by the Government of Pakistan in collaboration with PTCL (Pakistan Telecommunication Company Limited). The network aims to connect all premier research and education institutions in the country, with a focus on collaborative research, knowledge sharing, resource sharing, and distance learning through the use of intranet and Internet resources. PERN aims at being an integral part of the overall education system of the country by providing state of the art telecommunication infrastructure and services to educational and research institutions. For doing so it provides a research-based network with a digital library of online resources to serve as a model for collecting and distributing educational resources. It provides interconnectivity between universities, institutes, and other educational networks worldwide to foster data collection and upgrading of teaching learning skills. It also provides access to Distance Learning and Video Conferencing facilities. In the first phase of PERN, 56 educational institutions have been connected; the second phase, PERN II, which was recently inaugurated not only connects the remaining 59 Higher Education Commission (HEC) recognized universities in

Pakistan but enables educational institutions in Pakistan to connect to the global research community through a high-speed link.

Virtual University

Pakistan's Virtual University is a not-for-profit institution established by the government to provide affordable education to the students of Pakistan. It uses a combination of free-to-air satellite television broadcasts and the Internet. The Virtual University uses television for broadcasting its lectures. It operates its own television channels Virtual Television-1 and Virtual Television-2. Lectures are recorded in the form of slides or movie clips, which are then broadcast using free-to-air television or made available through multimedia CD-ROMS. Interaction between students and tutors takes place over the Internet. Virtual University Web servers have a Learning Management System (LMS), which is accessible over the Internet. LMS provides comprehensive learning material/lecture notes and e-mail facility for students to interact with the Virtual University community. LMS also has a "Moderated Discussion Board" which is a Question and Answer board where the VU faculty provides answers to questions posed by the students. *(This initiative is covered in more detail in the Pakistan Case Study)*

Punjab IT Lab Project

Punjab IT Labs project is one of the first "ICT in Education" projects in Pakistan. It was initiated by the government in 2008 primarily to overcome the digital divide between the public and private sector schools. The project was completed in November 2009, equipping over 4,286 schools with 3 desktop PCs and 12 virtual desktops each. Software was licensed by Microsoft and hardware solutions were provided by companies such as Inbox, Siemens, PEL, NComputing, PTCL, and New Horizon. Microsoft has also provided training for master trainers in the schools in an effort to enhance the teaching methodology adopted by teachers, so as to meet international standards. Efforts are ongoing to ensure that internet connectivity is provided in all the schools covered under this initiative. As it is still in its early phase of implementation, the impact of the initiative is yet to be ascertained.

[\(http://punjabitlabs.edu.pk/\)](http://punjabitlabs.edu.pk/)

The International Education and Research Network

The International Education and Resource Network (iEARN) is a nonprofit global telecommunications community consisting of more than 35,000 primary and secondary schools and youth organizations in more than 125 countries. The objective of iEARN is to enable young people to use the Internet and other technologies to engage in collaborative projects and enhance learning. iEARN's Pakistan center is dedicated to providing teachers and students in primary and secondary schools with a platform to participate in online curriculum-based telecommunications projects. iEARN-PK (iEARN Pakistan) also provides members resources and tools for effective implementation of school-based ICT initiatives and a range of educational programs and learning

materials. Working under the Society for International Education, it has organized many workshops for students and teachers supporting the use of online curriculum-based projects; it has also published teaching resources for technology in education and project-based learning. Most of these programs involve development and participation of students in Internet-based collaborative projects, curriculum development, teacher training, and students and teacher participation in exchange and study programs. It has also launched initiatives like the Achay Dost (Good Friends) in collaboration with UNICEF, Sindh. Under this project an FM radio program is created that addresses children's issues such as gender-based discrimination, corporal punishment, and child abuse, in order to creating awareness in society about these issues. The radio program is developed and presented by youth and goes on air at specific time slots every week.

Aga Khan Education Services

Aga Khan Education Services (AKES) aims to provide quality education pre, primary, secondary, and higher secondary schools in select countries. One of its major initiatives is the introduction of computers and distance learning to supplement teaching and improve learning methods. In Pakistan, it operates in 187 schools and 5 hostels serving 37,000 students mainly in rural parts of the country. On average, Aga Khan Schools possess 20 computers per schools. AKES is also attempting to help teachers use ICT for more learner centered approaches (MoE).

Beaconhouse School System

The Beaconhouse School system has a network 141 schools across Pakistan. The Beaconhouse schools have done pioneering work in integrating ICTs in the teaching learning process at all levels in their schools. The distinct advantage of the Beaconhouse approach lies in the fact that they have moved away from an IT curriculum based approach to mainstreaming ICTs in teaching learning processes in all subjects and disciplines. Therefore their IT program has been re-designated as Emerging Technologies Across the Curriculum (ETAC). Students and teachers at Beaconhouse use ICT tools like power point, mind maps, and other suitable software for preparing projects, doing coursework and preparing for exams and revising their work. In addition to computer labs in each school, computers are also provided in resource rooms and libraries for both students and teachers to do their research. The Beaconhouse Schools have an in-house training programme in collaboration with several UK universities to train teachers in order to provide a unique advantage in ensuring teachers have training of the highest standard.

<http://www.beaconhouse.edu.pk/bssgroup/southasia/cms.php?id=14>

Intel Teach Program

The Intel Teach Program is a professional development program that helps classroom teachers integrate technology to enhance student learning. In Pakistan, it has trained more than 20,000 in-service and pre-service teachers. The in-service program was launched in 2002 in collaboration with the MoE; the program aims to enhance the capacity of teachers in Pakistan by training them on

how to use technology in the classroom. The pre-service program was introduced in 2005 under which the Intel Education team works with the universities and affiliated colleges to integrate ICT in the Instructional Technology or Computers in Education courses at the universities. To date approximately 28,000 pre-service faculty and student teachers have been trained in Pakistan. *(This initiative is covered in more detail in the Pakistan Case Study.)*

Development of Education Management Information System

Recognizing the significance of timely information, data and statistics for effective planning in the Education, the Academy of Education Planning and Management has been working on the establishment of an EMIS, in order to collect and consolidate educational statistics and information. The Academy has acquired micro computers and personal computers to access educational data which will be available on computer files. EMIS has been developed for the provinces of Punjab, Sindh, Northwest Frontier Province, Balochistan as well as the Islamabad Capital Territory and the FATA region. According to the recently revised Education Policy 2009, the Provincial and Area EMIS would cater to the data needs of all tiers of the local governments and further would also provide data to the National Education Management Information System for national aggregation on a regular basis

Educational Television

Various viewing centers are established with televisions and combined with the hardware with ODL approaches. This ensures the availability of educational programmes in remote areas, in the form of video-based training (via Internet, satellite, VCR/television, or DVDs). This initiative had helped in providing an impetus to the learners to learn through setting up a virtual classroom.

Interactive Radio Instruction:

Radio has by far the highest penetration in Pakistan compared to any other mass communication medium. IRI has facilitated instruction for students in remote areas and for those without access to extensive educational resources and qualified teachers. Recently, USAID launched a new interactive radio program, the "Time for English" series. The program aims to provide English-language lessons for primary students of classes 1 and 2. The series includes 102 half-hour taped lessons based on the national curriculum which rely on games and group and individual activities to engage students and improve their learning levels. All activities are guided in the classroom by the teacher. USAID has also provided teacher training to 132 teachers, as well as other learning resources such as guides and educational posters. The program is now running in 66 rural schools of the Federal Directorate of Education.

7.4. Constraints

Literacy levels in Pakistan, particularly female literacy, are extremely low compared with other countries in the region. Though the "National Information and Communications Technology (NCIT) Strategy for Education in Pakistan" was formulated keeping in mind the broad principles of ICT integration in the education sector, the policy articulation was not supported by detailed

implementation strategy and has not been the driving force behind any major initiative using ICTs in the education space in Pakistan. Some of the other significant challenges are:

Quality and Competency Level of Teachers: The extreme dearth of quality teachers is a major constraining factor for the successful implementation of ICT based teaching-learning. One of the major reasons is the low level of qualification required to become a primary school teacher. Another reason relates to the quality of teacher certification programs, little emphasis is laid on teaching practice and there is no proper support or monitoring system for teachers.

Expensive Internet Access: Pakistan's broadband market has been slow, as a result internet access to rural areas becomes an expensive undertaking. With internet access being limited to only the affluent there is little scope to use it to increase literacy levels in these underprivileged areas.

Linguistic Constraints: Developing software for the local languages will be another challenge for implementing ICT in the education sector.

7.5. Insights

In Pakistan, fiber availability is relatively high and therefore even though at present connectivity is a constraint, this can be overcome. Further, the Universal Service Obligation Fund (USOF) is committed to providing broadband to underserved areas. In terms of infrastructure, it was understood that low levels of electrification, posed a more significant challenge for integrating ICTs in the education space than low levels of connectivity.

The most important aspect in ensuring that ICT investments yield results would be to ensure that ICT usage is promoted in a way such that ICTs are used as tools to enhance the teaching learning process itself and not merely to familiarize students with the hardware and software. ICT usage in government schools is extremely low and as efforts are beginning to get underway to provide government schools with ICT facilities, it is important that ICTs are integrated as tools for improving teaching learning rather than focusing exclusively on a specific IT curriculum-based approach. On the other hand private schools systems in Pakistan such as the Beaconhouse School system have been making effective use of advanced ICT tools to enhance their teaching learning practices. However, given the relatively high fee structure in these private institutions cost of ICTs is met by the school and students themselves, which is not a viable option for government schools.

Distance education in Pakistan is well established at the higher education level. Both AIOU and the Virtual University are achieving important milestones in ICT-enabled learning at the higher education level. However, Open Schooling has not yet been established for the K 12 level and given the expertise in the country in distance learning systems, it could be an avenue worth exploring.

Another key aspect that needs to be addressed is the gender disparity in educational attainments and access to ICTs. Initiatives to promote educational attainments in girls and women using ICTs should be encouraged. Further, awareness among women and girls about specific opportunities using ICTs should also be increased.

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Links to Initiatives

Government Links

- Electronic Government Directorate: www.e-government.gov.pk/
- National Telecommunication Corporation: www.ntc.net.pk/
- Pakistan Computer Bureau: www.pcb.gov.pk/
- Pakistan Council for Science and Technology: www.pcst.org.pk/
- Punjab IT Labs Project: www.punjabitlabs.edu.pk/

Schools and Education Institutions

- Allama Iqbal Open University (AIU): www.aiou.edu.pk/
- Virtual University (VU) of Pakistan: www.vu.edu.pk/

Private Companies

- Intel Education Initiative: www.intel.com/cd/corporate/education/APAC/ENG/pk/266519.htm

Non Government Organizations

- International Education and Research Network (iEARN): www.iearn.org

Other Important Links

- Pakistan Education and Research Network (PERN): www.pern.edu.pk/
- Aga Khan Education Services (AKES): www.akdn.org/akes

8. Sri Lanka

The Democratic Socialist Republic of Sri Lanka is an island country in the Indian Ocean located about 31 kilometers off the southern coast of India. Colombo is the capital of this island nation. Sri Lanka is a multi-ethnic society, with the majority of the population being of Sinhalese origin and Tamils forming the largest minority. The Constitution of Sri Lanka has accepted Sinhalese and Tamil as the official languages. English is accepted as a link language.



Figure 9: Map of Sri Lanka

Source: www.wikipedia.org; www.cia.gov

Sri Lanka is a plantation economy. The country is famous for the production and export of tea, coffee, coconuts, rubber, and cinnamon, which are the key contributors to its GDP.

Some of the key demographic and economic indicators are given as follows:

Table 23: Key Demographic and Economic Indicators - Sri Lanka

Parameter	Value	Year
Population	19,299,000	2007
Gross domestic growth (million US \$)	32,347	2007
GDP per capita (US \$)	1676.1	2007
Human development index ranking	102/182	2009
Population below poverty line	22%	2004

Source: <http://unstats.un.org>; www.cia.gov; <http://hdr.undp.org>

8.1. Background

Sri Lanka's education system is divided into five parts: primary, junior secondary, senior secondary, collegiate, and tertiary. According to Sri Lankan law it is compulsory for all students to go to school till grade 9 (age 14); however, the MoE has the objective of making all students appear for at least the General Certificate of Education (G.C.E) Ordinary Level.

Most of the schools in Sri Lanka are maintained by the Government. Currently, there are around 9,800 schools in Sri Lanka. There has been a considerable increase in the number of private schools as well.

Sri Lanka's adult literacy rate is around 91%, which is very high as compared with other developing countries and countries in South Asia. The Secondary Gross Enrollment Ratio is also very high compared with other South Asian countries at 88%.

Some of the key education indicators are given as follows:

Table 24: Education Indicators - Sri Lanka

Education parameter		Value	Year
Adult literacy rate	Male	94.8	2000–2007
	Female	90	2000–2007
Youth literacy rate	Male	97	2000–2007
	Female	98	2000–2007
Gross enrollment ratio (%): Primary education	Male	98	2000–2007
	Female	97	2000–2007
Gross enrollment ratio (%): Secondary education	Male	86	2000–2007
	Female	88	2000–2007
Expenditure on education (% of GDP)		3.2	2003–2006

Source: www.unicef.org; www.cia.gov

The Information and Communication Technology Agency (ICTA) of Sri Lanka is the apex body for development of the ICT sector in Sri Lanka. The Agency's aim is to use ICTs for economic and social advancement by ensuring the proliferation of ICT to every village in the country. ICTA is responsible for building connectivity infrastructure across the country, it has been formulating policies to enable reforms and restructuring in the educational framework. To reduce the digital divide and reach out to the rural population is the key goal of the agency. ICTA strategizes to:

- Facilitate the formulation and adoption of a National ICT Policy, ICT Action Plan and necessary Legal Framework in collaboration with the Administrative Reforms Committee and relevant stakeholder groups.
- Provide focus and leadership in ICT for development, including building "e-leadership" skills among top government officials, business and civil society leaders.
- Ensure timely and cost effective implementation of projects and build external capacity in project management skills.

- Monitor and evaluate progress to ensure a focus on development results, through obtaining feedback and lessons learned, to inform decision making and continually adjust strategies.

ICTA has planned to launch numerous campaigns through newspapers, radio and television throughout the year. These will be accomplished through initiatives that are simple and attractive to the target group. In July 2003, ICTA took the responsibility of spearheading the initiative of e-Sri Lanka by encouraging the successful implementation of e-Sri Lanka.

e-Sri Lanka's vision involves leveraging ICT to improve public service delivery, increasing private sector competitiveness, promoting new sources of growth, accelerating social development, and bridging the digital divide. It works with the objective of reaching out to the larger population, which is not privileged enough to have access to the updated technologies.

Importance of extending telecommunication facilities to rural areas has been acknowledged at the highest level by the government. Rural communication networks are relatively expensive to establish, and difficult and expensive to maintain, and are often underutilized.

The key action plans include the development of physical infrastructure, deregulation of the telecommunication sector, mobilization of private sector investment. The tele-density in Sri Lanka is relatively low, with about 44 telephones per 1,000 people in 2001 and Internet use estimated at 8 users per 1,000. Though one may find mushrooming computer vendors and training centers in Colombo and provincial capitals, there is little access to computers in Sri Lankan schools and colleges in rural areas.

The declaration of 2009 as the year of ICT and English is a significant milestone in the Government's long-term plan to improve the quality of life of the people by leveraging the use of ICT. It is hoped that the ICT sector will be able to earn revenue of two billion U.S. dollars by 2012 for the Government. It would also be able to generate employment.

Some of the key ICT indicators are given as follows:

Table 25: ICT Indicators - Sri Lanka

ICT parameters	Value	Year
Internet users (per 100)	5.7	2008
Internet subscribers (per 100)	1.23	2008
Broadband subscribers (per 100)	0.5	2008
Mobile coverage (%)	90	2007
Mobile subscribers (per 100)	39.9	2007
Personal computers (per 100)	3.54	2006-2007
Internet affordability (US \$/month)	4.4	2007
Mobile affordability (US\$/month)	1.2	2007
Radio subscribers (per 1000)	191.8	
Households with TV (%)	31.6	

Source: www.itu.int; www.mdgs.un.org; World Development Indicators Database; www.cia.gov

8.2. Policy Framework and Delivery Mechanism

The MoE realizes that the field of ICT education in Sri Lanka has a huge responsibility and a role in meeting the skill requirements of the information technology industry. Since the time ICT was introduced to the education system (1994), the government has been taking various steps to improve the educational machinery.

A key government initiative to reap the benefits of ICT has been the “e-Sri Lanka” program, which commenced in early 2003. It is a five-pronged strategy that intends to extend the benefits of ICT to impoverished regions by implementing a number of initiatives. The vision of e-Sri Lanka is to be realized through strategies that involve framing ICT policies, spearheading leadership, and supporting institutional developmental program. Attempts are made at creating adequate human resources for ICT and building a dependable information infrastructure. The vision conceived through the initiative of e-Sri Lanka has laid the ICT roadmap for the country. The e-Sri Lanka project had been successful in establishing rural knowledge centers, and e-libraries with the vision of spreading the pulse of ICT education to the majority of the population.

A draft of a National ICT Policy was placed before the government for approval through the National Science and technology Commission (NASTEC) and the Ministry of Science and Technology. The main objectives stated were to use ICTs for efficient administration and management, create a competitive advantage and attract a significant portion of the global software and ICT services market to Sri Lanka, provide information on the country to the world, and use ICT as a tool for the acquisition of information needed for the society. In 2002, Sri Lanka went through yet another review and realignment of national policies related to ICT and telecommunications. The importance of introducing ICT in the school curriculum has been realized by the government, and clear objectives have been laid out which include:

- Enable the effective use of IT as a tool in learning and teaching in school education
- Provide “information literacy” for all school leavers
- Facilitate effective involvement of school system in lifelong education of citizens.
- Restructure the course model in order to meet the requirements of ICT
- Initiate capacity building projects

The National Policy on Information Technology in School Education (NAPITSE) had been framed by the government in order to impart ICT education to the younger generation. This policy aims to provide a global vision and direction to the education system of Sri Lanka. The government has followed a strategic action plan to implement the policy. It had been broken into three stages:

Stage 1: 2002–03

Stage 2: 2004–05

Stage 3: 2006–07

To reach the goals, the following objectives would be achieved under four major strategic themes:

Curriculum Development

- To introduce, sustain, and enhance IT involvement into general education in schools and create opportunities for IT-based learning and teaching
- To introduce IT into pre-service and in-service teacher development and training program and create opportunities for system wide professional development of teachers

Human Resource Development

- To provide necessary education and training to all teachers in government schools, making them competent in using IT for teaching purposes
- To upgrade officers in the education system to handle IT-related activities competently and with ease
- To create opportunities for out of school population to utilize resources in school-based IT resource centers, thus creating an environment for community learning

Physical/Infrastructure Development

- To allocate and distribute optimal resources in an equitable manner to meet the learning needs of students and learning/teaching requirements of teachers. Around 30,000 computers have been installed and supplied to the schools through various projects. The ministry had planned to establish a hardware trainer pool which can take the responsibility of maintaining and upgrading the infrastructural facilities provided to the schools and various institutions.
- To set up an Information Technology Education Resource Center (ITERC) at the national level, nine ITERCs at provincial level and zonal level ITERCs for teacher training/development
- To establish an IT education laboratory at the National Institute of Education (NIE) to improve curriculum development
- To establish an ITERC at the Center for Professional Development of Management of Education
- To dedicate a National College of Education (NCOE) for development of IT teachers under pre-service teacher training
- To provide innovative means of training through activities, such as mobile training laboratories
- To set up a Multimedia Education Software and Web Development Center

Support Initiatives Development

There would have to be support initiatives to ensure the sustenance of IT education in the school system. As IT undergoes rapid changes in terms of technology and usage, the support initiatives will

ensure that such changes are incorporated in the learning process of pupils, without having to wait for the curriculum changes. The following are the envisaged support initiatives:

- To establish IT school clubs
- To encourage preparation of Web sites for schools
- To encourage teachers to own personal computers
- To design, develop and maintain a Web site for the Ministry of Education & Higher Education to assist the school system in e-learning and information management
- To convene appropriately time-framed IT education research and development conferences/colloquia
- To facilitate the setting up of a professional body for those who are involved in IT education in schools
- To establish a fund to support innovative approaches and creative initiatives for school IT education development
- To initiate an award scheme to encourage educators to promote innovative IT education
- To forge strategic partnerships with other government institutions, Sri Lankan Missions abroad, foreign missions in Sri Lanka and national and international NGOs and the private sector to extend the coverage of IT education, promote and enhance the quality of IT education in the school system

8.3. Initiatives

In Sri Lanka, community radio is quite widespread. The initiatives in Sri Lanka have tried to use the extensive experience with radio in integration with computer-based technologies to yield salient results. Some of the key initiatives using ICT in education are:

Kothmale Community Radio

The Kothmale Community Radio was implemented in Sri-Lanka by UNESCO in an effort to extend the benefits of ICT to rural people. The Kothmale radio station provides access to computers with dedicated Internet connectivity. This project uses radio as an interface between community and Internet through “Radio Browse” model. Listeners of the radio channel request the broadcasters to surf the Internet on their behalf and find information they require. This information is then relayed back to the listeners in the local language through the program by experts, for example if information on health was demanded, a doctor would be requested to explain and contextualize the information. The station also helps the community develop skills to develop their own Web sites. Since this radio was not owned and run by the community, there were issues regarding its sustenance.

Sri Lanka Environmental Television Project

The Sri Lanka Environmental Television Project (SLETP) is a nonprofit, educational service, which uses audio-visual and electronic media—television, video, and the Internet—to address

environment and development issues. The Project, launched in 1994, works with television broadcasters, as well as with a wide range of other users of video material: schools, universities, government agencies, training institutes, and NGOs. SLETP offers country's television broadcasters and video users a broad range of factual programmes on subjects such as the environment, development, health, social justice, and science. The Video resource center is affiliated to International Television Trust for the environment and has access to some of the best factual programmes around the world.

One Laptop per Child

The OLPC movement works with the Sri Lankan government to ensure that all school-aged children have access to their own personal laptops. The MoE piloted the OLPC program by purchasing 1,300 laptops from the OLPC foundation with funding aid from the World Bank; full deployment of the laptops will begin in 2010. The XO laptops can be operated using solar power and will enable Sri Lanka to tackle Internet access issues as these laptops use a mesh-net working system, which allows students to communicate instantaneously.

Secondary Education Modernization Project

Secondary Education Modernization Project (SEMP) is an initiative funded by the Asian Development Bank (ADB) to support the government's strategy of modernizing the secondary school curriculum and teaching-learning methodologies. It aims at improving the quality of education in secondary school throughout Sri Lanka to ensure an increase in classroom learning and in pass rates on national examinations. Under this initiatives, target schools were equipped with science laboratories, computer facilities, and multimedia units. SchoolNet is another concerted effort of MOE and ADB. It is an initiative to establish a Wide Area Network (WAN) connecting most of the secondary schools and related organizations. SchoolNet gives teachers access to reference material, tutorials, and other educational programmes.

Nensala Project

ICTA initiated the Nensala Community development Task force with the vision of spreading a thread of community learning across the rural areas of Sri Lanka. It has established 590 rural telecenters or "Nensalas". The Nenasala Community Development Task Force is set up to manage, conduct and supervise the centers. The Task Force caters to the Nensala operations such as communication development, setting up kiosks, development of the ICT skills and imparting ICT education in the school curriculum, monitoring and evaluation, and capacity building through special training and guidance. Workshops are conducted to receive feedback and ensure proper functioning of the centers.

The Open University of Sri Lanka

The Open University of Sri Lanka (OUSL) was established in 1980 under the purview of the University Grants Commission (UGC) of the Ministry of Higher Education. The University provides educational opportunities to working adults through a distance education mode. The admissions policy has been formulated in such a way that even an individual possessing mere literacy skills can enroll in the University at the lowest level and progress to the postgraduate level at his/her own pace. The self-instructional course content or "Tutor in Print" is designed to cater to the needs of working adults to ensure that work commitments are not disrupted to pursue higher education. Currently the University serves 30,000 students across the country. The Distance Education Modernization Project (DEMP) funded by ADB is an initiative by the Ministry of Higher Education to increase the access to tertiary education for the country through a technology-enhanced distance mode. DEMP has initiated the Open University of Sri Lanka Capacity Enhancement Programme (OUSL-CE) to modernize OUSL into a world class distance education institution, expanding its student capacity to 40,000 learners (National Online Distance Education Service).

The University functions through 4 Regional Centres, 7 Study Centres, and 6 Teaching Centres spread across the country, with educational content being disseminated through multiple media. In 1993, the original audio-visual unit of the university was expanded into the Educational Technology Division (ET). The ET division is responsible for producing instructional audio-visual material, conducting institutional research and training staff to produce state-of-the-art techniques in teaching and learning including online materials. Most audio and video programmes are focused to a specific study component and are given to students as supplementary tools for the courses and modules taught. Students can access audio and video material at the Audio Visual Resource Centre which has a facility for individual/group viewing.

The University uses a Virtual Learning Management System (LMS) called Moodle; this e-learning platform enables students to access course content through the internet irrespective of their location, and it also allows students to discuss subject matters with a network of fellow students and tutors. Using this LMS, students can even upload their assignments and arrange counseling sessions with their tutors.

The OUSL library maintains a vast database of books and e-journals. In 2006, the Virtual Resource Centre (VRC) of the library was established to provide online access to the electronic information resources available at the library. For the maintenance and upgradation of IT infrastructure at the University, an Information Technology Division has been established. The IT division is also responsible for maintaining the integrity and security of the university network and student database. (<http://www.ou.ac.lk/>)

Shilpa Sayura Project

To address the issue of lack of digital content in local languages, the ICTA launched Shilpa Sayura Project to create digital content based on school curriculum in Sinhalese to help students prepare for national examinations. The content is available for eight subjects at telecentres. ICTA is also addressing issues related to standard fonts and keyboards in Sinhala and Tamil and is translating English into local languages to ensure higher participation.

UNESCO, in co-operation with the Sri Lanka National Commission for UNESCO and the Sri Lanka National Institute of Education, convened the "ICT-Integration and Tele collaboration" hosted by the National Institute of Education; which was a workshop to train participating teachers on how to integrate ICT into teaching. The ICT in Education programme, under the Asia-Pacific Programme for Educational Innovation for Development (APEID), has implemented three inter-related projects, which aim to build the capacity of teachers and teacher educators to integrate ICT into teaching. Two of these projects, "Training and Professional Development of Teacher Educators in the Effective Use of ICT for Improving Teaching and Learning" and "Strengthening the Use of ICT in Schools and SchoolNet in the ASEAN Context" are supported by Japanese Funds-in-Trust (JFIT). The third project, the "Next Generation of Teachers" project is supported by JFIT, Microsoft, Cisco Systems, Smart Technologies Inc., and GTCO.

The UNESCO ICT Education Unit initiated the Next Generation of Teachers (Next Gen) Project. The project aims to provide trainee teachers with skills in the operation of ICT, help them to integrate ICT effectively into teaching, and utilize ICT to enhance preparation of teaching materials.

Intel Teach Program

Intel Teach Program was initiated in Sri Lanka in 2006 in order to strengthen the capacity of teachers on using technology in the teaching learning process. Intel Teach in-service program is currently conducted in Western, Central, Uva and Sabaragamuwa provinces in Sri Lanka. For pre-service training, Intel recently launched the Intel Teach pre-service program in National Colleges of Education (NCoE). Intel will also work with the Sri Lankan government to undertake various initiatives to increase broadband penetration in the country and deploy connectivity like WiFi.

The Pan Asia Networking Program Initiative

The Pan Asia Networking Program Initiative (PAN), a project of the International Development Research Centre (IDRC), provides electronic infrastructure for networking in the Asian region to ensure affordable Internet services. It is a joint venture company that was set up to operate Internet-related services in the country. It is registered with the Board of Investments in Sri Lanka and is jointly owned by several partners including IDRC. It promotes networking between research and educational institutions, government bodies, the private sector and national government and international program that are concerned with economic and social development.

8.4. Constraints

For an effective ICT penetration in the education sector, there are number of factors that need to be addressed. The following is a list of areas where considerable effort is needed for the successful deployment of ICT in education sector.

Lack of Trained Manpower: There is a dire need for proper capacity building. Teachers need intensive training not only in computer literacy, but also in how to integrate educational software into classroom activities and the school curriculum.

ICT Literacy: ICT as a subject needs more financial support than the other subjects. Cost of establishment of computer laboratory is considerable amount for a developing country.

Language Barrier: Proficiency in English language remains poor. It is important to increase proficiency in the language to see a better communication system prospering in the country.

Digital Divide: The problem of a greater urban rural divide needs to be addressed in order to see a successful penetration at every sector.

8.5. Insights

In Sri Lanka at the policy level there is a recognition of the potential of technology for improving education and more generally the socio economic condition of people. The National Policy for ICT in Education (NAPITSE) 2002-07, the e Sri Lanka Programme 2003, and the recognition of 2009 as the 'Year of ICT and English' highlight the importance placed on mainstreaming ICTs at all levels of society in Sri Lanka.

While government efforts at introducing ICTs in education are more focused at the secondary school level, non formal education programs and community awareness programmes through community learning centres called Nensalas and initiatives like Radio Kothmale are more widespread.

More emphasis is required on creating appropriate content in local languages and providing adequate training to teachers and students to enable them to integrate ICTs in their teaching learning practices.

Although Sri Lanka has made advances in ICT infrastructure over time, significantly increasing connectivity and dependability, the country will need to strengthen this sector further in order to transform itself into a knowledge based economy. The high cost of connectivity prevents people from using ICT. To ensure a better availability the government of Sri Lanka needs to take this issue into consideration. The government should consider revising the telecommunications law to address the issues of fair competition within the sector.

A better management system would further pace up the entire system and ensure a stable development. The key stakeholders should be aware of what can be achieved and by when, and

should be informed about the many issues and challenges that need to be overcome. Smaller projects that are initiated by individuals or groups should be encouraged in a proper way. A better public private partnership can enhance such initiatives spearheaded by small groups.

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- Meegamma, Niranjana "Shilpa Sayura –Localized Self and Group e-Learning System for Handicapped Students in Remote, Rural communities of Sri Lanka" www.shilpasayura.org/in/paper.pdf. The paper describes the Shilpa Sayura Project in detail. The author is the project director - E-Fusion.

Links to Initiatives

Government Links

- National Institute of Education: www.nie.lk/
- University Grants Commission: www.ugc.ac.lk/
- National Science and Technology Commission: www.nastec.lk/
- Information and Communication Technology Agency of Sri Lanka: www.icta.lk/
- Telecommunications Regulatory Commission of Sri Lanka: www.trc.gov.lk/

Schools and Education Institutions

- Open University of Sri Lanka: www.ou.ac.lk/

Private Companies

- Intel Education Initiative: www.intel.com/cd/corporate/education/apac/eng/lk/344256.htm

Other Important Links

- eSriLanka: www.icta.lk/index.php/en/e-sri-lanka
- Sri Lanka Environmental Television Project: www.sletp.org/
- Nenasala Project: www.nanasala.lk/
- Kothmale Community Radio: www.kothmale.org/
- Sri Lanka: Secondary Education Modernization Project www.adb.org/Documents/Reports/Validation/SRI/in135-09.pdf

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"Global Education Digest 2008: Comparing Education Statistics Across the World" UNESCO.

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“Promoting ICT for Human Development in Asia, Realising the Millennium Development Goals.”
2004. United Nations Development Program. The paper is a research of nine Asian countries—
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Volume III Case Studies

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Abbreviations

ADB	Asian Development Bank
AEPAM	Academy of Educational Planning and Management, Pakistan
AIOU	Allama Iqbal Open University
BPO	Business Process Outsourcing
CAL	Computer Aided Learning
CBSE	Central Board of Secondary Education, India
CLASS	Computer Literacy and Studies at School
CLC	Community Learning Centre
DANIDA	Danish International Development Agency
DDA	Delhi Development Authority
DSERT	Department of State Educational Research and Training
EDUSAT	Education Satellite
ERNET	Education & Research Network
GDP	Gross Domestic Product
GER	Gross Enrolment Rate
GRACE	Girls of Rajasthan and Computer Education
GSDP	Gross State Domestic Product
HEC	Higher Education Council
HiWEL	Hole in the Wall Education Limited
ICT	Information and Communication Technology
IET	Institute of Educational Technology
IETS	IL&FS Education Technology Services Limited
IGNOU	Indira Gandhi National Open University
IIT	Indian Institute of Technology
ISRO	Indian Space Research Organization
JMC	Jaipur Municipal Corporation
LAN	Local Area Network
LMS	Learning Management System
MCD	Municipal Corporation of Delhi
MCDC	Multimedia Courseware Design Centre, Pakistan
MIS	Management Information System
MoE	Ministry of Education
NCERT	National Council of Educational Research and Training, India
NCR	National Capital Region
NDMC	New Delhi Municipal Council
NICTE	National ICT Strategy for Education, Pakistan
NIIT	National Institute for Information Technology

NIOS	National Institute of Open Schooling, India
NUEPA	National University of Educational Planning and Administration, India
ODL	Open and Distance Learning
OLIVE	Open Learning Institute of Virtual Education
PERN	Pakistan Education and Research Network
RCEE	Rajasthan Council of Elementary Education
REI	Rajasthan Education Initiative
RMSA	Rashtriya Madhyamik Shiksha Abhiyan
SIERT	State Institute of Education Research and Training
SSA	Sarva Shiksha Abhiyan
SWAN	State Wide Area Network
UNDP	United nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UPS	Uninterrupted Power Supply
USAID	United States Agency for International Development
VSAT	Very Small Aperture Terminal
VUP	Virtual University of Pakistan

About the Report

The survey on Information and Communication Technologies (ICTs) for education in India and South Asia was commissioned by *infoDev* to be undertaken by PricewaterhouseCoopers, India. The survey is a third in the series after similar surveys for the African and Caribbean regions completed in 2008 and 2009. The main objective of the survey is to create a consolidated source of information on the experiences of using ICTs for education in the South Asian region and to provide a framework of reference for policy-makers.

The survey report is in five volumes, the first Volume is an extended summary which captures the main findings of the survey. Volume II is a series of Country Studies profiling the policy environment and major initiatives using ICTs for education for each of the eight South Asian countries – India, Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka, with a more detailed focus on India. Volume III is a set of Case Studies for India and Pakistan. For India the case studies include detailed studies of ICT initiatives in the education space in five states. For Pakistan the role of ICTs in Open and Distance Education and Teacher Education has been profiled as two case studies. Volume IV is a series of thematic papers that address key issues across the focus countries in an attempt to provide a horizontal, comparative view of the subject in the eight focus countries, with an emphasis on India. The fifth volume captures the details of the survey process including the research methodology, list of interviewees, details of meetings held etc.

Structure of the Case Studies

The sub-national level Case Studies include detailed studies of ICT initiatives in the education space in four Indian states, namely Delhi, Karnataka, Rajasthan, and West Bengal. The states profiled for case studies were identified at an initial stakeholder meeting, keeping in mind the geographical distribution, availability of information, and success of ICT initiatives. For Pakistan, the role of ICTs in Open and Distance Education and Teacher Education have been profiled as two case studies.

Report Limitations

However, there are several limitations of a project of this nature covering a wide geographical span and directed at a fast changing scenario:

- The Survey has primarily been based on secondary research and face to face or telephonic interviews and workshops with relevant stakeholders. It is thus not an exercise in primary data collection.
- While effort has been made to ensure that data collected covers all major initiatives, given the vastness of the geography and the dynamic nature of the use of ICTs, the initiatives outlined will be more illustrative than exhaustive.
- Effort has been made to present the most relevant and updated information; however, because the field is rapidly evolving, the data represented here is “current” at the time of the study, that is, June 2009 to June 2010.
- The Survey has focused more on primary and secondary education but has covered significant initiatives in tertiary education, vocational, non-formal and mass education, and distance education where these are significant for the region or the country.

- The purpose of the survey is to create a repository documenting innovative initiatives using ICT in education; in addition, the survey will provide a basis for designing strategies for effective integration of ICT in education, based on trends and experiences documented.

1. India Case Studies: Delhi

New Delhi, the capital city of India, is situated in Northern India bordered by Uttar Pradesh and Haryana. It is spread over an area of 1,482 sq. km and is one of the most densely populated cities in the world. Delhi along with Faridabad, Gurgaon, and Noida constitute the National Capital Region (NCR). NCR was developed to support the increasing growth and development in the region. The most common languages spoken in Delhi are Hindi, English, and Punjabi.

Over the decade economic growth in the NCR region has averaged more than 7%; the challenge for the state however is not only to sustain the economic growth but broaden it to a larger share of the population. The tertiary sector contributes to approximately 80% of Delhi's Gross Domestic Product and consists of service sectors such as trade, real estate, hotels, restaurants, financing, banking, insurance, business services, and other service centre industries.

Over the past few years, Delhi has also witnessed the establishment of new industries such as jewelry, export, fashion, corporate industries, BPOs, and many others. Unlike other states in the country, Delhi is primarily urban with only some agricultural lands in its outskirts.

Compared with the rest of the nation, the key socioeconomic indicators in National Capital Territory (NCT) of Delhi are marginally better, particularly in terms of literacy. Some of the key demographic indicators are given in the following table.

Table 1: Demographic Indicators –Delhi

Parameter	Statistics (2009)
Capital	New Delhi
Population	9,420,644 (2001 Census)
Population density	9340/sq.km
Area	1482 sq.km

Source: India 2009, A Reference Annual



Figure 1: Map of Delhi

Source:

<http://en.wikipedia.org/wiki/Delhi>

1.1. Background

The Directorate of Education under the Government of NCT of Delhi is responsible for ensuring the delivery of quality education in Delhi. Its main objectives are to ensure universal enrollment, reduce dropout rates, and create an atmosphere of joyful learning and overall development. The educational structure is divided into 6 stages. Pre-Primary and Primary Education is mainly the responsibility of the local bodies such as the Municipal Corporation of Delhi (MCD), New Delhi Municipal Council (NDMC), and the Delhi Cantonment Board (DCB). Middle, secondary, and senior secondary education is primarily looked after by the Directorate of Education. At the university level, Government of Delhi runs 28 degree colleges with funding support by the University Grants Commission (UGC). Apart from government-run schools, there are also a number of private organizations running schools across the capital; some of them receive grant-in-aid by the Government of Delhi to meet the expenditure on education. The Delhi Development Authority (DDA) has control over land use in Delhi and therefore the respective local bodies have to purchase land from DDA for construction of schools in Delhi. The Government of Delhi has approved an overall budget outlay of INR 6.5 billion (approximately USD 0.1 billion) for the various departments imparting education in New Delhi. (Budget at a glance, Government of Delhi).

On the basis of management, the schools are classified as follows:

Table 2: Number of Schools - India

Stage	Number of schools	Govt.	Unaided	Enrollments (in millions)	No. of children per school
Primary	2,569	1,796 [LB]	728	1.675	652
Middle	640	73	525	0.955	1,492
Secondary	465	186	240	0.449	965
Higher Secondary	1,303	714	414	0.325	249

Source: Select Education Statistics, Ministry of Human Resource Development, 2007–08.

Apart from these another set of schools include the Kendriya Vidyalayas (KVs) and the Jawahar Navodaya Vidyalayas (JNVs) which are managed by the autonomous organizations under the Ministry of Human Resource and Development and are situated in Delhi as well as across the country.

Some of the key education indicators for the State are given as follows:

Table 3: Education Indicators - Delhi

Education Indicators (2006-2007)			
Literacy level (%)¹	Total	Male	Female
2001 Census	82 (65)	87 (75)	75 (54)
Gross enrollment ratio (%)	Total	Male	Female
Class I-V	105.83	105.74	105.94
Class VI-VIII	93.33	90.35	96.89
Class IX-X	66.14	65.20	67.24
Class XI-XII	46.52	46.03	47.09
Drop out rates (%)	Total	Male	Female
Class I-V	-1.04	-5.66	3.97
Class I-VIII	23.49	20.67	26.39
Class I-X	35.31	31.39	39.30
Teaching staff	Pupil/teacher ratio	% Trained	Female teachers/100 male
Primary school	46	100	220
Middle school	29	100	387
Post basic school	26	100	226
Higher secondary school	33	100	233

Source: Ministry of Human Resource Development, Select Education Statistics 2006-07.

The high dropout rate for class I-X at 35% reflects the low level of retention in schools across the city. In Delhi, no detention policy is followed at the primary stage; this implies that students are simply promoted to the next class on the basis of satisfactory attendance. Despite this the dropout rates for Delhi continues to be high (Soumya Gupta, Overview of School Education in Delhi).

1.2. Policy Framework and Delivery Mechanism

The Department of Education in Delhi is tasked with the responsibility of formulating and implementing policies, programs, laws and regulation for the development of school education across the state. It also has a herculean task of managing around 1,000 schools with 40,000 staff to cater to about 1.1 million children. The department therefore has decided to collaborate with NGOs and corporates with Corporate Social Responsibility to leverage the use of ICT to achieve its objectives. ICT will be used to address all issues that have a direct or an indirect bearing on classroom teaching, students' performance, and accountability of teaching staff including office personnel. ICT interventions include computer-aided learning (CAL) in multimedia classrooms,

¹ Literacy figures for the entire nation are given in brackets to compare Delhi with the rest of the nation.

admission of students and tracking their details, school information including geographical boundaries, student feedback, inspection of schools, assessment of classroom teaching, attendance of students online through various Web-based modules, continuous and comprehensive evaluation of students performance. Under the “e-Governance Roadmap for Good Governance in the State of NCT of Delhi,” the Education department has proposed the following initiatives to achieve its ICT implementation goals.

- Setting up computer kiosks in slum areas to attract children toward using the computer by installing games and multimedia-based content and then moving to knowledge-based content
- Using busses as mobile classrooms in remote and slum areas for the dissemination of information and increasing awareness of education. These centers can further be used to impart vocational training.
- Consolidating Web-Based System for imparting education to school students for vocational training via a host of interactive tools and multimedia technology. This system could have a number of submodules such as Online Test, Voice-Enabled Tutorials et cetera.
- Providing computer-based learning on a regular basis to teachers for upgrading their skills. Regular online courses followed by qualifying tests will help continuously upgrade the skill set. Another method to upgrade skills could be international and national teachers exchange program.
- Providing incentives for obtaining certification in IT-enabled areas for teachers and computer literacy to be made mandatory for the recruitment process.
- Managing the libraries in an organized manner through an online centralized system for all schools. This will also enable all students to access a soft copy of textbooks.

Other initiatives include creating an education statistics monitoring and reporting system to monitor vital statistics such as dropout rates and collaborating with computer training institutes to use their IT facilities during non-peak hours to educate teachers and students.

The Department of Information Technology, New Delhi was created in 2000 to implement the IT policy of the Government of National Capital Territory of Delhi. One of the aspirations of the IT policy is to use ICT to enable literacy and education for the masses by initiating action under the following broad policy framework.

“Teach the Teachers” Program: A special cell will be set up by the government in the State Council for Education, Research and Training to work out the details of a “Teach the Teachers” program which is initiated to upgrade the skills of teachers on a regular basis. There shall be an incentive scheme to attract teachers to this program and to encourage them to complete it successfully.

Computer Labs: The government in collaboration with the private sector will establish computer laboratories in all government schools. The government will also encourage aided schools to set up computer labs in collaboration with private sector.

Upgrading Industrial Training Institutes (ITI): The government shall upgrade ITIs for providing ICT training to boost IT-enabled services in the state.

Training Centre for Unemployed: The government will encourage private sector initiatives in setting up Training Centers for the Unemployed Educated Youths.

IT Open University and IIT: The government will take steps to establish an IT Open University and also set up a premier Indian Institute of Information Technology to encourage technical courses in its universities, schools and ITIs.

Digital Library: The government will also set up a Digital Media Library that would be a central storehouse of digitalized data containing information on education along with other government records.

1.3. Initiatives

As the national capital, Delhi enjoys the advantage of better infrastructure both in terms of technology and talent. There are a range of initiatives in which ICTs are being used in the education space in Delhi from the most sophisticated high end technology solutions in elite private schools, to more basic government implemented schemes for integrating ICTs in education. Many national level initiatives such as Navodaya Vidyalaya Samiti, Kendriya Vidyalaya Sangathan, National Institute of Open Schooling, and Indira Gandhi National Open University have their headquarters and strong presence in Delhi, with many of their pilot programs being initiated here (Refer to Volume I, India Country Study). Some of the other major initiatives are profiled in the following:

1.3.1. National Institute for Information Technology (NIIT)

NIIT is a global IT solutions company which offers training programs to students and professionals. It aims to use ICT to transform the teaching-learning process into a more interactive and efficient process. In Delhi, NIIT and the New Delhi Municipal Council (NDMC) have entered into an agreement to provide ICT education in 29 Municipal Schools catering to 11,500 students in the city by setting up computer labs equipped with hardware and connected accessories inside NDMC and Navyug Schools.

NIIT also experimented with “Minimally Invasive Education” kiosk in a slum in Delhi where they carved a “hole in the wall” and embedded a freely accessible computer for the slum children. This initiative was conducted under the Hole-in-the-Wall Education Limited (HiWEL) which is a joint venture between NIIT Ltd. and the International Finance Corporation. Encouraged by its success, the Government of Delhi set up 30 computer kiosks in a resettlement colony. These kiosks or “Learning Stations,” typically located in a government school playground or in the community are unsupervised and are available to the children for at least eight hours in a day. The HiWEL team has come up with several patented innovations such as outdoor proofing to withstand extreme weather conditions; tamper proofing to protect the system from damage and pilferage and the proprietary

Remote Monitoring System (RMS) to track the day-to-day activities in the stations. HiWEL has also implemented a monitoring and evaluation System, monitoring is done on a continuous basis both onsite and as well as through RMS. Evaluation is done through tests which measure various aspects of the child's development. The project has received many prestigious awards by the World Bank, Computer Society of India, Institute of Social Inventions in UK et cetera.

According to the facilitator at the Madangir Learning Stations in New Delhi, at least 20 children come per day to visit these stations, the maximum rush is between 9 AM to 10 AM and then again from 4:30 PM till the kiosk closes at 6, he also ads that on some days the children beg him to keep the kiosk open for another half an hour, seeing how much children learn through these kiosks he usually cooperates whenever possible.



Figure 2: Hole-in-the-Wall Learning Station Madangir

Some learning stations in the capital have not been as successful, the learning station at the Vivekanand camp area has been kept closed as this is an illegal colony and government has cut the electricity supply.



Figure 3: Hole-in-the-Wall Learning Station R.K.Puram

In August 2009, The NIIT Institute (TNI) a not-for-profit society by NIIT set up a Community Learning Centre (CLC) in New Delhi. The objective of establishing the centre is to leverage technology to provide relevant skills to the unemployed youth in urban slums so as to make them employable in various industry sectors. NIIT in association with NGO Navjyoti India Foundation has also set up NIIT Yuva Star, a Career Development Centre to achieve the same objective.

1.3.2. Sarva Shiksha Abhiyan

Sarva Shiksha Abhiyan (SSA) is a flagship programme of the Government of India to support the states in creating, developing, and strengthening the formal primary and upper primary school systems to achieve the goal of Universal Elementary Education. It is a partnership programme between the central and the state governments, which seeks to improve the performance of the school system through a community-owned approach. SSA is a time bound mission, with the objectives of ensuring Universalization of Education and bridging gender and social gaps by 2010. SSA realizes the benefits of harnessing the use of ICT in completing its mission and therefore the following interventions/projects have been implemented in Delhi.

