

ICT as an enabler of Socio-Economic Development

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Abstract: *Today's is a world of many divides, one of the most typical being the Digital Divide which in itself has given birth to or is worsening other economic and social divides. In this world more suffer and less are able to benefit from technology. This paper fosters the importance and need of international cooperation for use & promotion of Information and Communication Technologies for Development (ICT4D) trying to bridge the digital divides within countries, regions and the world. The concept of "Information Society" has made it imperative that no country can develop without involving & focusing on regional and global development perspectives. Collaboration has become the key word. When we talk of integrated socio-economic development, it takes into account many areas which can benefit from faster access and enhanced productivities by using ICT in each of these. Some case studies on use of ICT for different initiatives within Pakistan are reviewed and conclusions drawn on how it does support the socio-economic development, which may be similar and bear lessons for many developing countries.*

Keywords: Digital Divide, Digital Opportunity Index (DOI), ICT for Development (ICT4D), ICT Policy, International Cooperation

Introduction

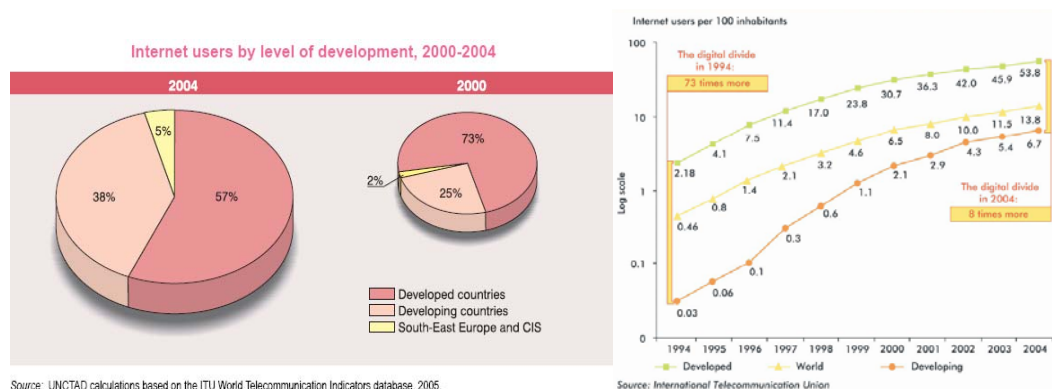
A formal definition of IT terms it as a broad subject concerned with technology and other aspects of managing and processing information and that it deals with the use of electronic computers and computer software to convert, store, protect, process, transmit, and retrieve information¹. The term Information and Communication Technologies (ICT) was coined to reflect the seamless convergence of digital processing and telecommunications. As commonly perceived it is not limited to the modern hi-tech gadgets or networks. In fact, the ICTs have been in use since long for instance postal services and radio as communication mediums to transmit information even to very remote places. For ease of use, we can divide these into old and new ICTs wherein the former one includes Radio, Television, Telephone, Fax, Telegram, etc while the later

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¹ Online available at: http://en.wikipedia.org/wiki/Portal:Information_technology

comprises of data networks, e-mail, World Wide Web (or internet) and cutting-edge wireless & wire line technologies.

Digital divide is the uneven diffusion of technology and inequality in access to technologies with significant social, economic and political consequences. These may



(a)

(b)

Figure 1 : Internet Users by level of Development & the trends of the digital divide²

exist between rich and poor countries, rural and urban areas, men and women, skilled and unskilled citizens and large and small enterprises. There are many reasons for the creation of these divides but this is certain if these are not taken care of immediately, the situation for some will keep on worsening till the economies collapse. A snapshot of the digital divides is provided in Figure 1 (a) and (b) for ready reference.

Digital Opportunity initiatives (DOI) on the contrary are the efforts to bridge the digital divide. The paper primarily focuses on importance of international cooperation in ICT to bridge these digital divides at country, regional and global level. This is utmost essential for an overall sustainable socio-economic development process.

The topic is very broad and the complete picture requires many aspects to be reviewed. As much work has already been done in these directions I have only focused on the International Cooperation on ICT for Development referring necessary literature in other related areas for reader's interest.

