Information and Communication Technology for Education in India and South Asia

Volume I
Extended Summary

infoDev

PRICEWATERHOUSECOOPERS

Contents

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 *info*Dev 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	• 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	• 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	• 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)	• 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	• 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	• Use ICT for capacity building of teachers • Develop an Education Management System (EMIS)
ICT Policy	2003	• 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	• 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	• 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	• 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	• 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	• 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 Librariers) 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	• 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	• 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	• 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)	• 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	• 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	• 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	• 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	• 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	• National Information Technology Centre
Ministry of Information and Communications	Formulating and implementing the rules, regulations and policies pertaining to telecommunications, and broadcasting,	• 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 polices 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	• 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	• Federal Directorate of Education
Ministry of Information Technology	Planning and coordinating projects and programmes pertaining to ICT	• Electronic Government Directorate • National Telecommunication Corporation • Pakistan Computer Bureau
Ministry of Science and Technology	Formulating policies and supervising scientific and technological programmes	• 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	• 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)	• 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	• 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	• University Grants Commission
Ministry of Science and Technology	Formulating and implementing the policies pertaining to science and technology	• 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 educations 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 oer 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	• 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 USESCO 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		

organization using Same Language Subtitling (SLS) on several song based TV programs to inculcate reading skills for the masses	broadcast informative and inspiring programs for children who have been deprived of education for various reasons		
	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		

Maldives	Nepal	Pakistan	Sri Lanka
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	**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	**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	**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

	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	**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	**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.
	Rural Information Centres Rural tele-centres are to be established to provide information on distance education, agriculture and telemedicine		**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

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.

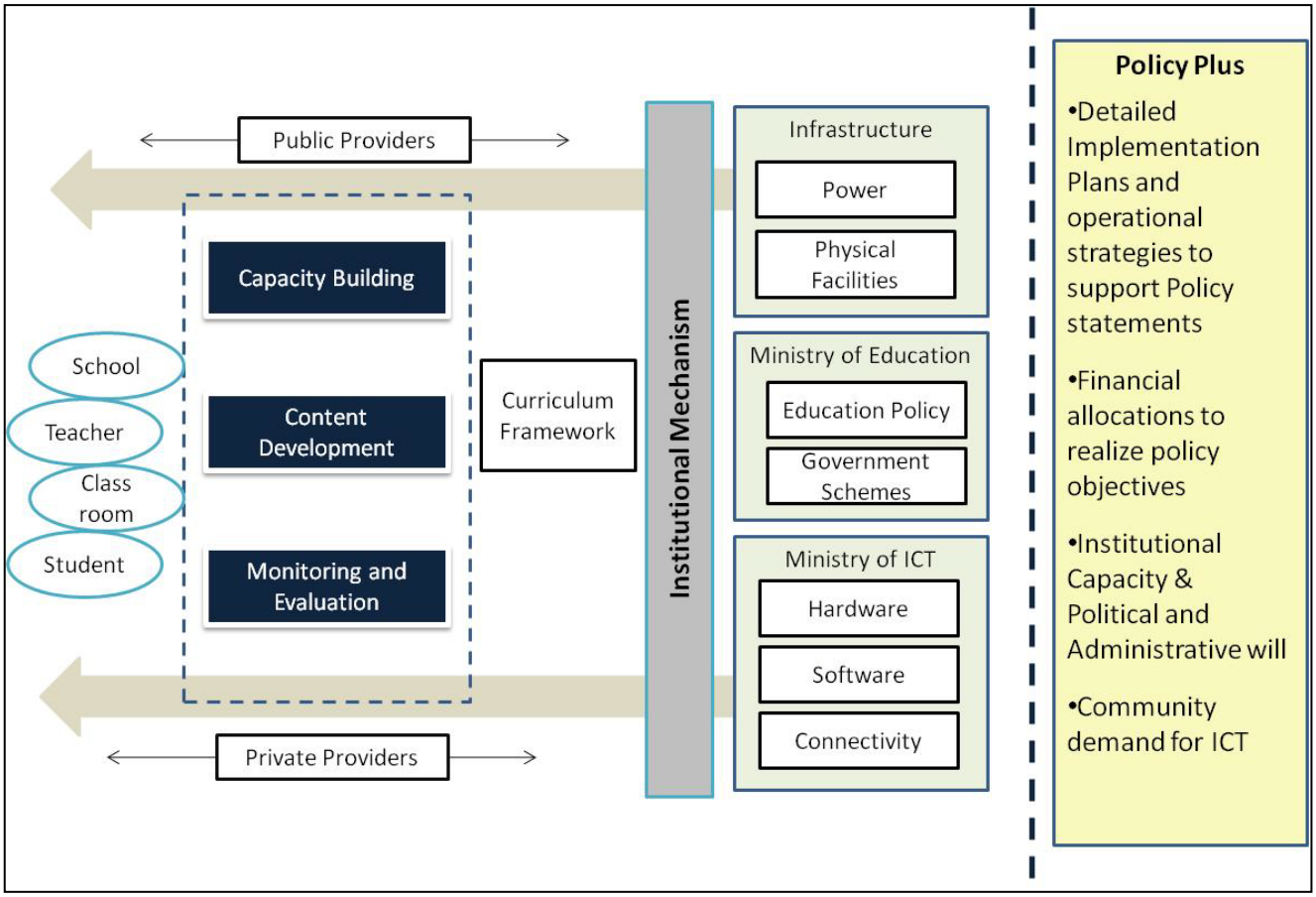
The second perspective is that of the e learning paradigm. The e learning paradigm is in effect a response to the needs of the so called emerging 'knowledge society', where ways of learning and applying that knowledge are changing at a fast pace. It reflects the requirements of 21st Century teaching 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 I 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, Nenasa 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 Tele-centres 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 is is acknowledged that tele-centres 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 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.