Chalta Firta Schools

The two “Chalta Firta” Schools run in New Delhi operating at four habitations on daily basis catering to the urban deprived children. Chalta Firta (literally meaning “moving”) Schools are effectively mobile buses which have been fitted with a television screen and equipped with computers, multimedia facilities, a book library, blackboard, and toys which go around to the slum clusters of New Delhi where children do not have access to education. Each bus has two teachers specially trained to educate children through books, computers, exhibits, films et cetera. So far, more than a hundred children have been mainstreamed through this initiative. The Department of Education intends to upscale the initiative in order to take it to a more children living in difficult circumstances such as traffic signals, construction sites, red light areas etc.

Khulja Sim Sim Project

With an aim of providing education to out-of-school children and adult learners through an interactive, interesting, and enjoyable manner, the department has initiated a project to establish 75 ICT-based learning stations on the boundary wall of government schools all over Delhi. SSA has collaborated with Hole-in-the-Wall Education Ltd. (a unit of NIIT Ltd. and the International Finance Corporation) to set-up, operate, and maintain the computer kiosks. Till date around 50 learning stations have been set-up.

Computer-Aided Learning

Under the CAL component of the SSA, the Department has ensured that all government schools and around 400 Municipal Corporation Schools are equipped with CAL labs. These labs aim at imparting education as per the curriculum in a more interactive and fun manner. The Department has also developed multimedia-based content to support the classroom teaching learning process in the schools of New Delhi. Efforts are being made to ensure the effective utilization of the CAL labs and to develop more material based on the national curriculum.

Distance Education Program (DEP-SSA)

Indira Gandhi National Open University (IGNOU) is the nodal agency responsible for implementing the Distance Education Program for SSA. The DEP-SSA focuses on effective utilization of ICT for training teachers without dislocating them from their place of work. The DEP-SSA, strengthens the

ongoing efforts of capacity building at elementary education level through distance learning inputs such as:

- Development of Self Learning Material (SLM)
- Development of Audio/Radio/Video scripts
- Development of Multi-Media Package (MMP)
- Developing Users Manual for Distance Learning (DL) Materials
- Training through teleconferencing

1.3.3. Computer Education Project (CEP)

To bridge the digital divide, the Government of Delhi is imparting computer education through the Computer Education Project (CEP) started in 2000. The implementation of CEP was initiated as an outsourcing model; that is, specific agencies were chosen to carry out the tasks regarding installing computers, providing computer education, maintenance of hardware, supplying books, and stationary et cetera. To assess the performance of these agencies regular inspections were carried out; however, over time it became clear that some outsourced agencies could not effectively meet the program's objective, and henceforth, the implementation of CEP was decentralized and heads of schools were empowered to procure the hardware and other peripherals. The implementation of the project is now monitored through supervisors, inspections by the Headquarter team, and through Monthly Monitoring Reports, which are available online.

According to the Department of Education in its "Quick Report 2008" 512 computer laboratories covering 638 schools and benefiting about 635,000 students are operational under this project.

1.3.4. CALtoonZ

In an effort to ensure that learning in schools is joyful, interesting, and meaningful, the Department of Education has introduced CALtoonZ, a specialized Computer-Aided Learning program (CALP), in all its schools. CALtoonZ is the ICT component of its flagship YUVA program launched "to bring about a radical change in government-run schools in New Delhi." Through this new CAL initiative, the Department of Education hopes to improve the extremely low dropout rate prevalent in the city. This initiative also aims at empowering the teachers with skills and technology required to engage the students in an interactive and joyful learning experience. The concept of the programme is that the teacher will be trained and given the relevant tools required to teach academic concepts to students through presentations and graded exercises on the computer. The pedagogy of CAL aims at harnessing four specific advantages to enhance the quality of learning in classrooms.²

- **Access to Quality Information:** Computer-aided instruction provides the opportunity to ensure that accurate and comprehensive information is provided on every concept. This is done through standardizing the information provided in every classroom and reviewing the multimedia content to suggest further improvement.

² Source: http://edudel.nic.in/CaltoonZ/cal_index.htm

- **Learner Engagement:** CAL technology uses animation to learn concepts, which results in increased learner engagement as this method is more fun, and visually appealing to students than traditional methods.
- **Response Time:** The computer software is designed to provide optimal response time. The response time is longer for challenging topics and shorter for easier, well-understood topics.
- **Individualized Learning:** CAL also provides students with the opportunity to practice on their own or have access to information taught in classes.

The following table shows the improvement in drop out rates between CAL and Non-CAL schools.

Table 4 : Dropout Rates (CAL Vs Non-CAL Schools) - Delhi

Reduction in Dropout Rates in CAL Schools and Non-CAL Schools			
Dropout rates (%)	2005	2008	Reduction
CAL	35.45	27.94	7.51
Non-CAL	30.87	25.13	5.74

Source: http://edudel.nic.in/Caltoonz/cal_index.htm

There has been a marked decrease in the dropout rates in all Delhi Government schools; however, the extent of the decrease is steeper in schools with CAL as compared with schools without CAL.

1.3.5. E-Governance/i-Schooling

To manage its 900 schools, 40,000 employees, and 1.2 million students, the Department of Education has developed a Web-Based Management Information System (MIS). The purpose of the MIS is to computerize most of the administrative processes of government schools so as to enable them to function faster and smoother. Through MIS the department has introduced the concept of i-schooling to all government-run schools in New Delhi. Every school has been given a computer, a printer, broadband connectivity, and IT assistance. The MIS software has been developed by the Department with the help of outside professionals. In the year 2007 the department received the Golden Icon Award for Excellence in Government Re-engineering for Online Admissions and Student Management System.

Apart from online admissions, online mark sheets and online transfer forms for teachers, the MIS has numerous other features; some of them are highlighted in the following:

- *Online Attendance:* Attendance of each teacher is marked online by the principal of all schools within half an hour of the school opening. This information is then made public which has helped reduce absenteeism to almost NIL. Student attendance is also marked and this information is used while inspecting schools and ensuring punctuality.
- *Finance:* The finance feature in MIS enables the department to monitor the expenditure status of the schools/districts/zones and the department. Through it, the Department is able to sanction orders and individual bills for schools and redistribute funds according to requirement

- *Library Management:* This feature will enable the authorities to monitor the mandate that every child will be issued at least 2 books a month. The centralized database will also enable students to know about the availability of books in different schools.
- *Online Student Management:* This feature is used to keep track of every student in the department right from admission till the issuance of the School Leaving Certificate. It is also used to issue certificates and maintain records of incentives offered to children in terms of scholarship etc.
- *District Information System:* This information system contains details of all registered schools in Delhi. The information includes year of establishment, number of classrooms, medium of instruction, school infrastructure, details of funds provided by government or other aids, teaching and non-teaching staff details et cetera.
- *Computer Education Project:* MIS helps monitor the work of IT assistants and faculty provided under the computer education project (CEP) of the department. It generates monthly monitoring reports from schools and helps in payments of bills related to the CEP.

1.4. Key Learnings

The capital city of India has the advantage of enjoying high literacy rates when compared with the rest of the nation. It also hosts many successful and growing international and national IT companies. This makes it a very hospitable environment for harnessing the use of ICT in the education sector. However, many existing constraining factors will need to be overcome to effectively exploit ICTs for imparting education. Some of these factors are as follows.

Lack of Qualified Teachers: There is a distinct lack in the number of skilled teachers available in schools. This is primarily due to the lack of an incentive schemes for teachers; there is little motivation for youngsters to take up teaching as a profession particularly in government-run schools as compensation packages are even lower than private schools. Even where qualified teachers are available their apprehension to use technology poses a major hindrance toward the implementation of ICT in the teaching-learning process. To ensure an increase in IT-trained teachers, the mismatch in salaries of teachers in the IT domain with that of the IT industry will need to be corrected.

Infrastructure Development: The current infrastructure in terms of classrooms, libraries, computer laboratories et cetera needs to be constantly upgraded to keep pace with the rapidly improving technology industry. This however is a tedious task as the process for seeking approvals and implementation for any infrastructure development is highly cumbersome. Therefore, better coordination between the Education and IT departments needs to be ensured.

Maintenance and Use of Hardware: Awareness regarding the benefits of ICT in imparting education has been spreading as more and more schools have introduced computer and Internet facilities in schools; however, it is only limited to its installation, and in terms of usage the figures still remain low. There is no method of evaluating whether computers are actually being used

efficiently in schools. Also, since maintenance is costly as well as cumbersome students and teachers are left to use outdated and faulty systems.

Availability of Quality Content: There are no national level policies or guidelines for identifying quality content. For most schools, the teachers are left to decide what content to use; this approach is useful only if teachers are competent and are aware of all the software available but given the lack of ICT-qualified teachers a new methodology will need to be adopted. The government should encourage well-established software companies to work with teachers to develop state-specific content to support the curriculum and language diversities.

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Sarva Shiksha Abhiyan (<http://ssa.nic.in/states/delhi/>)

National Institute of Information Technology (<http://www.niit.com/>)

Hole in The Wall Initiative (www.hole-in-the-wall.com/)

CALtoonZ (edudel.nic.in/caltoonz/cal_index.htm)

1.6. Stakeholders

The details of persons contacted for Case Studies are provided in the following table:

Name	Designation	Organization
M.S. Khanna	Joint Commissioner (Personnel)	Navodaya Vidyalaya Samiti (NVS)
Manjulika Shrivastav	Director—Distance Education Council	Indira Gandhi National Open University (IGNOU)
Prit Singh	Principal	Jawahar Navodaya School, Mungeshpur
T.P. Singh	Geography Teacher	Jawahar Navodaya School, Mungeshpur
Sarita Govil	English Teacher	Jawahar Navodaya School, Mungeshpur
D.K. Mehta	Physics Teacher	Jawahar Navodaya School, Mungeshpur
P. Rajendran	Chief Operating Officer	NIIT Ltd.
Abhishek Gupta	Coordinator	HiWEL
Rajeshree Dutta Kumar	Sr. Research Associate	Centre for Science, Development and Media Studies
Somit Shrivastav	Education Officer (ICT Roadmap, training teachers in computers)	Kendriya Vidyalay School
S.M. Garg	Principal	Kendriya Vidyalay School, JNU New Delhi
Nisha Dua	Senior Manager Education (Launched Intel Teach Program in India)	Learning Links Foundation
Shweta Khurana	Corporate Affairs	Intel Technology India
Pramod Tripathi	Chief Operating Officer	National Institute of Open Schooling (NIOS)
V.K. Sharma	e-Learning Content Development	C-DAC
Dr. V.P. Singh	Joint Director (Education) & State Project Manager	Sarva Shiksha Abhiyan

2. India Case Studies: Karnataka

Established as a state in 1973, Karnataka with Bengaluru as its capital has emerged as the leader in the sectors of IT and biotechnology in the country since the 1980s and became the first state in India to announce an IT Policy in the year 1997. It is the eighth largest Indian state by area with a population of 52,850,562.³ Kannada is the official and most widely spoken language. The State has an estimated GSDP (Gross State Domestic Product) of about INR 2.68 trillion⁴ (approximately USD 59 billion) at current prices, in the year 2008-09, and is regarded as one of the more economically progressive states in India. More than half of the population in Karnataka is dependent on agriculture. Karnataka is also the manufacturing hub for some of the largest Public Sector Companies like Hindustan Aeronautics Limited, National Aerospace Laboratories, Bharat Heavy Electricals Limited, and so on.

The state of Karnataka is divided into 30 districts, which are further divided into subdivisions, and the subdivisions are divided into blocks.

In 1980s, Karnataka emerged as the world wide hub in the field of Information Technology and Information Technology-enabled Services. In 2007, there were more than 2,000 IT companies operating out of Karnataka, including IT giants like Infosys and Wipro.

Some of the demographic indicators of Karnataka are as follows:

Table 5: Demographic Indicators - Karnataka

Parameter	Statistics (2009)
Capital	Bengaluru
Population	52,850,562 (2001 census)
Population density	275.6/sq. km
Area	191,791 sq. km

Source: India 2009, A Reference Annual

³ http://india.gov.in/knowindia/st_karnataka.php

⁴ des.kar.nic.in/ecsurveynew/chapter1_eng.pdf

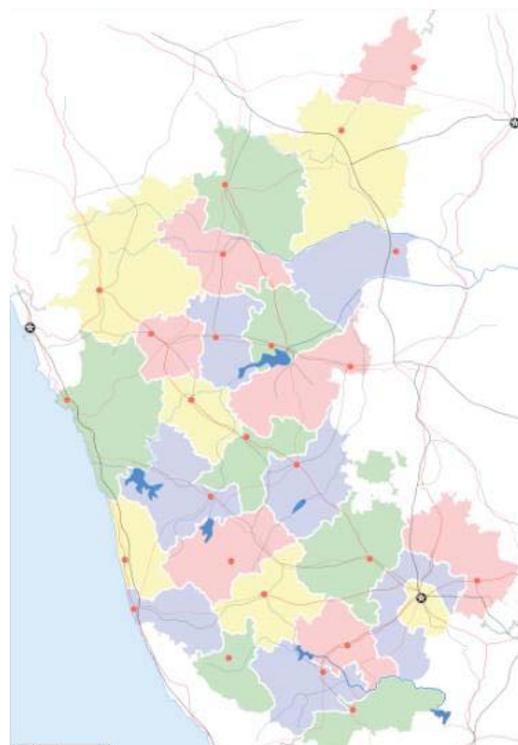


Figure 4: Map of Karnataka

Source:

<http://en.wikipedia.org/wiki/Karnataka>

2.1. Background

Brief Overview of the Education Scenario

There are three kinds of schools in the state, viz., government-run, private aided (financial aid is provided by the government), and private unaided (no financial aid is provided). The primary languages of instruction in most schools are Kannada and English. As of March 2006, Karnataka had 54,529 primary schools with 8.495 million students and 9,498 secondary schools with 92,287 teachers and 1.384 million students.⁵ The syllabus taught in the schools is either of the CBSE, the ICSE, or the state syllabus (SSLC) defined by the Department of Public Instruction (DPI) of the Government of Karnataka. To maximize attendance in schools, the Karnataka Government has launched a mid-day meal scheme in government and aided schools in which free lunch is provided to the students.

The state is also home to some of the premier educational and research institutions of India such as the Indian Institute of Science, the Indian Institute of Management, the National Institute of Technology Karnataka, and the National Law School of India University. Many of India's premier science and technology research centers, such as Indian Space Research Organization, Central Power Research Institute, Bharat Electronics Limited, and the Central Food Technological Research Institute, are also headquartered in Karnataka.

Some of the key education indicators in the state are given as follows:

Table 6: Education Indicators - Karnataka

Education Indicators (2007-08)			
Gross enrollment ratio (%)	Total	Male	Female
Primary school	106.19	107.35	104.99
Upper primary school	84.64	86.07	83.14
Secondary school	57.11	58.33	55.82
Higher secondary school	33.45	34.58	32.24
Dropout rates (%)	Total	Male	Female
Class I-V	15.5	16.65	14.25
Class I-VIII	44.83	44.34	45.37
Class I-X	60.86	61.58	60.04
Teaching staff	Pupil/teacher ratio	%Trained	%Female
Primary school	26	100	81
Upper primary school	32	100	124
Secondary school	24	100	71
Higher secondary school	47	100	30

⁵ <http://www.karunadu.gov.in/education/Pages/schools.aspx>

Literacy level (%)	Total	Male	Female
Urban literacy level (India)	80.58 (82)	86.66 (88)	74.12 (75)
Rural literacy level (India)	59.33 (61)	70.45 (72)	48.01 (50)

Source: Select Educational Statistics, 2006-07, Government of India

Administration of School Education

The Department of Public Instructions (DPI) controls and coordinates the activities of school education in Karnataka at all stages of school education, starting from pre-primary to secondary education in the State. The Department has a secretariat and field departments with a three-tier structure at state, district, and block levels.

The Department of State Educational Research and Training (DSERT), the academic wing of the DPI, works to improve the quality of education provided in primary and secondary schools. Various ICT-based projects in schools that are presently being undertaken in the state are carried out by DSERT's Education Technology Cell. Preparation of teacher training modules and catering to the needs of various categories of teachers is also undertaken by DSERT. The Education Technology cell is also experimenting with various approaches in teacher training through activity-based methods, teleconferencing, direct to class room broadcasts, multi-grade teaching techniques, and so on.

The objectives of the department are as follows:

- To provide academic leadership in school education in the state
- To achieve qualitative improvement in school education through teacher training
- To promote Action Research in order to facilitate teacher development
- To undertake academic reforms in the light of policy changes by the state
- To coordinate at the state level, schemes of various state, central, and international agencies like NCERT, NIEPA, UNICEF, SSA, RIE, IISC
- To undertake various projects in the field of education in collaboration with various agencies working in the field of education including NGOs
- To administer teacher education in the state
- To act as a nodal agency in providing in-service training of both primary and secondary teachers
- To prepare teachers' hand books, resource books, and other materials for use of students and teachers

Brief Overview of the ICT Scenario

Administration of ICT

The Department of Information Technology, Biotechnology and Science & Technology has the responsibility of promoting the growth of Information Technology, Biotechnology and Science in the State. In the last few years, Bengaluru has become one of the major Information Technology hub with more than 1,000 IT companies operating out of Bengaluru. Some ICT parameters are shown in the following table:

Table 7: ICT Parameters - Karnataka

Parameter	Data	Year
Wireless subscription base	28,867,734	Sep 2009
Wireline subscription base	2,751,296	Sep 2009
Total number of Internet users	1,063,819	Sep 2009
Total number of broadband users	768,245	Sep 2009

Source: The Indian Telecom Services Performance Indicators, July–September 2009: Telecom Regulatory Authority of India

Usage of ICT

As per a recent survey conducted by PricewaterhouseCoopers optimal use of ICT in the elementary education service delivery is yet to be achieved:

Computers

Computers are used more by the administration than in academics as teaching tools. Computers are found in most of the offices up to the block level. At block offices, there are about 1 to 2 computers but with limited access and restricted usage. Usage is also limited to word processing, like typing out letters; even spreadsheets are used as a word processing tool with no utility on data analysis.

Satellite Programme—EDUSAT

The DSERT is responsible for the EDUSAT (Education Satellite) programme wherein television-based video lessons are broadcast direct to classroom in a total of 1,770 primary schools in Chamarajanagar district and Gulbarga district. It was observed during the field visit that the departments' radio programme has a wide impact and is effective, especially on the rural schools.

Electronic and Mobile Communication

One of the least exploited ICT facilities is the e-mail and mobile telephony. The present e-mailing features are limited to few of the officers up to the block level and mostly limited to the meeting notice and information transaction. Further, these communications are mostly followed and duplicated through manual communication. Given the wide coverage on field by the cluster-level officials especially for data collection and collation, usage of mobile technology would have facilitated easy connect and information exchange, which is lacking in a big way.

Education Management Information System

With state-level e-Governance initiatives in place, the DPI has also developed and put in place a large-scale operational Education Management Information System. However, given the concerns with reference to data quality and usage by the various levels and for various developmental aspects, the initiative has not grown beyond its preliminary status.

Further, the department does not adopt any standard principles or framework of monitoring and evaluation to channelize the data capture and reporting for intelligent business analysis at various levels of the organization. The present system only operates on the information consolidation principles, where all the micro/minute details are commonly shared across various levels in the organization.

Web sites

The State department of Primary and Secondary education operates two informative Web sites: one being (<http://kar.nic.in/schools/>) acting as a comprehensive school-level databank and the other (<http://www.schooleducation.kar.nic.in/>), providing the overview of the department, its functions, and various activities undertaken by the department including the data pertaining to schools. However, it is felt that the information presented in these Web sites is limited and does not facilitate any dynamic usage.

Further, the DSERT operates a Web site (<http://dsert.kar.nic.in/>), which details the overview of the departments' roles, functioning, and initiatives, and provides access to textbooks of Class X, for Kannada and English medium of instruction for all the subjects. Even though DSERT aims to gradually cover all classes and all mediums, at this juncture there is very limited focus on the elementary education service delivery.

2.2. Policy Framework and Delivery Mechanism

This section describes various policies and plans adopted by the State of Karnataka to bring in an ICT-based educational change in the state.

IT Policy

Karnataka State Education Act 1983 (amended in 1998) does not mention the use of ICTs for primary and secondary education, neither has the state of Karnataka released any policy for ICTs and primary and secondary education specifically. However, the state announced its IT policy in the year 1997 known as "Mahiti, The Millenium Information Technology Policy of Karnataka." In the area of education, the policy plans to take ICT to all the schools and to set up training centers in schools. These centers are to be supported by the private sector to impart teacher training, computer education as well as foster general education with the help of ICT tools. The policy further stipulated that private companies running such centers can employ them for commercial use before and after school hours.

Thus, computer-based education was introduced in Karnataka, starting with 1,000 government Secondary Schools under the Mahiti Sindhu Project in the year 2000 by the Government of Karnataka. The Project was exclusively funded by the State, and later on various other central- and state-funded schemes for ICT in education was introduced in a number of government schools and private grant-in-aid schools. A list of the number of schools covered under various schemes to introduce ICT in education is as follows:

Table 8: Number of Schools under ICT in Education Schemes - Karnataka

S.N.	Schemes/Programs for ICT in education	No. of schools
1.	Mahiti Sindhu (State-funded project)	1,009
2.	Revised CLASS Project (Centrally assisted scheme)	150
3.	11th Finance Commission Scheme (Centrally assisted scheme)	88
4.	ICT@Schools, Phase-I (Centrally assisted scheme)	480
5.	ICT@Schools, Phase-II (Centrally assisted scheme)	1,571
6.	ICT@Schools, Phase-III (Centrally assisted scheme)	516
Total no. of government schools in the State of Karnataka		3,814

Source: Department of Education, Government of Karnataka

Computer Education Plan (CEP)

As per the Central Government Policy, each State shall develop a computer education plan, which shall identify the specific roles to be played by the State and Central Government. Thus under CEP, the State requires to cover the remaining secondary schools (yet to be covered) under ICT Phase-III along with the government schools under the Mahiti Sindhu Project, Revised CLASS Project, and the 11th Finance Commission Scheme. In addition to the 3,814 government schools, it is also planned to outreach the ICT Program to 2,633 private grant-in-aid schools in Karnataka. While extending this program to private grant-in-aid schools, it is proposed that 50% of the share will be met by the State Government as grant and the remaining 50% shall be met by the management of the respective schools.

2.3. Initiatives

Despite of not having a cohesive set of policies for ICT in education, Karnataka is one of the leading states in the country in this field. The Department of Education has shown immense interest and commitment toward promoting the use of ICTs for primary and secondary education. Thus, due to the initiatives of the state, public private partnerships (PPPs), and NGO activities, various programs have been implemented in the state. Karnataka is one of the leading states in the country in PPPs in this field and numerous benefits have emerged from this type of partnership.

The following section provides an overview of the ICT in education initiatives of the State. The initiatives have been described under four broad sections namely formal education, teacher training programmes, non formal education and radio programmes.

Formal Education:

The Education department has initiated ICT programmes for government schools; a majority of which are located in the rural areas. Through these programmes, the Department is addressing computer-aided education in primary schools and computer education and CAL in high schools.

2.3.1 Mahiti Sindhu programme

The programme plans to provide free computer education to students and teachers (grades VIII, IX, and X) in 1,000 schools of Karnataka. A special emphasis was given to girls and backward class students of rural areas while selecting the schools to be covered under this project. The programme is a fully State-funded project. The Project was implemented by the Education Technology cell of the DSERT; monitoring and supervision was done through the district DIETs, which acted as nodal agencies; and evaluation was conducted by the Indian Institute of Science and computer science departments of other engineering colleges of the state. The project has already been completed in 50 high schools of Karnataka in 5 years and has been extended up to 88 more schools in Karnataka for 3 years under the 11th Finance Commission.

The key deliverables of the project are as follows:

- Provide computer education to the students of selected government schools in the State of Karnataka.
- Help the subject teachers in teaching the hard spots with the help of content CD ROM's available in the lab.
- Train the subject teachers on the basics of computers and its applications in teaching.

The Department collaborated with many private IT companies to implement the project. Software for subjects like Social Science and Mathematics were prepared by School Net India Ltd. and software for subjects like English and Science were developed by Edurite Technology Ltd. Three Institutions, NIIT, Aptech, and Educomp Solutions, were given the responsibilities for project execution on a turnkey basis for a period of 5 years. Their responsibilities for the project are highlighted in the following box.

Allotment of Schools to Computer Agencies

1. Responsibilities of Computer Agencies under Turnkey Educational Projects:

- Infrastructure: This involves setting up computer lab inside the premises with the required computer hardware, software, and accessories and providing the necessary furniture and fixtures, including the maintenance of the computer hardware and accessories.
- Appoint two full-time qualified teachers (trained instructors) in each school to handle the curriculum and maintain the center for a specified period of time.
- Train the government school teachers in computer literacy and computer-based learning.
- Bearing recurring expenses such as monthly electricity charges, computer faculty salary, and consumables such as printer paper, floppies.
- Imparting IT education from Classes 8–10 as per the syllabus prescribed by Karnataka Government
- Students should be taught either in Kannada or English medium as opted by them
- Provision of bilingual courseware and multimedia instructional material (CBT) in English and Kannada

Responsibilities of NIIT

- ❑ Setting up computer facilities with hardware, software, UPS, and other accessories at **700** secondary schools in 15 districts of Karnataka.
- ❑ Provision of telephone and Internet connection at each school.
- ❑ Development of course materials and multimedia-based instructional materials in English and Kannada.
- ❑ To train 150,000 students every year.

Responsibilities of Aptech

- ❑ Setting up computer facilities with hardware, software, UPS, and other accessories at **250** secondary schools in Karnataka.

Responsibilities of Educomp

- ❑ Setting up computer facilities with hardware, software, UPS, and other accessories at **50** secondary schools in Karnataka.

The Mahithi Sindu Project has been extended for another three years. Keonics annual maintenance has taken up the responsibility of delivering computer education and training of teachers in the implementation of extended Mahithi Sindu Project. Various impact studies for the project have been conducted, details of these studies can be found in Annexure I

2.3.2. Eleventh Finance Commission Project

The project implemented in 2003–04, spread over a period of 3 year, aimed at providing computer education in selected 88 government secondary schools in the state. The total estimated cost of this project was INR 0.11 billion (approximately USD 2 million). Educomp Datamatics was selected through open tender process for the implementation of the project. Project, computer hardware, software, UPS, generator, and peripherals were taken on an outright purchase basis.

2.3.3. Revised CLASS (Computer Literacy and Studies in Schools) Project

The Computer Literacy and Studies in Schools (CLASS) Project was first introduced in 1984–85 throughout the country in collaboration with MHRD and Electronics departments on a pilot, basis but the project came to a halt in 1997–98. The deficiencies in the CLASS project were sought to be rectified in the Revised CLASS Project, which was framed by MHRD in 2001. Under this project, only those schools which taught computer education as an optional subject were entitled for aid and the state governments had to bear 25% of the total cost of the project. The details of the project are provided in the following box.

Project details: Revised CLASS

- ❑ Based on the proposals submitted by the state, GOI approved the implementation of the Revised Class Project in selected 150 government secondary schools in Karnataka. Each school got a server and nine work stations. Computer education was to be given to a

maximum of 350 students in each school. Approximately 53,000 students in 150 government secondary schools are benefited under this project.

- ❑ The estimated cost of the project was INR 0.17 billion (approximately USD 3 million) for 3 years.
- ❑ An amount of INR 55,000 (approximately USD 1,000) was allocated to each school for site preparation. This amount was spent through the respective SDMCs.
- ❑ The identified agency to implement the project was Electronic Corporation of India Ltd. (ECIL). The agency had to provide hardware and software to the schools and also provide computer teachers for the implementation of the program.

2.3.4. ICT @ Schools Project

The ICT @ Schools Project is a centrally assisted scheme, which is to be implemented across the state through three phases.

ICT@ Schools Project Phase-I

The Government of India in 2005–06 has approved ICT@ schools scheme in 480 schools in Karnataka state and the first phase has been implemented in 2006–07.

Two institutions Educomp Solutions and Everonn were given the responsibilities for project execution for a period of 5 years.

Project Details

Each School has been provided with a server and 09 workstations. Approximately 168,000 students of 480 schools are benefitted under this project.

The key deliverables of the projects are as follows:

- **Educomp:** Setting up computer facilities with hardware, software, UPS, and other accessories at **264** secondary schools in Karnataka and teacher training
- **Everonn:** Setting up Computer facilities with Hardware, Software, UPS and other accessories at **216** Secondary Schools in Karnataka, and Teacher Training

Source: Department of Education, Government of Karnataka

ICT@ Schools Project Phase-II

ICT@ schools Phase-II scheme was implemented in 1,571 schools in Karnataka 2007–08. Only Educomp Solutions have been given the responsibility to execute the project for a period of 5 years.

Project Details

Each school has been provided with a server and 10 workstations. Approximately 314,280 students of 1,571 schools are benefitted under this project.

Educomp Solutions have signed an agreement with Department of State Education Research &

Training (DSERT), Government of Karnataka, for implementation of computer-aided education in 1,571 schools in Karnataka under the ICT @ Schools Phase II for a period of 5 years. The order is valued at INR 1,090 million.

The key deliverables of the projects are as follows:

- Supply of computer hardware, software, and connected accessories
- Teacher training

Source: Department of Education, Government of Karnataka

ICT@ Schools Project Phase-III

The third phase of the project is still under the planning stage, but it has been envisioned that the third phase shall encompass all the schools that have been covered under the Mahiti Sindhu Project, 11th Finance Commission, and Revised CLASS project along with all the 2,633 private grant-in-aid schools in Karnataka, with the objective of standardizing ICT in education for all the schools in the state. Also, the computers and other peripherals of the aforementioned projects are old and outdated and needs to be replaced.

Thus, the total number of schools under Phase-III shall be as follows:

Table 9: Schools Covered Under ICT @ Schools Phase III - Karnataka

S.No	Category of Schools	No. of schools
1.	Government schools yet to be covered under any ICT in schools program	516
2.	Schools under the Mahiti Sindhu Project	1,009
3.	Schools under the Revised CLASS Project	150
4.	Schools under the 11th Finance Commission Scheme	88
5.	Private grant-in-aid schools in Karnataka	2,633
Total schools to be covered under ICT @ Schools Phase-III		4,396

Source: Department of Education, Government of Karnataka

2.3.5. Azim Premji Foundation – Computer Aided Learning

In 2001, the Azim Premji Foundation, a nonprofit organization, set up Computer-Assisted Learning Centers (CALCs) in 35 rural government primary schools to enhance the quality of learning of children through computer-based lessons developed for the Karnataka state curriculum for grades I to VII.

Today, in association with the Azim Premji Foundation, the Education Department is creating CALCs in government primary schools across the state. A total of approximately 600,000 students have benefited in 3,000 primary schools by the program, along with a total of 15,000 teachers trained. The Foundation develops a range of multilingual CDs to assist the primary school children in grasping their curricular subjects. For example, content based on animation and child-centered interactive games was created for use in the CALCs in the subjects of Mathematics, Environmental

Science, Geography, Kannada, Hindi, and English. The computers and operating expenses for the first year are provided by the government, whereas the physical site of the CALCs and the security and maintenance of the centers is provided by the community from the second year onward. Digital content for learning and managerial support for setting up and running the centers is provided by Azim Premji Foundation.

The foundation has mobilized community support and enabled the use of computers by community after school hours. Thus, many of the CALCs become kiosks after school hours enabling them to earn additional revenues to support the school and the program.

Teacher Training Programs

As a part of implementing ICT in schools, the State Government of Karnataka has taken up computer training of teachers in a big way. Besides computer literacy, the teachers are trained in using the Internet to enhance their teaching capabilities and skills. The summer vacations are used for computer training of teachers. Apart from the agencies (NIIT, Aptech, Educomp, ECIL, Everonn) who are involved with the aforementioned projects in implementing ICT in schools, Intel, Microsoft, World Links, and the American Indian Foundation are also associated with teacher training programs in Karnataka.

2.3.6. Intel

Innovation in Education: Intel has a worldwide nonprofit initiative called “Innovation in Education” and have tied up with the Education Department in Karnataka to impart training for teachers to innovatively use computer technology to enhance student learning. This teacher-training programme in CAL is currently being conducted in 1,000 schools under the “Mahiti Sindhu” programme. Under this program, Intel has trained and created a resource pool of teachers 1,500 master trainers.

2.3.7. Microsoft

Microsoft has tied up with the Education Department with an objective to:

- Accelerate IT literacy among government school teachers and students
- Promote ICT integration in schools

Outcome: Microsoft under an MoU with the State Government has set up three computer academies in Bengaluru, Dharwad, and Gulbarga for teacher training.

Progress:

- 1,864 master trainers trained
- 16,799 teachers trained by master trainers
- 32 teacher educators trained as master trainers
- 256 teacher educators trained by master trainers

2.3.8. World Links India

The World Links India Program was initiated in January 2002, with the training of 30 master

trainers from Delhi and Karnataka. As part of Stage I of the World Links India Program, World Links targeted 32 rural and underserved government schools in Delhi and Karnataka. The World Links Karnataka Program was launched in collaboration with DSERT and teachers have completed the Phase I training “Introduction to Internet for teaching and Learning.” As an outcome of the training program teachers in these schools have had an opportunity to work in computer labs and have also accessed the Internet to develop curriculum-based resources for their courses. In Karnataka, World Links is operating in 21 government and government-aided schools: 6 in Bengaluru urban, 8 in Gulbarga, and 7 in Bengaluru rural.

2.3.9. American Indian Foundation

Digital Equalizer Programme has been implemented in 216 government high schools in 18 districts in the state in collaboration with American India Foundation. The project encompasses the following:

- a) Capacity building and collaborative activities by developing course modules and providing inputs for technical and academic developments, students, and teachers
- b) Training programme for teachers and activity programme for students
- c) Material development for teachers and students
- d) Documentation of all activities

Radio Programs to Support School Education

There are various interactive lessons and educational programs being broadcast through radio and televisions to support school education in Karnataka. For example, programs such as Chinnara Chukki (for Class I–II), Chukki Chinna (for Class III–V), and (Keli Kali for Class VI–VIII) are being broadcast on Akashvani (AIR—All India Radio) and various other programs on Science and Mathematics are being telecast everyday under the EDUSAT Programme at various government schools in the State.

2.3.10. DOT-EDU (T4) Project

In 2004, the SSA, the DSERT, and the Education Development Corporation (EDC), Washington, through a USAID initiative, collaborated to produce the dot-EDU project, which was launched in the state on August 16, 2005, with a pilot programme of *Chukki Chinna* (for students of Classes IV–V) in select districts. The program was then scaled up to the entire state as it became successful and achieved the requisite academic results. Thus, since 2005–06, *Chukki Chinna* (along with a separate series for Class III) and another series titled *Chinnara Chukki* (for Classes I and II) are being broadcast in all 32 districts of the state. The IRI (Interactive Radio Instructions) programmes are broadcast through 13 AIR stations in the state.

Chukki Chinna series of IRI programmes for grades 4 and 5 consist of 134 programmes. These programmes in Kannada cover content areas in English, Kannada, Maths, Science, and Social Science. Chukki Chinna series for grade 3 has 42 programmes for content areas in Kannada, Maths, and EVS.

Chinnar Chukki series of IRI programmes for grades 1 and 2 consist of 94 programmes of 30 minutes each in Mathematics, EVS, Kannada, and English. Based on “hard spots” identified by Karnataka teachers, trainers, and the State Government, both of these IRI series help teachers to more effectively teach difficult content in the five subject areas

For the implementation of all T4 (The Technology for Tools for Teaching and Training) project activities in the state by the EDC, there is an MoU between the SSA, Karnataka, and EDC. As per the agreement, the SSA shares the costs related to teacher training and printing of teacher guides. EDC has also entered into an agreement with the DSERT to produce 20 IRI programmes for grade III in English language as the Government of Karnataka has decided to introduce English language as a subject from Class I onward in all the government schools.

Forty educational video films have been developed by EDC, which are being telecast through EDUSAT. It reaches around 1,888 schools across four districts in Karnataka. Similarly, unique Group Teaching and Learning computer software developed by EDC is being used in 2,500 primary schools with computers. A digital library has also been introduced in the state since 2007 and is used by district and sub-district structures. EDC also provides teacher training and apart from the regular IRI and GTL teacher training, teachers in Karnataka have also undergone training in a module developed by EDC called “My Inner Self.” In phase I, EDC had trained 1,356 master trainers who in turn trained 89,900 teachers across the state. Details of students reached and teachers covered by the programme in the state are:

Primary schools	Students (Grade 1-5)		
	Boys	Girls	Total
81,550	3,380,911	2,998,167	6,379,078

Number of teachers/administrators trained		
Male	Female	Total
150,450	32,718	183,168

Source: Department of State Educational Research and Training, DSERT, Government of Karnataka

2.3.11. Keli Kali (Listen and Learn, started in 2000–01)

Keli-Kali is a radio program on AIR and covers about 50,000 schools and 7 million children. The broadcast started from ten stations of AIR in 2000–01, aiming at Classes III–V of the schools in some of the backward north-eastern districts of the state. Teachers were provided the timetable and a handbook in advance, so that they could synchronize their teaching with the broadcasts, which were textbook based. The program was designed by the DSERT. Keli-Kali was then extended to all primary schools through all stations of AIR for Classes III–V, which broadcast programs throughout the year (Monday to Friday); the program was extended to Class VI in 2003–04. The subjects covered are Kannada, English, Urdu, EVS, and Mathematics. There is another afternoon program, which targets Classes VI–VIII and teachers and focuses on hard spots.

Internal assessments have shown that Keli-Kali is a much appreciated initiative since it provides additional resource material and help teachers use the radio as a supplement to classroom teaching. The music, sound effects, and theatre skills that are called for are also attractive. In all 185 episodes in different subjects and 45 episodes for Urdu-medium schools are broadcast.

2.3.12. EDUSAT: Satellite Project in Karnataka

EDUSAT, a dedicated educational satellite, was launched by the Government of India (in 2004) to serve the educational sectors offering an interactive satellite-based distance education system for the country. In Karnataka, it was proposed to utilize the technology to improve the quality of education at the elementary and secondary schools. In the first phase (launched in March 2005), all the primary schools of Chamarajanagar district were covered, and later on in the same year, it was expanded to the Gulbarga district. With both the districts combined, 1,770 (885 in each district) schools have been covered through EDUSAT.

At present, EDUSAT is also available in 427 schools in Bengaluru rural and 406 schools in Ramnagaram district. From an archive of 450 programmes on science and mathematics, two select episodes of half-an-hour duration each are telecast everyday under the EDUSAT programme. The UPLINK facility was established in DSERT, Bengaluru, and the downlink facilities at all the primary schools are provided with facilities such as ROTs and television sets to receive video lessons through EDUSAT, and with solar power facility to combat the frequent power problems. SSA supports the project in partnership with the Indian Space Research Organization (ISRO).

Source: Department of State Educational Research and Training, DSERT, Government of Karnataka

Non-Formal Education

The Karnataka Government has initiated various e-governance systems for enhancing rural development, for the purpose of education, the government started the YUVA scheme to provide basic education to the rural youth.

Non formal education is also being imparted through community radio, the concept behind community radio is –“radio for the people and by the people”. Community radio is characterized by access, public participation and decision-making, and by listener financing. “VOICES” is an NGO that looks at using media for social change and has been actively lobbying for Community radio in India.

2.3.13. Namma Dhwani

VOICES together with MYRADA, another NGO, and UNESCO have initiated “Namma Dhwani,” India’s first cable audio initiative, in 1999, in Budikote village, Kolar district, Karnataka. In the absence of legislation that allows for use of airwaves, the Namma Dhwani initiative uses audio cable connections to transmit information to the school and individual homes. The format of the programmes for the school consists of newspaper reading, local news, general knowledge, music, model lessons, and programmes about issues like dowry, environment preservation, and so on. Programmes for the general public are decided by the community themselves and include

entertainment and information on locally relevant matters. More than 350 programmes have been cablecast so far.

Sustainability—The study and subsequent implementation of the project, including setting up of the infrastructure, training the people, and preparing the first few programmes were funded by UNESCO. Subsequently, the entire activity is being managed by the village residents. VOICES and MYRADA continue to have a presence in the village. For such an initiative to be sustainable and replicable, the audio production centre, transceivers, and communication channels need to be reliable and yet inexpensive to build and maintain. There is also a need for a trained manpower to attend to breakdowns if any.

2.4. Key Learnings

The power situation in the state is a major bottleneck to ICT initiatives. Electricity is barely available for six hours a day in most villages and that too at usually odd times. Most of the programs have addressed this issue through UPS (Uninterrupted Power Supply) systems and diesel generator sets, but these can provide electricity only for a few hours which might be adequate for the use of individual applications but are not adequate if a combination of services is to be provided over a longer period of time. With the cost of renewable energy devices being prohibitively high and the problems encountered in the availability and storage of diesel to run diesel generator sets, implementation of a set of economically viable ICT-driven services is severely hindered.

As for initiatives that require Internet connectivity, the connectivity available across rural India is not very reliable, but efforts are on to enhance the same, using a variety of technologies. In some cases, more expensive home-grown connectivity solutions are being implemented to promote indigenous enterprise, but the tradeoff in cost needs to be studied carefully, especially since the rural market has a limited paying capacity.

Karnataka is highly advanced in IT/BT/BPO Industry/Services. E-governance initiatives supported by the Department of IT, Government of Karnataka are gaining momentum. Daily Radio lessons are integrated with school timetable. Teleconferencing in teacher training is extensively used. All high schools are supplied with computer laboratories. However, integration of syllabus with computer technology for transactions, availability of CD libraries in schools, and capacity building of teachers need immediate attention.

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2.6. Stakeholders

The details of persons contacted for Case Studies are given in the following table:

Name	Designation	Organization
Rajeev Katyal	Director, Education	Microsoft
Krishna Nagaraju	Strategic Account Manager	NIIT
H.N.S. Rao	Academic Head ICT	Educomp Solutions
Linson Joseph	Channel Platform Manager	Intel, South Asia
Sukumar Aniker	Head, Technology for Education	Azim Premji Foundation
Nived Dinesh	Head—Content Licensing and Development Services	Edurite India
Satya Narayanan	Fellow	American Indian Foundation
R.G. Nadadur	Principal Secretary, Primary & Secondary Education,	Karnataka—Department of Education
I.F. Magi	Special Officer	Karnataka—Department. of Education
Devaprakash	Joint Director	Department of State Educational Research and Training (DSERT)
Jayaramu		Department of State Educational Research and Training (DSERT)
Rangaswamy	Officer in charge for Radio Programs—DSERT	Department of State Educational Research and Training (DSERT)

2.7. Annexure I

Impact

The evaluation study conducted by Center for Multi-Disciplinary Development Research, Dharwad, has highlighted the impact of the Mahiti Sindhu Program as follows:

- Significant improvement in enrollment and attendance in these schools
- Reduction in dropouts
- Increase in computer literacy among students
- Improvement in SSLC results.
- Improved English language skills of the students
- Majority of teachers are trained in computers and are able to computers in class room teaching

The **Intel-IMRB** survey 2006 has highlighted the following:

Even though Karnataka has displayed a high infrastructure growth post implementation of the Mahiti Sindhu program, infrastructure and support issues are major challenges faced by the state. Inadequate access to Internet and lessons not fitting well into the curriculum are the main reasons for not implementing technology-based lessons among teachers. Computer knowledge is a motivating factor and there is high satisfaction among teachers about the program across districts.

With any monitoring system in to place to carry out the effective study of a program, flaws should be detected during the pilot phase itself and it should be ensured that it is corrected in the final policy/implementation. For instance, the ambitious Mahiti Sindhu Project has not been able to achieve the desired results as per an NGO “IT for Change”:

Mahiti Sindhu Program—A Review by “IT for Change”

According to a study conducted by Bengaluru-based non-governmental organization “**IT for Change**,” the government’s Mahiti Sindhu programme in Karnataka using the outsourcing-based model, which took computer education to 1,000 schools across the state, has not achieved its goal. According to the study, the larger goal of establishing IT-enabled education in government schools has been abandoned. Further, the use of proprietary software has limited the scope of IT-enabled education in the schools. The programme, which outsourced the setting up and teaching process to private vendors, has not benefited the overall school system says the study.

The report also found that vendors, who designed content and process, were in the business of selling computer hardware/software or general computer training and not equipped to teach education-specific tools. The vendor-deputed trainers were poorly paid—salaries ranged between INR 2,500 to INR 4,000 (approximately USD 50 to USD 85) per month—and thus contributed little in terms of quality or expertise to the job.

In contrast, Kerala’s IT@ schools emphasized was on developing systemic in-house capabilities anchored around the role of school teachers, said the report. High school teachers in Karnataka, unlike their counterparts in Kerala, were not trained to apply computer skills to regular lessons despite having computers in their schools.

3. India Case Studies: Rajasthan

The state of Rajasthan situated in the north west of the country is the largest state of the Republic of India in terms of area, constituting 10% of the total landmass. Rajasthan's economy is primarily agricultural and pastoral, though western Rajasthan is largely a desert with acute water shortages. The state is among the largest producer of edible oil and wool in India. It has rich mineral deposits and hence the main industries are based on minerals.

Apart from agriculture and manufacturing, tourism is one of the major sources of income in Rajasthan. Endowed with natural beauty and great history, tourism is one of the most productive industries in the state.

The GSDP is INR 1.39 trillion (approximately USD 30.75 billion) at constant prices in the year 2006–07.

Jaipur is the capital of Rajasthan. Other major cities include Jodhpur, Udaipur, Kota, Ajmer, and Bikaner.



Figure 5: Map of Rajasthan

Source:

<http://en.wikipedia.org/wiki/Rajasthan>

Some of the demographic indicators of Rajasthan are as follows:

Table 10: ICT Parameter - Rajasthan

Parameter	Statistics (2009)
Capital	Jaipur
Population	56,473,122 (2001 Census)
Population density	165/sq. km
Area	342,239 sq. km

Source: India 2009, A Reference Annual

3.1. Background

Brief Overview of the Education Environment

The Department of Education, Government of Rajasthan, is responsible for the development of education in this state. There are over 13.8 million children enrolled in schools at the elementary level (between Classes I and VIII). The state has a high dropout rate, and the government has undertaken various measures to reduce the dropout rate and ensure that all children attend classes and stay in school. While the Directorate of Elementary Education is responsible for education from Class I to VIII, the Directorate of Secondary Education is responsible for Classes IX–XII.

The following are the number of schools in the state:

Table 11: Number of Schools - Rajasthan

Type of school	Government	Non-government	Total
Secondary	6,231	5,149	11,380
Higher secondary	3,108	2,902	6,010

Source: <http://rajshiksha.gov.in/>

Rajasthan has achieved impressive results in enhancing the reachability and quality of education by improvement in delivery and management of education services in the state. Focused efforts have been made to increase access to schools for all children, fill teacher vacancies, and to raise the public expenditure on education. The main focus of Government of Rajasthan is to universalize primary education by 2010, and secondary education by 2020. Other objectives of the government include improving retention of students, improving girl education and expanding the curriculum to provide ICT skills to secondary school students.

Various educational interventions like alternative schools, evening schools, bridge course, Shiksha Mitra Kendras, mobile schools, and other remedial teaching centers have been proposed and implemented to address the needs of girls, out-of-schools/never-enrolled children, dropouts, children with special needs, and children from SC/ST (Schedule Caste/Schedule Tribe) and other disadvantaged section of the society.

Education for girls has been of prime significance in the state. Many Kasturba Gandhi Balika schools have been sanctioned in the state and many have already been constructed. Girls belonging to the tribal areas who continue their education into secondary or higher education are exempted from any fee. There are special residential bridge courses of three to six month duration designed to mainstream those girl students who dropout of school. A total sanitation campaign has been designed with the purpose of providing toilet and sanitation facilities in schools. Approximately 41,000 schools will be provided with this facility by clubbing finances available with SSA, the PHED, the Rural Development Department, UNICEF, and the Balika Shiksha Foundation.