In the first section some views in ICT4D and International Cooperation are summarized seeking references from the contemporary research and findings. Second section targets at explaining the country situation of Pakistan delineating its IT & Telecom industry status as well as e-Readiness status. This may serve as a brief reference for the current county position on IT & Telecom industry. Using this case, I have tried to raise some questions reinforcing the need for applying an overall long-term cross-cutting approach

² Figures from UNCTAD Information Economy Report 2005 and ITU publications

to ICT for development in all sectors. In the third section, International Cooperation in ICT with Pakistan has been deliberated using many case studies.

Drawing the conclusions, it is made clear that without a strategic integrated approach it will be difficult to receive full benefits and prosperity of ICT driving the socio-economic development. After all, technology is a means and not an end. International partners and support is vital for funds, to shorten the development cycle and to avoid the pitfalls. A reference model is drawn for developing countries for ICT4D identifying inputs, outputs, tools and enablers for the broad based development.

1 ICT for Development

1.1 A tool for socio-economic development

Hargittai and other studies have shown that the rate of IT diffusion is correlated to the general level of socioeconomic development. [1] A most recent finding is that ICT plays a vital role in advancing economic growth and reducing poverty. A survey of firms carried out in 56 developing countries finds that firms that use ICT grow faster, invest more, and are more productive and profitable than those that do not. 3

Dabla has made comprehensive literature references enticing the relationship between ICTs and Socio-Economic Development. [2] Similarly, Jeremy Grace et. al have deliberated the characteristics and forces in ICTs which can play a pivotal role in the economic growth of a country.[3]

These results tend to indicate that to achieve IT induced development, developing countries will have to wait until they cross the hub of per capita income growth and human development. Hence, developing countries are trapped in the vicious circle of low per capita income that leads to a low level of IT diffusion, resulting in turn in low per capita income and growth. [4] The same is verified by Hargittai in his study about the Internet diffusion in OECD countries. [1]

ICTs can be used to directly influence the productivity, cost effectiveness and competitiveness in industries, which is the advantage developing countries can build their economies upon. Catching up on developed economies in terms of application of technology and resulting economic benefits had never been that easier. On the other hand, the results for not being able to adopt ICTs can also be disastrous.

As noted by the Noeleen Heyzer, Executive Director, United Nations Development Fund for Women ⁴

³ A summary of the world bank publication published by IFC, "Information and Communications for Development 2006: Global Trends and Policies" includes the key findings.

⁴ Online available at: <http://www.idrc.ca/IMAGES/ICT4D/PanAsia/PAN/chap4.html>

“If you look at the opportunities and the threats which exist in the context of globalization, information technology can become a tool of either decreasing the inequalities that already exist in the world or increasing it”.

1.2 Means but not an End

People do not need word processing to survive, but they may want efficient ways of sharing information about livelihoods and employment. ICTs for human development are not about technology, but about people using the technology to meet some basic need. Understanding human requirements takes time and effort. User needs assessments are essential in planning the introduction of ICTs to communities, no matter what their status or HDI.⁵

1.3 Knowledge as a Competitive Advantage

The advantages of previous decades, i.e abundant natural resources or cheap labour are no more the advantages in the newly emerging “Information Society” or “Knowledge Economy”. While presenting his ideas on knowledge society, Drucker had already pointed out developing countries can no longer expect to base their development on their comparative labour advantage. The competitive advantage that now counts is the application of knowledge.⁶

Unfortunately, the brain drain is the result of non-recognition of the importance of knowledge and knowledge workers by developing countries as a result of which the divides are widening further and some of these least developed nations (LDCs) further losing their competence and to be advantage.