Some of the key education indicators in the state are given in the following table:

Table 12: Education Indicators - Rajasthan

Education Indicators (2006-07)			
Gross enrollment ratio (%)	Total	Male	Female
Primary school	121.69	124.69	118.40
Upper primary school	74.12	87.27	59.45
Secondary school	45.89	58.70	31.42
Higher secondary school	22.25	29.21	14.31
Dropout rates (%)	Total	Male	Female
Class I-V	52.84	57.20	45.94
Class I-VIII	59.47	55.72	64.64
Class I-X	75.73	71.36	81.80
Teaching staff	Pupil/teacher ratio	%Trained	%Female
Primary school	47	82	40
Upper primary school	31	78	42
Secondary school	23	93	33
Higher secondary school	29	95	43
Literacy level (%)	Total	Male	Female
Urban literacy level (India)	76.20	86.45	64.67
Rural literacy level (India)	55.34	72.16	37.33

Source: Select Educational Statistics, 2006-07, Government of India

The Government of Rajasthan has been implementing flagship schemes like the Sarva Siksha Abhiyaan (SSA), Rashtriya Madhyamik Shiksha Abhiyaan (RMSA), and the ICT @ Schools of the Government of India.

The government has been running programmes in the state to improve the state of education, some as a part of the SSA. The SSA in Rajasthan is being implemented to address 192 million children. One of the major objectives of the program is to open new schools in places where schools are not present and to improve the infrastructure of current schools as well. There is a focus on augmenting the number of teachers and building capacity of existing teachers by providing them necessary training. Girls' education and plans to bridge the digital gap by providing computer education are also important considerations for the state. The government in addition undertakes several programmes on Formal Elementary Education, Teachers Training, Alternative Education, Civil Works, CALPs, Research and Evaluation, Quality Monitoring Formats, Quality Assurance Programme, District Information System for Education, Remedial Teaching, School Water Sanitation & Hygiene Education cell (SWSHE).

Apart from these programmes, the Government of Rajasthan in 2005 launched a unique PPP initiative, the Rajasthan Education Initiative (REI), aimed at engaging global and local partners from private sector, foundations, and NGOs to improve the delivery of educational services. The REI is inspired by the Jordan Education Initiative (JEI), but unlike JEI focuses both on ICT as well as non-

ICT-based projects. REI plans to leverage technology in an attempt to modernize delivery mechanisms in education, improve learning levels, and provide skill development. The REI brings together the government and its core partners like the World Economic Forum, the Confederation of Indian Industry, and the Global e-Schools and Communities Initiative (GeSCI).

REI during the course of its operation has contributed significantly to the objectives of SSA and various facets of educational development in Rajasthan, including increasing access, promoting efficiency, improvement of quality of learning and teaching, and improving infrastructure and management systems.

The objective of REI is to provide an environment to bring in global and local private sector, foundations, charitable organizations, and other grassroot level NGOs to support the Government of Rajasthan to achieve its education objectives and act as a catalyst to initiate innovative multistakeholder partnerships. Another objective of REI is to demonstrate robust, sustainable, and scalable models and approaches, tools, and methodologies.

The REI has adopted the following strategies to bring a new educational paradigm to the state:

- Evolving and encouraging local, sustainable, and scalable PPP models
- Adopting best practices form public and private sector
- Integrating and deploying new technologies like use of ICT for modernizing educational services
- Adopting strategies to increase community participation in the State's Education Programmes
- Encouraging flow of resources into the education sector in Rajasthan by creating incentives for participating in the development activities in the education sector
- Focus on improving the condition of education of underprivileged sector in urban and rural area, girl children and children with special needs
- Showcase the success of similar partnerships in appropriate forums by evaluating their results with other flagship programs like SSA

A major focus of the REI is on the education of girls, rural children, urban underprivileged children, and children with special needs.

REI Institutional Framework:

The state has designed a state steering committee to supervise the work of REI. REI also has a programme office to oversee the operations and coordinate between partners. The REI Governing Committee is headed by the Chief Minister and consists of government officials and representatives of non-government stakeholders as well.

The committee takes all policy level issues to ensure that PPP initiatives are aligned with the objectives as planned by the Government of Rajasthan. The committee also formulates strategies for the success of the project and resolves any issues with the partners. Other tasks of the committee includes designing strategies to attract more resources and more partners, deliberate on

issues being faced by partners in the project and work out solutions, track the progress and suggest corrective actions, and so on.

REI was implemented for a period of 3 years (2005–08); this period of inception, experimentation, and trial was the first phase of the initiative. UNICEF and several other co-partners are working with the Ministry of Education, Rajasthan, to develop the second phase of the initiative.

Brief Overview of the ICT Scenario

The Department of Information Technology and Communications (IT&C) is responsible for the development of ICTs in the state of Rajasthan, including the development of IT and ITeS industries. The Department of IT&C has been implementing many projects to develop the status of ICT in the state. The Department has constituted a State Agency called the RajCOMP as a consulting organization in the field of Information Technology. The RajCOMP operates under the aegis of Government of Rajasthan with the State Chief Secretary as the Chairman of Governing Board. The Secretary of Information Technology heads the Executive Committee and qualified professionals manage the day to day work of RajCOMP.

RajCOMP has been operating since 1989 and has successfully implemented many e-Governance projects in the state. It is also involved in the development of a State Wide Area Network called the RAJSWAN, which will act as a backbone for connectivity for all the e-Governance initiatives in the state. Apart from the RAJSWAN, a State Data Center Project has also been undertaken by RajCOMP that will act as a centralized data center for all the applications/initiatives in the state.

Some of the key ICT parameters for the state are given in the following table:

Table 13: ICT Parameters - Rajasthan

Parameter	Data	Year
Wireless subscription base	27.74 million	Sep 2009
Wireless teledensity	41.85	Sep 2009
Wireline subscription base	1.60 million	Sep 2009
Total number of Internet users	711,377	Sep 2009
Total number of broadband users	216,203	Sep 2009

Source: The Indian Telecom Services Performance Indicators, July–September 2009: Telecom

3.2. Initiatives

In Rajasthan, in addition to the government, a number of NGOs and Corporations have partnered with the REI to ensure effective delivery of education using technological interventions. Some of the major initiatives are profiled in the following:

3.2.1. Intel Education Initiative—Intel Teach Program

The Intel Education Initiative has been active in Rajasthan since 2005 and primarily focuses on improving teaching and learning using ICT for government schools. As a co-partner for the Rajasthan Education Initiative (REI), Intel initiated the “Teach to the Future” project, which aims to provide comprehensive IT training to government school teachers to enable them to incorporate technology in their classrooms. For the 26 districts covered by the Project, the government covers infrastructure and logistics expenses while Intel provides training, support, and resources, including Internet, multimedia, and assessment tools.

“The major challenge faced in implementing the project has been lack of electricity particularly in peak summer months. However, the government has been instrumental in developing infrastructure for schools. In a phased manner they have covered all government schools in Rajasthan by providing them with computers. They also have a strong monitoring and evaluating system in place; the district project officer monitors whether ICT is actually being used by the schools. Since Intel has provided support in terms of capacity building, the government at times turns to us for assisting them in the monitoring process.”

Anoop Singh Rawat, State Coordinator for Intel Teach Program

Intel has also been working with other state government organizations such as the Education Ministry, Rajasthan Council of Elementary Education (RCEE), Elementary Education, and State Institute of Education Research and Training (SIERT).

The Intel Teach Program was launched in Rajasthan in 2005. It is a professional development program, which enables school teachers to enhance student learning by making effective use of ICT. The Intel Teach Program launched in Rajasthan differs from the rest of the country as it follows the Lead Master Trainer (LMT) model. LMTs are chosen from SIERT and District Institute of Educational and Training (DIET), who are trained on how and when to incorporate technology in the classrooms; the LMTs further impart training to master trainers (teachers from upper primary schools) who in turn informally train other teachers in the school. Till date more than 22,682 teachers across 1,766 government schools and 5,500 private school teachers have been trained from 20 districts in Rajasthan.

“The LMT model aims at converging in-service and pre-service training. Since the LMTs are responsible for training school teachers in their own district, teachers find it easier to relate to them and reach out to them in case they require further assistance. LMTs are also being used by the government for implementing other ICT initiatives.”

Vinay Mehra, Regional Education Manager, Learning Links Foundation

3.2.2. American India Foundation—Digital Equalizer Program

The American India Foundation (AIF) is a not-for-profit organization aimed at accelerating social and economic change in India. It covers many socioeconomic factors, including public health, livelihood, and education, particularly elementary education. Through its Digital Equalizer (DE) program the foundation strives to bridge the digital divide prevalent in India by providing computers, Internet access, and training to under-resourced Indian schools. The program is targeted toward children in grades 6 through 10 (ages 10–14) and its objective is to promote the use of technology to improve the quality of education and prepare under-privileged students for the emerging digital age.

In Rajasthan, AIF signed an MoU with the government in 2005 to implement the DE Program in 200 schools across 7 districts to help the schools in their implementation of the computer education, GRACE or CALP programmes. AIF supports a DE school for a period of 3 years to prepare the school for complete self-sufficiency after which schools sustain the program on their own. The support extended by AIF for the DE schools is in the form of the 3T's:

Technology: (Hardware infrastructure) A typical DE center contains multimedia computers (a minimum student to computer ratio of 4:1) loaded with Windows/Linux Operating System, power broadband networking, Internet connectivity, and other peripheral digital technologies (including printers, digital cameras, projection system, digital telescopes)

Tools: (Software, Internet, and learning tools) All DE centers come equipped with a software tool package that includes Open Office, regional language fonts, and browser capabilities in addition to grade-appropriate curriculum software and project-based learning resources.

Training: (Student, teacher, and school administration) The DE program provides training for students, teachers, and school administration for a period of 3 years. The training includes computer basics, use of popular productivity tools (MS Office, Open Office, etc.), Internet for research, use of e-mail, and other digital technologies.

By 2009, when the partnership between REI and AIF ended in Rajasthan, the DE program had been implemented in 84 schools.

3.2.3 Azim Premji Foundation—CALP

Azim Premji Foundation is a not-for-profit organizations focusing on providing quality education to government run elementary schools situated in rural areas. Realizing the importance of technology in providing quality education and augmenting the teaching learning process, the foundation initiated the CALP in India in 2002. Following its success, the government of Rajasthan signed an MoU with the foundation to launch CALP in all 32 districts in Rajasthan. The programme was started in the year 2004–05 and to-date 1,134 upper primary schools have been covered. To implement the program, the role of the government is to provide the hardware and the foundation will provide the content and the training. To impart training, a team of facilitators called the field team were recruited and they conducted induction programs for the school teachers. In terms of

content development, the foundation created syllabus-based bi/trilingual multimedia content, which was given to the teachers along with a one-day orientation.

REI partnerships are being sought to scale up this programme to a larger number of schools and to augment the facilities being made available in schools already covered under this scheme.

3.2.4. Hole-in-the-Wall Initiative

Hole-in-the-Wall Education Ltd. (HiWEL) is a joint venture between NIIT Ltd. and the International Finance Corporation (a part of The World Bank Group). It was established in 2001 to experiment the idea of Minimally Invasive Education kiosks or Hole-in-the-Wall. These learning stations are embedded into the boundary walls of government schools and freely available to slum children so as to enable the students and kids from adjoining slums to have access to educational content and games, with minimal intervention from adults.

HiWEL has been present in Rajasthan since 2002 when it took on the task of installing Learning Stations in five districts in and around Jaisalmer. The installation of these learning stations was extremely challenging in Rajasthan given that most schools in the state do not receive regular electricity supply. However, upon conducting an impact assessment, HiWEL found that the Learning Stations had had a positive impact on the learning process, particularly in terms of honing IT skills.

In 2005, the government of Rajasthan signed an MoU with HiWEL to establish Hole-in-the-Wall Learning Stations in three districts across Rajasthan. The aim of these learning stations was to inculcate problem solving and functional computer literacy skills in underprivileged children in Rajasthan. It also aims at helping students go beyond the rigid grade-achievement system imposed by formal schooling. With the help of UNICEF, HiWEL had established a total of 15 learning stations in Jhalawar, Tonk, and Dholpur.

In 2007, HiWEL partnered with the Jaipur Municipal Corporation (JMC) and Rajasthan Council of Elementary Education (RCEE) to install two computers per school in the playgrounds of 200 schools in Jaipur. While JMC is responsible for providing financial support and building the learning centres, HiWEL will facilitate the implementation and the overall functioning of the centers. HiWEL has also collaborated with Pratham Rajasthan, an NGO which works in the area of primary education, to ensure the acceptance of the project within the community. After supporting the schools for 3 years, HiWEL passed on the responsibility of maintenance and usage of the learning stations to the schools.

However, by 2010, when the project ended, only 63 schools were covered as opposed to their target of 200. Implementing HiWEL Learning Stations in Rajasthan has been a challenging task given the circumstances prevalent in the State. It is prone to extreme weather conditions; in summer, the temperature can exceed 50°C; since all learning stations are installed outdoors, the weather can play an important role in its functioning and implementation. The housing structure in Rajasthan was another challenge affecting the construction of the stations; unlike other states, bricks are not easily available so the team had to resort to using stones for its construction. Irregular electricity supply in schools was another challenge faced in Rajasthan; some districts in Rajasthan have power cuts for eight hours in a day.

While implementing the stations in collaboration with the Jaipur Municipal Corporation, HiWEL faced other sets of challenges such as administration clearance issues and delay in construction work, which was to be undertaken by JMC.

Apart from implementing the playground learning stations across India, HiWEL continues to research innovative techniques in terms of hardware technology, software technology, and cognitive design. It also offers services such as periodic content upgrade, monitoring and evaluations, student-teacher orientation, and community intervention programs.

3.2.5. Microsoft—Partners in Learning

“Partners in Learning” is a global education initiative by Microsoft to increase the access to technology and to ensure its use in enhancing the teaching learning process. In India, Partners in Learning focuses on teacher development and student empowerment. The government of Rajasthan signed an MoU with Microsoft in 2005 to provide comprehensive IT training to government school teachers in six districts in Rajasthan. The aim of this partnership was to enable teachers to include technology in their schools. Through the training teachers learnt basic IT skills as well as the skills required to develop their own “e-Lesson Plans.” As part of the MoU, Microsoft also launched an IT Academy, which is situated in Jaipur, to train teachers across the entire state. The Academy is equipped with hardware, software, curriculum, and the staff required to ensure that effective IT training is imparted to the teachers. Microsoft also provides software solutions for school teachers and develops courseware and curriculum for schools.

In Rajasthan, over 12,740 teachers have been trained from 6,511 schools in 11 districts till date. Teachers receive certification after 3–6 months of training to ensure sustainability and retention of the program. Posttraining monitoring and evaluation have also been conducted through visiting schools and assessing on ground implementation.

Some of the other ICT-related initiatives under the REI for which partnerships have been sought are as follows:

Rajasthan Education Initiative, ICT Projects

Project GRACE (Girls of Rajasthan and Computer Education)—Under the framework of the Government of India's ICT @ Schools scheme, this project aims to provide Computer Education to Senior Secondary Girls' Schools in educationally backward areas in Rajasthan. Currently, 170 Senior Secondary Girls' Schools are being targeted under this scheme and partnerships are being sought to scale up the programme

District Computer Training Centers—Computer training centers comprising of a computer lab of 30–40 computers have been set up in all 32 districts headquarters of the state. Under REI, partnerships are being sought to operate these centres on a PPP model to generate a revenue stream that can enhance their potential as a sustainable commercial venture.

EDUSAT—EDUSAT programme implemented with the assistance of the ISRO has been ongoing in the state. Under it a hub has been established at Indira Gandhi Panchayati Raj Sansthan and teaching end studio at Shiksha Sankul, Jaipur. 44 SITs (Satellite Interactive Terminal) and 13 ROTs (Receiving Terminals) have been established at relevant locations. Partnerships are now being sought under REI to develop relevant content for the students, utilizing of the Edusat for teacher training and providing technical manpower to resolve operational and maintenance problems.

Teacher Training Technology Academies—Teacher training programmes need to keep abreast with the available technologies, with that in mind partnerships with technology companies to provide effective training to teachers on ICTs have been undertaken.

Departmental Computerization—The government seeks to computerize and connect all field level offices down to block level. Support is required for data management and connectivity solutions and for ensuring that the ICTs installed are used effectively.

<http://www.rei.org.in/>

3.3. Key Learnings

Rajasthan faces several significant natural disadvantages due to its geographical conditions. The desert nature of the terrain with acute water shortages, combined with a largely traditional society, has posed severe problems for economic and social development.

The state was characterized by extremely low literacy levels especially for women in 1991, with a literacy rate of only about 20%. In 2001, the literacy rate for women rose to 44%, still about 10% points below the national average of 54%. Overall the state in the last two decades has shown a sharp improvement in literacy, and the total literacy in the state as per the 2001 census was estimated at about 61% as compared to the national average of 65%. While the male literacy level in fact exceeded the national average, the low female literacy levels are contributing to the overall lower literacy of the state.

Though access has improved considerably through recent efforts under the Sarva Shiksha Abhiyan, Shiksha Karmi, and Lok Jumbish projects, the state struggles with issues of retention and high dropout rates. The dropout rate for girls from Classes I to X was as high as 81% (2006–07) and for boys for the same period is 71%. Further, at the higher secondary levels (Grades XI–XII), the GER is as low as 22%.

The government is also keen to develop adequate human resources for the development of a vibrant IT industry in the state. To that end it is in the process of undertaking steps with the assistance from NASSCOM to enhance the training required to widen the scope of the BPO industry in the State.

In Rajasthan, community mobilization through partnerships with civil society organizations, such as in the case of projects like Lok Jumbish,⁶ Shiksha Karmi,⁷ Mazdoor Kisan Shakti Sangathan (MKSS),⁸ have resulted in significant gains in implementing key initiatives in education and the Right to Information campaign. It is through the efforts of these organizations that the literacy levels in the state have almost doubled in the last decade or so, enrollments have considerably increased, and a key legislation like the Right to Information was passed. Community mobilization remains therefore a key aspect and ICT initiatives in order to be successfully implemented and subsequently sustained should engage in partnerships at this level.

The Rajasthan Education Initiative was a unique public private platform that guided the government's effort in improving education levels in the state from 2005 to 2008. However, after the initial success, the initiative has not been sustained in its vibrant form. Political will at the highest level and the government's continuing focus will be required to make the platform effective. However, there have been some valuable lessons learnt from REI; the government and other stakeholders are now better prepared to manage a multiple stakeholder platform for integrating ICTs in schools.

Despite the apparent success of several education projects at primary level, there are a number of problems in education and training in Rajasthan. These include low level of literacy, low level of participation rates in schooling, lack of emphasis on technical vocational education, lack of teachers and facilities in government schools (particularly in rural areas), exploitation of parents and

⁶ Lok Jumbish was initiated as a people's movement to universalize primary education in Rajasthan. It mobilized the local village communities to undertake various activities for school improvement including formation of village level bodies, organization of women in village communities, and improvement of the school facilities and teaching-learning process. For more information refer to <http://unesdoc.unesco.org/images/0011/001175/117580e.pdf>

⁷ Shiksha Karmi, meaning education worker, was a project aimed at training local para teachers in remote educationally backward areas where formal schools were not functioning effectively, in order to tackle problems of teacher absenteeism, high drop outs, and so on. The project relied heavily on involvement of local communities. For more information refer to <http://www.eriindia.org/files/Shiksha-Karmi-Rajasthan-March2000.pdf>

⁸ <http://www.mkssindia.org/>

teachers by private schools (even with poor quality of education), poor quality of teacher training (particularly in private teachers training colleges opened in the last decade), and need for strengthening professional training in various sectors. Distance education was initiated by establishing Kota Open University. Also there are centers of IGNOU in the state, the potential of this mode with use of ICT to resolve pressing large-scale education and training problems is not fully realized. There is potential for the expansion of the scope and range of courses available to service human resources development needs in teacher education, technical education, professional updating in variety of fields, training of teacher in ICT and distance education. There is an urgent need for effective efforts for improvement in quality of education. There is a need for the development of ICT policy with adequate budgetary provisions as well development of private education policy. Private education has become business in real terms with zero service element. There is a need for fullflaged sector study of education with special emphasis on use of ICT in education (including distance education) to identify areas requiring support. Capacity building is one of the priority areas for consideration.

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3.5. Stakeholders

The details of stakeholders contacted for the Case Study are given in the following table:

Name	Designation	Organization
Vinay Mehra	Regional Education Manager	Learning Links Foundation (representing Intel)
Anoop Singh Rawat	State Coordinator	Learning Links Foundation (representing Intel)
Neeraj Aggarwal	Head	Hole in the Wall Education Ltd
Purnendu Hota	Project Implementation	Hole in the Wall Education Ltd
Sundar Krishnan	Head, Digital Equalizer Programme	American India Foundation
Sukumar Anikar	Head, Technology for Education	Azim Premji Foundation

4. India Case Studies: West Bengal

The state of West Bengal is an agriculture-dependent state, situated in the eastern part of India, sharing its border with the Republic of Bangladesh. It is one of the most densely populated states of India, with a population density of about 903 persons per square kilometer.

Administratively the state is divided into 19 districts, which are further divided into subdivisions and blocks. The capital and the largest city in the state is Kolkata, which is the fourth largest city in the country. Other important cities include Siliguri, Asansol, Durgapur, and Raniganj.

The population of West Bengal is predominantly dependant on agriculture. Rice is the principal food crop and jute is the prime cash crop of the state. Tea is also produced commercially. Manufacturing industries are mostly centered in and around the city of Kolkata, with Asansol and Durgapur hosting many steel manufacturing industries. Although agriculture is the prime source of income for the citizens, the service sector is the largest contributor in the Gross Domestic Product of the state.

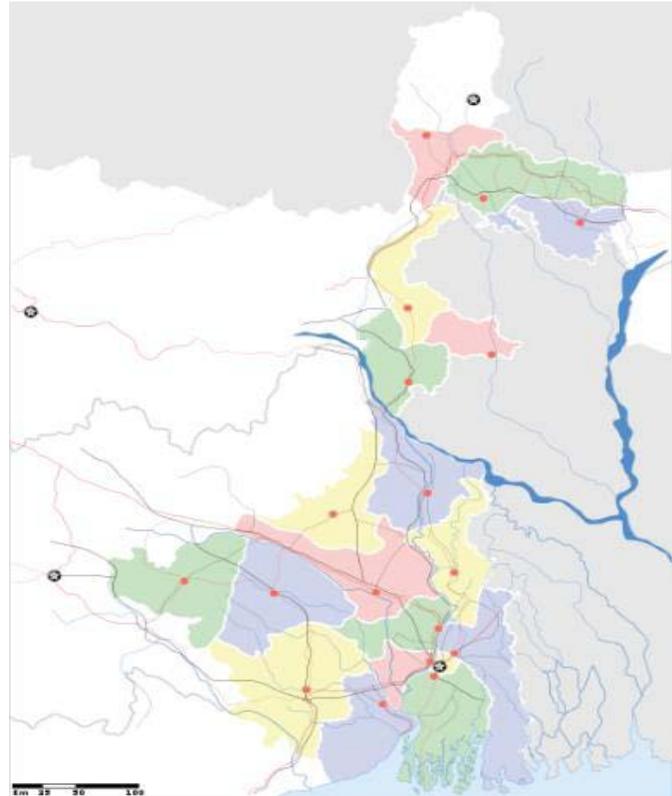


Figure 6: Map of West Bengal

Source: http://en.wikipedia.org/wiki/West_bengal

Key demographic indicators of West Bengal are given in the following table:

Table 14: Demographic Indicators – West Bengal

Parameter	Statistics (2009)
Capital	Kolkata
Population	80,176,197 (2001 Census)
Population density	903/sq. km
Area	88,752 sq. km

Source: <http://www.banglarmukh.com/>

4.1. Background

Brief Overview of the Education Sector

The development of education in the state is the responsibility of the Ministry of Education. The Ministry of Education in West Bengal works through different departments like Mass Education Extension and Library Services, School Education, and Technical Education and Training.

The prime objective of the department is universalizing school education. While, there is a thrust on quality, the government has set certain quantitative milestones to be achieved in the state:

- Ensure 100% Net Enrollment Ratio (NER) for primary education within 2008–09
- 100% NER for elementary education within 2010–11
- 100% NER for secondary education within 2014–15

The Ministry has worked out many strategies to meet the aforementioned objectives. The Department of Education has been working on ensuring universal access to education at all levels, including unhindered enrollment at the higher secondary level for all the students passing secondary school. Bridging the gap between the gender disparity in the field of education is another major concern for the government. To address the issue, the government has been working on enrolling girls in schools at all levels giving special attention to girls coming from backward, reserved, and minority communities. The high dropout rate, 75% from Classes I to X, is a critical issue in the state. As the government is focusing on ensuring universalization of education at all levels, reducing the dropout rate has become equally important. Steps are also being taken to rationalize the teacher student ratio, introduce and implement computer literacy, recruit trained teachers, and help them with proper pedagogical facilities and updated learning material. The government is also planning to provide infrastructural facilities like equipped laboratories, better school buildings, drinking water, and so on.

The government has a special focus on technical education. The Department of Technical Education and Training administers schemes providing technical education at all levels through various institutions:

- Diploma level through Polytechnics
- Craftsmen training through Industrial Training Institutes and Industrial Training Centers
- Formal Vocational Training through Vocational Training Centers (VTCs)
- Non-Formal Vocational Training through Community Polytechnics
- Short Term Vocational Training Programme implemented through Zilla Parishads and Non-Government Organizations

West Bengal also envisages leveraging EDUSAT to provide distance education to supplement school education. The government is trying to bridge the digital divide through various initiatives. Some of the major initiatives have been profiled in this report in subsequent sections.

Some key education indicators in the state are given in the following table:

Table 15: Education Indicators – West Bengal

Education indicators (2007–08)			
Gross enrollment ratio (%)	Total	Male	Female
Primary school	104.91	106.75	103.01
Upper primary school	66.71	70.97	62.22
Secondary school	44.66	49.21	39.81
Higher secondary school	26.23	30.68	21.43
Dropout rates (%)	Total	Male	Female
Class I–V	38.67	37.67	39.73
Class I–VIII	62.45	61.16	63.88
Class I–X	75.12	72.82	77.68
Teaching staff	Pupil/teacher ratio	%Trained	%Female
Primary school	50	74	37
Upper primary school	62	80	34
Secondary school	58	83	39
Higher secondary school	51	85	43
Literacy level (%)	Total	Male	Female
Urban literacy level (India)	81.25 (82)	86.13 (88)	75.74 (75)
Rural literacy level (India)	63.42 (61)	73.13 (72)	53.16 (50)

Source: Select Educational Statistics, 2006-07, Government of India

Table 16: Number of Schools – West Bengal

District name	Primary	Upper primary up to class VIII	Secondary	Higher secondary
Bankura	3,463	29	229	190
Burdwan	4,001	53	452	335
Birbhum	2,373	42	225	138
Dakshin Dinajpur	1,171	8	87	70
Darjeeling	1,171	53	69	95
Howrah	2,117	29	251	239
Hooghly	3,005	112	294	270
Jalpaiguri	2,038	19	155	126
Coochbihar	1,822	21	121	118
Kolkata	1,439	46	282	276
Malda	1,887	26	178	134
Murshidabad	3,165	103	282	181
Nadia	2,598	40	190	226
North 24 parganas	3,635	58	421	492
Paschim Medinipur	4,673	91	385	509
Purba Medinipur	3,245	85	319	
Purulia	2,986	73	152	142
South 24 parganas	3,674	65	406	328
Uttar Dinajpur	1,430	27	84	85

Total	49,893	980	4,582	3,954
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Source: <http://www.banglarmukh.com/portal/banglarmukh/Government/Departments/DepartmentListPortletWindow?action=e&windowstate=normal&mode=view>

Brief Overview of the ICT Scenario:

There are around 500 IT & ITeS companies, employing about 60,000 software professionals according to the state's budget announced for 2008–09. Almost 80% of the companies are in the small and medium scale enterprise (SME) sector. The state has estimated a growth rate of 45% for export revenue during 2007–08 and it is expected that the same growth rate will be maintained during the next couple of years enabling West Bengal to get closer to realizing its IT vision.

The state has initiated e-governance projects to improve access to services for the citizens and bring IT closer to life. The telecom infrastructure of the state is in a good condition to support these facilities. The government is focusing on building the core infrastructure in the state through several key initiatives. The State Wide Area Network (SWAN) has been created to provide state wide intranet connectivity that can be leveraged by different departments to provide electronic services to the citizens. Vertical connectivity through the West Bengal SWAN is complete, which provides intranet connectivity at the state level, district, subdivision, and block head quarters. Work on horizontal connectivity is underway, which will connect government offices of different line departments situated away from district, subdivision, and block headquarters.

Apart from the SWAN, the government is in the process of building a State Data Center (SDC), which will be able to store and process all the data from the entire state and support the applications running to provide services to the citizens. These key infrastructure projects will provide a platform for excellence in the field of education as well, once they are fully operational.

The telecom industry in the state has been growing significantly, in terms of number of mobile users. As of October 2009 the total number of subscribers both for Global System for Mobile (GSM) and Code Division Multiple Access (CDMA) mobiles was 19.8 million according to the Indian Cellular Association.

4.2. Policy Framework and Delivery Mechanism

There is a growing awareness among the policymakers globally and across India on the emerging and pivotal role of ICTs in the education sector. There is recognition of the need to bridge the digital divide and keep the present generation abreast with the changing technologies. The integration of ICT would call for changes in various aspects of the delivery mechanism.

With the objective of universalizing primary and elementary education the Government of India launched its flagship scheme Sarva Siksha Abhiyan (SSA) in 2001. The Government of West Bengal is implementing this ambitious scheme since its inception and has further focused on the need for universalizing secondary education, in conformance with the national plan, with the objective of enhancing GER for class IX and X to 75% by the end of 2012.

Use of IT in schools

The ICT @ Schools scheme is a centrally sponsored scheme being implemented by the different State Governments in India. It was launched in 2004 and has been a very important step toward crystallizing educational policies and aligning them with ICT. The scheme is currently being implemented in both government and government-aided secondary and higher secondary schools.

In 2007–08, Government of West Bengal took up the scheme for implementation and introduced computer education in 543 government aided higher secondary schools at a cost of INR 0.4 billion (approximately USD 8 million). The state engaged full time computer teachers in these schools and encouraged computer education. In 2008–09, 2,418 more schools were brought under the ambit of the scheme with training being provided to other subject teachers to utilize ICTs in the teaching learning process.⁹

In 2008–09, under the central scheme for universalizing secondary education, the Rashtriya Madhyamik Shiksha Abhiyaan (RMSA), five states including West Bengal have been selected to implement ICTs in schools. 1,400 schools in West Bengal were each provided with 10 computers, 10 UPSs, 1 scanner, 1 web camera, 1 projector, and 1 printer at a cost of INR 0.9 billion (approximately USD 19 million).

Further, the Department of Education, Government of West Bengal, has constituted a committee with the Director of SCERT (State Council of Education Research and Training), West Bengal, as the chairman to develop strategies for utilizing media resources like TV and radio to educate students and teachers. The Committee is still in the process of formulating and evaluating strategies.

Apart from the initiatives of the Ministry of Education, the Department of Information Technology also envisages the development of education through the use of ICT. The West Bengal IT Policy 2003 envisages the following in the field of education:

- Set up a state wide delivery backbone to support e-governance, ecommerce, distance education, and provide an efficient government citizen interface.
- Address IT in education to produce IT professionals, proliferate an IT culture at the gross-root level, and promote specialized education institutions.

There is also a focus on promoting and supporting education for IT professionals in the state to foster the growing IT Industry in the state. West Bengal IT policy 2003 was announced with the vision of bringing the state among the top three IT States of India by 2010, contributing 15–20% of the country's total IT revenue. The government has been actively promoting the state as the IT destination for the major IT giants.

⁹ Data from the Department of Education, Government of West Bengal.

4.3. Initiatives

Several initiatives using ICTs for education are ongoing in the state, led by government as well as private players. Some of the major initiatives are profiled as follows:

4.3.1. State Council of Education Research and Training (SCERT)

The West Bengal SCERT, with the West Bengal Board of Secondary Education, West Bengal Council of Higher Secondary Education, and West Bengal Board of Primary Education, has primarily been responsible for developing textbooks as per the prescribed national curriculum framework. In addition, SCERT has been working extensively to create multimedia content to help in CAL for students in the government schools across the state of West Bengal.

Multimedia Content:

Developing multimedia content is a continuous process and SCERT has been involved in this activity since 2006. Extensive workshops were undertaken with around 100 teachers to formulate the strategy for developing content. It was realized that simply digitizing the textbooks would not be sufficient and hence the teachers were asked to be actively involved in the creation of the content, where they wrote the scripts and gave voiceovers simulating a classroom session. This exercise is done at the district levels at the District Institute of Education and Training (DIET) labs and at the state level at SCERT headquarters. The lessons made at the district levels are sent to the SCERT for verification and correction by experts and then this content is put into an interactive multimedia package by Center for Development of Advanced Computing (CDAC), who work closely with SCERT in packaging the content.



Figure 7: Inside the SCERT Education Technology Laboratory – West Bengal

Workshops have been conducted at the DIET level by SCERT to demonstrate the process of writing of scripts and recording voiceovers. All the DIETS have been equipped with at least one computer for various activities including creation of digital content. These workshops have been conducted in four districts and have led to the training of around 300 teachers. There are around 300,000

teachers in the state and SCERT is in the process of training as many teachers as possible to create content digitally.

After establishing a stable and sustainable model of content generation, SCERT has created 11 lessons for classes VI, VII, and VIII and has handed these over to Sarva Siksha Abhiyan authorities for deployment and circulation. The lessons can be downloaded from their Web site. (http://www.scertwestbengal.org/multimedia_main.php)

Radio Scripts

In 2002, SCERT conducted a workshop to develop a strategy of using radios for imparting education. As a result of the workshop, a set of 21 scripts were prepared to help students in learning English. In 2005–06, SSA sponsored a timeslot at 9:30 p.m. to broadcast these lessons, which were prerecorded at the Rabindra Bharti University Studio. The program has been a success in terms of its reach and response. SCERT has been working on developing more scripts to broadcast on RADIO.

SCERT has also assisted AIR in formulating a list of topics/lessons to be taught at specific time slots. AIR, based on the inputs of SCERT, invites teachers who take a class on the specified topic. This live program runs every day at 2:30 p.m. and is called Bidyathider Jonno Onusthan.

4.3.2. IL&FS Education and Technology Services Limited

IL&FS Education and Technology Services Limited (IETS) is a subsidiary of Infrastructure Leasing & Financial Services Limited (IL&FS) offering educational infrastructure and education technology support in the country. IETS has partnered with various State Governments and other national and international agencies to catalyze the outreach of education in the country. IETS have been working closely in collaboration with the government of West Bengal to promote the use and benefits of ICT in the field of education. An innovative product designed by IL & FS ETS is KYAN, which is being deployed by the government of West Bengal in almost all districts. KYAN, the Vehicle of Knowledge, has been developed by IETS, in collaboration with the Indian Institute of Technology (IIT), Mumbai, as a Community Computer. It is effectively a digital multimedia device which was designed by Dr. Kirti Trivedi in 2004 and commercialized by IETS in 2007. The device contains a computer with inbuilt projector, content, speakers, and has wireless keyboard and mouse. It combines the computing power of a computer with an appropriate high luminosity, high resolution, and large screen projection system.

KYAN:

The Department of Information Technology has funded the project to introduce the KYAN in schools, with the objective of bringing the benefits of ICT to children from disadvantaged communities. A pilot initiative was undertaken in 65 government schools across two districts, namely, Bardhaman and Bankura of West Bengal in 2007–08. The initiative covered 500 teachers and 40,000 students, mostly from marginalized section of the society (Scheduled Caste & Scheduled

Tribe communities). The initiative was an effort to utilize ICT tools such as digital content, alternative power supply solutions, and capacity building programs to bridge the digital gulf and ensure sustainability.



Figure 8: A KYAN Machine – West Bengal

In the pilot phase, 65 schools were selected in the two districts by the respective district administrations, based primarily on the number of SC/ST children in the schools. With the success of the pilot, the project has then been rolled out gradually in other districts as well. KYAN is now being deployed on a small scale in almost all the district in the state. The project is currently in the fifth phase. Phase wise deployment of KYANs is as shown in the following:

- Phase I (2007)—65 schools in Bankura and Burdawan
- Phase II (2008)—51 schools in North 24 Parganas
- Phase III (2009)—90 schools across 6 districts (15 each in Cooch behar, Malda, Nadia, Purulia, Howrah & South 24 Parganas)
- Phase IV (2009)—115 schools across the state



Figure 9: KYAN multimedia class – West Bengal
Source: Department of Information Technology, GoWB

The content in the KYAN, developed by IETS, consists of 1,090 lessons on various hard to teach topics in all the subjects from kindergarten to class X, and is preinstalled in the machine. After the first phase it was realized that the lessons needed to be mapped to the topics of the textbooks as per the curriculum, and hence IETS has done an extensive study and with the help of the teachers mapped the topics in the textbook to the lessons created by IETS. IETS has recently been involved in translating the lessons into Bengali and Urdu as well. The content generation is a continuous process and the content is updated in all the KYANs running the state as and when required. IETS has provided extensive support to implement KYAN in terms of content as well as technology.

At the time of installation, representatives from IETS conduct a one-day orientation training for the head of the institute, followed by a two-day teacher training. In the first day, the teachers are given basic computer training and the fundamentals of using the KYAN, and in the second day, they are taught how to navigate to find lessons; they are given a demo of a class and finally the teachers are asked to take a small KYAN class in front of other teachers giving rise to a healthy competition among teachers. After these trainings, the teachers are asked to practice delivering classes with KYAN and once they are comfortable using the machine they are asked to give classes to the students. This brings a sense of ownership in the teachers. IETS has setup a call center to address any technical issues with the machine, and representatives of IETS also visit the schools on a periodic basis to extend handholding support to the teachers.

KYAN has also helped in increasing attendance of students in the schools as the students find KYAN classes interesting and it makes them stay in the schools and attend classes. Further details of KYAN and visit to Achana High School, one of the schools implementing KYAN in West Bengal can be found in Annexure II

Double Click!

Double click is an initiative of UNICEF in collaboration with IETS Kolkata to develop and test run a capacity building initiative in computer literacy among the tribal children of Kasturba Gandhi Balika Vidhyalaya (KGBV) centers in Purulia. The target group of the children is destitute girls mostly from backward classes. Capacity building has been the focus of this initiative to ensure better employable opportunities for the children. All the 20 residential schools have received an orientation on classroom management skills. The wardens have been oriented through the use of computer aided programs. The training was conducted for a period of 2 months between January and March 2009, where the students were introduced to the basics of computers and MS paint applications.

SPEED

A Spoken English Program for the rural and semi-urban youth has been planned by IETS in partnership with Webel Informatics Ltd., which is the nodal agency of the Government of West Bengal for developing Information Technology and implementation of eGovernance in the State. SPEED (Spoken English for Enhanced Development) has been conceptualized as a program to be delivered through 50 centers across all the districts of West Bengal. The project was launched at Press Club, Kolkata, in March 2009. Following this, the SPEED Training of the Trainers (TOT) was organized for the facilitators of SPEED in this project. Forty-five faculty members were certified for delivering the training and, nearly, 100 students have enrolled in 10 centers across West Bengal by now. The other centers are not fully operational yet.

IETS has developed the content for imparting this training and also designed the guidelines for the trainers, but the multimedia content is designed in such a way that the trainer acts merely as a facilitator. The course fee is INR 2,400 (approximately USD 50) and has 40 classes of 90 minutes each. IETS has created the content for blended mode learning, where each class is divided into three sessions of 30 minutes each for reading, writing, and listening English. The target group of the program is young adults from class X onward. IETS has trained more than 80 trainers so far.

4.3.3. Intel Education Initiative

Intel in collaboration with the Government of West Bengal started an initiative to encourage computer literacy across schools, equipping them with standardized Intel processor-based PCs and servers running the Linux operating system. The curriculum was developed by the West Bengal Board of Secondary Education. The Computer Literacy and Training Program (CLTP) was initiated by the government in 2002 and deployed in 500 schools by early 2005. Approximately 400 of those schools were each equipped with nine Intel Celeron processor-based PCs running Red Hat Linux 8.0* and one Intel Pentium 4 processor-based server provided by IBM. Since 2002, the program has enrolled 160,000 students. Evaluators have recognized not only an improvement in basic computer skills among participants but also a general improvement in all academic skills as a result of the program. The Intel Teach Program was initiated in West Bengal in 2004 with the Education Department and in 2005 with the Madrasa Board. More than 6,168 teachers were trained across 330 government and private schools in 19 districts (Education Department) and 13 districts (Madrasa Board) under this program.

4.3.4. NIIT@Schools

NIIT@Schools is a program for providing computer education to private and public schools. NIIT has been working since 2001 in different states in the country. Through the implementation of this initiative Computer Literacy Training Programme has been introduced in selected higher secondary

schools in West Bengal. The plan was executed in phases, where in the first phase 100 schools have been computerized and computer education started through partnership between Webel (a nodal agency of the Government of West Bengal for developing IT and ITeS industries in the State) and NIIT from October, 2001. In the second phase, 200 selected schools have been computerized and the computer education has started in these schools through Webel-IBM partnership from May, 2002.

The schools participating in this initiative in West Bengal have shown remarkable improvement in results. Additionally, two schools from the State, that is, the Howrah Zila School and the Hindu School, received the Government of India's Department of Information Technology Excellence Award in Computer Literacy from the President of India in 2003 and 2004.

4.3.5. IBM

IBM is working in collaboration with the Department of Information Technology (DIT) in West Bengal to address the issue of bridging the digital divide. As part of its responsibility for promoting the growth of the IT industry in West Bengal, the Department of IT, Government of West Bengal, has identified the need to create effective education programs for building basic IT skills at the middle school and high school levels as a primary objective.

In 2004, as part of the IBM Integrated IT Literacy Program in association with Webel, BM Learning Solutions planned to provide the necessary IT infrastructure, education services, IT support, and project management for 400 schools and install 10 computers in each school. The program planned to bring more than 150,000 students under its coverage. IBM was responsible for selecting the trainers, enrolling them in "train the trainer" programs and certifying them.

The program has been conceptualized with the objective of empowering every student to use computers in their professions and businesses. For those inclined toward a career in IT, the program includes technology content in the higher-level classes. In the future, the infrastructure will support a blended e-learning solution for both IT and K-12 curricula.

To popularize the learning content, it has been made available in local languages. IBM conducts annual student assessment tests and provides appropriate student certificates upon completion. Orientation sessions are also conducted annually for regular teachers from each school, so that they can take up the curriculum at the end of IBM's contract with the Government of West Bengal.

4.3.6. Media Lab Asia

Media Lab Asia (MLAsia) has been set up by the Department of Information Technology, MCIT, Government of India, as not-for-profit Research & Development organization. MLAsia works on the paradigm of collaborative research in the task of developing relevant and sustainable technologies and culturally appropriate solutions and bringing them to the daily lives of people. MLAsia works with academic and R&D institutions, industry, NGOs, and government in this endeavor.

MLAsia at its research laboratory at the Indian Institute of Technology (IIT), Kharagpur, has undertaken many projects in the areas of ICT for village livelihood generation, healthcare education, empowerment of the disabled, and rural connectivity. Some of these are now undergoing test deployment and are being made ready for national/large-scale deployment. The following are some of the pilot initiatives in the field of education.

Multimodal Participatory Content Repository for the Education of Rural Children

The project has been undertaken jointly with IIT Mumbai and IIT Kharagpur for the development of a Multimodal Participatory Content Repository for the education of rural children.

It has a browser-based interface to access online educational content and a searchable, sharable repository of courseware from different sources in various languages. It provides multilingual support. It aims to provide educational institutions with a repository of courseware in major subjects.

Sahayika: The Knowledge Network

The project Sahayika is a system that works with the objective of supplementing the knowledge requirements of the school students. It works with a vision of learning and beyond. The initiative has been taken up in collaboration with IIT Kharagpur. The objective of the software is to provide school children with a knowledge network through which they can perform concept-based as well as topic-based navigation of contents.

It has the interface to create a new ontology for subjects in the school curriculum. It provides an ontology builder, ontology browser, and ontology visualization through navigation. Sahayika supports English as well as Bengali. It provides automatic indexing and manual document indexing to attach actual contents to any entity belonging to the ontology. Indexing tools enable the system to be used as a course organizer or a self-learning system. It is being test deployed in eight secondary schools in West Bengal.

Development of ICT-Based Resources for Rural School Education

The project has initiated different programs to train the teachers of rural schools to develop multimedia content using an open-source multimedia authoring tool and to design Virtual Physics Lab (VPL) experiments for the rural school children, who do not have access to physics laboratory infrastructure in their schools. Large numbers of teachers have been trained by International Institute of Information Technology (IIIT), Hyderabad, through this project.

Gyanpedia

It is an interactive portal for collating, organizing, and circulating contents generated in schools in India through a Single Open Web Platform. It envisions bringing in a change in the entire learning experience through promoting and popularizing distance learning methods such as E-learning and E-education. It has an online presence of 50,000+ students covering 10 states.

The beta version of the portal is available on <http://www.gyanpedia.in>

Samvidha: Low cost Internet access and content personalization for rural schools.

It is a project undertaken by IIT Kharagpur, which aims at providing offline Internet access at low cost to the schools and provide the users with relevant content in answer to their queries on subjects related to their curriculum. It has navigation interfaces in Bengali, Hindi and English and has a local repository built for reference. The relevance of information provided is ensured through proper scrutiny and filtering of the information provided.

This project has been initiated with the objective of finding innovative methods of providing low cost, offline, low bandwidth Internet access. It explores store and forward methods for asynchronous searches.

The technology is being tested for curriculum based offline internet access in selected schools at Bhalopahar, Galudihi, Purulia, whereas deployment is in progress at Bankura and Ashok Nager.

Multimodal Participatory Content Tutoring System for the Education of Rural Children

The project has been taken up in collaboration with Indian Institute of Technology (IIT), Kharagpur, targeting selected rural schools in Maharashtra and West Bengal. The project is based on a system, which includes an artificial intelligence-based Intelligent Tutoring System (ITS). An ITS contains a control engine as a common teaching model and stores all the information of the students. It provides an interactive environment for the children to access the educational material at their own pace. It provides the platform to make teaching more effective, interactive, and interesting. It has the facility to present the same courseware in different forms and delivery paths. Based on the performance of students, the ITS system adopts different routes to teach the same concept.

All the aforementioned information are however micro initiatives at a test stage.

4.3.7. InTuition (Techno Teaching Info Solution Pvt. Ltd.)

InTuition is an online interactive learning process, which provides multimedia lessons for Physics, Chemistry, Biology, and Math for classes 9 to 12. The interactive multimedia content has been developed by subject matter experts including teachers from schools and professors from colleges. The lessons are delivered to the students in the forms of DVDs that are sold at a price of Rs. 6,000 for four subjects for 12 months which comes out to be Rs. 125 per month per subject. The students even have the facility to pay in installments.

The unique value proposition of InTuition is the availability of online teachers from 6 a.m. in the morning to 10 p.m. in the evening for all the subjects. The teachers are available for online interaction with chat and video facility to answer queries that the students might have during the lessons. There are more than 100 teachers in West Bengal operating to provide this service. InTuition also plans to start labs for Physics, Chemistry, and Biology, which will be recorded and broadcast on Internet, and students who have subscribed to InTuition will be able to view the experiments online.

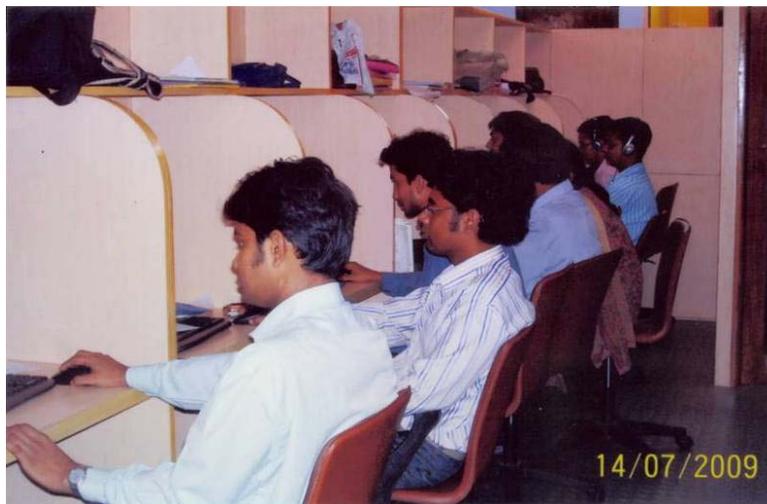


Figure 10: An InTuition Content Generation Lab – West Bengal

InTuition has an assessment program as well in which the students get to take online tests every three months on the lessons already taken and hence they can track their progress periodically with modern analysis tools.

InTuition is in the process of developing content for classes 6 to 8 for Science and for Humanities subjects for classes 9 to 12. InTuition is also developing content to support students of class 11 and 12 in preparing for the competitive exams.

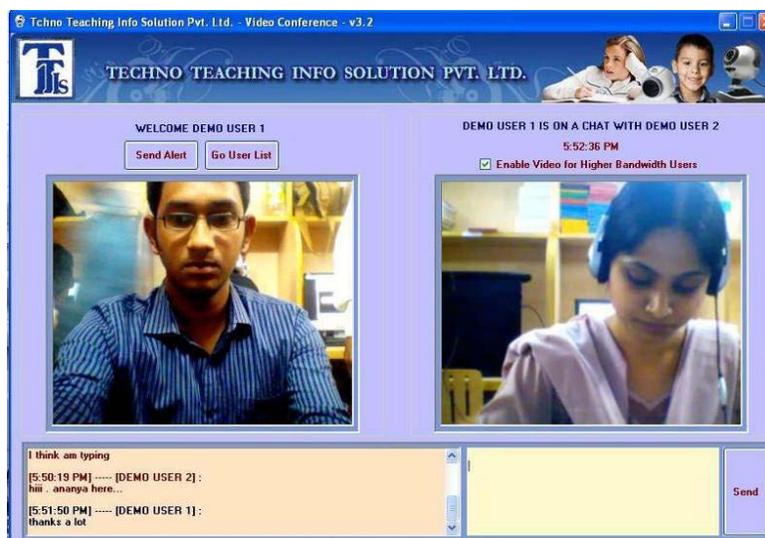


Figure 11: InTuition Online Teacher Student Video Chat Forum - West Bengal

4.3.8. e-Governance for the Department of Education

In addition to the aforementioned initiatives, the Department of Education has also been working for computerization of the department so that it can provide electronic services to the citizens. All the district headquarters have been provided with District Computer Centers, with 50 computers in each centre. The aim of establishing these computer centers is to impart computer education to school children predominantly in the rural areas. Five District Computer Centers have started functioning at Paschim Medinipur, Hooghly, Malda, Uttar Dinajpur, and Dakshin Dinajpur.

A detailed project report has been prepared by the State for introducing e-governance as a part of State e-governance program under National e-governance Plan. The report is currently being reviewed by the Department of Information Technology, Government of India.

To ensure better communication with the districts, the Department of School Education, its Directorates, and the offices of the District Inspectors are being computerized. Various activities like educational statistics for school education in the state, management of schemes, monitoring of funds, archiving government acts, orders for references, and management of court cases have been computerized to a large extent.

4.4. Key Learnings

West Bengal enjoys the advantage of being one of the emerging IT hubs in the country with significant potential for harnessing ICTs for education. It has the added advantage of a wide reach of ICTs, since it is one of the few states where successful PC penetration has been achieved at the village level through the empowerment of the local self-government bodies, the gram panchayats. PCs are now available to all 210 gram panchayats across 19 districts of the state. However, several

critical factors need to be addressed to ensure successful integration of ICTs in the education system:

- Capacity building is one of the key areas where there is a scope of development. There is a lack of a trained pool of teachers, who can efficiently train the students and appreciate the aligning of ICT with the regular curriculum.
- Infrastructure in schools remains a key bottleneck; existing infrastructural facilities in schools need to be improved for the successful and unhindered implementation of ICT.
- The curriculum needs to be updated and new mode of learning needs to be promoted in order to keep pace with changing requirements.
- An effective partnership with private players with clearly defined roles and responsibilities can ensure better management and can support the government initiatives efficiently.
- Better coordination between different government departments, with responsibility for IT and education initiatives would result in more streamlined and effective implementation of major schemes.
- Since ICT is new to rural areas it will be appropriate to establish institutional networks at panchayat samiti (local self government body) level to facilitate in-service training of teachers and panchayat samiti officials to ensure optimal utilization of ICT resources. State institute of education and training could provide leadership at the state level which can have network with districts and district level lead institute can develop network with panchayat samities. These institutions, if provided with adequate funding and professionally trained staff, can effectively take responsibility of capacity building at different levels to ensure absorption of ICT inputs.

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State Council for Educational Research & Training, SCERT, West Bengal
www.scertwestbengal.org

IL & FS Education and Technology Services Limited
www.ilfsets.com

Intel Education Initiative, West Bengal
http://cache-www.intel.com/cd/00/00/42/17/421739_421739.pdf

National Institute of Information Technologies, NIIT
www.niit.com

Media Lab Asia, Department of IT, Government of India
http://medialabasia.in/index.php?option=com_content&task=view&id=35&Itemid=38

Webel Informatics Limited: <http://www.webel-india.com/webel-informatics.html>

4.6. Stakeholders

The details of persons contacted for the Case Study are given in the following table:

Name	Designation	Organization
Rathindranath De	Director	State Council of Educational and Research and Training (SCERT)
Debojyoti Basu	Assistant Manager	IL&FS Education and Technology Services Ltd.
Pranata Dhar	Officer	IL&FS Education and Technology Services Ltd.
Biswajit Das	District Coordinator	IL&FS Education and Technology Services Ltd.
Sidhartha Roy	Executive Director	West Bengal Electronics

		Industry Development Corporation Limited
Suwendu Chatterjee	Managing Director	Techno Teaching Info Solution Pvt. Ltd.
Pranab Rai	Head Master	Achana High School, Achana, South 24 Parganas, West Bengal
Mritnunjaya	Teacher, Computer Division	Achana High School, Achana, South 24 Parganas, West Bengal

4.7. Annexure II

School Visit: Achana High School, District South 24 Parganas

Introduction of KYAN has been a successful initiative in the state with the device reaching schools in 17 out of 19 districts in the state so far. Achana High School is one government-aided school in the district of South 24 Parganas with around 800 students, where KYAN has been running.

The selection of schools for the deployment of KYAN is based on the number of children from disadvantaged communities in those schools. Achana High School has more than 90% of the children belonging to backward communities and hence as per the recommendations of the District Administration two KYANs were installed in the school in August 2009.



Figure 12: Front View of Achana High School

This was preceded by a meeting with Heads of Schools to gauge the interest of the Head Masters in the initiative and a preinstallation survey was undertaken by the IL&FS team. It is believed that the success of running KYAN in a school predominantly depends on the will of the Head of the Institution. After the installation of KYAN in the school along with a UPS for backup power supply, six teachers from the school were provided training to use the machine. Among the teachers

selected in the training one has been selected as an ICT coordinator for the initiative. This selection has been done by the Head Master on the basis of interest and previous knowledge of computers. The job of an ICT coordinator is to coordinate and encourage teachers to effectively utilize KYAN and to train other teachers in the school as well.



Figure 13: Achana High School

The school with its two devices has managed to provide 2–3 KYAN classes to a class in one day. The KYANs have been kept in rooms called the Audio Video (AV) rooms. As per the Head Master, the KYAN classes are extremely popular with the students, and students often prefer to attend a KYAN class as opposed to a lecture-based class. This holds true not only valid for the high achievers in the class but also the academically weaker section of the class. KYAN classes have brought interest in the students and have increased class participation and student attendance.

Hence KYAN has improved the learning experience of the students and has brought more interest in the students. However, there are certain issues involved with the use of KYAN. One major concern is the security of the machines; the Audio Video rooms have to be secured to keep the machine safe as there have been instances where the machines have been stolen. Given the poor physical infrastructure in rural school, this is a significant challenge. Further lessons are in English and IL&FS has been working on translating the lessons to Bengali (local language of West Bengal) and Urdu. According to the teachers, the classes will be much more helpful if they are in Bengali. There are also several issues with the comprehensiveness of the content and several teachers felt that some topics were not covered in adequate details. Moreover, the set of 1,090 lessons does not always match to the exact lessons in the West Bengal School Education Curriculum. The technical support has also been a cause of concern as the schools are situated in very rural areas and getting local technical support is nearly impossible and hence in case of any technical problem the school has to depend on the support from IL&FS for troubleshooting, which sometimes takes more time than expected.



Figure 14: A KYAN machine in the AV Room – West Bengal

Going ahead, IL&FS aims to provide soft skills training to selected teachers to enhance their performance and add more value to the classes. Apart from the soft skills, the teachers will also be provided training on using the KYAN to develop their own content. The possibility of developing their own content also makes the model self-sustaining after the project time of 3 years. Although KYAN success varies from school to school, Achana High School has been leveraging ICT in education effectively through the KYAN.

5. Pakistan Case Study: Distance Education in Pakistan

Pakistan like other South Asian countries initiated its distance education programme historically to provide mass education and literacy to the people. Over time distance education evolved to cater to the needs of those who for various reasons were not able to attend formal institutions or those who desired flexibility in their education. The Allama Iqbal Open University set up in 1974 was the first Open University to be set up in Asia. This was followed more recently by the setting up of the Virtual University in the year 2000. Distance education is now poised to evolve into another stage with the advances in information and communications technologies and ways of learning, which could place the distance education model as one of the most responsive to the changing educational needs.

The telecommunication industry in Pakistan has witnessed a boom following its deregulation; this has laid a strong foundation for Pakistan to strengthen its distance education delivery mechanism. However, there are also many constraining factors that need to be overcome to take full advantage of a distance education system. These factors include language barriers, current state of ICT penetration, computer literacy, and apprehension to move away from traditional learning methods.

5.1. Modes of Distance Education

A combination of radio, television, and the Internet is used in distance learning institutes in Pakistan. Since 2004, when the government deregulated telecommunication in Pakistan, the sector attracted 54% of the total Foreign Direct Investment (PTA 2006). It is estimated that 10,184 hours of programming are broadcast annually on 3.6 million TV sets; the estimates for radio programming are four times this figure (Iqbal 2004). The Institute of Educational Technology (IET) established in Allama Iqbal Open University is a centre of media production. The educational audio and video content developed in IET is broadcasted on national television and radio channels. Virtual University of Pakistan operates four free-to-air satellite channels on which some of their lectures are broadcasted.

5.2. Major Initiatives

Distance Education in Pakistan is dominated by Allama Iqbal Open University (AIOU), Asia's first Open University, which was established in 1974 with a mandate of providing educational opportunities to the masses and to those who could not leave their homes or their regular jobs. In 2000, the Government of Pakistan developed a new initiative—the Virtual University of Pakistan (VUP). VUP was established specifically to create more capacity in the system by leveraging modern information and communications technologies. Even though VUP used ICT to deliver education through a distance learning mode, it was not conceptualized as an “open” university since AIOU already served that market (PANdora Distance Education Guidebook). Together AIOU and VUP serve 750,000 students (with an annual growth rate of 14%), which is three times the student population of all other universities in Pakistan combined (Ansari and Saleem, 2010). Due to the

efforts made by the government as well as private and non-government donors, enrollment in distance learning institutes has increased from 199,660 to 305,962 from 2005-06 to 2007-08 (Economic Survey 2008-09). Some of these initiatives are highlighted in the following:

5.2.1 Allama Iqbal Open University

The primary objective of AIOU is to provide educational opportunities to people who can not leave their homes or jobs. It also aims to fulfill Pakistan's current shortage of technical and professional education opportunities for the lower middle class and poorer classes. It is a distance education institution and has its headquarters in Islamabad and a network of regional centers spread across the country. AIOU is also one of the 17 members of the Mega University Club. (A Mega University is one in which the number of admissions exceeds one hundred thousand annually.) In 2007-08, student enrollment was more than 1 million, more than 50% of whom were females and 58% were students from rural areas. The budget for the year 2007-08 was 1921.848 million [Treasure's Department (budget section), AIOU] and the university gets around 15% as grants from the government and other donors.

Teaching Methodology

The University applies a non-formal method of correspondence through three basic models of education delivery: traditional distance learning, traditional face-to-face learning, and blended learning. The traditional distance learning mode uses special textbooks and reading material prepared on self-learning basis, part time teachers engaged near students' residence and a system of study centers spread across the country. This traditional method of teaching has also been supplemented with radio and television programs. The university produces audio and video programs, which are regularly broadcasted on the radio and television; they are also sent to the students in the form of cassettes. According to the Academic Audit of AIOU 2006, the university broadcasted 1,034 media programs for 144 courses. The traditional face-to-face learning mode is used for students studying science programs, who need regular access to laboratories. For this purpose, evening and weekend classes are offered. The third model of education delivery is blended learning or e-learning, for which it utilizes Satellite and Internet facilities. e-Learning was started at AIOU in 2000 with the initialization of a conceptual online education framework called Open Learning Institute of Virtual Education (OLIVE). OLIVE is a Learning Management System (LMS) which allows students to interact with teachers in a virtual classroom by enabling Web-based management and delivery of courses.

Open Learning Institute of Virtual Education—An e-Learning Framework

OLIVE, which was developed to overcome the shortage of trained teachers in Pakistan, is an online model to get support of teaching and research faculty from abroad. It also focuses on developing infrastructure needed for supporting blended activities and e-learning. For quality of education and better learning, the use of multimedia courseware is considered an essential at OLIVE and as a result multimedia CDs have been distributed nation wide in about 25 cities where students were

studying under different OLIVE delivery models; TV and Radio programs are also broadcasted. Some of the courses offered at OLIVE have used multilingual multimedia content. Keeping in mind the diverse needs and geographic location of its students, three e-learning models under the OLIVE framework are used at AIOU. A brief description of each delivery model is highlighted in the following table:

Table 17: Delivery Model at Allama Iqbal Open University - Pakistan

	Student profile	Delivery mechanism
Model A—Regional Study Center Student	Used where the class size is small and study centers have been established in the local community	<ul style="list-style-type: none"> • Each study center is equipped with high speed Internet connectivity, laboratories and trained faculty • Developed multimedia courseware is streamed in centers. • Each student also has an online access to the main campus server or regional server for additional open self learning sessions • However students are not allowed to participate in online sessions as they have been provided teaching support at the center.
Model B—Internet-Based Student	Aimed at students who have access to the Internet at home or at the office.	<ul style="list-style-type: none"> • Internet is used for online assignment submission, additional online lecture sessions and live sessions with teachers • Multimedia courses are available to students online. • Students can access recorded video conference lectures.
Model C—Girl at Home	Aimed at students who do not have access to the Internet.	<ul style="list-style-type: none"> • Students are supplied self learning multimedia courseware on CD's and other reference materials at their home. • Students can use the Internet facilities available at either the main campus, study centers or Internet Café's to submit assignments.

Source: Sangi (2005). "Engineering Quality Learning through ICT: An AIOU Model for Online Education and Research"

In addition to providing student learning, OLIVE has also been used to address access issues, administrative issues, and teacher resources. Students can register themselves through the online admissions software; this allows the university to predict student enrollment and make arrangements of teachers and classroom sessions accordingly.

ICT Directorate

The ICT Directorate was established in 2007 to develop, guide, and provide technical support for the AIOU ICT infrastructure and also to train staff, faculty, and students in use of modern ICT devices. The specific objectives of the department are mentioned as follows:

- Transforming AIOU into a 21st century Open Distance Learning University
- Developing a TV channel and FM radio network
- Developing electronic media to support distance learning
- Providing online support services for academic and administrative functions

To achieve its objectives, the directorate has various departments operating under it which have been established through a phased program under the sponsorship of the Higher Education Commission. These departments include the LAN department, the Internet department, and the e-learning department.

Other ICT-Based Learning Methods

Following the success and cost effectiveness of OLIVE, AIOU has planned a major organizational change to incorporate ICT-based learning in all its traditional education programs. To facilitate the shift in the delivery mechanism, AIOU in collaboration with the Higher Education Commission (HEC) has taken the following initiatives:

- The Multimedia Courseware Design Centre (MCDC) was established to develop the infrastructure required for the design, development, testing, and deployment of multimedia electronic courseware at AIOU.
- An FM radio broadcast system was established at AIOU to broadcast live discussions on many professional courses offered at the university
- University campus was networked with fiber optics. WAN was established to connect regional centers and student centers.
- A digital library was created and made available on campus. This growing eBook collection spans all academic subjects taught at the university
- In 1980, the computer center was established which enables the university to address administrative issues such as enrolling students, conducting exams, tabulating results, registering tutors et cetera

ICT Vision at AIOU

The university plans to continue incorporating ICT for the delivery of education and to overcome many operational and academic problems. The university has signed an MoU with HEC to establish a Self-Access Centre (SAC) to facilitate teacher training in Computer-Assisted Language Learning (CALL) and Internet-Mediated Language Learning (IMLL). An agreement has also been signed with Intel to provide AIOU students with 700,000 computers by 2012. Further detail of AIOU's plans related to accessibility and ICT infrastructure is highlighted in the following box:

ICT Plans: 2009-2012

- AIOU will establish VSAT-based television and live communication channels. Its network will be extended to all AIOU regional buildings, selected community schools and Interactive Learning Centers (ILSC). Current telephone and mobile service will be integrated with the AIOU network.
- E-learning software and content will be acquired and delivered in a digital form and, where needed, in a local language. New learning technologies and tools will be continuously added
- Electronic assessment facilities will be provided
- Both Communication network and content delivery services will be extended to students in all localities.

Source: "Blended Learning (Part 2)." Journal of the Research Center for Educational Technology (RCET) Vol. 5, No. 2, 2009

5.2.2 Virtual University of Pakistan

The Virtual University of Pakistan is a not-for-profit university under the Government of Pakistan. It aims to overcome the acute shortage of qualified faculty and lack of sufficient infrastructure in current universities to accommodate new students, by using technology to share the knowledge of existing experts in the field and making it available to a larger set of people. To achieve its objectives, the university uses a blend of free-to-air television broadcasts, the Internet and multimedia technologies. Currently, 17 degree programs are offered; however, programs that would require the use of physical infrastructure such as science laboratories are not yet available at the university. There are more than a 100 campuses located in 60 cities of the country. Student enrollment has increased from 1,095 students in 2004 to close to 50,000 in 2009. Major funding for the university is provided by the Higher Education Commission, though students are charged a relatively subsidized fee.

Teaching Methodology

The delivery mechanism of the VUP is based primarily on ICT; the university operates four free-to-air satellite channels, which utilizes Pakistan's first communications satellite, PAKSAT-1 (PANdora Distance Education Guidebook). The channel is used to deliver lectures; the Internet is used to

facilitate interaction between the students and the professors. Video content has been developed for over 170 courses covering more than 7,650 lecture hours (Baggaley and Belawati, 2009).

To overcome the shortage of qualified teachers, the university identifies renowned professors in the country and requests them to develop hand-crafted courses, which are distributed to VUP students as well as the general student population. These professors belong to other top universities of the country and are recognized experts in their fields. To efficiently utilize the limited amount of time that these domain experts can spare, the experts are requested to deliver the lectures in VUP's studio. After the lecture has been visually modified by the graphics department they are broadcasted on the university's free-to-air channels.

The lectures are available to the students on campus according to a defined timetable or via a CD to view at home. They can also watch the lectures at defined broadcast times from their homes. The students receive and submit their assignments using the Internet through the Learning Management System. They can also check their grades as these are made available on the LMS by the teachers. Examinations and assessments are conducted through traditional methods and centers have been established throughout the country for undertaking these periodically.

Learning Management System

While the television is a powerful tool to deliver the lectures to the students, VUP uses the Internet to facilitate contact between the teachers and the students. Through the in-house developed Learning Management System (LMS), VUP provides flexibility to interact with the teachers irrespective of the student's geographical location. Every registered student of the university receives a unique ID to access the LMS. Students can post questions on various subject matters on the Moderate Discussion Board (MDB). The discussion topics are segregated by courses and then further divided for each lecture so that teachers can respond to questions pertaining to their expertise. LMS is also used by students to chat with other students, view their grades for each assignment submitted, view course material available online, and practice problems related to the course at their own pace.

Other ICT-Based Learning Methods

Television, radio, and the Internet are the driving modes of education delivery at VUP. The university along with the Higher Education Commission has initiated several steps to enhance the quality of these modes; these initiatives are discussed as follows:

- Establishing the "Virtual University Radio (VUR)—Sound of Knowledge," which is a Web radio service aimed at delivering educational and informational programs via the Internet to the people of Pakistan as well as the rest of the world
- Increase the number of television channels dedicated to education as well as enhance the automated and manual broadcast infrastructure at the university

- Providing Virtual University Channels on cable networks so that the university campus and all the major cable-head-ends have the necessary equipment to receive the television broadcast through PAKSAT-1.

Future Vision of VU

“VU lives and breathes ICT from its very inception. To broaden outreach, we will have to improve the state of IT literacy in the country and also provide easy access to computers. VU has already developed a full set of interactive programs in the local language to address the former issue, while the latter is being looked at through the Universal Service Fund.

From an academic perspective, VU intends to look at major national priority areas and try to address those. In the formal domain, these include education (producing quality teachers) and vocational training (how do we do it through DE), while in the non-formal domain VU will be targeting agriculture (techniques and value addition).”

Dr. Naveed A. Malik, Rector Virtual University of Pakistan

5.2.3. Higher Education Commission: Distance Education

The Higher Education Commission has taken up various initiatives to support the Distance Education Institutes as well as other academic institutes, which contain a component of distance learning. These initiatives are mentioned as follows:

Online Lecturing and Net-Meeting using IP-Based Video Conferencing System

To meet the shortage of faculty members and to improve the overall quality of education, HEC initiated the “Online Lecturing and Net-Meeting using IP-based Video Conferencing System.” Under this project, HEC provides video conferencing facilities to universities/degree awarding institutions across Pakistan.

Broadband Facility

In 2007, HEC signed an MoU with Pakistan Telecommunication Company Limited (PTCL) whereby PTCL will provide Broadband DSL connections to students, faculty members, and administrative staff at subsidized rates at their residence.

National Digital Library

The National Digital Library (DL) is a programme under HEC, which provides universities (public and private) and nonprofit research and development organizations with access to journals, databases, articles, and e-books across a wide range of disciplines. DL hosts over 10,000 e-books and 20,000 full-text journals; through the British Library Document Delivery Service 150 million items can be accessed (HEC, Pakistan).

Pakistan Education and Research Network

Pakistan Education and Research Network (PERN), an initiative of HEC, is aimed at providing interconnectivity between all public and private sector chartered universities/degree awarding institutes. Currently, PERN uses the intranet and Internet to interlink 56 institutes to provide integration of data banks, collaboration of research and development activities, and resource sharing, which strengthens the distance learning departments of the concerned universities.

5.3. Constraints

Some of the constraints that Pakistan faces in terms of enhancing the current state of distance education along with some initiatives to overcome these constraints are highlighted in the following:

Language Barrier: With literacy figures being low in Pakistan, familiarity with the English language is rare. Most of the population understands only Urdu which is the national language. The unfamiliarity with the English language poses as a major constraint for Pakistan as Internet content in Urdu is scarce. Web sites that do offer Urdu content are slow to load because they contain scanned images of the Urdu script as there is no standard Urdu script for computers (Sayo et al.).

To overcome language barriers, the role of the Centre for Research in Urdu Language Processing (CRULP) is crucial. CRULP was established in July 2001 and is supported by the government. Its primary objective is to carry out research and development in areas such as Speech Processing, Computational Linguistics, and Script Processing. Currently it is in the process of developing a machine translation system, which converts and displays English Web content to Urdu (Siddiqui, 2007).

Current State of ICT Penetration: Even though Pakistan's telecommunication sector has witnessed intensive growth, basic and broadband access to the Internet remains low. In 2007, it was estimated that there were only 10.8 Internet users for every 100 inhabitants and only 1.3% of them were broadband subscribers (ICT at a Glance, World Bank). Due to low Internet penetration, television and radio have become the major distance learning drivers in Pakistan.

"The main requirement for effective distance education would be to have broadband available across the country. Large cities already have DSL availability and further broadband penetration is now underway. Under-served areas are being supported through the Universal Service Fund of the Ministry of Information Technology. The provision of international bandwidth has improved substantially over that last few years and is no longer considered an impediment. The shortage of electrical power however, is an extremely serious issue and impacts all ICT interventions severely."

Dr. Naveed A. Malik, Rector Virtual University of Pakistan

Apprehension to move away from traditional teaching methods: Distance education is not considered to be at par with conventional education in Pakistan particularly because no teachers are physically present to address queries and students are not trained in Self-Regulated Learning which makes comprehension of concepts problematic (Siddiqui, 2007).

“The perception about DE has been a major issue and was also a serious impediment at the time VU was launched. However, by carefully nurturing the public exposure of the University and ensuring that all its offerings, especially video lectures, are made visible to a large population, VU has been able to establish a quality image for its graduates. VU graduates are now accepted without question by other universities into their graduate schools, and many have gone on to top tier international institutions for their doctoral studies. However, VU is still a very small University by DE standards (50,000 students) as compared to Allama Iqbal Open University (>1,000,000 students) and much more is needed to overcome the generally negative perception about DE in Pakistan.”

Dr. Naveed A. Malik, Rector Virtual University of Pakistan

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Virtual University Radio (<http://vur.vu.edu.pk/>)

HEC Digital Library (<http://www.digitallibrary.edu.pk/>)

PERN (<http://www.pern.edu.pk/>)

Alliance Française of Islamabad (<http://www.afislamabad.org/fol.asp>)

CRULP (<http://www.crulp.org/index.htm>)

6. Pakistan Case Study: Teacher Education in Pakistan

A major concern regarding Pakistan's education system is the high dropout rate from primary schools. Apart from extreme poverty, the inability of schools to retain students is a major factor leading to high dropout rates. In this regard, teachers have a pivotal role to play in engaging students through interactive learning methods and developing the student's interest to remain at school. The major challenge in integrating ICT in the teaching-learning process in Pakistan is the low competency level of teachers, stemming from the fact that very low level of academic qualifications are required to become a teacher. To address this issue and to improve the overall quality of the education delivered to the students, the Government of Pakistan has taken various steps to set standards for teacher education and enhance teacher training institutes. In Pakistan, even private companies have directed their corporate social responsibility division to educate the teachers particularly in terms of using ICT in the teaching-learning process.

6.1. Government Policy and Vision

The Ministry of Education in the "National Standards for Teacher Education" has proposed ten standards for teacher training institutes to abide by. The application of ICT to strengthen the quality of teaching and educational management in Pakistan is one of the core elements of the government's ICT in education vision. In the "National Information and Communications Technology (NCIT) Strategy for Education in Pakistan," the government proposed various strategies to enhance teaching quality by supporting and reinforcing the use of innovative teaching practices.

6.2. Administration

Teacher Training is administered by the provincial departments/organizations as well as the Curriculum Wing of the Ministry of Education. According to the Academy of Educational Planning and Management (AEPAM), in 2007, there were 275 Teacher education/training institutes in Pakistan out of which 227 were government-owned institutes. For government school teachers, training is imparted through Government Colleges for Elementary Teachers (GCETs), the distance education program of Allama Iqbal Open University and teacher training courses run in secondary schools known as Normal Schools or PTC units (Memon, 2007).

6.3. Current Situation

Despite the various efforts taken by the government and donor agencies, the quality and competency level of teachers remains low in Pakistan. This is an alarming fact considering 85% of the teachers are estimated to be trained, however the quality level of teachers who are deemed to be trained is questionable, primarily due to the low level of educational qualifications required to become a trained teacher. A primary school teacher only needs ten years of schooling and an eleven month certificate program. Aside from the number of years of formal schooling received being less, the quality of the certification program is also questionable. Little emphasis is laid on teaching methods and no monitoring and evaluation system is in place for the program (Memon, 2007).

6.4. Major Initiatives

The government along with many non-government and private donors has made efforts to establish and enhance Teacher Training institutes, particularly in terms of educating teachers on how to integrate ICT in the learning-teaching process. Some of these initiatives are highlighted in the following:

6.4.1. Intel Teach Program

The mission of the Intel Education Initiative is to prepare students across the globe for the 21st century. To achieve this goal Intel seeks to improve teaching and learning through the effective use of technology and to advocate for educational excellence through multilateral organizations. In Pakistan more than 200,000 Master Teachers and Participant Teachers have been trained on using technology for the delivery of education. Intel carries out its objectives through a portfolio of programs which are outlined in the following:

Intel Teach Program (In-service Program)

The Intel Teach Program is a professional development program that helps classroom teachers effectively integrate technology to enhance student learning. The program follows the “Train the Trainer Model” and is designed to help bring schools into the 21st century by providing teachers and administrators with the skills and resources they need to bring about the change. The Intel Teach Program is a customizable set of offerings that range from basic ICT literacy skills to training on tools that support students’ development of 21st century skills. It also includes the training of school administrators on effective ICT implementation. In 2002, Intel signed an MoU with the Ministry of Education, Government of Pakistan, to train teachers across the country, including Sindh, Baluchistan, Punjab, NWFP, FATA, FANA, ICT, and Pakistan administered Kashmir. Within each provincial ministry, contact persons have been assigned by the Secretaries and Ministers to help the Intel team with the operational aspects of the program. In Pakistan, apart from government schools, Intel has also trained private school teachers but these schools are contacted directly. The training activities are supported and assessed through a comprehensive evaluation program. The Intel Teach Program portfolio includes both face-to-face training and online resources and tools that consist of:

Skills for Success Course

Through a formal curriculum, teachers learn to deliver a prepared curriculum incorporating student-centered activities and projects exploring practical technology tools. These projects utilize technology tools such as word processor, multimedia and spreadsheets.

Getting Started Course

This course introduces software productivity tools and student-centered learning approaches to teachers with little or no technology experience. The course is carried out through a series of 12 two-hour modules that can be expanded to 32 hours of face-to-face instructions, individual work,

hands-on activities, discussion, and teamwork.

Essentials Course

Once the teachers have been trained on using technology and basic software, the Essentials Course trains the teachers on how to integrate this technology into existing classroom curricula to promote student learning. It is typically a 10-module, 40-hour; face-to-face professional development course. The online version allows a flexible blend of online as well face-to-face training.

Thinking with Technology Course

This course is typically a 24 to 40 hour workshop that builds on key concepts acquired in the Essentials course to enhance students' higher-order thinking skills using a set of free online "thinking tools." These thinking tools can be used with any subject area and are designed to help students visually represent their understanding of complex interconnected ideas and issues.

Advanced Online Course

This course enables teachers to build communities to advance the integration of technology and 21st century learning through a blend of face-to-face and online training. This is also a follow-on resource that allows teachers to engage in ongoing learning and continue their collaborations online.

Intel Teach Elements

This is a series of short courses which include animated e-learning tutorials, interactive learning exercises and offline activities to apply concepts. An option is also available for teachers to take the course as per their convenience through a self-paced program.

Leadership Forums

To ensure its effective and judicious use of ICT, principals need to develop strategies to encourage and motivate teachers to integrate technology, enhance student learning and ensure the optimum use of available resources. To accomplish this Intel conducted a number of workshops and seminars to spread awareness among school principals.

Intel Teach Program (Pre-service program)

The Intel Teach Pre-service Program empowers the faculty in teacher education institutions to train their students with the knowledge, skills, and attitudes required to integrate technology-supported project-based learning into the future classroom. During the training, pre-service teachers learn how to integrate technology judiciously and seamlessly in their classroom processes. As a result, they enter their first classrooms equipped with the knowledge, skills, and capabilities to integrate technology resources into any unit they teach.

Intel partnered with the Ministry of Education Pakistan, pre-service governing bodies, and the Teacher Education Institutes (TEI) to introduce the pre-service program in Pakistan in 2005. A pilot program was conducted in the Punjab through the Punjab Provincial University of Education. The total enrollment has been more than 8,000 pre service teachers annually ever since. The pre-service program has also been implemented in Sindh through the Menrah University of Sindh which trains 1,000 teachers annually and the Karachi Institute of Teacher Education.

In 2009, Intel signed an MoU with a consortium partner in Pre-STEP (the Pre-service Teacher Education Program). Pre-STEP is a five year, national program led by the Academy of Educational Development (AED), with support from USAID. Under this agreement Intel Pakistan and Pre-STEP will develop and pilot a technology course with the objective that trainee teachers receive hands on experience with technology-aided teaching methodologies. Pre-STEP aims to strengthen the capacity of 75 teacher training institutes and 15 universities in Pakistan.

Constraints Faced by Intel in Implementing ICT in Education in Pakistan

Constraining Factors

- Lack of availability of infrastructure (hardware)
- No connectivity in most of the government and private schools
- Regular power breakdown
- Lack of coherent Policy framework
- Lack of IT awareness
- Rigid education policies

Procuring Funds

Government has limited funds for education due to which they hesitate to allocate funding for ICT in Education initiatives, but in some areas district government provided support in terms of providing Travel Allowance to teachers.

Intel's Role in Overcoming Constraints

- Intel is providing labs to government school under the ICT for Education program
- Intel has approached third party development agencies to provide infrastructure
- Advocacy of ICT in education in different forums, such as Reform Support Unit Govt. of Sindh, MoU with MoE and different Development Agencies and private schools.

Sharleen Ghauri, Corporate Affairs Manager, Intel Pakistan Corporation

“The implementation of Intel pre-service course is relatively new in Pakistan and has met with a great deal of success in this short period—the major benefits to the teacher educators and prospective teachers is improved computer skills and more effective and interesting learning for their students. However, the implementation and practice of using this course does face some major challenges which includes, lack of access to resources and infrastructure, lack of incentives to put into practice the program and mismatch between teacher education curriculum and the Intel program” (Oakley, 2008; Pakistan Pre-service Evaluation Summary)

6.4.2. ICT for Science Teachers Project

The academy of Educational Planning and Management (AEPAM) was established in 1982 to assist the MoE in planning, monitoring and policy formulation. Among the various responsibilities that AEPAM is charged with, organizing training programs particularly in terms of IT and computer skills to head teachers, teachers, computer personnel and education managers is of their major responsibilities. In this regard, AEPAM initiated the ICT for Science Teachers Project, which is a basic training program for teachers from Islamabad, FATA and FANA to develop computer skills so as to enhance their professional competency. The objectives of the project are highlighted as follows:

- To orientate teachers with the basic functions and operations of a computer system
- To acquaint teachers with the scope and benefits of implementing ICT in teaching-learning process
- To orientate teachers with the Internet and with frequently used software such as word-processing and spreadsheet software.
- To provide hands on experience in using ICT to improve their teaching-learning process

The project was carried out in a phased manner; from 2005 to 2008, AEPAM conducted 17 two week training programs under which it trained a total of 421 science teachers.

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Essay I

Policy Coherence in the Application of ICTs for Education

infoDev

PRICEWATERHOUSECOOPERS 

Executive Summary

This essay on **policy coherence**¹ examines the different elements that must be addressed in any policy framework that seeks to effectively integrate ICTs in education. It delineates an “ICT for Education Ecosystem,” where coherence needs to be achieved between different arms of the government, different implementation agencies and supported by financial allocations, detailed implementation plans, monitoring and evaluation strategies, as well as a community demand for ICTs. The essay provides a study of existing policies in the focus countries, both in the education and the ICT sectors, to see what are the enabling features and the gaps with respect to key aspects such as content development, curriculum design, infrastructure and capacity building, monitoring and evaluation, as well as use of ICTs in education management. In most focus countries in the region while infrastructure remains a key bottleneck, focusing on adequate strategies for content development and capacity building would maximize benefits and overcome some of the infrastructure gaps. The uneven nature of infrastructure availability in most of these countries means that large sections of the population may not be provided with basic infrastructure, including ICT infrastructure, whereas the urban centers in these countries are a market for increasingly sophisticated applications to run on the existing infrastructure. Therefore, in all these countries a range of ICT applications are available for the education sector. In some cases, ICT affords a cost-effective way of ameliorating disadvantages of location in remote areas, where adequate teaching staff and school infrastructure is difficult to establish, by providing virtual access. The essay highlights the need for organically developed integrated ICT for education policies that are firmly grounded in pedagogical practices and which use ICTs primarily as a tool to achieve the desired learning objectives.

Policy Coherence in the Application of ICTs for Education

Education is a key requirement for social and economic prosperity. In the developing economies of South Asia, it is often seen as the only means to social mobility and financial self-sufficiency. Governments across these countries recognizing the significance of education have devoted considerable resources in terms of money and comprehensive programs for improving the access, quality, and delivery mechanisms of education.

The proliferation of ICT tools in education at all levels has been an emerging trend in the South Asian region. ICTs in developing countries are often seen as an opportunity for achieving developmental goals of the country. Sometimes due to felt need, due to observing success stories, and at other times due to the success of the IT industry as a whole in the region, ICTs are being used enthusiastically often without a real understanding of their relevance and impact.

Thus, quite often initiatives are planned without a proper policy framework to support the success of these initiatives. Furthermore, the nature of ICT adoption in education requires the planning process to combine micro-level planning at the smallest unit, say a classroom, to the highest level of

¹ An early version of the essay on Policy Coherence in ICTs for Education was presented at the Workshop on Policy Coherence for ICTs for Development organized by InfoDev and the OECD in Paris on 10th–11th September 2009.

macro-planning vis-à-vis basic infrastructure policies, connectivity policy, communication policy for the nation as a whole.²

Thus policy coherence has to be achieved at many levels ranging from education policies to ICT policies, telecommunication policies, and infrastructure policies as well.

The South Asian countries in our study, broadly recognizing the importance of ICT for development, have put in place some sort of policy framework for the growth of ICTs. ICT applications in all sectors are an evolving phenomenon; however, it is interesting that education particularly is both a consumer and producer of ICT. Without a robust educational framework, the required know how for development of ICT applications would not be possible. Therefore, using ICTs to reinvigorate the education process is especially important. If benefits from ICT are graded on a spectrum then in order to achieve the highest order benefits in terms of increase in productivity through ICT service provision, use of ICTs as a tool to improve quality and delivery of our most fundamental processes would yield enormous benefits.

In the countries of study, a broad classification based on educational achievement and infrastructure would place at the top end Sri Lanka and Maldives with near 100 percent literacy, universal primary education, and the basic infrastructure in place. India, Bhutan, and Pakistan in the next tier with lower literacy rates but with broadly the systems in place for achieving higher educational attainments in the future. In the final tier would be countries like Nepal, Bangladesh, and Afghanistan each with significant political, geographical, and educational upheaval, which are struggling to institutionalize processes and achieve basic services.

Policy Framework for ICTs for Education

In most of the focus countries, policy articulations for ICT for education are made in one of the following ways, (depicted in Figure 1):

India, Sri Lanka, and Pakistan have either developed or are in the process of developing distinct ICT in education policies. The common features in their Policy recognize the importance of ICT both as **a subject and as an instructional aid.**

India’s policy making process was initiated through a stakeholder dialogue on formulating a draft national policy for ICT in education, led by the Ministry of Human Resource Development and Global eSchools Initiative and Centre for Science, Development and Media Studies (CSDMS). Based on feedback received, a draft ICT in Education Policy has now been published for comments and

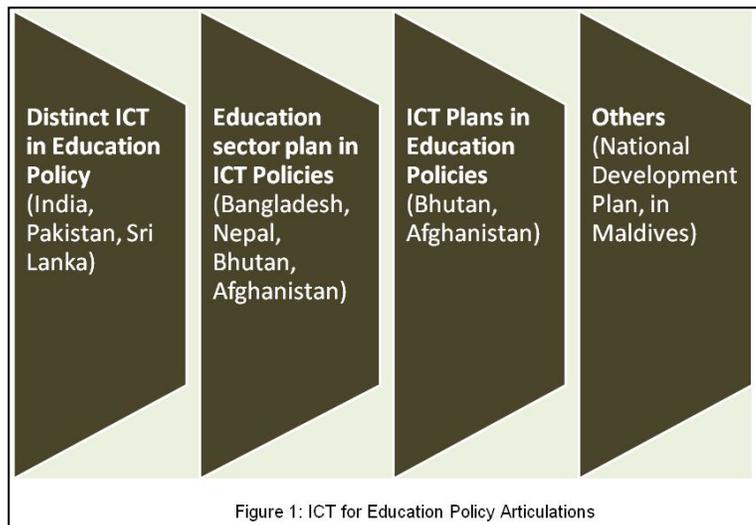


Figure 1: ICT for Education Policy Articulations

² UNDP

revision. However, much before the focused policy action, ICT has been mainstreamed in several education initiative and flagship programs of the government.

In Sri Lanka, the National Policy for ICT in Education (NAPITSE)³ was formulated in 2002, where ICT would be used both in education as well as for management of education systems.

Pakistan formulated its National Information & Communication Technology Strategy for Education⁴ through a consultative process in 2004–05. It recognizes the importance of ICT for creating access, improving quality of learning, strengthening teacher education, and improving student achievement. However, for all these countries policy/strategy documents have to be backed with detailed implementation plans. Sri Lanka has a strategic plan of action from 2002–07, but targets set out in the ambitious policy are yet to be realized. Further separate financial allocations have to be made in support of initiatives outlined. Very few countries’ policy documents have extensively outlined a Monitoring and Evaluation methodology to evaluate success of the given initiative or tools used.

In studying the various ICT for education initiatives in the different focus countries, it emerged that initiatives are successful precisely because they are able to pull together many different elements, supported by a robust yet flexible policy framework. Very broadly a graphical depiction of what may be understood as an **ICT for Education Ecosystem** is depicted in Figure 2.

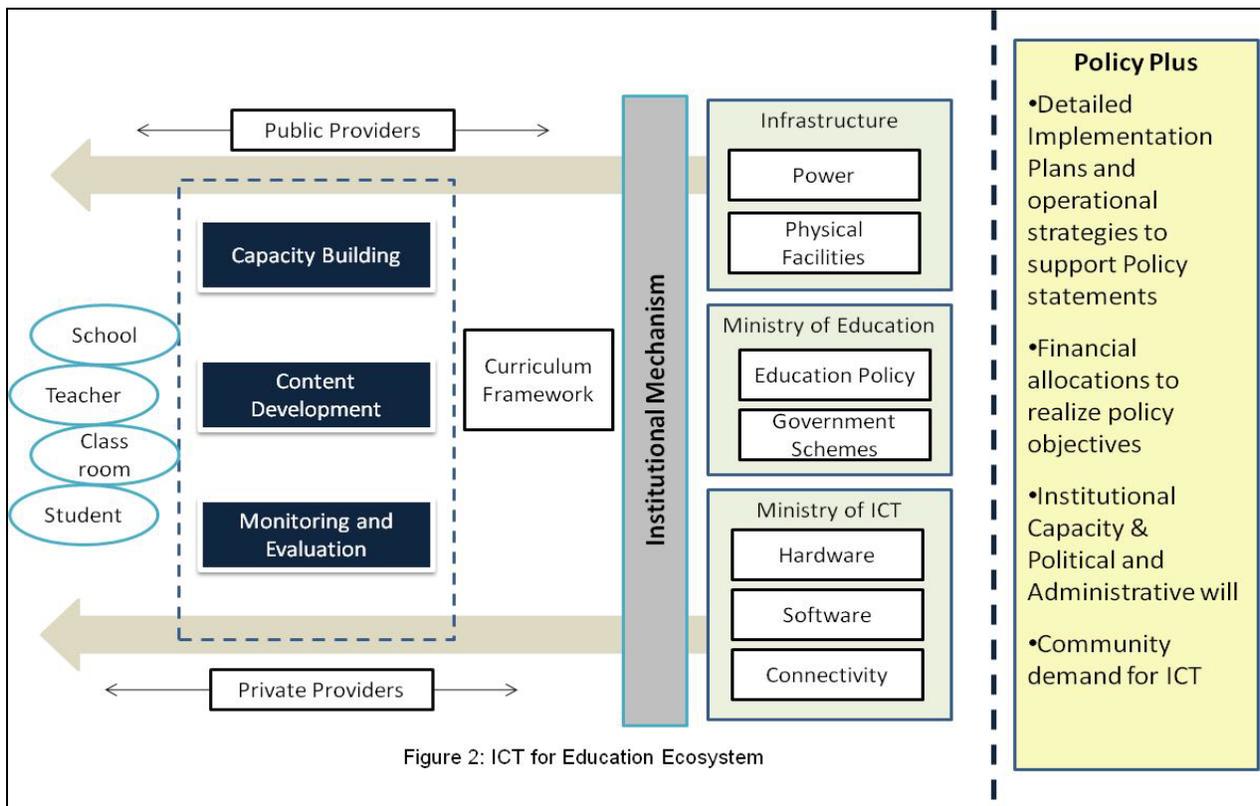


Figure 2: ICT for Education Ecosystem

³ National Policy for ICT in Education, Government of Sri Lanka, 2002–07.

⁴ National Information & Communications Technology Strategy for Education in Pakistan, Government of Pakistan, 2005.

Core infrastructure policies would provide for electrification and physical facilities; the Ministry of Education has the responsibility for articulating the larger education policy and the Ministry of ICT would have in place a broad communications policy as also policies on developing hardware, software, and connectivity.

These policies may then be translated into initiatives and schemes by both public and private providers, through different mechanisms. Initiatives specific to ICT for education would have several critical elements such as capacity building, content development, and monitoring and evaluation strategies. These put together would then be geared toward the student in his environment, ensuring that ICT initiatives actually result in improved teaching learning. In addition to these policy elements, several critical factors like detailed implementation plans to operationalize policy statements, financial allocations, institutional capacity, and also community demand for ICT are all essential to ensure that ICTs are effectively integrated in the education system.

All the aforementioned elements will be discussed in detail in the following sections.

Major Elements of an ICT for Education Policy

Use of ICTs for education is a horizontal activity that requires elements from different verticals to come together to enable meaningful learning experiences for the students. The following major aspects need to be addressed in a Policy for ICT in Education

- **Curriculum**
- **Content/Digital Resources**
- **Infrastructure**
- **Capacity Building**
- **Monitoring and Evaluation Framework**
- **ICT for Education Management**
- **Policy Plus**
 - Implementation Plans
 - Financial Allocations
 - Political and Administrative will
 - Community demand for ICT

Content and Curriculum Development

This is the most significant aspect of the use of ICT in education. If ICT applications are to yield meaningful results they will depend primarily on the quality of the content and curriculum that is

being transacted in the class. There is a need to ensure that ICT is not used simply to teach the old curriculum using the computer and other tools at hand, but that concepts are taught in a fundamentally new way leveraging the advantages provided by ICT. Visualization, experimentation, and learning by doing are some of the hall marks of this new method.

Introduction of ICT in the learning environment is an opportunity, therefore, for rethinking our teaching-learning paradigm at the most fundamental level. As models of learning change, what should be taught in class at what level also needs to be rethought. This is an opportunity to instill in learners the 21st century teaching learning skills.

Based on this curriculum, content needs to be designed which is relevant to the target group. Content development and curricular reform are important pillars and often with all the other aspects in place if these are ill designed, we are unable to see any utilization or performance improvement through ICT.

In the focus countries almost all policies underscore the need for appropriate curriculum and content. Curriculum is usually prescribed for ICT as a subject starting at the secondary school level and at the primary level the aim is to improve general ICT literacy and facility with working with technology. There is also a mention of using ICT as a tool for teaching other subjects. However, strategies for content development have been articulated to varying degrees in the focus countries.

India

The Draft National Policy for ICT in Schools, published by the Ministry of Human Resource Development in 2009,⁵ stresses the significance of achieving general ICT competency for all levels at school, appropriate curriculum for ICT as a subject at the higher secondary level, and the need for ICT-enabled teaching learning practices for school education. The policy outlines requirements of different levels of ICT Literacy and Competency from Basic to Advanced and proposes an implementation strategy for ensuring these levels are achieved. In addition, it articulates the need to develop modular courses in different areas of IT at the Higher Secondary level.

The policy recognizes the significance of good quality, locally relevant content in multiple local languages for all learners, given India's linguistic, cultural, and social diversity. It spells out a strategy to develop content in a phased manner by focusing first on the more difficult to teach/understand concepts and subsequently making quality digital resources available for all concepts and disciplines, moving finally toward a model of highly interactive digital resources such as virtual laboratories. National and state level Web-based digital repositories are envisaged that will host content for students and teachers in a range of formats from question banks to FAQs to activities, notes, and so on. Appropriate licensing norms to facilitate open and free access to resources will be highlighted and knowledge of issues like copyrights, restrictions on reuse of content, and so on will be given to all users.

Further to encourage development of quality content educational standards and instructional design models would be widely distributed to ensure quality in the digital content being produced by different agencies.

⁵ National Policy on Information & Communication Technology (ICT) in School Education, Ministry of Human Resource Development (MHRD), Government of India, 2009.

School libraries will be revamped to function as gateways for access to quality digital content for students and teachers and will thereby play a crucial role in catalyzing usage of digital resources in all classes. These libraries would have adequate Internet connectivity and would move toward digital cataloging and automation.

Content development is entrusted to various agencies both in the public and private domain. In India, several agencies like the Central Institute of Education Technology (CIET), National Council of Educational Research & Training (NCERT), Indira Gandhi National Open University (IGNOU), State Institutes of Educational Technology (SIETs), and Doordarshan (National Broadcasting) have dedicated resources for developing and disseminating digital content at various levels for a variety of objectives from informal educational messages to structured course modules. Private companies like EduComp, Everon, NIIT, Aptech, IL & FS, Intel, and Zee Interactive systems are some of the firms working extensively to develop and deliver quality digital content for education. These companies in addition to selling their products to individuals and schools have entered into MoUs with various state governments to design and deliver content in well-defined initiatives focusing on government schools in the states.

Sri Lanka

In Sri Lanka, the National Policy for Information Technology in School Education (NAPITSE, 2002) was formulated with a clear goal to “envisage and foresee the future global challenges in IT education and lay the foundation for appropriate human resource development to meet such challenges.” In addition, it seeks to improve information literacy of all its citizens, create lifelong learning opportunities through the school system, and enable the use of ICT as a tool in teaching learning at all levels of general school education. Specifically, the NAPITSE articulates the need to:

- Introduce, sustain, and enhance IT involvement into general education in schools and create opportunities for IT-based learning and teaching.
- Introduce IT into pre-service and in-service teacher development and training programmes and create opportunities for system-wide professional development of teachers.
- The NAPITSE also mentions the need to set up a Multimedia Education Software & Web Development Centre.

Recognizing the lack of relevant content in local languages as an impediment to adoption of ICT by a large number of people, the Government of Sri Lanka through its Information and Communications Technology Agency (ICTA) has launched Shilpa Sayura Project to create digital content related to the school curriculum in Sinhalese to help students. Shilpa Sayura enables students to interact with ICT to study eight subjects digitally at telecentres and develop their knowledge to prepare for national examinations. The National ICT Literacy Project aims to increase the e-literacy level of the population by providing them training through a network of rural service delivery centers called “nensalas.”

Pakistan

The National ICT Strategy for Education (NICTE, 2005) stresses upon the use of ICT both as a subject and as a critical instructional aid. It talks about improving student learning using ICT

through locally relevant content created by training teachers adequately to develop their own teaching learning materials. It also suggests distribution of *CD-ROM*-based software (including items from and links to relevant Web sites and education *portals*) to schools, professional development centers, and teacher training institutions to help preservice and in-service teachers expand their content knowledge.

The Policy also articulates the need for overall curricular reform in light of tools and pedagogical techniques made available through ICT, so as to enrich education at every level. It stresses the need to use ICT to provide access to quality content (internationally or nationally produced) available online to supplement existing textbooks and materials. This content by being flexible, interactive, and multimodal (radio/TV, etc.) would improve learning in students.

The Policy suggests that Ministries, education departments, and district education offices can establish Limited Area Search Engines—online database collections of appropriate content for use by students. International open educational resources and models for curriculum and content development may be used after adapting them to national requirements based on guidelines.

Bhutan

Bhutan Information and Communication Technologies Policy and Strategy (BIPS) 2004 talks about creating appropriate curriculum for ICT as a subject based on market needs, as well as curriculum for general ICT Literacy and competency for all school students.

The 26th Education Policy Guidelines & Instructions (EPGI-2007) state the aim of the Government to make teachers and students who complete basic education (i.e., class X) IT literate. To that end since April 2007, Bhutan Telecom has made all dial-up Internet packages free. Therefore, all schools which have computer and Internet facilities are urged to introduce relevant IT programmes for students and encourage the use of computers and Internet for learning especially after school hours and during the weekends, when the facilities are often underutilized and students have ample time to practise and learn. Along this line, CAPSD has developed a standard IT literacy framework, which schools are urged to use to initiate and carry out IT literacy programmes.

A strategic component of local content development is the Dzongkha localization project currently being executed by DIT. Under this project, a beta version of Dzongkha Linux was released in 2006. It has the capacity to undertake common desktop computing tasks such as word-processing, spreadsheets, and PowerPoint presentations in Dzongkha. It symbolizes beginning of a commitment toward open-source software development. Diminishing of language barrier is another feat. The Department of Information Technology, the National Library, and the Institute of Language and Cultural Studies are collaborating to establish the National Digital Library of Bhutan (NDLB), which aims to present aspects of Bhutanese life, traditions and culture, and provides resources for scholars.

The other focus countries namely **Afghanistan, Maldives, Bangladesh, and Nepal** while stressing the importance of locally relevant content do not have a separately articulated strategy for content development, instead they are focused on creating qualified IT professionals to boost their local ICT industry, which will in turn create local capacity for content development. In addition, some ongoing initiatives are focused on creating locally relevant content in local languages.

Afghanistan

The ICT Policy of Afghanistan highlights the need to promote effective ICTs training courses at secondary and tertiary level. It focuses on the need to create curricula for ICT and related subjects at secondary and tertiary levels as well as development of material for teacher training and training of trainers. In general, content development capacity in Afghanistan is still being developed with a focus on training faculty, IT professionals, and supporting the general ICT Industry. International content may be accessed using connectivity through distance education centers, partnerships are also encouraged for content development; for example, the Ministry of Education with assistance from Asia foundation has undertaken digitalization of science subjects of grade 10–12 in the form of DVDs.

Maldives

In Maldives, the Seventh National Development Plan by the Ministry of Planning and National Development is dedicated entirely to expanding current ICT levels. It highlights the need for providing access to computers for all students especially at the secondary level and to develop a national curriculum for primary and secondary education focusing on ICT skills and usage including Internet skills.

Bangladesh

Likewise, the National ICT Policy 2009 of Bangladesh stresses the need to produce more trained ICT professionals through improvement of curriculum of ICT as a subject. The Policy has several strategic focus areas for use of ICT in Education & Research from the primary to tertiary levels. Content development is highlighted as important and the policy talks about the need to create central repository for e-Learning content for teacher training and for all students and providing incentives for e-Learning content development.

Nepal

The Nepal IT Policy 2000 highlights the need to have “computer education for all by 2010.” It proposes a phased introduction of IT as a subject at the secondary level. In Nepal, Open Learning Exchange (OLE) is a nonprofit organization that is dedicated to assisting the Government of Nepal in meeting its Education for All goals by developing freely accessible, open-source ICT-based educational teaching-learning materials. OLE has set up a digital library (E-Pustakalaya), which includes all required curriculum textbooks in local language.

Capacity Building

Human Resource Development is an important aspect of capacity building for effectively integrated ICT in education. Teachers, administrators, and managers in the education system all need to be adequately equipped to enable them to maximize the potential of ICT in improving teaching learning practices.

All focus countries have some sort of articulation for teacher training in ICT. Teacher training institutes are being equipped to provide pre-service and in-service training in ICT.

In **India**, the Draft National Policy for ICT in School Education underscores the need to reform pre-service training curricula in teacher training to include relevant ICT courses. Furthermore, ICT competencies will form a part of the eligibility criteria for teacher appointments. Appropriate ICT infrastructure would also be made available at all teacher training institutions. The Policy recognizes that periodic in-service training comprising induction and refresher courses will be the key to the widespread infusion of ICT-enabled practices in the school system. The training will consist of initial sensitization through ICT operational skills and ICT-enabled subject training skills, after which the teachers will be expected to become part of online professional groups and associations to keep themselves abreast of latest developments, share and develop relevant content, and to engage with a larger community of experts.

Recognizing the significance of bringing onboard school leaders and administrators to ensure optimum adoption and utilization of ICT-enabled teaching learning, it is proposed that all school heads will be given orientation in ICT and ICT-enabled education training programs. Schools will be encouraged to increasingly automate their processes in administration, management, and monitoring of school systems so that school leaders will be provided adequate capacity building training. School leaders through these trainings will thus be able to contribute in the successful development and implementation of a School Education Management Information System (SEMIS).

Quite often, government personnel working in education departments at various levels—national, state, and districts—do not have adequate knowledge of ICT. The Draft National Policy states that training will be provided to government personnel in order to encourage them to use ICT in their day-to-day activities. Specific training would also be provided on any MIS system for schools and general maintenance and upkeep of the ICT infrastructure managed by them.

In **Pakistan**, the NICTE 2005, places great emphasis on using ICT to strengthen teacher's professional development and educational management. The strategy highlights the need to maximize opportunities for professional development through different ICT media such as IRI, television, ODL, and online resources. This will ensure that teachers have access to ongoing professional development including follow-up support. The strategy will be particularly useful in areas which are geographically remote and where face-to-face interactions for professional development are difficult and not cost effective. Teachers will learn ICT skills as well as how to teach ICT as a subject and integrate it within the curriculum, such that ICT training is not merely about skill development to enable using different equipment but to actually integrate ICT to enable developing new instructional methodologies (e.g., project oriented, *problem-based learning*, and collaborative learning). The Policy recognizes that while skill training in ICT is essential, the focus should never be only on teaching ICT as a separate subject. It is more important for teachers to know how to teach with ICT than how to use ICT, and such instruction should be integrated within the basic courses at teacher training colleges.

The strategy highlights the importance of suggesting appropriate technology based on assessed needs of teachers so that the correct technology is made available to them based on their needs. The Policy also suggests exploring internationally available standards, such as those provided by International Society for Technology in Education (ISTE) for ICT education for teachers and to adapt them to local conditions.

The Policy further highlights the need to provide adequate resources to teachers through various platforms to enable them to develop their own teaching materials. A National Education Portal is envisaged to develop a community of teachers who are able to communicate with each other, learn from each other's experiences and have access to subject matter specialists to improve their own understanding. Training of administrators and education managers should be part of a planned programme to make school environments conducive to maximum use of innovative ICT.

In **Sri Lanka**, the NAPITSE articulates the need to provide training and education to all teachers in government schools to make them competent in using ICT for teaching purposes. It also reiterates the need to introduce IT into pre-service and in-service teacher development and training programmes and create opportunities for system-wide professional development of teachers. The Policy envisages training for government officers managing education systems and encourages use of school-based ICT resources by out-of-school population to provide general ICT literacy for the community. The Intel Teach program is aimed at enabling teachers to better exploit the full education potential of the technology age. The response from the education administrators, principals, and teachers was exceptionally encouraging. The program has made tremendous headway in Sri Lanka. More than 7,500 teachers have already been trained under this program in the Island.

The National ICT Policy 2009 in **Bangladesh** identifies the shortage of trained and qualified teachers and therefore proposes to leverage ICT tools for imparting effective teachers' training programmes and mitigating the shortage of good quality teachers. The Policy underscores the need to incentivize acquiring ICT skills for teachers, strengthening all primary and secondary teacher training colleges through connectivity, multimedia content, and so on. It also talks about the need for more trained ICT professionals through improved curriculum for ICT as a subject. The National Academy for Computer Training and Research (NACTR) is an autonomous educational and computer training institution charged with the responsibility to prepare, conduct, and evaluate computer training syllabus for the personnel engaged in the government, semi government, autonomous, and non-government institution of Bangladesh. An "ICT Professional and Skill Enhancement Programme" will also be initiated, which would assess the skills of ICT professionals and meet gaps with targeted training programmes to overcome the short-term skills shortage in the ICT industry.

The **Nepal** IT Policy also highlights the need to provide computer training as part of preservice and in-service training for teachers. It states that the knowledge of computer shall be made compulsory to all newly recruited teachers in phases so as to introduce computer education in schools; and computer education shall also be provided to all in-service teachers in phases through distant education.

In **Maldives**, nearly 80 percent of teacher training costs are transport related. In response to this constraint, Teacher Resource Centers have been set up in 20 atolls in Maldives, which are equipped with state-of-the-art technology to provide an interactive learning experience for students through a "smart board" and to improve the quality of teacher training. Through the Educational Development Centre Teacher Resource Web site, teachers can sit in front of a computer in a resource centre in their atoll, search for materials for their next lessons, download syllabi, and share their own ideas with colleagues in other islands. Through the virtual learning environment

developed for the Educational Development Centre by Cambridge International Examinations, up to 400 teachers could simultaneously receive training by participating in an online course and interacting with one another.

Box 2: Summary

- Training of Teachers, School Leaders, & Education Department Personnel
- Role of ICT for professional development of teachers in pre service and in service training recognized by most countries
- Strengthening of Teacher Training Institutes with multimedia resources highlighted in most focus countries
- Training and orientation for school leaders recognized as important by some countries (India and Pakistan)
- Training for education department personnel in general ICT in day to day activities, as also distinct SEMIS tools has been emphasized in (India, Nepal, Sri Lanka, and Bangladesh)

Key constraints in effective use of ICT for professional development:

- Teacher attitudes toward ICT
- Lack of relevant content
- Lack of access to internet and computers after school
- Lack of adequate funding and resources
- Lack of training focusing on pedagogical innovation and learner centric strategies

At the Policy level there is an emphasis on creating a larger pool of ICT professional, through certification, accreditation processes.

The BIPS 2004 highlights the need to ensure appropriate ICT awareness and skills from computer literacy to high-level technical skills to boost the ICT industry. Further, the 26th Education Policy Guidelines reiterate the need to ensure that all teachers and students are IT literate.

Afghanistan identifies the lack of technical ICT professionals and appropriate training materials as a major constraint for using ICT for teacher Training and Professional Development. The Afghanistan Higher Education Portal developed in collaboration with the Global Learning Portal (GLP) and the Afghanistan Ministry of Higher Education (MoHE) in an effort to empower teachers, learners, and communities to improve education access and quality. The Portal will provide faculty of education members in Afghanistan with technical assistance, learning resources, and networking tools to support professional development.

There are several initiatives for training senior school leaders and administrators in ICT. Administrative departments will also increasingly use ICT to better manage public spending and planning for education; all the personnel in these departments also need to be trained in using effective school management information system and other planning tools to provide better governance.

Infrastructure

Infrastructure is the key enabling framework for deploying ICT in education. We have to look at the spectrum of infrastructure requirements from proper buildings/rooms, electricity and power supply, to sophisticated hardware, system software, and most importantly connectivity. The trends on all these parameters show a mixed bag of results in terms of government success in ensuring effective infrastructure availability. Although in countries like Maldives and Sri Lanka relatively high standard of education and ICT infrastructure is available, their application and content development pace is slower than say India, which has patchy infrastructure availability but a fast developing ICT industry able to develop many new applications and content for education. In Bhutan and Nepal, there are geographical and climactic problems in the way of providing basic infrastructure.

Afghanistan and Pakistan in addition to geography face unstable political terrains as an impediment to adequate infrastructure development. Bangladesh also has a poor track record of infrastructure availability.

Policy articulations for improving infrastructure availability have been made in almost all the focus countries. These articulations have been made at various places through the respective IT Policies, Education Policies, ICT in Education Policies, and other infrastructure policies.

The several components of infrastructure are connectivity, hardware, and software and enablers like electricity, classrooms buildings, and so on.

According to the **India** draft National Policy for ICT in Education, ICT requirement for each school will be determined based on its size and norms articulated by the State Government. The Draft Policy envisages that all states will establish state of the art, appropriate, cost-effective, and adequate ICT and other enabling infrastructure in all secondary schools to begin with. This infrastructure would include computer labs with adequate hardware and software, AV rooms with digital still and video cameras, music and audio devices, digital microscopes and telescopes, digital probes for investigation of various physical parameters, adequate hardware for EDUSAT terminals, and so on.

Each school will have a LAN in place and a dedicated broadband connectivity of at least 2 Mbps. In addition to Internet connectivity in the computer labs, connectivity will be provided to terminals in the Library, Teachers' Common rooms, and office of School Administrators. An Edusat network will be planned at each state with interactive terminals and Receive Only Terminals (ROTs). At least 1,000 such terminals could be planned at each state.

A judicious mix of software will be introduced at the secondary stage comprising a range of software from the standard office suite to Graphics and animation, desktop publishing, Web designing, databases, and programming tools. To enable cost-effective software usage and development free ware, free and open-source software applications will be preferred.

The Policy also emphasizes that the enabling infrastructure required to efficiently maintain the ICT facility will be defined, established, and maintained. This includes adequate and regular power supply, physical facilities like large room, adequate ventilation, and other supporting infrastructure.

The NICT **Pakistan** while highlighting the need for adequate ICT infrastructure in each of the six elements of the strategy does not outline a distinct strategy for creating this ICT infrastructure at each level, instead the strategy document is seen as a set of guidelines for federal, provincial, and school level administrators to develop their own capacity and tailor this strategy for integrating ICT in education systems at their level. It was also understood during the course of this study through discussions with key stakeholders that the NICT has remained since its inception as a general set of guidelines and has not been translated into any specific schemes at the Federal or at the Provincial level.

The National Policy on IT in Pakistan has also emphasized the importance of IT vis a vis education, some of the relevant provisions made in the Policy with respect to education are:

- Launch a scheme for providing low-priced computers and Internet connectivity to universities, colleges, and schools through a public-private sector initiative.
- Network all universities, engineering and medical colleges, and institutions of higher learning in the country for improved quality of education.
- Set up electronic libraries to ensure economical and equitable access to world information.
- Encourage educational facilities to computerize their registration, examinations, accounting, and other activities.
- Encourage educational facilities to adopt computer assisted learning and other IT tools to aid in the teaching process.
- Establish virtual classroom education programs, using online, Internet and/or video facilities, to provide distance learning to a large number of individuals.
- Establish a national educational intranet (linked to the Internet) to enable sharing, among educational institutions, of electronic libraries of teaching and research materials and faculty

The e-**Sri Lanka** program, which commenced in early 2003, aimed at extending the benefits of ICT to impoverished regions by implementing a number of initiatives. e-Sri Lanka focused on providing infrastructure and installation of hardware, whereas the NAPITSE 2005 of Sri Lanka focuses on creating adequate human resources and develop quality content to ensure that the maximum benefit of ICT integration into education is realized.

The government of **Bangladesh** in its ICT Policy 2009 proposes to do the following in order to provide ICT access to all schools:

- Install computers, Internet connectivity, and appropriate multimedia educational content for every primary, secondary, and higher secondary school, accessible to each student; include solar energy panels if necessary
- Create a Model School as an Information Access Center with ICT facilities in each union, so that all other adjacent school students can use that facility.
- To bridge the digital divide the policy aims to provide Internet connectivity for all villages in the country and seeks to ensure subsidized pricing for Internet connectivity to primary and

secondary educational institutions as well as technical and vocational education training programs.

The BIPS 2004 outlines the need to develop a plan for a countrywide connectivity to ICT infrastructure, including schools, geog centers, and villages. According to the 10th Five-Year Plan, all higher and middle secondary schools have a computer laboratory each with a minimum of 10 computers. Similarly, some lower secondary and community primary schools have also been supplied with 2 to 5 computers. The Plan states that RGOB has committed, through the Prime Minister's Executive Order in 2006, to support the ongoing development and enhancement of ICT in education.⁶ There is a plan to provide computers to schools as they get electricity supply. By 2010, the government is committed to ensure an affordable, fast, secure, sustainable, and appropriate ICT infrastructure throughout Bhutan.

In the **Maldives**, ICT infrastructure is relatively well developed with near 100 percent mobile network coverage, nearly 90 percent of Internet users using broadband Internet connections, and a relatively high penetration of personal computers compared to the rest of the region. The Seventh National Development Plan by the Ministry of Planning and National Development articulates the need to provide access to computers for all students. The government hopes to ensure that each secondary school has a computer lab for learning purposes and that each secondary school has sufficient capacity to maintain and operate the computer lab effectively. Already the government has been able to provide 60 percent of secondary schools a computer lab and most schools have a technician and a computer teacher.

Nepal IT Policy 2000 states that Internet facility shall be made available free of cost to universities and public schools for 4 hours a day within the next 5 years to provide computer education in a systematic way. The policy also states that the distant learning system shall be introduced through the Internet and intranet as well through radio and television. Networking systems like school-net, research-net, commerce-net, and multilingual computing shall be developed. With its difficult geographical terrain and nascent ICT and telecom sectors, it has low ICT penetration figures compared to the rest of the region.

Afghanistan too has extremely low ICT penetration for various geographical and political reasons. Based on the Ministry of Education strategic plan review, by 2014–15, the Ministry aims to develop 100 percent ICT Infrastructure in the centre and throughout the provincial educational directorates and 50 percent coverage of the district education units and educational institutes around the country. A phased plan for development of ICT infrastructure has been articulated starting at the national level for the Ministry of Education and eventually going down to the district education unites and education institutes.

⁶ 26th Education Policy Guidelines & Instructions (EPGI-2007), Government of Bhutan.

Box 3: Summary

- Distinct articulation for making available basic ICT infrastructure for schools and other educational establishments articulated in the IT policies as well as educational policies of most countries
- Most of the focus countries have plans to provide connectivity to schools and other educational institutions
- Enabling infrastructure like electricity and physical facilities still a major constraint in almost all focus countries (except Maldives and Sri Lanka)

Key constraints in developing adequate ICT infrastructure:

- Significant difference in access to connectivity and electricity between rural and urban areas
- Lack of resources for maintenance and upkeep
- High cost of connectivity
- Lack of institutional frameworks and robust implementation capacity

ICT for Education Management

Use of ICT in planning for better service delivery in the field of education is a significant aspect. Starting from school administrative processes to communication between schools and management of education systems by respective departments can all be greatly facilitated by SEMISs. Standard procedures like admissions, transfer and posting of teachers, salary payments, attendance, and so on can be greatly simplified using IT applications. GIS applications for school planning are also being used along with Student Tracking initiatives.

In **India**, the Draft National Policy for ICT in Education envisages the use of ICT in School Management at all levels. Starting with introduction of local school wide area network to enable automation of various administrative process from student/teacher tracking, to maintenance of records, and resource planning, leading to a School Management Information System, which will then feed into the proposed statewide Web-based SEMIS. At the state department level, states will adopt an e-governance and automated school administration programme for schools, build capacities for its implementation and deploy school-based Management Information Systems. These MIS will be integrated with the proposed national level Web-based SEMIS.

The National Education Strategic Plan (NESP) of **Afghanistan** envisages an ICT strategic plan as part of developing the overall capacity of the Ministry of Education. An Education Management System (EMIS) is being developed with assistance from donors. The lack of information and reliable data is a major impediment in improving the planning and management capacity of the education system. The Ministry also envisages that all management and administration civil service

employees should have the opportunity to be “digitally literate” by the end of this planning cycle. Afghanistan also has some GIS-based data to enable school planning.

The government of **Pakistan** in the NICT 2005 envisages the need to ensure proper planning, management, support and monitoring, and evaluation of ICT initiatives by organizing ongoing efforts to ensure capacity building at the federal and provincial Levels and creating an external body, which advises the Ministry of Education on ICT in education. Specifically, the NICT suggests establishing a Technical Implementation Unit (TIU) for ICT in education. The TIU will develop the technical planning, monitoring, and evaluation capacity of policy-makers, planners, and administrators at national, provincial, district, and school levels. It will also liaise with teacher training institutes, oversee the implementation of the NCIT strategy, and support the overall monitoring of education through the national Education Management Information System (EMIS).

The NAPITSE **Sri Lanka** along with a focus on use of IT in Education (teaching and learning) also highlights the need to use ICT in management of the Education system. As part of the support activities for effective integration of ICT in education, the policy outlines the need to design, develop, and maintain a Web site for the Ministry of Education & Higher Education to assist the school system in e-learning and information management. It also talks about training education department officials to better deal with IT in their day-to-day work.

In **Nepal**, an Educational Management Information System has been continually evolving and is used to derive the Flash Reports that chart progress against agreed educational indicators for the Education for All programmes.

Bangladesh Bureau of Educational Information and Statistics (BANBEIS): This organization is responsible for collection, compilation, and dissemination of educational information and statistics at various levels and types of education. This organization is the main organ of the Ministry of Education responsible for collection and publication of educational data and statistics. It functions as the EMIS of the Ministry. It is also the National Coordinator of RINSACA (Regional Informatics for South and Central Asia).

Box 4: Summary

- Use of ICT in Education Management articulated distinctly in the policies of some focus countries (India, Afghanistan, and Sri Lanka)
- Emphasis on developing SEMIS in several focus countries (India, Afghanistan, Nepal, and Bangladesh)
- GIS mapping for planning is emphasized in (Afghanistan and Bangladesh)

Key constraints in using ICT in School Management:

- Lack of adequate infrastructure and connectivity at the school level
- Low motivation to use ICT in Education Management by teaching and administrative staff as well as department personnel. Fear of eroding of discretion and authority
- Weak institutional capacity to utilize SEMIS software

In Bhutan and Maldives, there is no distinct articulation of the use of ICT in School Management.

Monitoring and Evaluation

Monitoring and evaluation of ICT initiatives should be incorporated into any strategy for integrating ICT in education.

India

The Draft policy envisages that monitoring tools built into the SEMIS along with other information such as DISE data will be used to monitor progress of initiatives and programs. The State governments will design its own monitoring mechanism and undertake a monitoring mechanism, mapped at each level, that is, local, district, and state level to feed into the national Web-based MIS for the progression of ICT in the schools and to suggest mid-course corrections. Independent third-party evaluations are suggested, whereby states will appoint their own agencies to evaluate various parameters such as the ICT programme, infrastructure, digital resources, capacity building, and the overall management of the programme.

Pakistan

The NICT envisages the setting up of a Technical Implementation Unit (TIU) for ICT in education as mentioned before. This body would work in an advisory capacity to MoE to develop the technical, planning, monitoring, and evaluation capacity of policy-makers, planners, and administrators at national, provincial, district, and school levels. The TIU will also liaise with teacher training institutes, oversee the implementation of the NICT Strategy, and support the overall monitoring of education through the national EMIS.

In most of the other focus countries no distinct Monitoring and Evaluation strategy has been articulated for ICT in education initiatives.

Policy Plus

However, policy coherence does not only imply articulating well-integrated strategies; there are several measures that need to be taken to ensure effectiveness of the policy. Some of these are:

Detailed Implementation Plans: In almost all the focus area countries while the Policy clearly highlights the need to integrate ICT into education, there are very few clear implementation plans for operationalizing the policy. In both India and Pakistan, the implementation strategies are briefly

Box 5: Summary

- Monitoring and evaluation strategies very weakly articulated in most countries (except India and Pakistan)
- Existing monitoring and evaluation strategies in education initiatives are mostly focused on program evaluation and EMIS type tools, instead of being based on evaluation of learning levels (India, Pakistan, and Nepal)

Key constraints in developing monitoring and evaluation strategy:

- No standards based on which an evaluation of impact of ICT initiatives in education can be done.
- Weak institutional structures and fragmentation of responsibility

indicated in the Policy documents. However in Pakistan, the NICTE since its inception in 2005 has not been the driving force behind any major initiative for inducting ICTs in the education sector. Most specific schemes on ICTs in the School Education space have been initiated under the aegis of specific IT and Education Policies at the provincial level. For example, the Punjab provincial government has recently completed an ambitious initiative of installing computer labs in more than 4,000 government schools under the leadership of the Chief Minister, and the Education department and the Punjab Information technology Board. In Sri Lanka, the National Policy on ICT in Schools (NAPITSE) was to be implemented through an action plan: “National Policy on Information Technology in School Education, Action Plan, Operational Strategies.” However, there is very little information available on the success of the implementation of the action plan.

Financial Allocation: Financial allocations should back the distinct policy statements made by governments. Funding from different sources, including Government, Private, and Public-Private Partnerships should be explored. Policy statements in almost all the focus countries lack detailed financial allocations or frameworks for funding specific initiatives (Except Bhutan, BIPS 2004)

Institutional Capacity and Political and Administrative will: This is the most critical constraint in the South Asian region where there is little institutional and administrative capacity to translate good policies from paper to real initiatives on the ground. For example, according to the Bangladesh ICT Policy 2002, of the 103 Policy directives in 16 areas only 8 were fully or largely accomplished by 2008 when the review was conducted.

Community Demand for ICT: General ICT awareness and community participation were seen as critical in effectively integrating ICTs in education. With a robust demand for ICT services in general in the larger community, there is better adoption and utilization of technology in the school environment. Very few Policy documents in the South Asian countries recognize this critical linkage (Except Bhutan, BIPS 2004. Bangladesh, National ICT Policy 2009).

Key Learnings

- ❖ The imperative for a policy for ICT for education in this region has largely come from recognition of the need to develop adequate human resources for becoming competitive in the Global ICT market (Bangladesh, Nepal, Sri Lanka, and Pakistan).
- ❖ There is a greater focus on the incorporation of ICT as a subject in the curriculum than on using ICT as an instructional aid to improve overall education quality. This has meant that the focus of ICT at the school level has quite often been IT Education based on a defined curriculum at the secondary and senior secondary level.
- ❖ Only in Sri Lanka, Pakistan, and India (Draft) there is a specific ICT in education policy. These policies focus both on ICT as a subject as well as use of ICT as an instructional aid. Of these, Sri Lanka NAPITSE has been in operation since 2000, and India’s Draft National ICT in School Education Policy is still under formulation, with the first draft having been published in 2009. Pakistan’s NICTE was formulated in 2005; however, as discussed it is not supported by detailed implementation plans and has not been the driving force behind any major ICT initiative in the education space in the country.

- ❖ In Bangladesh, Bhutan, Nepal, and Afghanistan, the national ICT Policies have a section on Education, where they highlight the need for qualified manpower and work back to familiarizing the general population with ICT through the education system. Even in the countries with a distinct ICT for education policy, major schemes at the local level have often been initiated through the ICT policy framework, within the ambit of different IT departments.
- ❖ The Maldives does not have a distinct ICT Policy as on completion of research on this project, but with the basic IT infrastructure already in place (relatively higher Internet penetration, mobile network, TV, and Radio penetration) as well as good educational indicators (near 100 percent literacy and high GERs at primary as well as secondary levels), it is in a good position to realize benefits from a dedicated ICT for education policy that focuses on quality content and delivery.
- ❖ Infrastructure remains a key bottleneck in most of the focus countries, especially Afghanistan, Nepal, Bhutan, and Bangladesh, and parts of India.
- ❖ India and Pakistan have a certain amount of critical infrastructure in place and would have to focus on developing content and applications and leveraging the potential of ICT as a tool to strengthen the teaching learning process.
- ❖ The Maldives and Sri Lanka have been relatively successful in putting the key infrastructure in place (with the exception the high cost of Internet in Maldives), they would now need to focus on using ICT tools and content to improve the overall quality of education and create access for those who have been excluded from their existing systems
- ❖ By and large, the lack of administrative capacity to translate policies into actionable plans and then to have specific initiatives with financial allocation and institutional structures has been a bottleneck in all the focus countries.

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Information and Communication Technology for Education in India and South Asia



Essay II

ICT in School Education (Primary and Secondary)

infoDev

PRICEWATERHOUSECOOPERS 

Executive Summary

The essay on **use of ICTs in school education** provides a study of trends and dominant features of the use of ICTs for school education as profiled in different initiatives captured in the country reports. The essay highlights the spectrum of experiences from high-end technology solutions to low-end TV/radio-based initiatives that have been successful in different countries at the K12 level. The paper also examines the key issues and challenges in the effective implementation of ICTs in school education and provides suggestions to address these challenges and aid the implementation of ICTs in school education. An observation of international trends in application of ICTs in schools indicates that it is directly related to the development of schools and the teaching and learning environment. It is observed that new and emerging technologies are being integrated with the older technologies to make ICT applications in education more effective. Educators are also showing an increasing tendency to use mobile technology to enable access to education. There is a great deal of effort being expended around the world on the development of systems that will standardize the development of resources, catalog them, and store them. These include learning objects, which are digital Web-based resources created to support learning and can function as discrete entities or be linked in order to relate to explicit concepts or learning outcomes. Repositories are libraries where these digital resources are stored and provide teachers, students, and parents with information that is structured and organized to facilitate the finding and use of learning materials regardless of their source location.

ICT in School Education (Primary and Secondary)

The United Nations' Millennium Development Goals (MDGs) two and three are about 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. Despite the continued efforts of the various Governments on universalizing the primary and elementary education, through a wide range of programmes and schemes, access to quality education continues to be an obstacle in the achievement of the education goals.

For instance, in India, during 2004 - 05, while the Gross Enrolment Ratio for children enrolling in classes I to VIII was 97 percent, the Drop-out Rate for the same classes was as high as 46 percent. The situation is more worrying at the secondary education level (classes IX and X), where the enrollment is recorded at 53 percent and the Drop-out Rate is as high as 60 percent¹. Efforts so far have addressed to a considerable degree, the concerns of equity as well as that of regional parity, however concerns of quality have not received adequate attention. Recognizing this, the Government of India's flagship education programme at the primary level - the Sarva Shiksha Abhiyan (SSA) - has streamlined its focus on 'quality'. The situation is similar across the South Asia

¹ Selected Educational Statistics 2006 - 07; Government of India, Ministry of Human Resource Development, New Delhi

region. With the target timelines for universalizing of primary and secondary education nearing, there is a sense of urgency in accomplishing the goals set therein.

As is being increasingly articulated, if after spending large sums of money on programmes and schemes, countries have not become fully literate, it is time that innovative and cost effective methods to be put in place to address the problem of education in these countries². While this is a larger problem and points to the need for reform in the educational systems of these countries at various levels - pedagogical, curricular, as well as institutional, the emergence of various Information and Communication Technologies (ICTs) and their increasing acceptance and adoption by society provide unique opportunities and could potentially promote education on a large scale. While there is no conclusive research to prove that student achievement is higher when using ICTs in the education space, either in the developed or developing countries, there is a general consensus among practitioners and academics that integration of ICTs in education has a positive impact on the learning environment. It is understood that in diverse socio-economic and cultural contexts ICTs can be successfully employed to reach out to a greater number of students, including those to whom education was previously not easily accessible, and help in promoting learning, along with exposing students to the technical skills required for many occupations.

ICTs act as and provide students and teachers with new tools that enable improved learning and teaching. Geographical distance no longer becomes an insurmountable obstacle to obtaining an education. It is no longer necessary for teachers and students to be physically in proximity, due to innovations of technologies such as teleconferencing and distance learning, which allow for synchronous learning.³

ICTs in schools provide an opportunity to teachers to transform their practices by providing them with improved educational content and more effective teaching and learning methods. ICTs improve the learning process through the provision of more interactive educational materials that increase learner motivation and facilitate the easy acquisition of basic skills. The use of various multimedia devices such as television, videos, and computer applications offers more challenging and engaging learning environment for students of all ages.⁴ A study conducted by the International Institute for Communication and Development (IICD) indicated that 80 percent of its participants felt more aware and empowered by their exposure to ICT in education, and 60 percent stated that the process of teaching as well as learning were directly and positively affected by the use of ICT.⁵

Twenty-first century teaching learning skills underscore the need to shift from the traditional teacher-centered pedagogy to more learner-centered methods. Active and collaborative learning

² 'Using Technology for Education', Guilherme Vaz, IL & FS Educational Technology Services, Discussion Paper on National Policy on ICT in School Education

³ Victoria L. Tinio, *ICT in Education* (New York: UNDP-APDIP, 2003).

⁴ 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.

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).

environments facilitated by ICT contribute to the creation of a knowledge-based student population. 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.⁶

ICT in School Education in the Developed World

In the developed countries, and the urban elites of advanced economies, twenty-first century education integrates technologies, engaging students in ways which were not previously possible, creating new learning and teaching possibilities, enhancing achievement and extending interactions with local and global communities. Students live in a world that has seen an information explosion and significant and rapid social and economic changes.

ICT in School Education in the Developing World

In the developing world, ICTs are used largely to increase access to and improve the relevance and quality of education. ICTs have demonstrated potential to increase the options, access, participation, and achievement for all students. The unprecedented speed and general availability of diverse and relevant information due to ICT, extends educational opportunities to the marginalized and vulnerable groups, among the other disadvantaged.

ICTs in the developing world have the potential to enhance the education experience for children who:

- live in rural and remote-rural locations
- have special learning needs
- have physical disabilities constraining their access to schools
- have dropped out and/or have kept themselves out of school for various reasons.
- aim for excellence and fail to get satisfied in the current system

Teachers and learners in the developing world are no longer solely dependent on physical media such as printed textbooks which are often times outdated. With today's technology, one even has the ability to access experts, professionals, and leaders in their fields of interest, around the world at any given time.⁷

In India, various ICTs have been employed over the years to promote primary and secondary education. These include radio, satellite based, one-way and interactive television, and the Internet. However, there have been enormous geographic and demographic disparities in their use. Some states in the country currently have an enabling environment in place that allows for a greater use

⁶ Haddad and Jurich, "ICT for Education: Potential and Potency"

⁷ Ibid

of ICTs for education, whereas other states lack such an environment making the use of ICTs for this purpose very sporadic.⁸

It is also important to keep in mind that ICTs in education are a potential double-edged sword—while ICTs offer educators, tools to extend education to hitherto inaccessible geographic regions, and to deprived children and empower teachers and students through information, there is also the danger that such technologies may further widen the gap between the educational *haves* and *have-nots*. However, technology is only a tool and the success of ICTs in enhancing the delivery of quality education to the needy, without widening the gap, will depend largely on policy level interventions that are directed toward how ICTs must be deployed in school education.

The Governments in each of the countries in the South Asia region are now keen and committed on exploring the uses of ICTs for school education. Therefore, Government policies lately reflect their realization of the importance of integrating ICT use and the promotion of quality education enabled through ICTs. The creation of educational networks offer substantial economies of scale and scope, when attempting to improve the quality of education and seek to standardize quality across the system. Hence, Governments are investing in infrastructure facilities that link schools/educational institutions and resource centers.

However, despite administrators and experts alike recognizing the potential of ICT in improving access to quality education, the utilization of ICTs in school education in the South Asian countries is still not at a very advanced stage. The following table classifies countries in the Asia Pacific region based on their appreciation of ICTs and the availability of ICTs. It shows that while appreciation of ICTs is high in the South Asia region, their actual availability for utilization is low.

Countries	Appreciation of Technology	Availability of Technology
Afghanistan	Low	Low
Australia	High	High
Bangladesh	High	Low
Bhutan	High	Low
Cambodia	High	Low
China	High	Low
Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan)	High	No available data
Democratic People's Republic of Korea	High	No available data
India	High	Low
Indonesia	High	Low
Iran	High	No available data

⁸ 'Promoting the Use of Information and Communication Technologies for Primary and Secondary Education: The Case of the States of Chhattisgarh, Jharkhand and Karnataka in India' Discussion Paper by Amitabh Dabla, Educational Development Centre, Bangalore India.

Countries	Appreciation of Technology	Availability of Technology
Japan	High	High
Malaysia	High	High
Maldives	High	Low
Mongolia	High	Low
Myanmar	High	Low
Nepal	High	Low
New Zealand	High	High
Pacific Islands Countries	High	Low
Lao PDR	High	Low
Republic of Korea	High	High
Sri Lanka	High	Low
Thailand	High	Low
Vietnam	High	Low

Source: Strategy Framework for Promoting ICT Literacy in the Asia-Pacific Region, UNESCO Bangkok Communication and Information Unit, 2008

http://www2.unescobkk.org/elib/publications/188/promotingICT_literacy.pdf

South Asia is yet to harness the potential of ICTs in creating, constructing, capturing, managing, and sharing information and knowledge. India is rated high on appreciation because it has gone beyond policies that merely recognize the strategic role of ICT for growth and development and is already institutionalizing concrete measures that support ICT initiatives. However, it has been rated low on availability of technology due to data reporting that access to computers is “limited,” the cost of Internet connections is relatively high, ISPs are described as “limited,” and the ratio of number of computers per student stated as “insufficient.”⁹ These observations point to the need to frame appropriate policies, build adequate infrastructure, and set aside adequate funds in order to support the deployment of ICTs in furthering the education levels of the country.

Although ICTs do offer many beneficial opportunities for education, they are no substitute for formal schooling. The role of technology is to support school education and not replace it, though the technology may play an appreciable part in meeting the needs of children who cannot go to a conventional school. Access to ICTs ensures enhancement of traditional or formal education systems, enabling them to adapt to the different learning and teaching needs of the societies.

ICTs in school education initiatives that focus on the following areas are most likely to successfully contribute to meeting the Millennium Development Goals¹⁰:

- Increasing access through distance learning

⁹ Strategy Framework for Promoting ICT Literacy in the Asia Pacific Region, Elena E Pernia, UNESCO Bangkok Communication and Information Unit, Asia and Pacific Regional Bureau for Education, Thailand 2008.

¹⁰ The World Bank.

ICTs can provide new and innovative means to bring educational opportunities to greater numbers of children of all ages, especially those who have historically been excluded, such as populations in rural and remote-rural areas, girl children facing social barriers, and children with disabilities and other compulsions. In almost all the developing countries of South Asia, distance learning has been an important component of the education policy of these nations. It is probably in this domain that traditional ICTs like radio, television, and audio cassettes were first deployed in the education space. In India, distance learning offered by institutions like National Institute of Open Learning (NIOS) and Indira Gandhi National Open University have used a combination of print and audio-visual material as well as traditional face-to-face interactions to deliver their content.

- Enabling a knowledge network for students

With knowledge as the crucial input for productive processes within today's economy, the efficiency by which knowledge is acquired and applied determines economic success. Effective use of ICTs can contribute to the timely transmission of information and knowledge, thereby helping education systems meet this challenge.

- Training Teachers

Large numbers of school teachers will be needed to meet the MDGs for education. The use of ICTs can help in training teachers to accomplish the targeted tasks on a mission mode. Moreover, ICTs provide opportunities to complement on the job training and continuing education for teachers in a more convenient and flexible manner. The use of ICTs for teacher training has been recognized by the governments of most South Asian countries and teacher training programmes like Intel Teach across India, Pakistan, and Sri Lanka; Microsoft Shiksha in India; and several other initiatives in Nepal and Bhutan are focused on using ICTs for training teachers. This includes training in applying ICTs in their teaching practices as well as using ICTs as a mode of delivery for these trainings.

- Broadening the availability of quality education materials

Development of relevant, good quality content is perhaps the biggest challenge and opportunity in the educational technology space. While infrastructure, capacity building, monitoring, and evaluation are critical support structures without quality content, the learning experience of students will not be significantly improved by the mere presence of ICT. To that end content development is being focused on in many of the focus countries in our study. In India, several initiatives are ongoing for creating digital repositories and learning objects; the Sakshat Portal of Government of India, initiatives like National Program of Technology Enhanced Learning (NPTEL), the Multimedia Educational Resource for Learning & Online Teaching (MERLOT) seek to create quality digital content for different levels of education.

- Enhancing the efficiency and effectiveness of educational administration and policy

New innovative technologies can help schools' improve the quality of administrative activities and processes. The Government of Afghanistan's articulation of the policy for ICT in education focuses on the need to provide access to ICT for all Ministry of Education administrative staffs, teachers, and students. The policy further envisages that through the use of information management systems, ICT will be extensively used to automate and mechanize work such as human resource management, financial management, monitoring and evaluation, the processing of student and teacher records, communication between government and schools, lesson planning, assessment and testing, financial management, and the maintenance of inventories. The Ministry of Education has developed GIS-based spatial data with detailed maps for better management of the education system in the country. More than 35 maps have been produced showing the location of schools all over Afghanistan, including the number of students and teachers by province.

The Government of Delhi, in India, has been a pioneer in using ICTs for better administration of the education system. The Department of Education, Government of Delhi, with 40,000 employees, 928 schools, and more than 120,000 students under its administrative jurisdiction has developed a comprehensive and functionally effective Web-based and GIS-based Management Information System (MIS). All the schools, zonal offices, district offices, regional offices, and various branches at the headquarters can share information using the Web-enabled software. Information for all stakeholders—students, teachers, and administrators—is available online through the Directorate's Web site (edudel.gov.in); this includes information on admissions, mark sheets, teacher attendance, transfers, pay slips, and so on.

International Trends in ICT in School Education

An observation of international trends in application of ICTs in schools indicates that it is directly related to the development of schools and the teaching and learning environment. For instance, changes to pedagogical practices in classrooms require that teachers should have access to infrastructure and are given the opportunity to develop the expertise to use the machines and software tools. The trends also indicate policy-makers, administrators, and teachers are using a variety of tools and strategies to improve access to learning opportunities, improve the teaching and learning experience for teachers and students, and make effective use of limited resources.

This section presents a select few international experiences that have been observed in ICT applications in primary and secondary education across the globe.¹¹

Integrating New Technologies with Existing Technologies in Use

¹¹ A discussion on global trends in ICTs and Education in 2010 can also be found at the Education Technology Debate Forum of the World Bank <http://edutechdebate.org/2010-ict4e-trends/10-global-trends-in-ict-and-education-for-2010-and-beyond/>. It highlights trends like Mobile Learning, Cloud Computing, Gaming, Ubiquitous and Personalized Learning.

Older technologies such as print, radio, and television are more common in most part of the world, unlike the recent technologies such as Internet, e-mail, and wireless communications. This is largely due to the state of infrastructure development that had not allowed the adoption of newer technologies as extensive as the older technologies. In recent times, however, it has been noticed that these newer technologies are gaining prominence and are being integrated with the older technologies to make ICT applications in education more effective. Radio Sagarmatha in Nepal is one of the first community radios in South Asia. It is a radio-browse model wherein Internet is broadcast over the radio. It discusses public issues, conducts training for public radio journalism, and provides a venue for local ideas and culture. In 2000, the station added a weekly 25-minute Internet radio programme featuring local and international ICT-related news, and ICT glossary, radio web browsing, and interviews with relevant ICT resource persons. This program has been successful among the rural areas of Nepal.

Increased Use of Mobile Technology

In the developing countries of South Asia given the almost ubiquitous presence of mobile phones in some geographies, there is an increasing interest in the opportunities offered by this technology. Several initiatives using mobile phones for English language learning, for facilitating educational administration tasks, and other support informational and educational services are being widely offered.

In India, Bharat Sanchar Nigam Limited (BSNL), one of the largest telecom service providers with the widest reach in the country has launched “Learn English,” a spoken English mobile learning program. The program aims to teach spoken English through common everyday stories and situations that are familiar to most people. It is currently available in nine regional languages for two levels, namely basic and advanced. The service can be subscribed to at a nominal cost of Rs. 20 per month and a call browsing charge of 30 paise per minute.

Other service providers have also entered the arena. IL&FS Education & Technology Services Limited (IL&FS Education) in collaboration with Tata Indicom have launched an “English Seekho” Program, which uses the mobile phone to teach English through simple 5 minute lessons that can be accessed at the learner’s convenience. Another common usage of mobile phones is also found in support services for education, such as providing alerts and retrieving and sending EMIS reports. The Virtual University in Pakistan makes use of SMS to provide updates to students, schedule appointments, and so on.

However, as articulated by educationists and experts, the small screen size, limitations on the amount of data exchanged, and so on are problems that limit the usage of mobile phones (the models most commonly available) in actual content delivery in education.¹²

Content Development through Learning Objects and Repositories

¹² For a debate on the use of Mobile Phones vs PCs in Education refer to Edutech Debate at <http://edutechdebate.org/mobile-phones-and-computers/>

Learning technologies have been evolving over the last many years, starting from early mainframe-based programmed learning systems, microcomputer software packages, bulletin boards, CBT systems, authoring systems, and more recently after the Internet explosion, Web-based systems and Learning Management Systems. Development of content has largely been done on an individual basis, resulting in a scenario where the content software is not compatible with the latest technology. Moreover, there is no established system for cataloging and classifying virtual learning materials, leading to many excellent online learning materials remaining underutilized.

This scenario calls for the need for a standardized system for cataloging, storing, and retrieving content in ways that enable users to access and organize resources for their particular purposes as well as sharing it institutionally, nationally, and internationally. There is a great deal of effort being expended around the world on the development of such systems—ones that will standardize the development of resources, catalog them (metadata) and store them. Learning objects are digital assets that can be as diverse as a chapter in a book, a piece of text, a video or audio clip, or visuals on an overhead transparency or PowerPoint slide, and can be used in a variety of teaching settings, by course designers, managers, trainers, content writers, and learners.¹³

Learning objects can be identified, tracked, referenced, used, and reused for a variety of learning purposes. They are developed to function as discrete entities or to be linked in order to relate to explicit concepts or learning outcomes. Content requirements are determined through communication with educators across the target audience and then the learning object is developed by independent contractors. Learning objects may be self-contained, reusable, and capable of being aggregated.

Repositories may be described as libraries where learning object databases are stored and provide teachers, students, and parents with information that is structured and organized to facilitate the finding and use of learning materials regardless of their source location. Most repositories contain a Web-based user interface, a search mechanism, and a means of retrieving a learning object. While the initial leadership for learning object repositories has tended to come from the university sector, the interest and activity in the school sector is increasing rapidly.

¹³ 'An Overview of Developments and Trends in the Application of Information and Communication Technologies in Education'; Glen M Farrell, Commonwealth of Learning; UNESCO Meta-survey on the Use of Technologies in Education, October 2003.

Open Learning Exchange, Nepal: E Pustakalaya and E Paath

OLE Nepal is engaged in creating content at two levels. The E Paath consists of interactive learning modules, mapped to the topics in the curriculum as prescribed by the Curriculum Development Centre (CDC) of Nepal. Subject matter experts work closely with the OLE Nepal developers to create these interactive learning activities. This easy to use software, rich in multimedia elements including text, audio, video, and animations is then used by teachers and students to understand concepts as prescribed in the curriculum. The content contains lessons, exercises, as well as assessment tools to enable teachers to effectively teach and evaluate students.

E-Pustakalaya is an electronic library which is a repository of reference material for the students, consisting of full text documents, images audio, video clips and software that are relevant for students. E Pustakalaya deploys a simple child friendly user interface that allows children to navigate, search, and link different documents including reference materials, course-related content, magazine, and newspaper content. Students can download the content as well as read it online. The repository is also accessible on the Internet to other users at <http://www.pustakalaya.org>.

Content creation in the E Pustakalaya is an ongoing activity and OLE Nepal has collaborated with several national and international organizations to source materials, these include Room to Read, Rato Bangala Foundation, Madan Puraskar Library, Save the Children, World Education, E-Learning for Kids and Azim Premji Foundation. OLE Nepal continues to work with other organizations to supplement this database. (www.olenepal.org/)

eGyankosh, Indira Gandhi National Open University (IGNOU), India

eGyanKosh, developed by IGNOU and launched in 2008, is a National Digital Repository created to store, index, preserve, distribute and share the digital learning resources developed by Open and Distance Learning Institutions in India. The repository contains all course material of IGNOU in print and video format and allows users to download this material free of cost once they have registered themselves. (www.egyankosh.ac.in/)

As learning repositories are developed, there emerged a need for international standards for these repositories, with the aim of achieving interoperability among various learning repositories. The development of easily accessible and sharable learning repositories is perhaps the most significant trend of all because of the potential it holds for reducing one of the largest single costs in the use of ICT in education—the cost of developing content. This development offers not only the economy and flexibility that comes with reusability but also allows content to be developed independently from the form of its delivery. It offers benefits across the spectrum of learning venues, from the remote learner in some form of distance education, to the teacher and learners face-to-face in a classroom.

Teachers and Online Learning Activities

ICT is an important source, which teachers may use to keep themselves abreast of emerging issues, share knowledge, and reach out to students. Several portals are being developed where teachers can network and share information including best practices. In India, the Sakshat portal developed by the Government of India provides teachers an opportunity to connect with each other and share experiences. The Teachers of India, an online portal developed by the Azim Premji Foundation and the National Knowledge Commission, was created with the objective of providing a forum for teachers to freely interact with each other across languages, facilitate the sharing of insights and best practices of teachers across the country and provide access to resources, information, and new experiments in education from all over the world in all Indian languages.

Key Issues and Concerns

There are many challenges in implementing ICTs effectively in existing schools. Policy-makers need to give ICTs adequate priority and attention so as to reap the benefits of deploying ICTs in school education. Students from rural locations or impoverished communities often tend to slip under the radar so that they do not have even basic access to ICT. Given that a number of schools still do not even have appropriate classrooms, computers, telecommunication facilities and Internet services, ICT continues to be a distant dream. The existing shortage of quality teachers further compounds the problem.

In developing countries, budgetary allocations for deploying ICTs in school education are typically limited, and given the high initial costs of setting up ICT systems, the cost factor works as a further deterrent. Shifting the existing focus from traditional educational models to an ICT-based education system is bound to be met with constraints and roadblocks. Some key issues and concerns that need to be addressed in order to create an ICT friendly environment in schools, especially in countries in the South Asian region, are identified later.

Availability of Infrastructure to Support ICT

A country's educational technology infrastructure sits on top of the national telecommunications and information technology infrastructure. Availability of adequate infrastructure to support the deployment of ICTs in schools is a tremendous challenge that schools in the region currently face. Apart from the high initial cost of purchasing and setting up the requisite infrastructure, the maintenance and upgrade costs, as well as the cost and effort of supporting such infrastructure are also roadblocks to the successful usage of ICTs in schools, especially in poor and remote areas.

Before any ICT-based programme is launched, policy-makers and planners must carefully consider the following:

- In the first place, a basic requirement is whether appropriate rooms or buildings available to house the technology? In countries where there are many old school buildings, extensive retrofitting to ensure proper electrical wiring, heating/cooling and ventilation, and safety and security would be needed.

- Another basic requirement is the availability of electricity and telephony. In countries within this South Asian region, large areas are still without a reliable supply of electricity and the nearest telephones are miles away. Power situation in rural and remote-rural areas even in some advanced countries in this region is undependable, and this affects the functioning of any ICT initiative. Power cuts with different power cut schedules each week play havoc with the timetables. Power outages and fluctuations add to the high maintenance costs of computer hardware.
- Policy-makers should also look at the ubiquity of different types of ICT in the country in general, and in the educational system (at all levels) in particular. For instance, a basic requirement for computer-based or online learning is access to computers in schools, communities, and households, as well as affordable Internet service.
- Insufficient access to computers is one of the main obstacles to the spread of ICT usage in school education. This is more so in the case of rural areas where the school is often the only access point for computers. Moreover, system software is expensive and prone to upgrades and requires resources put aside for new versions and upgrades. Operating System (OS) itself adds to the cost burden of the hardware. 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.¹⁴ 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 (*refer Annexure II for details on Public-Private Partnerships [PPPs]*).

Availability of Funds to Implement ICTs

Given the current budgetary and resource constraints of various Governments, a widespread investment in ICTs in education is probably not possible in most developing countries. It is, therefore, critically important to better understand the cost-benefit equation of the wide range of ICT options and uses in order to effectively target-spend the scarce resources.

Economies of scale are achievable in distance education, although such Programmes typically require large up-front investments. Some of these costs may be shifted from the public sector to the individual users, but this in itself raises significant equity and access issues.

Capacity Building of Teachers

In most of schools in the subcontinent, the teachers are overloaded, less motivated and inadequately trained, and often deal with inconvenient working conditions. The use of ICTs in the classroom or in distance education does not diminish the role of the teacher; neither does it automatically change teaching practices. In such an atmosphere, building the capacity of teachers so that they are equipped to deal with using ICTs in classrooms is a challenge.

Resistance to Change

¹⁴ International Institute for Communication and Development, ICTs for Education: Impact and Lessons Learned from IICD-Supported Activities.

Resistance is commonly witnessed while attempting to introduce ICTs into schools, very often from the teachers themselves, since they may be of the opinion that they shall become redundant once technology comes in or due to their perception that it is too late for them to adapt to a new environment. Educators themselves may be skeptical about the effectiveness of using ICTs in school education.

Lack of Awareness

There is a general lack of awareness about the utility of ICTs in education, as well as about the ICTs at our disposal and how they can be accessed and utilized economically and effectively. This lack of awareness and knowledge about ICTs and their use in education, even on the part of policy makers, administrators and educators, makes it particularly difficult to deploy ICTs in the field of school education.

Another critical issue with the usage of ICT in schools 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.¹⁵

Internet Usage

While the Internet contains tremendous potential for education, as described in the sections earlier, it also has its own pitfalls. For one, providing all the students with Internet access is a very expensive proposition for most Government schools. This is more so in the case of rural centers and remote areas, where Internet connections are bound to be erratic, if available at all.

A different challenge altogether when it comes to Internet usage is the effort involved in monitoring the students usage of the Internet to ensure that they do not visit educationally irrelevant and socially undesirable sites, thus detracting from the intended objective.

Language Barriers

English is the dominant language of the Internet. An estimated 80 percent of online content is in English. A large proportion of the educational software produced in the world market is in English. For developing countries in the South Asian region where English language proficiency is not high, especially outside metropolitan areas, this represents a serious barrier to maximizing the educational benefits of the World Wide Web.

Monitoring and evaluation

Many of the issues and challenges associated with ICTs in education initiatives are known by policy-makers, donor staff, and educators. However, data on the nature and complexity of these issues remains limited because of the lack of good monitoring and evaluation tools and processes. Where evaluation data is available much of the work is seen to suffer from important biases. Another

¹⁵ Patti Swarts, "Main Issues, Possible Solutions and Opportunities for ICTs," Global e-Schools and Community Initiatives, <http://www.gesci.org>

problem in this area is the lack of a common set of indicators for ICTs in education. And, where data has been collected, it is often quantitative data related to infrastructure (number of computers, for example) rather than data that can help policy-makers gauge the impact of ICT interventions on student learning.¹⁶

If ICTs are to become effective and integral tools in education, and if accountability is to be demonstrated to donors and stakeholders, monitoring and evaluation must be a priority area of focus (*refer Annexure I for details on Monitoring & Evaluation*).

Key Learnings

Although there is great opportunity for improvement in school education at many levels through the use of ICTs, the road to achieving it is not easy. It will take continued commitment from all stakeholders involved to make any kind of substantial and sustainable change. The following broad-based suggestions may act as a basis for building a long-term roadmap to bringing ICTs to schools, and students at large in the South Asia region. A key to succeed in this endeavor is to adopt a comprehensive, end-to-end, systematic approach, with a phased and learn-as-you-go strategy for implementation, that can be adjusted to adapt to the specific needs and a changing environment.

Government Support

Government cooperation is necessary for ICT programmes to have substantial impact and be sustainable. In the attempt to reevaluate the education delivery system and curriculum of countries to include ICT, Governments have to consider the social context in which they are implementing this new phenomenon. The realities of individual countries and the disparities within and across their geographies, including their limitations say, the language barrier, 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.¹⁷

As discussed in the essay on policy coherence, governments need to adopt a coherent national policy framework, an effective ICT for education ecosystem, not just within the education field but also encompassing other complementing and enabling domains, which could ensure a child's overall development and the Country's larger objectives. Government policies must demonstrate political will and champion the integration of ICT purposes and be in line with national development goals and frameworks. In countries where implementation capacity is weak and misuse 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.¹⁸

¹⁶ Trucano, Michael. 2005. Knowledge Maps: ICT in Education. Washington, DC: infoDev/World Bank. Available at: <https://www.infodiv.org/en/Publications.8.html>

¹⁷ 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).

¹⁸ Muwanga, "High Cost of Internet Connectivity in Africa: How Do We Achieve Mobile Telephony Success Story?"

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 in school education. Ministries of Education need to reconsider how they institutionalize positions of responsibility for ICT. The ICT 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. Therefore, appropriate considerations have to be taken to establish the right kind of institutions and positions to take the mission forward.

In the longer term, the active participation of the Government is essential to ensure the sector-wide introduction of ICT4E. 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.¹⁹

Creating Community-Based ICT Facilities

In 1999, the Bangladesh Rural Advancement Committee (BRAC) undertook an initiative to improve rural communities' access to ICT facilities. This involved selecting 800 *Gonokendros* (multipurpose learning centers) and equipping them with computers so that rural communities become familiar with usage of ICT and have access to a wide range of reading materials and resources, educational and non-educational.

The concept of community-based ICT facilities may be expanded at the school level to increase school students' access to ICT-based materials. For example, one ICT centre may be created for every five schools in the village/block, and this centre may be equipped with computers, television, radio, or other technologies. A timetable may be allocated so that each school has access to the ICT centre for one day of the week. Within each school again, different classes may be allocated different periods for accessing the ICT centre.

The challenges with implementing such a scheme, is that the distance of the centre from the various schools that warrant the need for firming up the mode of students' mobility and the frequency of such mobility to access the ICT facility and others. Moreover, the cost of renting or buying land and a building for setting up the ICT centre is another deterrent. However, this concept of school communities using common ICT facilities is a feasible way in which to introduce students from rural communities to ICTs.

Prioritizing and Planning Access to Remote Areas

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 toward convergence and new mobile platforms for Internet-

¹⁹ International Institute for Communication and Development, ICTs for Education: Impact and Lessons Learned from IICD-Supported Activities.

connectivity need to be fully exploited through innovative policies and partnerships that can help lower cost and expand access.

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.²⁰

Adopting ICTs Suited to the Context

Given that Internet access is a problem for most schools, especially in rural areas, educators and administrators need to consider the possibility of establishing Local Area Networks (LANs) in schools. Content could be hosted on school LANs, instead of trying to make them available on the Internet. A digital library on a server on the LAN would be a valuable asset, as it can store all types of digital content. Interactive multimedia material can also be hosted on the LAN at a much lower cost than on the Internet. This also has the added advantage of enabling students to access Programmes at their convenience, instead of having to adhere to a scheduled telecast.

Given that India has invested significantly in educational television and already has a commendable satellite television infrastructure, schools should focus on leveraging this technology. Some Indian educational channels are planning to switch to DTH soon, and it is very practical for them to do this. Due to the rapid fall in the cost of servers and storage, it is possible to record thousands of hours of TV programmes in digital form onto a server and make it available on demand from every PC on the LAN.²¹

Focus on Capacity Building

The use of ICTs in education calls for a fundamental shift in the way content is designed and delivered, as well as for teamwork and collaborative practices. New technologies cannot be imposed without enabling teachers and learners to understand these fundamental shifts. Ongoing training is necessary for the trainers in institutions and organizations who are engaged in the design of curriculum, teaching materials, and delivery of ICT-enabled education. At the same time, middle-level managers, both in the public service and the NGO sector, need to understand the pedagogy of learning through ICT and the management models that are required.

Given that teachers themselves are not comfortable using ICTs for teaching purposes, it is critical that there is a focus on capacity building of teachers so that they are equipped adequately to use ICTs in the classrooms. A locally-accessible instructor/trainer may be hired to provide training to the teachers on the usage of computers and Internet, and other ICTs that are proposed to be used in

²⁰ 'Information and Communication Technologies (ICT) in Education for Development', Global Alliance for ICT and Development, White Paper July 2009.

²¹ Srinivasan Ramani, International Institute for Information Technology, Bangalore, e-Discussion with Community of Practitioners at UN Solution Exchange (Communities of Education and ICT for Development).

the school. Further, the contracts of procurement of ICT products could include among other, a short-term handholding feature with respect to familiarization and effective usage of the facilities.

It is also suggested that the Teachers Training Institutes (TTIs) shall ensure ICT-based teaching and learning methodologies be integrated into the educational streams and build capabilities to the next-generation teachers with the capacity to handle ICT facilities with ease.

Support of school administrators and, in some cases, the community, is critical if ICTs are to be used effectively. In addition, teachers must have adequate access to functioning computers (or other technologies) and sufficient technical support. Shifting pedagogies, redesigning curriculum and assessment tools, and providing more autonomy to local schools all contribute to the optimal use of ICTs in education.

Creative Solutions to Computer Shortages

Computer-based ICT interventions require significant investment in hardware. In addition, the expected active life of a computer is about 5 years, and as the hardware industry develops more sophisticated products, the software adapts to the top-of-the-line products. Computer recycling is an ecologically sound alternative to this problem. A growing number of not-for-profit organizations are dedicated to the tasks of collecting, refurbishing, and finding new homes for old computers.²² In most South Asian countries, it has been found that computer usage is most cost effective when placed in common areas such as cyber cafes, community resource centers, and so on.

Alternative Power Sources

Given the situation of power shortages in rural areas, and the effect of power shortage on the usage of computers and other technologies in schools, the Governments should actively promote the usage of alternate sources of power. This ecologically friendly solution will also ensure a steady power supply to schools in rural areas. For example, the Bangladesh National ICT Policy 2009 highlights the imperative of providing access to ICTs to all schools and using alternate sources of energy such as solar panels if required.

Financing ICT Investments

Financing mechanisms for ICTs in education initiatives are quite varied. Due to the high up-front costs and large recurrent costs, countries and communities typically employ varied models of financing and cost recovery mechanisms. Public-private partnerships and user fees are important components of financing ICTs in education in many countries, although more research is needed to determine the impact and effectiveness of these mechanisms (*refer Annexure II for details on Public-Private Partnerships [PPPs]*).

²² Wadi D. Haddad and Sonia Jurich 'ICT for Education: Prerequisites and Constraints', 'Technologies for Education: Potentials, Parameters and Prospects' UNESCO and AED 2002.

Conclusion

A carefully thought-out, integrated approach to introducing computers and the Internet into learning environments in developing countries can have a significant impact on teaching and learning. In countries where learning resources are limited and teachers never dream of having a fully stocked library, let alone the Internet, teachers and students have been introduced to a new world of learning. As a result, those with access to ICTs have been greatly empowered, and now believe they can compete in a global knowledge-based economy because they know that their knowledge, ideas, culture, and passions are as valuable as any in the world.

In order to more effectively prepare students to participate in ICT-driven education, greater commitments and willingness to share and adopt innovative solutions are needed from all aspects of society—from Governments, the private sector, communities, donors, parents, and students. Schools should be transformed into active learning environments open to their communities; telecommunication and power infrastructure policies should focus on schools as starting points for rural transformation; teachers and students must be empowered to be creative agents for change in their schools; and leaders must embrace a vision that will prepare their youth for tomorrow's challenges.²³

Despite the challenges outlined in the paper, ICTs are being increasingly used in education in both the developed and developing world, in order to reach out to children from poor and remote communities, provide them with a quality education, and in general equip both teachers and students with a wider range of educational resource and enable them with greater flexibility. However, the growth and success of ICTs in education depends on the extent to which the issues and challenges outlined in this paper are addressed.

There is a critical need to document every effort for the benefit of the various stakeholders—decision-makers, institutions, NGOs and civil society. It is necessary to know what works and what does not, and what the implications are for policy making, planning, and implementation. Specifically, it needs to be understood that any new technology comes not merely with hardware and software, but with a learning and teaching style and grammar of its own, and that management practices need to be adapted in order to use the technologies effectively.

ICTs are, ultimately, only physical tools, which by themselves cannot bring benefits to students, teachers and communities at large. Therefore the unique contextual realities of this region, including, primarily, the initiative and impetus of the various countries and its constituents, the involvement of private companies and NGOs, and the level of infrastructure, play determining roles in creating enabling environments promoting the use of ICTs for primary and secondary education.

²³ Robert J Hawkins "Ten Lessons for ICT and Education in the Developing World", World Links for Development Program, The World Bank Institute.

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Annexure I

Monitoring and Evaluation in ICT

The use of ICTs for school education as a result of the various programmes and projects implemented in the South Asia region has had an impact on educational access and quality, yet there are major issues pertaining to the measurement of these indicators. Monitoring and evaluation of learning gains, teaching practices, classroom environments, students' participation, and other activities are required and necessary for addressing ICTs-enabled educational quality and access. However, one of the major hurdles in assessing these indicators was that the majority of the programmes and projects implemented did not have adequate quantitative or qualitative monitoring or evaluation activities. Further even if any monitoring and evaluation activities were conducted they did not adequately measure indicators pertaining to ICTs enabled educational quality and access.

Monitoring and evaluating of programmes and projects are critical to ensure projects achieve their intended impacts and become sustainable in the long run. Appropriate indicators must be identified for every ICT 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.

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. 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.²⁴

Supply-side based development models which are based on centralized designs and make "top down" assumptions of people ("teachers are resistant to change" or "lethargy of management") have been tried several times and have not been found to be successful. Hence, a "monitoring and evaluation" theme that does not situate itself on the needs for professional development of the teacher, based on principles of autonomy, an agency can end up emphasizing centralized databases that seek to "control" teachers work based on quantitative assessments of children performance, which can be counterproductive to meaningful education.²⁵

This is not to deny the importance of "infrastructure" or "content" or "capacity building," except to state that these perspectives appear to reflect an dominant "ICTD" kind of thinking which is mostly "supply based." "We have ICTs so let us see what we can do with them" such

²⁴ 'Information and Communication Technologies (ICT) in Education for Development', Global Alliance for ICT and Development, White Paper July 2009.

²⁵ Gurusurthy Kasinathathan, IT for Change, Bangalore, Solution Exchange for the ICT for Development Community, 31 July 2008.

approaches do not proceed from the identifications of the objectives to be met, or critical challenges to be faced, from the respective domain's perspective. They seek to thrust some overarching technological world views on development domains whose enormous contexts and complexities, challenges, and goals are not given the prime positions as drivers of the policy.

Some suggested evaluating parameters that may be applied to monitor the effective implementation of the policy on ICT in school education are as follows²⁶:

- Are the ICT-based methodologies in sync with the existing traditional teaching?
- Does ICT facilitate the teacher in teaching better?
- Does ICT help in explaining abstract concepts?
- Does ICT make learning more exciting?
- Does ICT prod the student to know more, beyond the classroom?
- Does ICT make the student understand better and recall lessons taught during his absence or in manner alien to him or her?
- Does ICT make learning more participative and encourage group learning?
- Does ICT support interaction?
- Does ICT ensure continued progress through enhanced learning?
- Is the ICT-based solution a textbook page turner and contains too much of textual content?
- Is there an excess on animations and cartoons?
- Are the animations too trivial or too complicated?

Annexure II

Public-Private Partnership in ICT

Collaborative initiatives in the manner of PPP, to promote ICT for education may be most relevant at the implementation level, where select key roles and responsibilities may be outsourced in order to make them more viable and efficient. However, one needs to be vigilant about partner-institutions, which may have direct business interest in the value chain while the outsourced role on which they are inducted might enable performance of roles that may conflict the overall interest and purpose of the initiative. Moreover, there is also skepticism about the degree to which the ability of such partnerships under PPP arrangements will work to reach interior rural areas and conduct operations on the scale required.²⁷

If the Ministry of Education has to solely take on this task of equipping the schools with ICT facilities, it would be an enormous task and will require funds in large sums. Therefore,

²⁶ M.V. Ananthkrishnan, Developmental Informatics Lab, KreSIT, IIT Bombay, Mumbai, Solution Exchange for the ICT for Development Community, 31 July 2008.

²⁷ Binay Pattanayak, National Technical Support Group, Sarva Shiksha Abhiyan (SSA), New Delhi, Solution Exchange for the ICT for Development Community, 31 July 2008.

Governments will invariably need to form appropriate strategic partnerships in order to succeed in this endeavor of implementing ICT in schools.

The most common type of agreement is “seeding fund” partnerships with emphasis on front-end costs and mostly capital costs. However, such an approach tends to underestimate the total cost of ownership (TCO) of computers and other ICT equipment, which includes recurrent costs such as ongoing hardware maintenance and upgrades of hardware and software in addition to initial capital outlays. Also, teachers have to devote additional time and effort to learning new skills in content development, approaches to teaching, and methods of assessment.

An important aspect of private sector participation involves contributions “in-kind” of networking equipment, PCs, and concessional access to software licenses for an initial period, as well as ICT skills training for teachers and students. For example, Microsoft has partnered with many states throughout India to provide free basic technology training to teachers of state-funded schools. This includes “The Innovative Teachers Forums” that encourage innovative teachers to adopt ICT, award best practices in ICT integration, and support teachers in building global communities of practice (see “Microsoft Innovative Schools Program”).

International agencies such as the Asian Development Bank and the World Bank have also invested in providing ICT to the basic education subsector. Some of these initiatives have involved setting up computer labs in schools, computerizing education administration through EMIS, and developing an e-curriculum with appropriate learning materials. Other initiatives have set up “school nets” and school-based telecentre projects where school children use the ICT facility during school hours and the community uses the facility for a fee after hours to generate an income that can help offset the centre’s operating costs. Most of these are initially partnerships between the government and donor agencies but with the expectation that the community will take over the responsibility of ensuring sustainability once donor support ends. However, as mentioned, the transition has been difficult for many projects particularly in low-income communities.

India presents a wide range of success stories across various sectors, on effective partnership between the public and private sectors. Further, many of the Indian states have witnessed implementation of a variation of the CLCs through partnerships with private sector computer training companies.

The SSA has also undertaken a few initiatives to strengthen Computer-Aided Learning (CAL) in collaboration with a number of private organizations, since ICTs are accepted as capable of aiding the SSA in achieving its educational goals. Under the SSA framework, a provision has been made for computer education, which amounts to Rs. 1 crore (Rs. 50 lakhs for infrastructure) per district per year, and is made available to each State under CAL interventions. Under this programme PPPs are encouraged.

The State Government of Karnataka, for instance, has equipped seven hundred schools with ICT labs in a time frame of only forty-five (45) days. This was achieved through a partnership with NIIT, a private computer training institute. The Government of Karnataka contracted with NIIT to equip and maintain the school computer labs and provide an instructor for technical training for students during school hours. In exchange, the training institute is compensated with a 5-year contract for providing the training and is allowed to use the facilities after school hours for delivery of its private training courses to the community.

Some examples of PPPs under the CAL interventions of the SSA programme are:

- The States of Andhra Pradesh, Rajasthan, Orissa, Uttar Pradesh, Bihar, Nagaland, and Assam have adopted a BOOT (Build on Operative and Transfer) model. Private firms are given the responsibility of installing hardware/software and provide approved e-learning material and teacher training for a mutually agreed upon time period.
- The Rajya Shiksha Kendra in Madhya Pradesh, in association with Bhoj University, has developed interactive lessons for students at the elementary school level on VCDs titled “Headstart” in Hindi. These CDs are also being used by other Hindi speaking states in the country.
- In Uttarakhand and Tamil Nadu, training on CAL has been done in partnership with Microsoft. Teacher training is being imparted with the help of HARTRON in Haryana, INTEL in Gujarat, Himachal Pradesh, Kerala, and Tamil Nadu.
- In Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Gujarat, and Orissa, the Azim Premji Foundation has been associated in developing teaching and learning material for the CAL interventions.

A recent example of a varied PPP model that has addressed the specific aspects of efficient implementation of ICT in school education delivery systems is the partnership between the Ministry of Information Technology, Government of India, Indian Institute of Technology (IIT) Bombay and Vigyan Ashram, an NGO. The experimental study, called e-shikshak, was successfully implemented in six schools in rural Maharashtra. The model is based on the ICT-based tools developed by IIT Bombay that are transferred to the schools for their use and has received very positive feedback from the students. The NGO facilitates effective dialogue between IIT Bombay and the schools, and helps identify the appropriate person from each school to serve as the liaison. The NGO’s familiarity with the local language and the school administration make it the point of contact.

Information and Communication Technology for Education in India and South Asia



Essay III

Capacity Building for ICT in Education

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PRICEWATERHOUSECOOPERS 

Executive Summary

This essay on **capacity building** covers a number of aspects from training of teachers to support for content development. It highlights the critical issue that, without adequate capacity building, even well-designed policies and the most sophisticated technologies would not be able to achieve the desired results. Allocation of resources for use of ICT in human development areas in South Asia (also developing and least developed countries) has to balance the needs between providing basic infrastructure such as computers, connectivity, and physical infrastructure on one hand with the mass-based learning networks, content support, and development initiatives on the other. All the programs and policies related to ICT in education must address both these dimensions since inadequate infrastructure would undermine the feasibility of mass-based soft infrastructure such as creation of knowledge networks and content creation. On the other hand, creation of more infrastructure without availability of such soft resources for ICT-enabled learning would turn out to be white elephants and would realize no benefits for the lack of maintenance in the longer run. The essay explores the current availability of infrastructure and support mechanisms and also profiles some of the key initiatives taken by different focus countries to ensure adequate capacity building for effective integration of ICTs in education.

Capacity Building for ICT in Education

While there are many stakeholders involved in ensuring effective integration of ICT in the education system, teachers have a particularly important role to play. According to Carlson and Gadio (2002), teachers are the key to whether technology is used appropriately and effectively. Appropriate use of ICT can catalyze the paradigmatic shift from teacher-centered pedagogy to a more effective learner-centered pedagogy. Capacity building of teachers as well as administrators and managers can play a major role in enabling this shift. The focus of teacher training institute however should not be limited to training teachers on how to use ICT rather it should provide the teachers with the skills and expertise required to use ICT to teach a curriculum which is better suited to prepare students for the 21st century.

Policy directions in South Asia have a major focus on creating and expanding the ICT infrastructure, while this helps the countries lay a foundation for integrating ICT, according to Monahan (2004) it results in an “incredible influx of financial support for equipment but only a meager trickle for network support or staff training.” Without a sound capacity building framework, the financial resources spent on building the infrastructure will go to waste.

Important parameters that determine the success of ICT adoption in Education sector are the appropriateness of technologies, the suitability and quality of instructional materials and educational services made available, learning effectiveness and appropriation of new ways of work, and the cost-benefit ratio. It is, therefore, important that policy-makers are sensitized on the importance of incorporating these aspects within the plans for ICT in education at all levels.

Further, the need for capacity building of educational institutes principally arise due to high initial cost associated with setting up the infrastructure, lack of trained faculty and lethargy on part of

management and faculty to upgrade themselves, initial resistance to change by the teachers, lack of bandwidth and other technical support functions across geography, and above all the lack of awareness with regard to utility of ICT for education.

To maximize the effect of ICT on knowledge and growth it is required to create maximum connectivity, adequate network capacity and minimum required infrastructure at each node. Further, the diffusion of this process depends on the capacity of the human element to absorb and exploit the benefits of the technology. The policy framework and institutional mechanism coupled with the capacity to absorb and invest costs associated with both technology and human capacity building influences the role of ICT to support knowledge and growth.

Sustained educational capacity building through ICT means in today's advanced globalization process and communication infrastructure to integrate sustained "local" capacity into a "global" educational environment. Key components of "sustainability" within this globalized framework are not only "access" to global communication flows, but the creation of "active nodes": communication hubs as integral elements of global educational networks.

The following sections examine the key aspects of capacity building for ICT in education in India and South Asia on following critical components:

- Instruction-related aspects
- Institution-related aspects
- Investment-related aspects

Capacity Building at the Instruction-Level

Capacity building of teachers and other education resource persons has two dimensions attached to it in the South Asian context, namely, the pedagogical capacity building and the capacity building in using educational technology.

Capacity Building of Teachers and Others:

Capacity building of the people/manpower/teachers/instructors should not merely mean to enable the ability to use ICTs or "ICT Literacy." Though this is an essential prerequisite, it is rather trivial for a policy to be limited to this. The real meaning and power of ICTs for "capacity building" would be to enable the ability of the administrators, teacher and the student to use ICTs in their own processes of administration and teaching-learning in a manner they deem fit arising from their engagement with ICTs, facilitated by school administrators, teacher-educators, and teachers, respectively. Moreover, this would logically be components respectively within "school administration," or "teacher education" or "school education" itself.

The key components of the capacity building of the teachers include a clear understanding and appreciation of the pre-service and in-service training institutions, their vision, coverage, the methodologies, and the extent to which their interventions are effective. The important point is that

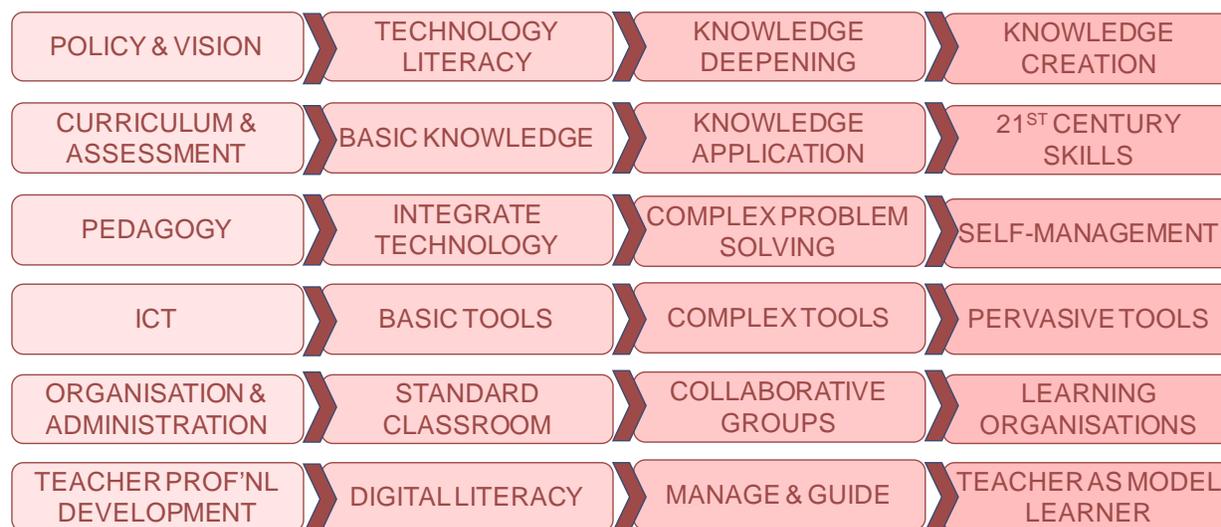
once we start analyzing from these perspectives deriving from domain understanding and domain priorities, then possibilities such as collaborative networks among teachers, “decentralized curriculum preparation” itself as a teacher professional development process, distance-mode “on-demand academic support” for teachers, asynchronous relationships possibilities across institutions and people, leveraging the capacities of ICTs, and so on, become apparent.

However, another equally important use of ICT would be its use for the capacity building of teachers. The capacity building is not restricted to improving the ICT skills of the teachers but more importantly the intention is to exploit the potential of ICT to build the professional competence of teachers, to develop their proficiency in classroom management practices, to enhance the quality of instructions, and others.

Most of the countries in the South Asia region have realized the need for training teachers in ICT and have launched various professional development initiatives. However, many of these training activities to date focus mainly on computer literacy instead of enabling teachers to integrate ICT in their day-to-day teaching activities and master the use of ICT as an effective tool to improve teaching and learning. For the South Asian region, apart from the UNESCO and other International agencies, there have been various Government initiatives and NGO activities in generating awareness and providing quality Training for ICT in education, for example: in **India**, various schemes and programs have been launched both at Government and non-governmental levels for almost two decades now for developing ICT skills in teachers to deploy technologies that enhance the quality of teaching and learning experience. Different universities in India have designed specific courses for this purpose. Organizations like the NCERT, UGC, NCTE, AIR, FTII, and so on have been launching schemes to enhance ICT skills of teachers, content developers, and so on. Private sector initiatives have also played significant role in ICT training for teachers. Prominent among them are Intel’s “Teach to the Future” nationwide initiative and Microsoft’s Project *Shiksha* in Maharashtra state.

In January 2008, UNESCO launched an ICT Competency Standards for Teachers (ICT-CST):

UNESCO ICT Competency Standards Framework for Teachers



Source: UNESCO 2008

As pictorially detailed earlier, the ICT-CST reflects a three-stage model of ICT integration in education based on the idea that education reform supports national economic and social development in one of the three ways, namely:

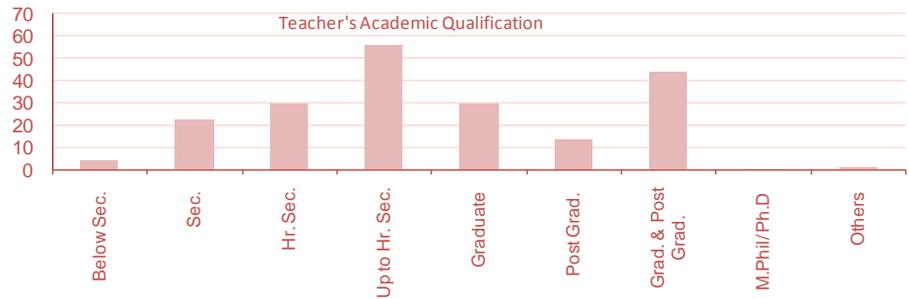
- by developing technology literate citizens and workers through the incorporation of technology skills in the curriculum (the technology literacy approach);
- by developing citizens and workers who can apply knowledge to solving complex, real-world problems and thus add value to society and the economy (the knowledge deepening approach);
- by developing citizens and workers who can innovate and produce new knowledge (the knowledge creation approach).

At various stages of development, different countries would espouse one of these three approaches to educational change, and this will be reflected in their policy goals and visions. Moreover, each approach impacts on five other components of the education system, namely, curriculum and assessment, pedagogy, ICT (technology use), school organization and administration, and Teacher Professional Development (TPD).

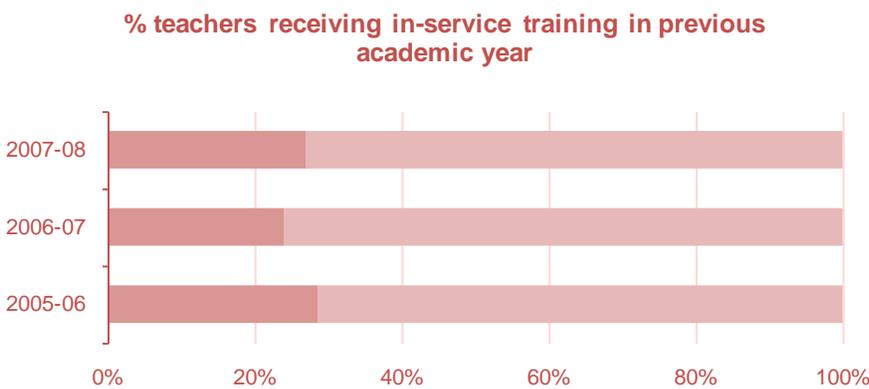
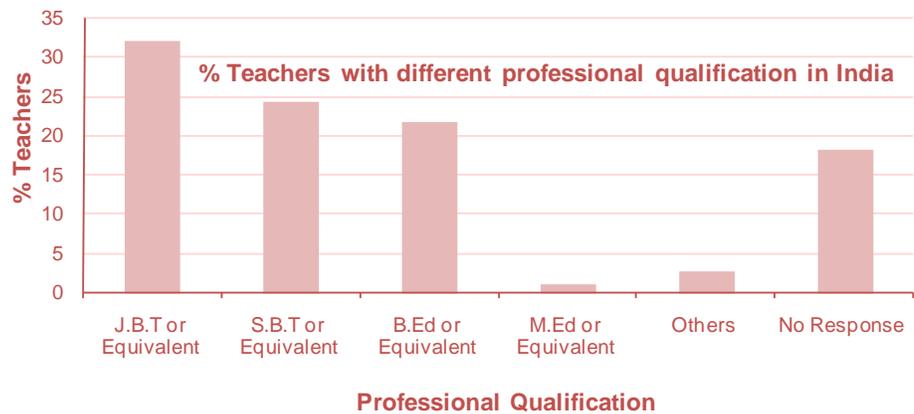
India has a total of over 5.2 million teachers¹ in the school education (including higher primary) system and 2,021 teachers' training institutions in the country catering to the elementary stream. The goal of Universal Elementary Education (UEE) is being attempted through the SSA, a flagship program of the Government of India.

¹ District Information System for Education (DISE) data for 609 districts for the year 2006-07.

Pedagogical capacity building for teachers is carried out at three levels—academic and professional qualification, pre-service training and in-service trainings provided to them. The capacity of Asian education system to attract the best teachers in terms of academic qualification is limited. As described in the following chart the academic qualifications of the teachers in Indian schools is observed to be largely at the higher secondary level.



The primary teachers and secondary teachers are also required to take up different teacher's training courses, to be qualified for employment in respective schools. There are different teacher's training institutes offering Basic Training Certificate (BTC), Junior Basic Training (JBT), Diploma in Education (D.Ed), Primary teachers training (PTT), Bachelor in Education (B.Ed) and several other teachers' training certifications. There are little over 30 percent teachers having a JBT qualification and little fewer than 25 percent teachers with SBT. Only 20 percent teachers have a Bachelor degree equivalent training in teaching, that is, Bachelor of Education. Teachers with a higher professional qualification such as Master in Education or PhD were almost nil.



Teachers' are also required to undergo in-service training to hone the skills and update themselves with the new areas of teaching and learning. This is an important aspect of the ICT capacity building of teachers because at this point teachers can be

acquainted with the new developments in educational technology. In some of the States in India, in-service teachers' training is also further supplemented with structured training programmes on ICT related aspects, and conducted through private training companies like HARTRON (in Haryana) and INTEL (in Gujarat, Himachal Pradesh, Kerala and Tamil Nadu). In India, according to DISE flash statistics published in 2009, less than 40 percent teachers had received in-service training during previous academic year from 2005–06 to 2007–08.

Intel Teach to the Future Training Programme

Intel Teach to the Future is a worldwide education programme created for teachers to help them effectively integrate technology in the classroom to enhance student learning. The programme started in Karnataka on 25 June 2001 and trained one teacher from each of the Mahiti Sindhu schools as Master Trainers for a period of 13 days. These Master trainers were then supposed to train other teachers in their schools. So far, 8,000 teachers and head teachers from 1,000 Mahiti Sindhu schools and 400 teachers and head teachers from 76 higher primary schools have been trained under this programme.

Source: <http://www97.intel.com/education/teach/>

Indira Gandhi National Open University—Primary Education Diploma Course for Teachers

In 2002 IGNOU, a national government affiliated higher education institution started a two-year diploma course in primary education, and 9,000 teachers are currently enrolled in the course in Jharkhand. Teachers are not only given print material, but academic support is provided through prerecorded programmes on radio and TV six days a week. IGNOU makes the educational content for the programme itself. As AIR Ranchi does not reach all of Jharkhand, programmes are also broadcast from one AIR station in neighboring Bihar. On Sundays there is a one-hour interactive question and answer session held over the telephone and teachers call in with their queries regarding the course. IGNOU also conducts workshops and school based modules to aid the teachers.

Source: <http://www.ignou.ac.in/>

In **Bhutan**, preservice teacher education is provided at the Colleges of Education (CoE) in Samtse and Paro, the former established in 1968 and the latter in 1975. There are two pre-service programs offered, a Bachelor of Education (B.Ed) and a Post Graduate Certificate in Education (PGCE). Since the year 2000, in-service teachers have had the opportunity to upgrade themselves to Bachelors of Education (B.Ed) specializing in primary education via a distance education programme. In 2002, a Masters of Education programme was also started at the Paro College of Education using the same mode. Out of a total of 6,650 teachers, 86 percent are trained in the teaching profession.

In **Pakistan**, there are 203 teacher training institutes and 300 Teachers Resource Centres established under the Education Sector Reform Programme.² Recently published white paper on Education in Pakistan also notes that “*one can safely aver that only a minority of the teachers in the public sector schools is of a good quality. Their continued availability is not necessarily the result of a*

² Ali, Javed Hasan, White Paper on Education in Pakistan, National Education Policy Review Team, 2007.

deliberate effort of the system. It is probably, simply the law of averages. Poor quality of teacher in the system in such large numbers is owed to the mutations in governance, an obsolete preservice training structure and a less than adequate in-service training regime.” These institutions train merely 40,000 teachers every year.

Table 1 Percentage of Trained Teachers across the various Countries in the South Asian region

World Development In indicator (ICT) 2007	World	South Asia	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
Primary education, teachers (% trained)	..	..	..	56	92.01	..	65.87	61.36	84.58	..
Secondary education, teachers (% trained)	..	..	..	39.11	91.94	..	..	..	..	..
Pupil-teacher ratio, primary	30.59	40.08	42.8	44.75	29.18	40.2	14.52	40.02	39.95	23.81
Pupil-teacher ratio, secondary	23.92	32.77	31.6	25.24	22.83	32.7	..	..	41.86	19.52

Source: <http://go.worldbank.org/ITABCOGIV1>

Other nations in the South Asian region such as Bangladesh, Maldives, and Nepal have not achieved impressive targets in teachers training shown in the aforementioned table on World Indicators 2007. These indicators include both pre-service and in-service in absence of the proper exact indicators. Data availability on academic qualification, teacher’s professional training, pre-service training and in-service training is another issue which requires attention.

In **Nepal** while there have been some early initiatives of human capacity building in ICTs in education, such as use of ICTs for communication by several NGOs and initiatives on non-formal community education programmes through community radios, there has been little activity in training. Nevertheless Nepal is trying to devise a course of action for teacher training and the following initiatives can be cited, which are already under implementation:

- Primary and secondary teacher training conducted by private agencies affiliated to MOE National Center for Educational Development, an apex body of teacher training in Nepal
- Certain Universities in Nepal (e.g., TU, KU, PU, NSU) are conducting University run certification courses for primary teachers to teacher educators
- Courses on use of computers for effective pedagogy is being included in University curriculum for teachers

In **Sri Lanka**, several examples can be cited on the use of ICT in various sectors of the economy, though not much initiative has been taken with regard to instructional purposes. Nevertheless, one scheme on the Training of Teachers in Information Technology can be mentioned; the project is coordinated by the Ministry of Education and supported by UNESCO and the National Open School of India. It seeks to bring together students, teachers, ICT professionals, research and development institutions and private sector organizations to upgrade the knowledge and skills of teachers and facilitators and to integrate educational technologies in their work. It also aims at tapping the potential of new ICTs (including distance education methods) to provide easy accessibility and better teacher education leading to professional development.

Maldives is the only country in the region which has succeeded in achieving almost 100 percent literacy. The Government is taking several proactive measures to improve the access and quality of education. As a consequence technology is considered as an essential component for improved learning in school education and ICT is seen as being able to play a major role in improving the quality of teaching. The UNDP Digitally Empowered Development in Island Communities project includes a substantial training component that is focused on the communities involved, so that the communities are to make use of the facilities and the technologies. However, there is no evidence of ICT training for staff in education per se and a roadmap needs to be developed to provide professional development and capacity building for the teachers, half of whom are currently untrained.

Bhutan has a severe shortage of properly trained ICT specialists in the country. Given the fact, the Division of Information Technology (DIT) has developed guidelines for ICT training institutes and ICT training courses at school and tertiary levels. Institutes have to fulfill minimum requirements to ensure quality instruction. Moreover, a number of standard courses are being developed for building a human capacity with the appropriate knowledge and skills for specific needs of the society.

In **Bangladesh**, there are numerous private sector computer and ICT training institutes, many of which are franchises of similar institutes in India. These institutes provide training in basic and advanced computing skills. There is a huge market demand for trained personnel but the government institutions lag far behind in its ability to meet the demand. The amount of allocated public funds available does not match the actual costs of training. And the investment opportunity for private sector in ICT projects is not attractive enough for any further investments.

As a commitment to ICT capacity building, the Ministry of Communication and Information Technology (MCIT), Government of **Afghanistan**, the core body mandated to promote and implement ICT projects in the country has set up 15 ICT training centers throughout the country which will be expanded to 34 by end of 2009 to provide ICT training to local governments and the public.

In **Pakistan**, there had been various initiatives in the recent times to empower teachers and students with ICT in education, for example the Intel Education Initiative in Pakistan and Teacher's

Training Institute, Pakistan Air Force (PAF), collaborated to promote the integration of ICT in education. PAF has 25 K-12 institutions nationwide, with approximately 5,000 teachers working at these schools and colleges. PAF is one of the major school systems of Pakistan, which has its own Teacher Training Institute. The institute focuses on building teachers' professional capacity in terms of effective classroom teaching practices and student-centered learning.

Another project on online e-learning training system called the e-Teacher Project was launched in Pakistan in 2003. Instead of a conventional classroom-based approach, this project encourages teachers to acquire ICT skills during their free periods by using the courses available through the e-Teacher Project. The course offered is most comprehensive, with units on Web ethics and security, as well as how to integrate various ICTs into classroom teaching, multimedia, databases, and so on.

Changes to current in-service and pre-service teacher education programs are crucial to cater to the needs of 21st Century teachers who will be required to use technology in their teaching in a sustainable and effective manner that supports constructivist learning. In today's "flat" world, the Government and schools need to think locally as well as globally when it comes to preparing their children to be active, engaged citizens of tomorrow's global economy. Curriculum planners and teacher trainers need to look to international standards for designing teacher training programmes of quality.

Further, it should be understood that capacity building is not a one time exercise and needs to be ongoing especially in Government schools where teachers are overloaded, schools short staffed, and transfers happen often.

Capacity Building for Educational Content Development:

Educational content is a key element of ICT use in education. It is basically the information that is offered to the intended beneficiary through telecenters, multimedia, or Web. The intended information may be textual, aural or visual, or a combination of them, and the importance of relevant content development can be easily assessed by the fact that any Web site or a community centre can draw interested groups only if information provided is useful to them, is passed to them in an interesting way, and is made user friendly.

The most critical factors for the development of Digital Content to ensure its impact are:

- **Content Relevance:** Unless the intended beneficiaries do not find any potential benefit from the content, no initiative on ICT in education can ever be successful and self-sustainable.
- **Content Availability:** The content that is generally available on the Internet is largely in English and is location independent. But in the South Asian countries (specifically in India), there is a varied literacy level and local language. Thus the availability of the right content targeting the general population but comprising different groups of end users is a huge challenge.

- **Content Research:** In the entire content delivery system the role of people who are involved right from development of content to presentation is very important. For instance, the mode of delivery of content depends on information that is required to be conveyed and the content needs to be developed accordingly. Thus, suitable training process needs to be evolved for the people who are entrusted with development so that better research practices are evolved for developing the content.

In South Asia, Content Development is definitely led by Government initiatives. The private sector content development industry is still at a nascent stage in this region, and they primarily focus on content development for the formal education sector.

In India, the UGC e-content scheme aims at developing high-quality e-content, as well as expertise for generating such content over the long term. The scheme provides financial assistance and technical support to teachers and other experts based in colleges and universities for the development of e-content. The e-content development and associated Web-based learning described here does not seek to replace traditional teaching and learning, but is expected to supplement them.

The goal of the UGC scheme is to encourage individual teachers, groups of teachers in colleges and universities and experts in the IT industry in visualization and multimedia production to develop educational content, in electronic format, suitable for use in various teaching and learning programmes. This scheme is open to teachers in all subjects and disciplines.

Another Programme in **India**, the CoIL-Net programme³ by Department of Information Technology, Ministry of Communications and Information technology, is presently developing language-specific IT-based content (in Hindi), solutions and applications for the Hindi-speaking states of MP, Chhattisgarh, UP, Uttaranchal, Bihar, Jharkhand, and Rajasthan. The programme aims at the following for content development:

- Develop Cultural Heritage Digital Library in Hindi
- Promote preparation and publication of IT Learning Material in Hindi
- Carry out content development, research, and its production through various existing mechanisms and methodologies
- Promote content digitization for promoting access and sharing of public sector information in Hindi
- Develop methodologies for content delivery, aggregation, and management
- Develop search engines, wizards, agents, and smart tags for rich media content management
- Human resource development to carry forward the task of IT Localization

³ <http://tdil.mit.gov.in/coilnet.htm>

In **Sri Lanka**, the e-Sri Lanka Initiative (launched in 2004) by the ICT Agency of Sri Lanka seeks to leverage on ICT to achieve both social and economic development of the Country. The e-Society Programme which is a key component of the e-Sri Lanka Initiative, works extensively on content creation and delivery. It has laid the foundation for many successful e-content projects in the country.

The ADB's Regional Technical Assistance (RETA) study in **Nepal**, built on the Teacher Education Project (TEP) and aimed to ascertain whether use of digital video recording and laptops as tools would enhance the training provided to teachers under the TEP and bring about better learning outcomes among the trainee teachers. The findings from the study served to inform the TEP and the Nepal National Centre for Educational Development (the central teacher education authority, under the Ministry of Education and Sports) about ways to optimize the use of existing, but underutilized, equipment provided to major primary teacher training institutes around the country. Furthermore, it may provide other countries with practical tips for implementing video recording and playback in the classroom, and suggestions for how the use of video can be expanded beyond its traditional use for self-assessment and critique in microteaching.

Capacity Building at the Institutional-Level

In addition to capacity building with respect to developing enabling infrastructure and equipping manpower/teachers and instructors, there is a definite need for interventions at the institutional level, especially through enabling of appropriate partnerships and collaborations. The most critical aspects of such partnerships and collations are the complementing capacities between the partners.

Further, it should be appreciated in such context that the Government which plays the very vital role in the implementation of Capacity Building for ICT in Education, is constrained in finances, and therefore financing the reduction of the digital divide remains a major challenge. For the development of ICT in education sector, the role of Government spending in alignment with the development goals of the country is critical. Although the private sector has contributed significantly to the investments for building ICT infrastructure, operating ICT networks and delivering ICT services over the last decade and provided considerable financial resources, public sector funding plays an important role in creating a roadmap for development, enabling policy environment, channeling resources towards less commercially attractive regions as well as towards the poor, and supporting innovative financing mechanisms for ICTs for development.

Several examples in many parts of the world have proven that such methods are applicable with success. Local and collective financing of ICT projects, show large advantages in terms of ownership, initiatives, and so on. Microcredit exists since some years and it can have a significant contribution to successful implementation of ICT for development.

Institutional capacity building also aims at developing adequate awareness on key ICT developments and opportunities within the local context, and thereby enables development of appropriate policies by the Government.

Capacity Building at the Investment-Level

At a first view, different technologies compete with each other and it is not yet visible, which one will finally be the best solution for a specific application. But a close look shows already that they will occupy different segments of the educational delivery and may finally be used in parallel.

There is hope that the developing countries need not go through a "copper-age" but that they will directly start with wireless and satellite-based applications. Such prudence in decision making is enabled through the sharing and exchange of information on successful implementation and experiences of failures in implementing ICT for capacity building in education.

The most important capacity needs at the investment level is the knowledge and awareness on the selection of the most appropriate technologies or the mix of appropriate technologies. For instance, Satellite radio exists for many years and is easy in use and accessible anywhere. Information and education programs are provided in the local languages and contribute significantly to the development of people. Satellite radio offers huge opportunities in the future. On the other hand, wireless mobile phones in the recent times are easily available and enable multifold advantage on enhanced educational transactions, as compared to the traditional ICT systems. Therefore it is well appreciated that there is a clear need for informed decision-making, which means, that the decision makers in the system needs to be made aware of the various ICTs available for use, and its' appropriateness with respect to the various local conditions and needs.

As highlighted earlier, development requires the possibility of the developing countries to learn from the industrialized ones and to use the knowledge to adapt technology to their local needs and to follow subsequently their own development path. This learning and adapting is only possible if the knowledge is actually accessible and can be further processed. There were claims for open software because this is the prerequisite to enable people from developing countries to learn how the systems work and to develop them further according to their needs. This contributes to the creation of specific knowledge in developing countries and increases their competitiveness.

Further, large-scale applicability of the aforementioned technologies depends on the costs of acquisition and operation. Availability of the wide range of ICTs is a critical factor for successful penetration of ICT for education.

A cross-country analysis of the Government spending pattern of the South Asian region reveals that the average public spending of the countries in this region is approximately 12 percent of Total Government Expenditure and 4.5 percent of GDP in favor of education. Whereas public spending on education as a percentage of total Government expenditure has remained very low in Pakistan, 1.8 percent of GDP is well below the prescribed international levels, which is the lowest in South Asia. Pakistan, today remains among the 8 to 10 ranked countries of the world that spend less than 2 percent of their GDP on education.

Key Issues and Concerns

Access to ICT depends on three basic prerequisites: infrastructure, financial resource to meet the costs and legal framework. Capacity building of the key resources ensures the availability and effectiveness of the ICT-enabled educational intervention. There are geographic, cultural, and economic regional complementarities in the South Asian region, which can provide excellent opportunities for minimizing regional digital divide. Most of the implementation costs are met by public funds from the national Governments and international funding agencies. However, there are various large- and small-scale innovative models with community and private participation.

Some of the key issues and concerns are discussed as follows:

1. Increase in the use of ICT in education has not occurred at the same pace as that of the increase in overall ICT infrastructure and, the overall increase in ICT availability has not yet reached a stage of providing access to most people in South Asia.

South Asian countries have seen a surge of ICTs such as telephone lines, mobile telephone, Internet and availability of computers over the last decade. However, the scaling up of ICT in education has not occurred at the same rate. There are several reasons for this divide in application of technology. First, support infrastructure like electricity access, telecommunication, and so on, and capabilities such as content development have not taken off as rapidly as the technology itself. Second, penetration of these technologies is still limited to a few people mostly economically higher classes. Mobile phone is an exception where South Asia enjoys one of the cheapest telephony in the world. For example, though the region has one of the biggest rises in the Internet users in recent years its penetration is still quite low and access to poor is limited. Thus, though the region has improved a lot in terms of its ICT availability and capabilities, it has not reached the comfortable levels in its application to the social development uses such as health and education.

2. Absence of integration and interaction across the South Asian region, restricts sharing of information resources and mandates duplication of efforts, resulting in ineffective utilization of ICT

There are relatively few available platforms for sharing best practices and resources at a regional level in South Asia. In India, there are various institutions that provide one or the other type of education technology-enabled program. For example, the University Grants Commission has a network of over 17 Educational Media Research Centers and Audio Visual Research Centers. There are more than 250 universities offering education technology as an optional subject to the students. The National Open University and Indira Gandhi Open University (IGNOU) have the capabilities of providing education through alternative modes. Thus, each nation has a number of institutions which do not interact with each other within the nations and their counterpart in the region. Thus, interconnected networks of these institutions with the country can provide a great opportunity for the regional networks on education which can use and share resources such as education content, media and other resources.

National Institute of Open Schooling of India (NIOS) and The Open University of Sri Lanka (OUSL)**National Open School**

The National Open School (NOS) India was established in 1989 to support India's National Policy on Education. The school caters to the needs of school children as well as children from socially marginalized communities in both urban and rural locations. While the school's early focus was on academic programs at the secondary school level, it currently offers courses in vocational and other life-skills areas. It also has extended its range from elementary to pre-university programs. Some 400,000 children are enrolled, and they come from challenged communities, socially disadvantaged groups, and isolated populations. The school uses ICTs for course development, administration, testing, and to deliver some content by audio and local radio. Its plans for the future include even more extensive use of the newer technologies through tele- and community-learning centers.

The Open University of Sri Lanka

The Open University of Sri Lanka (OUSL) is unique within the national university system in being the only University to offer programmes of study leading to certificate, diploma, degree, postgraduate diploma and postgraduate degree through the Distance Mode. The University was set up by the Government of Sri Lanka under the Universities Act No. 16 of 1978, for the purpose of providing higher educational opportunities to working adults. The OUSL also runs Educational Technology (ET) division which was established in 1983 with support from Japan. The ET division acts as a service provider for all the faculties to produce instructional audio-visual materials.

3. Absence of trained teachers of high quality and caliber poses a greater challenge

What happens in the classroom affects the success of education system the most. Teachers are "live" infrastructure and the quality of teachers defines the quality of instructions that in turn defines the education outcomes. The entire South Asian region has severe deficit of trained teachers and also robust training infrastructure and its linkages with broader pedagogical reforms. At the same time introduction and gaining importance of ICT in education poses new demands on part of ICT capacity building of teachers. Teachers' capacity building is required in areas like basic pedagogy and ICT.

4. Restrictive access to ICT facilities results in a lack of ICT enablement

Many experiments in the region and elsewhere have proved that the access to the basic ICT facility can itself become a major motivation for the children to learn new things. Many schools that have computers provide only partial access to the children during lab hours or to learn computer as a subject only. One of the best known experiments in this context is "the hole-in-the-wall" project (see box) where simply providing the access to computer led to learning in children.

Thus, rather than treating computer as a high valued assets, the school should find out ways to promote use of computer in every facet of schooling and seek way to provide more and more access to the children. Community participation can achieve significant results here. Many projects

relating to use of ICT are either community driven or run by organizations other than governments. For example, project shiksha driven by Microsoft in India.

Access to ICT is the key—Story of “The hole-in-the-wall” project in India

Dr. Sugata Mitra, Chief Scientist at NIIT, is credited with developing the concept of hole-in-the-wall. As early as 1982, he had been toying with the idea of unsupervised learning and computers. Finally, in 1999, he decided to test his ideas in the field. On 26th January, Dr. Mitra's team carved a "hole-in-the-wall" that separated the NIIT premises from the adjoining slum in Kalkaji, New Delhi. Through this hole, a freely accessible computer was put up for use. This computer proved to be an instant hit among the slum dwellers, especially the children. With no prior experience, the children learnt to use the computer on their own. This prompted Dr. Mitra to [propose](#) the following hypothesis:

‘The acquisition of basic computing skills by any set of children can be achieved through incidental learning provided the learners are given access to a suitable computing facility, with entertaining and motivating content and some minimal (human) guidance.’

Encouraged by the success of the Kalkaji experiment, freely accessible computers were set up in Shivpuri (a town in Madhya Pradesh) and in Madantusi (a village in Uttar Pradesh). These experiments came to be known as hole-in-the-wall experiments. The findings from Shivpuri and Madantusi confirmed the results of Kalkaji experiments. It appeared that the children in these two places picked up computer skills on their own. Dr. Mitra defined this as a new way of learning.

(Source: <http://www.hole-in-the-wall.com/Beginnings.html>)

5. Absence of authentic and adequate data restricts appropriate policy formulation and undermines impact

Despite increase in availability of technology and interconnected infrastructure and many focused initiatives, availability of data on wide-ranging education indicators is still an issue in South Asia. Availability of data on education is uneven in the South Asian region. Also, in countries like India, Pakistan and Bangladesh where some national-level initiatives have taken place these initiatives are limited to gathering data on basic indicators such as enrollment, dropouts, and access. There is an urgent need to gather information on wide-ranging attributes related to infrastructure, capacity building and in particular use of education technology. Although there are various international agencies such as UNESCO, which have taken initiatives in assembling data on education indicators with International Standard Classification for Education Data, there is a need to institutionalize collection and maintenance such national-level and ground-level data, based on such uniform standards across the country. Also, the linkage of such data to the policy formulation is the key to achieve the long-term objectives of improving education outcomes and its relation to the growth of knowledge in the region.

6. Narrow focused targeted interventions limit the overall gain from ICT and miss the broader vision and goals of the sector

There are many successful initiatives and many models that have worked in education technology in South Asia both driven by Government and non-government organizations. The Governments have tried to address the basic issues such as access to education or spreading the reach of education to all and improving facilities at ground level through targeted programs. There are many initiatives being taken by the Governments and non-government organization, which do not take note of the other programs. The need for an ICT in education policy has emerged only recently in the region. The region has seen large programs that are driven by agenda of improving access and availability of infrastructure, such as classrooms and computers, and teacher's training; however, to leverage on the availability of infrastructure and capacity there is need to think in broader context. For example, a large program targeted at improving educational outcomes by providing ICT-enabled teaching and learning opportunities cannot ignore capacity building issues for teachers at the same. The national ICT policies can not only target on what happens in the schools. It should start thinking from its effect in the teacher's curriculum, availability of devices, availability of content, capacity building of the teachers, capacity building of the parents, and availability of infrastructure together. Also, ICT in education has now gone beyond its stand alone benefits such as improving access or monitoring. Modern day technology provides inspiration for models that are outcome driven.

7. Continued need for a minimal level of physical and complementary infrastructure

ICT has helped removing many barriers in education such as physical presence of the educator and the learner at the same place and at the same time. Also, with the availability of improved mobile and wireless technology, requirements for fixed physical communication infrastructure can be ignored in the developing country context. However, to achieve the goals of "education for all" there is a dying need to provide minimum level of physical infrastructure and also upgrade existing school buildings and rooms in developing country.

8. Low utilization of ICTs potential

It is essential to ensure supply of adequate hardware to schools, availability of adequate uninterrupted power supply and qualified ICT-conversant teachers. Like many developing countries, South Asian countries have also taken these first steps toward ICT in education during last decade. However, there is a need to shift focus among policy planners, budget allocations and program design to ensure that ICT in education does not stop merely at providing these facilities. In turn it turns out to be an ironical paradox where computers are being used to monitor how many computers are installed in how many schools! The actual fruits of ICT in education can only be realized by designing and supporting a parallel pool of education technology-enabled content and ability to use it as a tool in actual teaching and learning. ICT in administration should grow beyond basic monitoring of progress to a scientific monitoring and evaluation system which could provide a wide range of inputs for education policy and indicators for monitoring outcome achievements.

Key Learnings

On analyzing the status of various countries across different types of ICT interventions, the following key learning are highlighted, which could potentially streamline the systems and align operations to meet the desired ends in implementing capacity building initiatives for ICT integration in education. Further it is appreciated that the best defined processes cannot make up for inadequacies in human talent. Irrespective of ICT, an issue that needs to be addressed urgently is teacher training. This training needs to include pre-service, induction, and in-service training. Given the size and nature of the teaching workforce, this is a daunting task and needs to be taken up in a phased manner with a project timeline spanning 2 to 3 years.

Development of technology savvy teachers

There is widespread need to impart excitement and relevance to the teaching-learning process so that the young men and women can contribute to, as well as benefit from, the socioeconomic progress. Rapid proliferation of ICT needs to be exploited for assisting a teacher to assimilate the art, science and technology of teaching. Simultaneously, creative teachers have to be recognized with morale-boosting rewards and awards so that they become a role model.

The focus should be on design of multimedia modules, borderless training strategy and providing preservice and in-service ICT training for teachers with the help of ICT-based resource packages designed by teachers for teachers under professional guidance and supervision. The objective of such training program should be to provide hands-on ICT learning opportunity for teachers to become more comfortable with technology, incorporating the Internet, Webpage design, and project-based approaches to support training.

Improve real-time instructional support available to teachers who use technology:

With a small number of teachers catering to vast population it is not a wise idea to displace them from their work places. It not only allows the work places to suffer but also troubles the teachers who are low paid employees. This is precisely the reason why our full-time teachers training programmes are a failure. The teachers' training at their work places can be effectively carried out through ICT networks .It will also enable us to take instantaneous feedback from field locations with out any hassle.

High-quality, comprehensive instructional support is critical in assisting teachers to integrate technology into their instruction. Such support may include the availability of just-in-time individualized training and professional development activities, with content that focuses on supporting teachers to integrate the technology available to them into their instruction. Technology coordinators also play a critical role in fostering the effective use of technology in schools through their knowledge of both technical and instructional issues. Strategies include:

- Countries within the region, states and districts within the country, and content associations and organizations, and private sector organizations should develop online

resources to provide just-in-time support to teachers. Specific examples include education-focused portal sites for teachers, which offer online communities for professional development or mentoring, tools for classroom management and administrative tasks, and tools to facilitate increased communication with parents and community members;

- Educational technology organizations should consider developing national standards and certification programmes for technology support professionals and programmes;
- Provincial Government, districts, and schools should develop comprehensive technology support programmes, directed by qualified technology coordinators at each school building;
- Countries within the region, states, districts and schools should investigate on emerging approaches to providing technical and instructional support over the Internet by building, using, or purchasing teacher-specific resources online.

-

Introduce ICT Proficiency in Certification and Selection of Teachers

Proficiency in ICT applications should be considered as one of the important criteria for teacher's qualification and their selection. Therefore, necessary steps should be taken at the Government and Sector-levels to notify such regime and ensure introduction of relevant courses by the TTIs:

- Facilitate liberal and easy loan facility for purchase of broadband Internet and PC by teachers and students in collaboration of Banks and so on.
- Facilitate concessional broadband connection and PC to the teachers and students in collaboration with industry.
- Provide income tax exemption on amounts spent on Internet connection and purchase of PC to students and teachers.

Enable appropriate Partnerships and Collaborations (including NGOs and Industry)

There are several private initiatives for enabling people in India, especially those in rural areas, disabled and marginalized sections of the society, and so on. to reap the benefits of the ICT revolution through out the country. Akshya in Kerala, ASHA in Himachal Pradesh, SARI, e-SEVA, Gyandoot in Madhya Pradesh, Lok Mitra/Jan Mitra in Rajasthan, Bhoomi, Drishtee, TARAhat, Gramdoot, and so on are some of the successful examples.

The aforementioned NGOs and other similarly placed entities could encourage adopting certain number of schools in their area for providing access to ICT in schools including educational content development for students and teachers training and handholding services for making this initiative successful. Active involvement of corporate sector in such initiatives could be catalyzed by the Government, which could include donation of obsolete computers, expert services for development of content, initial orientation programmes/training of teachers and students as per requirement. Government of India may provide token financial support to these NGOs to encourage them to supplement government efforts in accomplishing the desired results.

- Make "Free of Charge eLearning Services Provisioning" as a mandatory condition for private sector to become part of the Public-Private Partnership. In fact, this has to be sold as a concept to share the social obligation by the corporate sector.
- Allow the Public-Private Partnership to modulate services charges in a manner that they extend e-learning services to the schools free of cost including operation and maintenance support.

It is very critical to develop appropriate partnerships and collaborations between the stakeholders with complementing capacities, to build ICT capacity within the education system, yet influencing the larger economy, the community and education in a synchronous manner. The nature of partnerships envisaged for successful implementation of Capacity Building for ICTs in Education, include:

- ICT industry partnerships that provide immediate local and worldwide technology solutions and stimulate local economic growth;
- Community partnerships that provide an environment where underserved populations can use ICT to support workforce development and thereby impact current and medium term workforce needs;
- Education partnerships where we provide a broad range of support to improve teaching and learning effectiveness to build the skills those workforces need in the future.

Emphasize Learning over Content Delivery

The current system of evaluation of student learning does not allow creativity, innovation, and research, which are important tools for lifelong learning. Learning mechanisms that promote mastery or deep learning, facilitate personalized learning based on learning styles, and meta cognition can be adopted if teacher training curriculums accept new age technology tools to assess and evaluate student achievement on the basis of learning and not rote memorization. Train teachers to encourage cooperative and team learning environments enabled by appropriate ICTs.

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Information and Communication Technology for Education in India and South Asia



Essay IV

Gender Equity and the Use of ICT in Education

infoDev

PRICEWATERHOUSECOOPERS 

Executive Summary

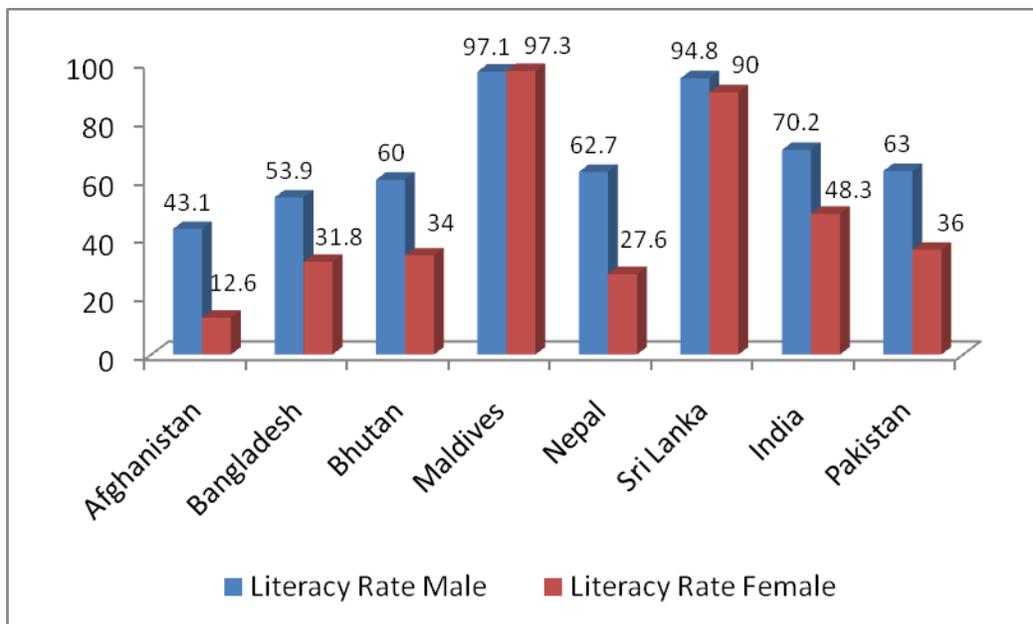
This essay on **gender equity and the use of ICTs in education** looks at how ICTs are being used by girls and women in the education space in the focus countries. Gender disparity is a critical issue in all focus countries, except perhaps the Maldives and Sri Lanka to an extent. Most countries in the region are characterized by low female literacy levels, lower participation in the labor force, and lower representation in the administrative and political arena. This essay discusses the potential of ICTs for ensuring gender equity as well as the policy level decisions required to mainstream gender in the initiatives and schemes formulated by the government. It profiles a few initiatives in the different focus countries where ICTs are being used either to promote education among girls and women or to improve their livelihood chances.

Gender Equity and the Use of ICT in Education

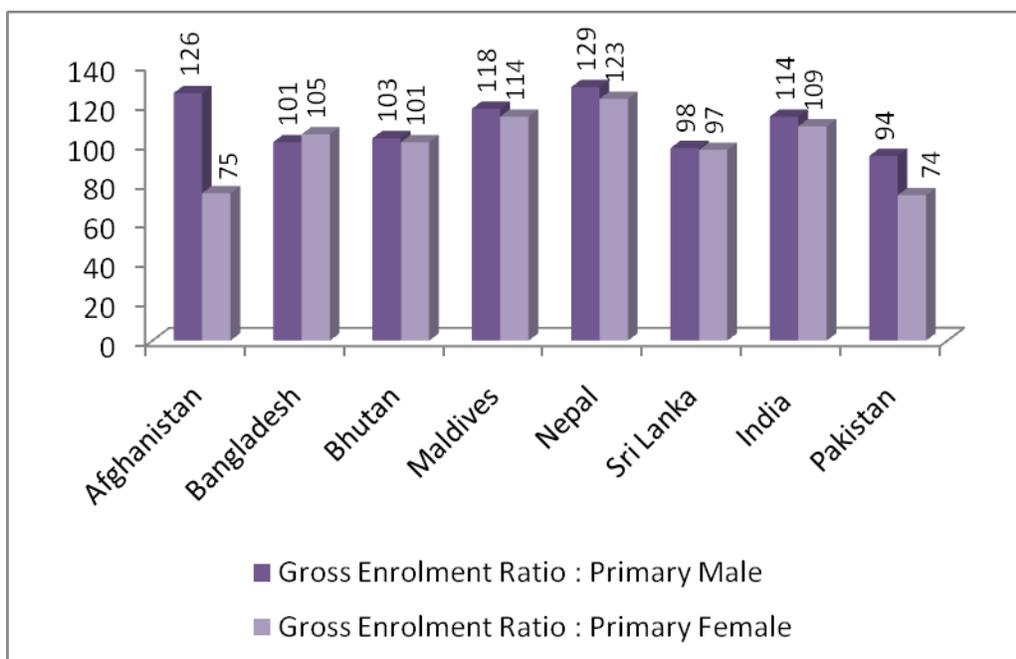
Recognizing the significance of education in the development of valuable Human Capital, investing in appropriate infrastructure for providing quality education to all is presently high on the policy agenda for India and the other South Asian countries. However, focus on gender-equity enabled investments is alarmingly lagging in this region. There are many arguments in support of policies leading to investment in education for girls and women. For example, a first order analysis which considers women to be equal to men in their potential contribution to the economy implies a huge untapped reservoir of talent in developing countries. Further arguments on the impact of such investments can be found below:

- Investment in female education leads to increased labor force participation and a subsequent expansion of the economy.
- A variety of positive health outcomes for women and their families are known to flow from increased education.
- Education generally leads to lower fertility rates as well as lower child mortality.
- As primary caregivers, women have a key role in the intergenerational transmission of knowledge.

In South Asia, the level of gender disparity in education varies across the region. A fairly rough idea can be acquired from the following figures, which depict the latest data on Literacy Rates and Gross Enrolment Ratios in Percentage of Population.



Source: UNICEF, www.unicef.org, * (2000–2007): Data refers to the most recent year available



Source: UNICEF, www.unicef.org, * (2000–2007): Data refers to the most recent year available

In Sri Lanka, women and men hold relatively equal status due to extensive social welfare programmes and the political empowerment of women, whereas in Afghanistan the gender disparity is extremely wide in addition to the fact that the rate of literacy level itself is very low in the country. On the other hand in India, where education deprivation of girl child is still a harsh reality, the literacy rates and health status have generally improved in the country; however, these improvements vary widely across the country. The Government and NGOs are active in

implementing programmes that focus on women's empowerment through education, health and livelihood security.

This gender disparity can primarily be attributed to complex and deeply embedded cultural values that tend to discourage women's active participation in personal and professional development. Furthermore, curricula and textbooks often reinforce gender stereotypes. Thus, gender mainstreaming across syllabi and in government policies and implementation plans needs to be appropriately addressed in most nations. It is clear that no education or communications process will be successful without a large-scale change in women's societal position.

Gender Mainstreaming for ICT in Education

ICTs have the potential to alleviate or remove some of the barriers or constraints that prevent women and girls from accessing educational opportunities, such as illiteracy, poverty, time scarcity, sociocultural factors, mobility, and relevancy, leading to women empowerment and gender equality. But there are additional factors that prohibit women from ICT usage such as restricted access to the technology, high costs and lack of skills and information. However, the lack of participation of women in the use of, and access to, ICTs can primarily be attributed to social behavior, culture, and religious traditions, for example:

- Cultural and social attitudes are often unfavorable to women's participation in the fields of science and technology, which limits their opportunities in the area of ICT.
- Women are often financially dependent on men or do not have control over economic resources, which makes accessing ICT services more difficult.
- Allocation of resources for education and training often favors boys and men resulting in lower levels of literacy and education, including training in languages which are predominantly used in ICT platforms and the Internet.
- In some societies, women are barred from public places making access to community telecenters difficult for them.

Unless explicit measures are taken to address the constraints girls and women face, any attempt to formulate ICT as a tool for knowledge and information dissipation for the underprivileged may increase gender disparities and lessen the potential impact of ICT in education. Thus to bridge the gap of Gender Digital Divide, appropriate policy frameworks to be established at the national level to address the issue of Gender Mainstreaming along with proper research work on the issues of Gender, ICTs, and Education.

Policy Framework for Gender Mainstreaming

To overcome the barriers to the access and usage of ICT by women, certain strategies need to be adopted on the following lines:

i. Ensuring a gender perspective in ICT-based projects

ICTs are generally regarded as gender neutral, but it is not true essentially. Given the persistent gender inequalities and unequal power relations in South Asian region, substantial disparities in

access, use and regulation of ICTs exist across societies in this region and the development projects need to address these disparities with a separate gender perspective and not as a single approach for both men and women together.

ii. Ensuring adequate and sustainable technology transfer

For any community project to sustain it is important to generate sufficient demand for ICT which can be attained only if the community learns more about ICTs and the array of services that they can provide leading to personal benefits and a better life. Thus, it is important that adequate transfer of know how should accompany technology transfer. Moreover, for sufficient demand generation for a sustainable working model, active participation is required from both men and women, and to seek active participation from the local women folk such initiatives should explicitly address their needs. A particular example in this regard can be cited as follows:

Grameen Bank, Bangladesh

In Bangladesh, the Grameen Bank has lent small sums to over 20,000 women to buy cellular phones to use in “pay phone” businesses, which has proven to be a successful model in economic and social security for poor women.

This case reflects the adoption of mobile technology by rural women against the benefit of social security.

e-Lanka Project

The e-Lanka project uses e-government applications in education services and uses them accordingly to promote women’s skills training. A voucher scheme initially grants women free access to rural telecenters; they then pay a few cents per hour to make the centers financially sustainable.

iii. Designing technologies appropriate to women’s needs

For women to adopt ICTs in the developing countries of South Asia, the technology should be made suitable to the given social and cultural contexts of the society. Ideally women should define their own agendas for information and communications technologies, including not only computers, cell phones and digital video, but even community networks, radio, and TV. But for that, it is crucial to understand women’s experiences with ICT, the kind of technology women want and how they want to use it. There is definitely a need for research on the classification of “women-centered” technology. Until ICT tools are tailored to the specific needs of women, they will never develop a sense of ownership for technology and will never be able to overcome the barriers to access and use of ICTs.

iv. Ensuring gender-sensitive ICTs policy and regulation.

Adequate policy making and regulation needs to be formulated at the national level for overcoming the persistent barriers to women’s access to and use of ICTs as well as making sure that ICTs benefit women equally as men, for example:

Open University of Sri Lanka

The Open University of Sri Lanka trains primary and secondary school teachers in the use of

gender-sensitive materials in the school and teacher education curricula and offers a number of computer programmes and courses that use gender-sensitive language.

Girl's schools in Bangladesh

The Government of Bangladesh aims to ensure that high school girls are provided with computer access in ICTs and Education programme announced in July 2002. Girls' schools are to be given priority in a programme that will provide 10,000 computers, along with Internet connections, to schools at the secondary level.

Girl's education programs in India

The Government of India has embarked on a vision to reduce the gender divide in primary and secondary education by setting the goal of "Education for Women's Equality" advocated by the National Policy of Education as per the Tenth Five-Year Plan (2002–07). Girls belonging to the segment of disabled, ethnic minorities, or underprivileged are brought under the scheme of Inclusive Education in (2006–07). The Mahila Samakhya and the SSA programmes to provide quality education for girls between 6 and 14 years has increased the literacy rate of girls from 15.35 percent in 1971 to 54.5 percent in 2007. In the past two decades, women's participation in primary, middle and secondary level has increased considerably. The District Primary Education Programme (DPEP) of the Central Government has reduced dropout rates to less than 10 percent and reduced gender gaps to less than 5 percent. One of the main objectives of the Sarva Shiksha Abhiyan (2001) is to bridge gender gaps in primary and secondary education by 2010. Since even after secondary education girls may not continue, "Extension Education," a policy providing job related knowledge, was introduced for those unable to proceed with formal secondary level. The National Literacy Mission (NLM) was set up in 1988 aimed to mobilize dropouts, introduce mass and functional literacy and involve the community in educating women to the Secondary level.

To integrate gender-sensitive concerns in policy-making and regulation, policy-makers need to gather information on various aspects such as:

- Statistical Data on women's use of ICTs, their role in development, their participation in science and technology in general, and their access to education
- Case studies on projects that take into account gender-related concerns are more successful than those which do not
- Review of projects demonstrating that women do not benefit when their concerns and situation are not specifically taken into account
- Examples and illustrations on how women could and should be better included in ICT projects

Gender-Focused Research and Analysis

In a research study conducted by APWINC (Asia Pacific Women's Information and Network Centre) on the ICT status of some Asian countries, it was noted that there was a paucity of available data, especially on gender-related data. This same situation was encountered by the COL (Commonwealth of Learning) for their project on women and ICTs for open and distance learning. And a similar situation exists in all the South Asian countries; there a lack of hard data around the issues of gender disparity and gender-sensitive issues for ICT and education. Thus commitments on

research work are necessary on gender-related data for ICT and Education, and such commitments needs to be an institutional imperative. As an example, one of the research priorities of the Open University of Sri Lanka is to address the role of gender in student enrolment and performance.¹

Therefore, to bridge the “disconnection” between gender experts and policy-makers, it is necessary to use findings based on qualitative research and raise the visibility of qualitative and feminist researchers to address the lack of understanding of gender-related issues and their social implications.

The Gender Evaluation Methodology² (GEM) is a tool developed by APC WNSP for gender analysis. It is basically a guide to integrate gender analysis to evaluate initiatives that use ICTs for social change. Apart from evaluation, the tool can also be used in the project planning process to ensure the integration of gender concerns. The following GEM projects can be cited from South Asia:

Anupama Saxena, Head, Department of Political Science and Public Administration and in charge Director of Women's Studies and Development Centre of Guru Ghasidas University, Bilaspur, Chhattisgarh, India

Anupama Saxena decided to conduct an evaluation research on the E-Gram Suraj project or the e-good governance project conducted at village level in India. A total of 64 village panchayats were selected for this research. The evaluation is aimed at examining what is the extent of rural women and men's participation in this e-good governance project, especially among the heads of the Village Self Government Units, and to also examine if the introduction of ICT through the Government of India's E-Gram Suraj project has been effective in changing the lives of women and men in these villages.

Development Research Network (D.Net), Bangladesh

D.Net is using GEM to assess its Computer Learning Programme, which has been in implementation since 2004. The Computer Learning Programme is one of D.Net's major programmes, which seeks to empower underprivileged youth in Bangladesh through computer literacy. Through this programme, D.Net is operating 80 computer learning centers in collaboration with local educational institutions and community groups. The Computer Learning Programme was evaluated in 2006, and the findings showed the need to interrogate more deeply the gender dimension of the project as responses from both girl and boy students were quite different. In 2008, D.Net decided to use GEM to look more closely at the behavior change of girl and boy students as a result of their participation in the Computer Learning Programme.

PAN Localization Project (PANL10n) Regional Secretariat is Based in Pakistan

The PAN Localization project is in collaboration with the GEM II project to determine how gender and ICT issues faced by localization initiatives can best be identified and addressed in the planning,

¹ Uma Coomaraswamy, “Barriers to Information and Communication Technologies Encountered by Women: Country Presentations – Sri Lanka,” (Vancouver: Commonwealth of Learning, 1998).

² <http://www.apcwomen.org/gem/>

monitoring and evaluation of localization initiatives. The PAN Localization project is using a gendered Outcome Mapping framework, and will be exploring what would be the most suitable complementary evaluation methods with the GEM II project team.

Impact of ICT in Education on Gender Equity

This section elaborates instances of the impact of ICT in Education on Gender Equity in the South Asian region. The most compelling cases regarding the potential of ICTs to improve access to education for girls and women is found in cases of informal learning. The following examples indicate that ICTs could become tools for women's active participation in improving their situations. Simple access to information and improved communications can end the isolation of women and promote improved health, access to reproductive services, economic growth as well as alleviate poverty.

The Information Village project, Pondicherry, India

The Information Village project in Pondicherry cites significant educational results from their project including support to women's small business development. Women's self-help groups use the system to contact other women's groups with which to share their experiences. One innovative use of ICTs is the development of a multimedia presentation and multimedia flash cards to provide gynecological information to reach women who are prevented by cultural attitudes from discussing their health problems with male doctors and younger females.

Radio Education for Afghan Children (REACH), Afghanistan

Radio Education for Afghan Children (REACH) uses radio to broadcast educational programs to children who have few opportunities to attend school. A major challenge was to develop programming which would stand alone, with no teaching, tutoring, or print support. While not a substitute for formal education, it broadcasts informative, interesting, and thought provoking programs to children and adults on basic subjects such as science, social studies, mathematics, grammar, and spelling. Programs for adults concentrate on life skills, such as dangers of landmines, adjustment after the civil war, and the role of women in Afghan society.

REACH was never conceived as a substitute for school, but as a dynamic tool designed to respond to children's wider educational needs. Programs are developed based on participatory rural assessment with focus groups made up of men, women, girls, and boys. Program ideas from these meetings are then further developed with experts in the topics covered, and then sent to the focus groups for feedback.

The role of women and programs focusing on women's concerns are a major part of REACH programming, including sessions on family and children's health, home economics, and women's rights in the family and society.

Key Learnings

In India and South Asia, cultural values, traditional beliefs, financial dependence on men, and restrictions to entering public places are some of the many reasons for gender disparity. A key point to note when understanding gender inequality in Education in South Asia is that even when gender parity in enrolment is achieved, discrimination toward women still exists as girls are discouraged from choosing subjects at the secondary and tertiary levels which would lead to higher paying career opportunities.

ICT tools provide an opportunity to overcome some of these key barriers. However, initiatives have to be designed specifically for women and awareness needs to be generated among women on the advantages of ICTs and their potential to address specific problems faced by them. Empowering women through access to information is a critical requirement, as experience in the South Asian region has often shown. For example in Pakistan recently an animated public services campaign was run by a private channel, following the passage of the sexual harassment Bill, which emphasized that women are now supported by law to complaint against any form of sexual harassment and that they may report such incidents to the police, courts, an ombudsman or a mandatory committee in case of a corporation. This awareness raising is an important aspect, as quite often there is no reliable information on available options for women.

It is encouraging to see that in an effort to achieve the MDGs and Education for All targets, South Asian countries have made serious efforts to overcome gender disparity. In situations where attending traditional schools is difficult or almost impossible, ICT has been used to bring education to the doorstep of the traditionally deprived gender. Mobilink, Pakistan in partnership with United Nations Educational, Scientific and Cultural Organization (UNESCO) has launched a recent initiative for providing literacy to adolescent girls using mobile phones. ICT has also been used to overcome poverty and make women financially independent. The government of Bangladesh has provided access to ICT for school girls at the secondary level. The Self Employed Women's Association (SEWA) in India is an initiative to encourage women to become fully employed and self sufficient. SEWA's initiative to start Rudi no Radio, the first community radio station in a village near Ahmedabad has made hundreds of women gain access to knowledge and information on career opportunities, education, health and sanitation and so on.

Encouraging women to use ICT remains however a challenging task since technology uptake of women and girls tends to be low in South Asia, even in environments where computers are available; since it is generally the boys who are encouraged to use it. To ensure that ICT is used efficiently to deliver education and to overcome the gender gap, differential attention is needed for boys and girls in ICT schemes in Education. Positive discrimination or Affirmative Action in favor of girls, in provision of access to ICT facilities in schools needs to be explored in many of these traditional societies.

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Information and Communication Technology for Education in India and South Asia



Essay V

ICT in Non Formal Education

infoDev

PRICEWATERHOUSECOOPERS 

Executive Summary

This essay on the **use of ICTs in non-formal education** provides a perspective on how ICTs are increasingly being used in the community in general to make available information and learning to a larger target group outside of the formal school system. This paper attempts to understand the penetration of ICT in delivery of NFE. It outlines the various modes of delivery of NFE using ICT tools and enablers, projects across countries that have achieved success more effectively through usage of ICT, the innovations in the same, and the emerging trends. In the process, this paper highlights the advantages accrued by the use of ICT in NFE, the critical success factors for such projects and impediments, and barriers faced in the implementation of ICT-enabled NFE. Quite often in the developing countries of South Asia, it is seen that when there is a wider dissemination of technology in the community by way of delivery of government services through the Internet, or by recourse to other e-government services, there is a greater demand for and adoption of technology in education in the formal system too. The widespread use of ICTs at this level for lifelong and continuous learning as well as community empowerment is a significant trend in making into a reality the 21st century ambition of living in truly “knowledge societies.”

ICT in Non Formal Education

Evolution of Non Formal Education (NFE)

Although education is a basic human right, there are millions of people who for various reasons have missed out on the opportunity of formal schooling, thereby constraining them from basic literacy. In the South Asian countries, NFE was encouraged to address this critical aspect and to provide mass education to the large majority who were outside the ambit of the formal school system. In many of these countries, NFE forms an integral part of the official programs of basic education, often with independent organizational arrangements as well as a program budget and portfolio of activities.

Definition of NFE

Coombs (1968) and Coombs and Ahmed (1974) defined NFE as an alternative form of education for adults and children that occurs outside of the traditional classroom environment.¹ While globally NFE has come to imply lifelong learning and alternative learning models, in India and most of the South Asian region till very recently, it was understood as basic literacy and numeracy skills and was squarely in the framework of providing basic education to all citizens.

More recently, NFE has undergone resurgence in developing countries because of the realization that formal schooling, in its present form, has limited reach. Furthermore, it is now recognized that the educational needs of young people and adults are varied and should be addressed through suitable programs. In developed countries, NFE has assumed importance in the context of lifelong

¹ COOMBS, Philip H. and AHMED, Manzoor (1974): *Attacking Rural Poverty: How Non-Formal Education can Help*, Johns Hopkins University Press, Baltimore.

learning, which sees learning as taking place not only in schools and colleges, but throughout the lifespan, in many different locations and times and in formal, non-formal, and informal modes.

NFE Characteristics

NFE may be defined as “any organized and sustained educational activities that do not correspond exactly to the formal education systems of schools, colleges, universities, and other formal educational institutions”. It may take place both within and outside educational institutions and cater to persons of all ages. Depending on country contexts, it may cover educational programmes to impart adult literacy, basic education for out-of-school children, life skills, work skills, and general culture. NFE programmes do not necessarily follow the ladder system and may have differing durations and may not confer certification of the learning achieved.

NFE has been gradually playing a critical role in achieving Education for all (EFA) goals and the MDGs. Recent phenomena such as the diversification of individual learning needs in a rapidly changing society, persistent problems of illiteracy and out-of-school children, limitation of formal schooling system in education delivery, and development of ICT, have spurred EFA stakeholders to revisit its potential.

NFE can address the diversified learning needs of preschool children, out-of-school girls and boys, young people, and women and men in a changing society. NFE emerges in varied forms such as early childhood education, community learning centers (CLCs) for village people and urban dwellers, adult literacy classes, skills and vocational training in workplaces, distance education for those who live in remote areas, public health education, civic education, and continuing education for youth and adults both in developed and developing countries.

NFE For Strengthening Linkages between EFA and MDGs

Through NFE, the linkages between EFA and MDGs can be strengthened by focusing on improving livelihoods and achieving more integrated and relevant educational and developmental interventions. This will be realized by connecting learning to individual empowerment and community development.

It is crucial for the EFA and MDGs stakeholders to reflect on a manner in which NFE can be integrated in the existing education and development framework. This is necessary in order to provide alternative learning to those in disadvantaged situations in developing countries and to address the changing learning needs of all aged population of developed countries beyond the school system.

NFE as an Accelerated Learning Programme

Accelerated Learning Programmes (ALPs) are “catch-up” initiatives to assist older children/youth, who have missed years of schooling, to complete their basic education and to obtain educational qualifications in a relatively short period of time. For example, an ALP can be a 3-year programme that condenses 6 years of primary schooling. Planned in partnership with educational authorities and covering essential elements of official curriculum, a programme attempts to cover rapidly

education content spanning years of missed schooling. In reality, accelerated learning is difficult to achieve, and will only become when effective teaching and learning methods are a strong focus. At the end of the “catch-up” period, students are integrated into a regular classroom. Specific target populations can include displaced children, girls or other disadvantaged.

NFE for Out-of-School Youth and Adults

Most countries in the Asia Pacific region have actively promoted NFE programs for out-of-school youth and adults. Many of these programs were well under way even before the Education for All (EFA) Conference held in Jomtien, Thailand, in 1990. In fact, by then most countries in the region had already established separate organizational arrangements for promoting NFE as an effective channel of basic education. Apart from national NFE programs initiated by governments, the last decade has also witnessed the emergence of non-governmental initiatives in NFE.

NFE for Lifelong Learning

A number of important socioeconomic forces are pushing for the lifelong learning approach. The economic rationale for lifelong learning comes from two principal sources. First, with the increasing importance of knowledge-based economy the threshold of skills demanded by the employers is being constantly raised. There is a relative decline in demand for low-level skills. Second, as firms respond to a more volatile market and shorter product cycles, career jobs are fewer and individuals experience more frequent changes in jobs over the working life. The shelf life of skills is shorter. There is a need for continuous renewal and updating of skills, which is essential for structural adjustment, productivity growth, innovation, and effective reallocation of human resources

ICT in NFE

Attempts to encourage full and effective participation in NFE now forms a central part of current educational and economic policy making in most developed countries—under the various banners of creating “learning ages,” “smart countries” or “knowledge-based societies.” ICT has been viewed by many Governments as having profound and far-reaching implications for the ways in which to achieve these aims.

Over the past 30 years, NFE initiatives have effectively used ICTs for mass literacy campaigns, training of health workers, and capacity building under the rural community development projects. NFE has a critical role to play in reaching marginalized groups, and ICTs are a tool in the effective performance of this role.

The Asia-Pacific Programme of Education for All (APPEAL) Resource and Training Consortium (ARTC) study that was undertaken in 2002 (UNESCO 2002) and the APPEAL study (UNESCO 2005) highlight the following benefits of integrating ICTs in NFE programs:

- ICTs are used to develop Livelihood Skills and thus contribute to Poverty Alleviation: Livelihood skills training is a common activity in CLCs. The use of ICTs as a tool in such training is an engaging way for learners to develop these livelihood skills (UNESCO 2005).
- ICT is a tool for Capacity Building: More specifically, ICT can be used as an effective and affordable tool in the professional development of NFE teachers. This is important because

although qualified and trained teachers are the key to quality learning and increased learner motivation, in many countries professional expertise, particularly for the provision of non-formal literacy education, is limited and thinly distributed and training in teaching and learning in NFE contexts consists of one-off programs and lack follow-up and sustainability.

- ICT facilitates Documentation and Information sharing: ICT can facilitate the print, visual, and video documentation that is needed for the dissemination of information about successful NFE projects. When undertaken by the members of the community, this documentation can help foster a sense of community pride and ownership and ensure continuing support and enthusiastic participation. And while ICT can promote information sharing between communities, they can also be effectively used to mobilize policy dialogue on the use of ICT for community empowerment.
- ICT can be used to facilitate the process of networking among organizations engaged in the design and delivery of NFE programs: It is essential for the Government and other organizations to coordinate their NFE activities to maximize available resources and expertise, including ICT equipment.
- ICT tools can improve the overall effectiveness of monitoring and evaluation: Monitoring and evaluation should be built into the entire planning and management of NFE programs

Delivery modes of NFE using ICT

The delivery modes and domain of NFE are wide ranging but it has common denominators, that is, “need-based approach,” “contextual relevancy,” and “flexibility in learning contents, time and place” that show a good contrast to formal schooling.

By transcending physical and spatial constraints, ICT and mobile devices bring unprecedented educational opportunities to people of all socioeconomic levels. Early distance education NFE projects used print, radio, television, audiotape, videotape, and satellite transmission as an efficient and cost-effective way to provide illiterate adults and out-of-school learners with educational opportunities. Further innovations in ICTs like Very Small Aperture Terminal (VSAT) satellite communications, the Internet, and CD-ROMs are helping to create new innovative learning tools that will profoundly change the way NFE is delivered.

In recent times, NFE projects have been making use of devices such as Personal Digital Assistants (PDAs), laptops, Pocket PCs, and mobile phones to provide interactive content to previously unreachable and remote locations. At the same time, conventional classroom approaches to learning are being supplemented by learner-centered anytime-anywhere mode of learning, with the potential to increase participation and school retention rates.

Many nations have developed e-learning and m-learning strategies, and are rapidly expanding the use and knowledge of ICT in educational activities by incorporating ICT into lesson plans, teaching methodologies and curricula, and devoting funds to procuring ICT-related resources. Currently there are at least three types of learning spaces where ICTs are used to enhance NFE:

Telecentres, Community Multimedia Centers (CMCs) and Community Learning Centers (CLCs)²

1. A **Telecentre** is a public space where community members can access telephones, computers, the Internet, and other digital technologies that can help them gather information and communicate with others. The simplest kind of telecentre is a booth in which the owner of a telephone sells user-time. This initially worked well in countries like Bangladesh where the Grameen Bank has been lending money to rural women to buy telephones since 1997, but has latterly been overtaken by higher rates of mobile ownership. A telecentre has a limited educational function but it is empowering to those who are enabled access to information easily. In the case of Grameen Bank, it has also helped in alleviating poverty by augmenting the income of the village women in Bangladesh.

2. **CMCs** are nonprofit telecentres that aim to promote community empowerment and addresses the problem of the digital divide. Also known as a community e-centre (CeC), a CMC combines community telecentre facilities (computers with Internet and e-mail, phone, fax, and photocopying services) with a community radio run by local people in the local language. The radio, which is low-cost and easy to operate, not only informs, educates and entertains, but also empowers the community by giving a strong public voice to the voiceless and encouraging greater accountability in public affairs. CMCs provide a gateway to active membership in knowledge societies by enabling everyone to gain access to information and communication tools that they can use to improve the quality of their lives.

3. **CLC** is “a local place of learning outside the formal education system usually set up and managed by local people for local people.” CLCs, which may be located in urban and rural areas, “are home-grown institutions that provide education programs that address the specific needs and desires of the populations they serve.” Their aim “is to help individuals empower themselves and promote community development through lifelong education for all people in the community, including adults, youth, and children of all ages. A CLC does not necessarily require new infrastructure, but can operate from an existing health center, temple, mosque, primary school, or other suitable venue.”

The emphasis on using the newest ICTs has begun to shift the focus of NFE away from local community development and toward individual lifelong learning. The future use of the new ICTs in NFE in developing countries will greatly depend upon how well NFE practitioners manage the issues associated with the use ICTs in NFE.

The latest ICTs are also being used to develop virtual learning communities for NFE purposes. Virtual learning communities are learning groups with a shared interest, who are able to overcome barriers of time, geography, age, ability, culture, and social status (Blurton, 1999). For example, the Global Learning and Observations to Benefit the Environment (GLOBE) project “... links students, teachers, and the scientific research community worldwide in a virtual learning community to study the global environment” (Blurton, 1999, p. 13). New pedagogical techniques that utilize new

² UNESCO study (2002)

ICTs are very promising in allowing communities to become owners of the technology as they learn to use them.

Public-Private Partnerships

Strategic Partnerships between Private Sector and Public Sector Enterprises/Governments to either pilot or fast track ICT-based projects is a strategy that has gained importance among Ministries of Education in most of the developing countries. These partnerships take many forms, including private sector grants with Government counterpart contributions, donations of equipment and education-related content by corporations to Government-run institutions or programmes, provision of technical assistance by the Corporates or institutions of excellence, for planning, management, and strengthening human resources at the grassroots level of the Government's service delivery. Multilateral organizations and international aid agencies have also driven many of the most significant ICT in education efforts in the developing world. Evidence strongly suggests that, in order to reap the benefits of ICT at a national, regional or sector level, it is necessary to create a new form of collaboration that involves the full range of actors in the public and private sectors in a process that is inclusive, open and participatory.³

The public sector includes various Government institutions or agencies at national, regional and local levels. The private sectors may include for-profit and not-for-profit organizations, professional associations and individuals, who are able and willing to complement the programme requirements by partnering with the Public/Government institutions.

The Stakeholders

NFE, when implemented through the PPP model, involves a multitude of parties or stakeholders viz. Governments, donor agencies, community (incl. community-based organizations, self-help groups, etc.), corporate, not-for profit organizations, and beneficiaries. Initially, the Government was seen as the body responsible for implementing education programs. However, over the years, Corporates, Not-for profit organizations and the community-groups, that is, people themselves have evinced interest in this domain and the Government is being vested the responsibility of policy formulation, regulation, and monitoring and evaluation. The following table provides an illustrative list of stakeholders identified from a select set of NFE programmes implemented across various countries:

Table 1 Examples of Stakeholders in a Non-Formal Education (NFE) program

Sector/Geography	Public/Multilateral Agencies	Nonprofit/NGO	Private/Corporate
International	<ul style="list-style-type: none"> ▪ World Bank ▪ UNESCO 	<ul style="list-style-type: none"> ▪ WorldSpace Foundation ▪ International Extension College 	<ul style="list-style-type: none"> ▪ AT&T ▪ British Telecom ▪ CISCO ▪ ITC

³ Creating a Development Dynamic, Final Report of the "Digital Opportunity Initiative" (United Nations/UNDP, Markle Foundation, and Accenture), July 2001.

National	<ul style="list-style-type: none"> ▪ Govt. Departments 	<ul style="list-style-type: none"> ▪ School net (India) ▪ National Extension College (UK) 	<ul style="list-style-type: none"> ▪ Unext(USA) ▪ IBM (Canada) ▪ TATA (India)
State/Regional	<ul style="list-style-type: none"> ▪ State Open Universities ▪ Govt. Departments 	<ul style="list-style-type: none"> ▪ State Resource Centre for Adult Education (India) ▪ Scottish University for Industry 	<ul style="list-style-type: none"> ▪ Small Enterprises providing training
Local	<ul style="list-style-type: none"> ▪ Local Schools and Training centres ▪ Local Bodies 	<ul style="list-style-type: none"> ▪ Women's groups ▪ Local credit unions 	<ul style="list-style-type: none"> ▪ Small Enterprises providing training

All stakeholders have an important role to play in the Information Society, especially through partnerships:

- a) Governments have a leading role in developing and implementing comprehensive, forward-looking and sustainable national e-strategies. The private sector and civil society, in dialogue with Governments, have an important consultative role to play in devising national e-strategies.
- b) The private sector plays the role of developing and diffusing ICTs infrastructure, content, and applications.
- c) The civil society is responsible for creating an equitable Information Society, and in implementing ICT-related initiatives for development.
- d) International and regional institutions, including multilateral agencies (incl. International Financial Institutions), play a key role in integrating the use of ICTs in the development process and making available necessary resources for building the Information Society and for the evaluation of the progress made.

ICT in NFE International Experiences

This section portrays select few notable experiences across the globe on implementing ICT-based NFE.

The UK Government has pursued a set of policy initiatives aimed at a technological reengineering of the NFE sector under the aegis of the "University for Industry" (Ufi) and "UK Online." Ufi most prominently takes the form of a telephone-based helpline and Web site for directing individuals to approved and kite-marked learning opportunities as well as providing its own technology-mediated learning opportunities via a network of more than 2,000 "learn direct" centers and 6,000 "UK Online" centers in community sites throughout the UK. The initiatives not only aim to widen participation and achieve a "mass-market penetration of learning," but to reduce the current inequalities in participation among those groups traditionally under-represented in adult education. The "People's Network" has established public Internet connections in England's 4,300

libraries alongside a host of other initiatives aiming to bring ICT and ICT-based learning to those currently without.⁴

Similar initiatives have been introduced across Europe, South America, East Asia and Australasia. From the German “IT in Education: Communication Rather Than Isolation” programme to the Indian “IT for all by 2008” initiative, Governments have firmly stated their faith in ICT to establish inclusive learning societies. These initiatives, coupled with the ever growing rates of domestic and work-based access to ICTs such as computers and the Internet, are now prompting politicians and educationalists to make wide-ranging claims about the combination of NFE and new technology as at last overcoming existing social inequalities and leading to a “renaissance” of lifelong learning. For some, therefore, the ability to learn with and through ICTs has solved the NFE conundrum in one fell swoop.

The prime objective of any ICT-enabled NFE programmes can be conveniently classified under one of the following heads.

1. Programmes for fostering adult/child education
2. Programmes for creating community awareness
3. Programmes for community empowerment/development

1. Programmes for Adult and Child Education

In the context of the Education for All and the Millennium Development Goals, the United Nations General Assembly proclaimed the years 2003–2012 to be the United Nations Literacy Decade (UN, 2002a), which was officially launched on 13 February 2003. The founding resolution (Resolution 56/116) reaffirmed the Dakar Framework for Action (UNESCO, 2000a) in which, the commitment was made to achieve 50 percent improvement in adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults.

The current emphasis on creating “knowledge-based” societies has made “learning” throughout life more important, which in turn requires an education system to have greater flexibility to enable learners to enter and leave the system at different points in time. Moreover, a wide range of education providers, including universities, NGOs, Government agencies, and the private sector, needs to be involved, particularly because learners, who have diverse learning styles, would need different kinds of skills from formal, non-formal, informal, and distance and open learning institutions. This has set the context for improving adult literacy worldwide and countries have been trying to harness the power of ICT to achieve the same.

International Projects

⁴ ICT in Non-Formal Youth and Adult Education: Defining the Territory, Neil Selwyn – University of Cardiff, U.K., 2003.

Both developing and developed nations alike have been trying to implement ICT-enabled NFE programmes for adults and children in order to ensure an environment where lifelong learning is possible. Some of the successful projects include:

ASHA Project—India

With a mission to educate illiterate adults by using Devnagri script in computers and also to train rural youths in computer applications in the most backward villages of Nagrota Surian block of Himachal, ASHA-2005 was launched in mid 2002. A joint initiative between the Science Awareness Trust (SAT) and the State Govt. of Himachal Pradesh, ASHA-2005 aimed to train 2,100 people in areas of health, social welfare and the environment, as well as educate 15,000 illiterate adults in three years. SAT invited officials of the district administration and other departments to create a platform for discussing and solving related problems.

www.ashanet.org

Skills.net (Australia) is a State Government of Victoria initiative Connecting Communities and working to ensure that everybody is able to access the resources on the Internet. Skills.net creates or expands existing community-based Internet facilities, making available new technology, multimedia equipment and training to meet the information and communication needs of all Victorians. In particular, Skills.net focuses on technologically disadvantaged communities, including those in rural and remote Victoria, people with disabilities, women, older Victorians, people from non-English speaking backgrounds, indigenous Australians and low income earners.

<http://www.unescobkk.org/en/education/ict/themes/non-formal-education/regional-and-country-es/>

Rural Education and Development—Nepal

READ Nepal has been established in 1991 to combat illiteracy in Nepal through the promotion and development of rural libraries. So far READ Nepal has a network of 35 rural community libraries in 29 districts. These libraries are established with a sustainable strategy integrating income generating projects through various other development initiatives in the respective communities. Depending on geographical location, the scope for income generation from the project selected and the need of the community, the libraries could have one or more sustainability projects. Income generating projects such as front stores, telecenters, fish ponds, printing press and ambulance ensure the sustainability of the libraries. The libraries function on the concept of Community Resource Center set up and managed by the local people, and at present, seven of these resource centers also provide telecommunication facilities.

PPP-Led ICT Enabled Services in Rural Nepal, Policy Paper 14, April 2006

All the aforementioned projects had utilized ICT for educating adults and children in the remote-rural and slum-dwelling urban communities. They were mostly community based with an active involvement of the community members that addressed their learning needs. Primarily Internet was used as the delivery medium.

2. Programmes for Creating Community Awareness

Radio Sagarmatha—Nepal

Radio Sagarmatha (RS) covers and discusses public issues, conducts training for public radio journalism, and provides a venue for local ideas and culture. The station also has regular focus on good governance, gender, women's issues, environment, economics, and ICTs. In 2000, the station added a weekly twenty five minute Internet radio programme featuring local and international ICT related news, and ICT glossary, radio web browsing, and interviews with relevant ICT resource persons.

The aforementioned projects successfully harnessed the power of radio to deliver lessons on ICT and ICT-based developments to the people of Nepal. Such programs are primarily intended to create awareness on various social issues such as alcoholism, female feticide, dowry, and so on. These have been found to be very cost effective with a wide reach.

3. Programmes for Community Empowerment and Development

ICT-based NFE programmes aim at improving functional literacy of the people and in turn empower the community by enabling them to make informed decisions in business, trade, health and education. Evidence suggests that such projects have mostly been effected through CLCs. Some of the successful projects include:

Community Radio Programme, Lao PDR

Implementing Agency—The NFE Department of the Lao PDR

Objective—To increase the village incomes among the rural ethnic minority youth and adult in Vientianne province.

Implementation—Radio broadcasts were done by the villagers themselves to solve the local problems and to educate the people. CD's containing information on good agriculture practices were distributed to the villagers by the NFE Dept. and this helped villagers to pick up new ideas to apply in areas to increase their productive capacity.

Learning—Radio and CDs are effective ICT mediums for community empowerment and increased income generation.

Multi Purpose Community Telecentre for Community Development—Sri Lanka

Implementation

The Sarvodaya Shramadana Movement, a leading NGO in Sri Lanka is administering this project at 18 sites under the supervision of the NFE unit of the Ministry of Education.

Medium of delivery—CLC is equipped with computers

Objectives

The purpose of this project is to help village entrepreneurs by enabling them to use ICT in marketing and selling their products. Project activities include training in the use of ICT, development of a community database, dissemination of appropriate information to villagers and entrepreneurs, an entrepreneurial skills development Programme. Each telecentre provides a computer, printer, scanner, photocopier, and binding machine for community member's use.

Critical Success Factors for Using ICT in NFE

A review of the successful ICT projects in NFE has shown that critical success factors include the following:

1. **Need for a coherent policy.** A meta-survey of ICT integration in 44 countries in the Asia Pacific region conducted by UNESCO Bangkok in 2003–04 showed countries at different stages with regard to policies pertaining to the integration of ICT in the education system. While all of the countries surveyed had stated that the development of ICT capacity was important to national development, few had grappled with the policy questions related to ICT applications in education, especially in NFE.
2. **Technology infrastructure.** A second factor for success of ICT-supported NFE is providing technology infrastructure and ensuring access. ICT-based non-formal literacy programmes have often suffered from inadequate infrastructure and technical support. This was highlighted in a study on the use of ICT in education in seven of the E-9 countries (Bangladesh, Brazil, Egypt, India, Mexico, Pakistan, and the People's Republic of China) undertaken by UNESCO (UNESCO 2006). The study recommended that the Literacy Decade should be considered as an opportune time for the Governments to set up the required infrastructure—for example, phone lines, reliable electricity supply, and connectivity.
3. **People-driven rather than technology-driven.** A third factor in the success of ICT-supported NFE programs is to make them people-driven rather than technology-driven. Often, there is a tendency to invest in technology without making a parallel investment in people.
4. **Effective planning and programme design.** Effective planning and programme design is the fourth factor in the success of ICT-supported NFE. There is a need to take stock of existing infrastructure and to plan for hardware and software requirements, taking into account

connectivity, affordability, and capability. Equally important is the need to understand the existing information systems catering to the economically disadvantaged which on ICT-enablement will become more effective and efficient. There is a need to understand how ICT and culture intersect, because cultural factors can be a hindrance to ICT adoption in rural areas.

5. **Development of content that is relevant to the learners.** ICT can play an important role in stimulating interest and engaging learners, and it can be a useful tool in developing learning materials that are culturally and linguistically appropriate. One such literacy course offered by a CMC in the Madurai district of Tamil Nadu, India, enables learners to create their own personalized content using digital cameras, computers, presentation software, and CD-ROMs.
6. **Planning for sustainability.** Most of the ICT projects have high operating costs, given the pace of change in technology, the replacement costs are also relatively very high. Due to such higher costs, most ICT projects tend to close down as soon as the project funds are used up. It is therefore essential to address the problem of sustainability at the planning stage itself.
7. **Ensuring multistakeholder partnerships.** Given the need for a wide range of specific competencies and capabilities for successful implementation of ICT-based education programmes for NFE, and that, such competencies and capabilities are spread over a wide spectrum of interest groups, it is more critical to ensure strategic partnerships between these interest groups to achieve the desired ends of success. In such partnerships, the principal role of the Government would be to facilitate the creation and equitable diffusion of infrastructure and the adaptation and scaling up of successful pilot projects. In addition, the public sector should provide the lead through strong policy interventions and substantial public investment. The private sector could play an important role in supporting development of content and applications in the local languages. NGOs could partner with the Government to ensure the participation of various disadvantaged groups, and to facilitate capacity building.
8. **Continuous monitoring and evaluation.** Each project should have built-in mechanisms to understand, measure, and be informed about, how well the programme is progressing and the extent to which it is meeting the set objectives, and to provide feedback to the implementers and other critical stakeholders to the programme.

Emerging Trends

Traditionally, ICT in NFE programmes have been based on radio, TV, or Internet. Of late, countries have started experimenting with newer technologies such as mobile phones, WiMax and games-based platforms. A brief overview of such projects is given in the following:

1. Mobile(m)-learning

The rate of adoption of mobile technologies in South Asia is among the highest in the world. Mobile phones have a greater penetration than Internet in developing countries of South Asia. Moreover, it is capable of overcoming the infrastructure divide between urban and rural areas. With the development of 3G and 4G networks, use of mobile phones in education could provide a way

forward. M-texts, downloadable lessons would enable any user with a cell phone to access the educational lessons.

Several initiatives are ongoing in South Asia where Service providers are also offering information and educational services on different aspects to farmers, fisherman, and so on using mobile phones. For example, Fisher Friend M.S. Swaminathan Research Foundation, e Choupal ITC.

Bangladesh—Mobile phone project

In 2007, **Bangladesh** Rural Advancement Committee (**BRAC**) came out with an interactive audio course to deliver information over mobile phones. Each course had a few points to convey, such as the importance of clinician-assisted birth, or the dangers of indoor smoke. As an incentive to take the courses, there was a short quiz at the end of each call and if the caller passed the quiz, free airtime was delivered to their mobile phone.

2. Games-based platforms

There are countries which have used the methodology of games-based platform to further the cause of adult education. With the significant penetration of 3G and 4G networks and increased adoption of mobile phones, this methodology is expected to gain momentum in the near future.

Educational games can make a profound impact on the learning needs of underserved communities. At least two non-government organizations, Pratham and Azim Premji Foundation, have deployed computer games in their initiatives with children living in the urban slums and rural areas of India respectively. Most importantly, a large-scale evaluation by Pratham demonstrated significant gains on mathematics test scores from playing computer games that target mathematics learning. Early experiments by the Azim Premji Foundation with rural children in India have shown equally promising outcomes with e-learning games for English as a Second Language (ESL) and other subjects.

3. WiMax technology

WiMax, meaning Worldwide Interoperability for Microwave Access, is a telecommunications technology that provides wireless transmission of data using a variety of transmission modes, from point-to-multipoint links to portable and fully mobile Internet access. WiMax provides high-capacity broadband wireless access (BWA) across a larger geographical area than other available wireless technologies like WiFi, thus offering a solution for point-to-multipoint last mile connectivity.

In India, Pakistan, and other countries in the South Asian region WiMax networks are being actively tested and deployed. BSNL the state owned service provider in India recently launched commercial 4G mobile WiMax networks in the states of Kerala and in Rajasthan at highly competitive prices. According to the Infonetics's new report, *WiMAX Equipment and Subscribers in Key Markets*, India is

the single largest WiMax opportunity area in the world with all major service providers like BSNL, Tata, Bharti Airtel, and so on pursuing WiMax technology.⁵

WiMax offers immense potential for the Education sector as well, since it provides a solution for affordable high speed broadband access in rural and under developed areas as well, thus facilitating distance education and e-learning. In Turkey, Turk Telekom offered a WiMax-based wireless broadband solution to the Ministry of Education for taking broadband connectivity to schools and children in rural areas. Countries in South Asia too are beginning to harness the potential of WiMax as the choice of technology for wireless broadband access in remote areas.

Key Issues and Concerns

1. Policy formulation for ICT in NFE

A policy framework is essential as it provides a vision of desired outcomes and outlines a roadmap for how these outcomes are to be achieved. In such a framework, the vision of NFE would have to be broad-based and all-encompassing and within the overall framework of lifelong learning. Policy leadership⁶ will be the key to any successful effort to introduce ICT into literacy and adult education, particularly if these efforts are to contribute to economic and social development. Projects and programmes offered outside of a policy context will fail in the long run.

Many countries have developed ICT national plans to provide a policy context that guides new technology-based programmes and projects. These master plans articulate a vision for how ICT can contribute to education reform and improvement and tie this vision to other national priorities. The national plan also authorizes specific projects and programmes to advance this vision and provide the resources needed to implement them. In a survey done by UNESCO to understand the issues in the development of policy for ICT in various countries, the following aspects came up for closer scrutiny:

- **Different parts of Government are responsible for ICT in education policies in different countries**

There does not appear to be a standard coordinating body responsible for the formulation of a country's ICT in education policies. In some countries this is strictly the purview of the Ministry of Education (which may have a separate ICT in education policy, or fold ICT's strategies into existing education policies), while in others it is handled by the Ministry of Science/Technology (if such an institution exists) as part of a larger technology or information policy, although in most cases there is no national policy at all.

- **Lack of database of existing policies**

There is no standard repository for existing ICT in education-related national policies, although there have been stray instance and attempts toward it by various agencies. On the other hand,

⁵ Infonetics Research, <http://www.infonetics.com/pr/2009/WiMAX-Equipment-KEY-MARKETS-Report-Highlights.asp>

⁶ New Technologies for Literacy and Adult Education: A Global Perspective, Daniel A. Wagner and Robert Kozma.

regionally the European Union has done a good job of collecting them for European countries, as has UNESCO-Bangkok in the Asia-Pacific region.

- **Successful policy requires consultation with a diverse group of stakeholders**

It is believed that the formulation of successful policies related to ICTs in education must include not only the Ministry of Education, but also a variety of stakeholders from other government ministries, as appropriate (often this includes the Ministry of Finance, the PTT and ministries related to science/technology/IT, labor and rural development), communities and other civil society groups (including NGOs) and the private sector.

- **Lack of ICT-Based Adult Education Policy**

Most of the participants from the different countries cited that though there was a national-level ICT strategy or program, there was no specific ICT in adult education policy.

2. Infrastructure

Public access to ICT is available to various extents in most of the larger urban centers in all countries through cyber cafés, but access is largely nonexistent in rural areas. Lack of infrastructure (electricity, telephone connections and hardware) is still the major challenge for introducing ICT in rural areas.

3. Cost and Sustainability

The costs associated with setting up ICT infrastructure are forcing many Governments to make difficult choices. For most national Governments, the priority is primary education. Ironically, the pressure to achieve Education for all (EFA) goals could be forcing a number of national Governments to sideline the education of out-of-school youth and non-literate adults. Similarly, the pressure to produce the necessary human capital for a “knowledge-based” economy is resulting in greater investments being made in formal higher education systems.

Further, meeting the ongoing costs of maintaining equipment, staff training, connectivity, content materials acquisition, and development and consumables is a major challenge. Donor funded projects have failed to run after the funding period ended as community funds was not mobilized for the project. Many ICT-based education programmes funded by aid agencies or by corporations could not be sustained because Government failed to step in with the necessary financing nor were the local communities in a position to generate the resources needed to continue these programs. This was the case with some of the Interactive Radio Instruction projects initiated by USAID.

4. Lack of local language content

English is the dominant language of the Internet. An estimated 80 percent of online content is in English. A large proportion of the educational software produced in the world market is in English. For developing countries in the Asia-Pacific where English language proficiency is not high, especially outside metropolitan areas, this represents a serious barrier to maximizing the educational benefits of the World Wide Web.

Key Learnings

1. Information sharing and documentation

Information on ICT policy, its implementation in practice and the lessons learnt on the successes and failures, within the region and across the world is very important. Hence, exchange of information related to policy and planning should be encouraged between countries and

communities, for creating more successes and sustainable models of ICT-enabled NFE. Documentation and information sharing on innovations and successful practices, latest developments in hardware, and software should be encouraged between the countries.

2. Formulation of a comprehensive ICT in NFE policy

Although ministries of education around the region and the world have already adopted usage of computers, both for teaching and learning, as well as administration, very few countries have developed coherent policies and strategies to fully integrate the usage of computers and other advanced ICTs as an effective tool of delivering NFE. Further, the holistic approach to adaptation of ICTs, which is looking beyond provision of access, is lacking in the policies developed by many countries. For a policy to be comprehensive enough, it should address the following issues⁷:

- Policies must take into account ongoing capacity building of trainers/teachers in enabling them to effectively use ICT in NFE delivery. Teachers need to consciously redesign learning environments so that students can transfer their newly gained ICT skills to other applications that can be used in an ICT rich environment.
- Most educational policies reflect the need for ICT infrastructure but the need for local educational content is often left out. The development of instructional content-ware remains a neglected area, affecting investments in hardware and resulting in a heavy economic and educational loss.
- The focus of developing countries in this region should be on how ICTs can be used to compensate for the factors that are lacking in NFE, namely, remote learning features including online tutoring, the resources to pay for expensive equipment and others.
- The policy should clearly specify the strategy for dealing with adult education and education for school dropouts

Conclusion

ICT's can be of great use in helping to achieve the goals of Education for All (EFA) and lifelong learning. Its focus should be on reducing digital divide between rural and urban areas and engendering community development and empowerment. ICT tools are very powerful and can go a long way in addressing certain issues like adult illiteracy, education for school dropouts and women empowerment.

The important factors for success of any ICT-based NFE Programme are Community involvement; formulation of a comprehensive policy; sharing of best practices among communities and countries; creating localized content; and constant technology upgradation/responsiveness.

Applications for NFE should be developed within the national framework which will in turn simplify the process of Monitoring and Evaluation. Though Governments will be responsible for overseeing the implementation process, it cannot be solely responsible for rolling out programmes. Corporate entities and communities should be actively engaged in such activities so that the projects remain sustainable in the long run. Finance and human resources are critical to sustain such projects; hence, the community member's involvement is of paramount importance.

⁷ UNESCO survey.

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Information and Communication Technology for Education in India and South Asia



Volume V Methodology

infoDev

PRICEWATERHOUSECOOPERS 

About the Report

The Survey on Information and Communication Technology (ICT) for Education in India and South Asia was commissioned by *infoDev* to be undertaken by PricewaterhouseCoopers, India. The Survey is a third in the series after similar surveys for the African and Caribbean regions completed in 2008 and 2009. The main objective of the Survey is to create a consolidated source of information on the experiences of using ICTs for Education in the South Asian region and to provide a framework of reference for policy-makers.

The survey report is in five volumes, the first Volume is an extended summary which captures the main findings of the survey. Volume II is a series of Country Studies profiling the policy environment and major initiatives using ICTs for education for each of the eight South Asian countries – India, Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka, with a more detailed focus on India. Volume III is a set of Case Studies for India and Pakistan. For India the case studies include detailed studies of ICT initiatives in the education space in five states. For Pakistan the role of ICTs in Open and Distance Education and Teacher Education has been profiled as two case studies. Volume IV is a series of thematic papers that address key issues across the focus countries in an attempt to provide a horizontal, comparative view of the subject in the eight focus countries, with an emphasis on India. The fifth volume captures the details of the survey process including the research methodology, list of interviewees, details of meetings held etc.

Structure of the Methodology

This volume, Volume V of the Survey of ICTs for Education in India and South Asia, seeks to provide a detailed report on the methodology adopted while conducting the survey. It includes - list of documents and websites consulted, list of stakeholders interviewed, details of meetings held and details of workshops conducted.

Overview of Methodology

The Survey has primarily been based on secondary research and is thus not an exercise in primary data collection. For each country we have studied in detail the following category of documents:

- Education Policies and specific schemes
- ICT Policies and specific schemes
- ICT for Education Policies and specific schemes
- Websites and documents of Education Departments, ICT Departments and other related institutions
- Websites and documents of Non Governmental Organizations, Corporations and other agencies active in the education technology space

At the outset of the Survey in August 2009 a stakeholder workshop was conducted to introduce the Survey to a wider set of stakeholders and build a platform for sustained dialogue on the proposed survey. At this stage, a Wiki Profile for the project was created under which all possible information including a bibliography was uploaded and stakeholders were invited to participate and contribute to the survey.

In addition, the research team conducted telephonic discussions, audio and video conferences as well as questionnaire based interviews with over 75 key stakeholders in India and other focus countries. In the case of India, the team also visited several sites where ICT in education initiatives were being implemented. Further, on completion of the survey each country study was circulated amongst key stakeholders in the country to validate the information captured in the study.

Approach

The execution of the survey proceeded through three distinct phases, namely:



1. Design

During the design phase, the overall survey process was mapped out. The team started building a stakeholder database and a bibliography of resources. The format for questionnaires was also finalized at this stage. A stakeholder workshop was conducted to introduce the survey to a wide range of stakeholders. Following the workshop a Wiki Profile was created to invite stakeholders to participate. Details of this phase are given below:

1.1 Initial Stakeholder Workshop

To introduce the Survey to a wider set of stakeholders and build a platform for sustained dialogue on ICT in the education space in India and South Asia, a stakeholder workshop was conducted on August 10, 2009. Apart from discussing best practices, experiences, key constraints and other relevant issues in the use of ICT in education, the survey also sought to finalize the key thematic areas to be covered for the survey and the Indian states that need to be studied in detail. The workshop was attended by a range of stakeholders relevant to the study including government officials, NGO representatives, academia and private companies in the field of content development and capacity building. A list of participants is attached as Annexure I.

1.2 Wiki Profile

Following the initial stakeholder workshop, a Wiki Educator profile for the survey was created (Wiki Educator Link: <http://wikieducator.org/ICT4SouthAsiaEd>). All relevant

information including a bibliography of resources was added on to the profile. The purpose of this exercise was to introduce the survey to a wider set of stakeholders and to provide a sustained platform for interaction between stakeholders. The profile link was shared with a large number of stakeholders and they were encouraged to participate.

2. Execute

After completing the preliminary research and finalizing the thematic topics and sub national level case studies, the team began conducting the secondary research as well as telephonic discussions and questionnaire based interviews with stakeholders. This was followed by preparing the draft Survey Reports and Country Studies. Details of this phase are given below:

2.1 Secondary Research

To gain an overall perspective of the policy framework in the focus countries, the team consulted relevant policy documents and government websites. A detailed list of the documents is attached as Annexure II. Apart from studying the policy framework of the South Asian countries, other documents and websites were also consulted to gain an insight into the socio-economic condition and the ICT and Education scenario of the countries. To study the various initiatives, websites of NGOs, Corporations and other agencies active in the education technology space were visited. As for the thematic essays, documents pertaining to policy coherence in the application of ICTs in education, ICT in school education, capacity building for ICTs in education, gender equity and use of ICT in education and ICT in non formal education were studied in detail.

A bibliography of all resources is attached at relevant sections of the survey reports.

2.2 Stakeholder Interaction

In order to validate the information collected through the secondary research and to broaden our understanding of the use of ICTs in the education space in the focus countries, questionnaire based interviews; telephonic and face to face conversations and audio and video conferences with relevant stakeholders was carried out. In the case of India, the team also visited several sites where ICT in education initiatives were being implemented.

Questionnaire Based Interviews

Questionnaires were sent out to 75 stakeholders in India and other focus countries. The stakeholders included key representatives from the government, NGOs, private companies and academia from schools and other institutions.

Telephonic Conversations and Conferences

Telephonic conversations and audio and video conferences were conducted with key stakeholders when gaps in the survey needed to be filled. The focus of these interactions was primarily to gain a perspective on:

- Current level of policy implementation

- On-ground education technology initiatives
- Common constraints faced by the country in implementing ICT in the education space

Meetings and Field Visits

In the case of India, the team met with many key stakeholders, this was done primarily to substantiate the sub-national level case studies and provide an in-depth analysis of the ICT initiatives implemented at the state level. For the same purpose, the team also visited several sites where ICT initiatives were being implemented.

A detailed list of all stakeholders interacted with and sites visited during the survey process is attached as Annexure III

3. Report

At this stage, after drafts of the survey reports had been finalized, a stakeholder workshop was organized on April 21, 2010 to present the drafts to key stakeholders. The workshop opened with a presentation on the key findings of the survey after which the floor was opened to questions. Drafts of the survey reports were then circulated amongst the attendees to get their feedback. Relevant sections of the reports were also circulated amongst key stakeholders in the South Asian countries to validate our findings. After receiving feedback from the stakeholders, the drafts were edited and the final survey report was submitted.

Annexure

Annexure I: List of Participants for Initial Stakeholder Workshop - August 10, 2009

	Name	Designation	Organization
1	A. S Seetharamu	Domain Expert	PricewaterhouseCoopers
2	A.N Ramachandra	Deputy Commissioner (Training)	Navodaya Vidyalay Samiti
3	Ajay Goel	Senior Vice President	National Institute for Information Technology Ltd.
4	Anshul Sonak	South Asia Education Manager	Intel –Intel Teach Program
5	Archana G Gulati	Deputy Director General	Universal Service Obligation Fund Administration
6	Ashish Garg	Asia Regional Coordinator	Global e Schools and Communities Initiative (GeSCI)
7	Brij Kothari	Professor	Indian Institute of Management (IIM) Ahemdebad
8	H. N. S. Rao	Academic Head - ICT	EDU-COMP Solutions Pvt Limited
9	I.P.S Bakshi	Director	National Literacy Mission
10	K.N. Bawle	Director	State Resource Centre –Pune
11	M.S Khanna	Joint Commissioner (Personnel)	Navodaya Vidyalay Samiti
12	Manjushree Reddy	Assistant Editor	Centre for Science, Development and Media Studies
13	Motilal Sharma	Domain Expert	PricewaterhouseCoopers
14	Nalin Jena	Sr. Education Specialist	World Bank
15	Pradeep Valsankar	Consultant	World Bank
16	Rajeshree Dutta Kumar	Sr. Research Associate	Centre for Science, Development and Media Studies (CSDMS)
17	Ravi Gupta	Executive Director	Centre for Science, Development and Media Studies (CSDMS)
18	Sandeep Saha	Vice President – Marketing and Alliances	Educational Initiatives (EI-India)
19	Sanjay Tiwari	Regional Director North	Education Development Center, EDC India
20	Tenzin Dolma Norbhu	Regional Coordinator and Senior ICT Policy Specialist	World Bank

Annexure II: Policy Documents Consulted**India**

- Education Policy (1992)
- National Policy on ICT in School Education (draft)
- Guidelines on ICT @ School Scheme

Afghanistan

- National Education Strategy Plan (NESP), 2006-2010
- Information and Communication Policy (2003)

Bangladesh

- National Education Policy (draft)
- National ICT Policy (2009)
- Community Radio Installation, Broadcasting and Operation Policy (2008)

Bhutan

- 26th Education Policy Guidelines and Instructions (EPI -2007)
- Bhutan information and communications technology policy and strategies (BIPS 2004)

Maldives

- Seventh National Development Plan (2009-2010)
- Strategic Action Plan (2009-2013)

Nepal

- IT Policy (2000)

Pakistan

- National Education Policy (2009)
- National IT Policy (2000 –revised 2008)
- National Information and Communication Technology Strategy for Education (NICTE)

Sri Lanka

- National Policy on Information and Technology in School Education (NAPITSE)
- The Information and Communication Technology Agency (ICTA) of Sri Lanka: “ICT act no.27”

Annexure III (a): List of Stakeholders Contacted

Name	Designation and Organization
A.N Ramachandra	Deputy Commissioner Training, Navodaya Vidyalaya Sangathan, (NVS), India
A.R. Rangaswamy	Officer in charge for Radio Programs - DSERT, Department of State Educational Research and Training (DSERT) , Karnataka, India
Abhishek Gupta	Coordinator, Hole-in-the-Wall Education Ltd, (HiWEL), India
Aimal Marjan	Director General ICT, Ministry of Communications and IT, Islamic Republic of Afghanistan
Ajay Kapur	Director, Oracle Education Foundation, Oracle, India
Ajay Mohan Goel	Sr. Vice President - Corporate Development, National Institute of Information Technology, (NIIT), India
Ameena Mohamed Didi	Education Specialist, UNICEF, Maldives
Anoop Singh Rawat	State Coordinator (Rajasthan), Learning Links Foundation representing Intel, India
Anshul Sonak	South Asia Education Manager, Intel
Anthony Lobo	Senior Manager (HR & OD), Tata Consulting Services (TCS), India
Archana G Gulati	Deputy Director General, Universal Service Obligation Fund Administration, India
Ashish Garg	Asia Regional Coordinator, Global e-Schools & Communities Initiative (GeSCI)
Biswajit Das	District Coordinator, IL&FS Education and Technology Services Ltd., West Bengal, India
Brij Kothari	Professor, IIM Ahmedabad, India
Debojyoti Basu	Assistant Manager, IL&FS Education and Technology Services Ltd., West Bengal, India
Devaprakash	Joint Director, Department of State Educational Research and Training (DSERT), Karnataka, India
G.M.Niel Gunadasa	Director of Education, ICT Branch, Ministry of Education, Sri Lanka
Gauri Arora	Lead – Corporate Citizenship, Microsoft India, India
H. N. S. Rao	Academic Head - ICT, EduComp, India
Habib Khan	Academic Program Manager, Microsoft Corporation, Pakistan
I.F. Magi	Special Officer, Department. of Education, Government of Karnataka, India
I.P.S Bakshi	Director, National Literacy Mission, Government of India
Jawaid Ghani	Chairman, Punjab IT Board (PITB), Government of Punjab, Pakistan

Jayaramu	Department of State Educational Research and Training (DSERT) , Karnataka, India
Joudat Ayaz	Head, IT Labs Project, Government of Punjab, Pakistan
K.N. Bawle	Director, State Resource Centre –Pune, Government of India
Karma Jurmi	Senior Program Officer for School IT Program, Department of School Education, Ministry of Education, Bhutan
Ken Maskall	Maldives Representative, UNICEF
Kishwar S Sayeed	Director, Bangladesh Rural Advancement Committee, (BRAC), Bangladesh
Krishna Nagaraju	Strategic Account Manager, National Institute of Information Technology (NIIT), India
Linson Joseph	Channel Platform Manager, Intel, South Asia
M M N D Bandara	Secretary Department of Education, Ministry of Education, Sri Lanka
M.S Khanna	Joint Commissioner, NVS, India
Manjulika Shrivastav	Director – Distance Education Council, Indira Gandhi National Open University (IGNOU), India
Manjushree Reddy	Assistant Editor, Centre for Science, Development and Media Studies (CSDMS)
Martin Hadlow	Project Manager for upgrading ERTV, UNDP, Afghanistan
Matthew Kam	Project Leader, Mobile & Immersive Learning for Literacy in Emerging Economies (MILLEE) project, Carnegie Mellon University
Mohammed Salim Hayran	Director of ICT, Ministry of Education, Islamic Republic of Afghanistan
Monali Handa	Manager, Ncomputing, India
Monika Talwar	Manager of ICT, EduComp, India
Nadya Karim Shaw	Project Director for Dot- EDU India, Education Development Center (EDC), India
Nalin Jena	Sr. Education Specialist, World Bank, India
Nasreen Khader	Manager, Learning Links Foundation, Andhra Pradesh, India
Naveed Malik	Rector, Virtual University, Pakistan
Neeraj Aggarwal	Head, HiWEL, NIIT, India
Nisha Dua	Senior Manager Education, Learning Links Foundation - representing Intel, India
Nived Dinesh	Head - Content Licensing and Development Services, Edurite India
Nuzhat Kidvai	Education Technology Consultant, Beaconhouse School System, Pakistan
P Rajendran	Chief Operating Officer, National Institute of Information Technology (NIIT), India

Pradeep Valsankar	Consultant, World Bank, India
Pranata Dhar	Officer, IL&FS Education and Technology Services Ltd., West Bengal, India
Prit Singh	Principal, Jawahar Navodaya School, New Delhi
Purnendu Hota	HiWEL, Rajasthan, India
R.G.Nadadur	Principal Secretary, Primary & Secondary Education, Department of Education, Government of Karnataka, India
Rabi Karmacharya	Executive Director, Open Learning Exchange, Nepal
Rajeev Katyal	Director ,Education, Microsoft
Rajeshree Dutta Kumar	Sr. Research Associate, Centre for Science, Development and Media Studies (CSDMS)
Rathindranath De	Director, State Council of Educational and Research and Training (SCERT), Government of Andhra Pradesh, India
Sandeep Saha	Vice President –Marketing and Alliances, Educational Initiatives, India
Sanjay Tiwari	Country Director, Education Development Center (EDC), India
Satya Narayanan	Fellow, American Indian Foundation, Karnataka, India
Saurav Dev Bhatta	Education Director, Open Learning Exchange, Nepal
Shabnam Aggarwal	Project Manager, MILLEE
Siddhartha Mukherjee	Advisor (Education & Training Services) West Bengal Electronics Industry Development Corporation Limited, India
Sidhartha Roy	Executive Director, Response India Pvt. Ltd., West Bengal, India
Somit Shrivastav	Education Officer, Kendriya Vidyalay Sangathan (KVS), India
Sukumar Anikar	Head, Technology for Education, Azim Premji Foundation, India
Sundar Krishnan	American India Foundation, India
Suwendu Chatterjee	Managing Director, Techno Teaching Info Solution Pvt. Ltd., West Bengal, India
Tarj Gunasekara	Assistant Director General, National Institute of Education, Sri Lanka
Tenzin Dolma Norbhu	Regional Coordinator and Senior ICT Policy Specialist, World Bank
Tshewang Tandin	Director, Department of School Education, Ministry of Education, Bhutan
V.K Sharma	Project Manager Centre for Development of Advanced Computing C-DAC, India
Vinay Mehra	Regional Education Manager, Learning Links Foundation - representing Intel, India

Annexure III (b): Details of Sites Visited

1. Achana High School

The team visited Achana High School in West Bengal, India. The school is located in the district of South 24 Parganas with around 800 students. Achana High School is one of the 17 schools where the ICT in education initiative - 'KYAN' has been successfully implemented.

The team had an opportunity to meet the head master, Mr. Rai and the teacher at the Computer Division, Mr. Mritnunjaya.



Figure 1: Front View of Achana High School



Figure 2: Achana High School

2. Jawahar Navodaya Vidyalaya, Mungeshpur

Jawahar Navodaya Vidyalaya (JNV) schools are a cluster of 576 schools spread across the rural areas of the country. The JNV School in Mungeshpur, like most other JNV schools has integrated a number of ICT facilities. During the field visit to the school, the team had an

opportunity to interact with the principal, teachers and students and gain their view point on the ICT facilities offered at the school.



Figure 3: Computer Classroom of JNV Mungeshpur

3. NIIT, Hole-in-the-Wall Learning Stations

Hole-in-the-Wall Learning Stations are effectively computer kiosks which are located in government school playgrounds. The team visited three schools where these learning stations were embedded in government school walls. The team also spoke to the facilitator present at the stations and the children who were using the kiosks.



Figure 4: Hole-in-the-Wall Learning Station, Madanqir



Figure 5: Hole-in-the-Wall Learning Station, R.K Puram

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