1.4 Approaches to develop ICT Strategy

Taking an example from ICT strategy of Pakistan, Mujahid has shown the comprehensive approach Government of Pakistan has adopted covering all the short-term and long-term growth objectives.[5] ⁷ As depicted in Figure 2, the sectoral approach focuses on developing a country’s economy by using IT as a production or sector, hence in short term the human resources as inputs and markets to absorb the outputs are required for success. Both of these are addressed through numerous strategies for industry promotion, incentives for investors, training and development of human resources etc. However, the other approach focuses on the long term goals and objectives of the country which obviously are an economic and prosperous Pakistan. Here the country needs to take up the challenge of raising, feeding, educating and providing economic opportunity for a large population satisfying the 18 targets set

⁵ Views extracted from , Elsevier, UNDP-APDIP, *ICT Policy Formulation and e-Strategy Development*, 2005, p.4

⁶ Drucker, Peter (1994), talks on Knowledge Society

⁷ Paper also available at <http://unpan1.un.org/intradoc/groups/public/documents/APCITY-/UNPAN005832.pdf>

under 8 Millennium Development Goals. Medium Term Development Framework 2005-10 of Government of Pakistan is clearly in line with these goals. For this, many cross-cutting strategies across various sectors are devised keeping in view ICT as a means only for improving the efficiency of planning, executing and monitoring of the projects for that sector hence delivering the end-objective. Also, the economic opportunities may be enhanced by more and faster access to information.

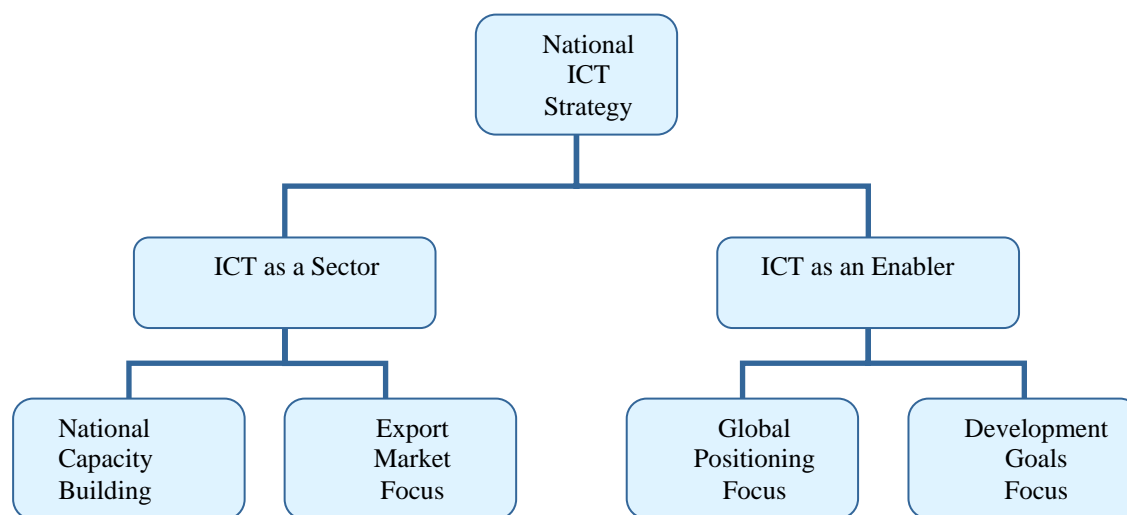


Figure 2: ICT Strategic Topology of Pakistan

This is called the enabling approach where ICT is diffused into masses at all levels enabling maximization of benefits and welfare. In Pakistan's case the sectoral approach has been combined with the diffusion or enabler approach to maximize benefits of economic growth in the short term without trading-off the sustainability of the same in longer run.

The ICT vision and strategy should focus on people and not just on technology. For this to happen, it is important to develop both the ICT vision and strategy with people in mind and with the involvement of these very same people. This sometimes in turn will require awareness. While planning and implementing an ICT agenda, it is helpful to take a look at established practice. Should the national ICT agenda be sector driven or should it focus on broader issues and objectives, on benefits for society and the economy as a whole.

Many ICT strategies adopt a sectoral approach to ICT implementation. The Digital Opportunities Initiative (DOI) report clearly states that while there are many types of strategies that various countries have evolved to develop ICTs, evidence suggests that

an integrated approach to ICT development and deployment is most likely to yield success in human, social and economic development over the longer term⁸.

2 The case of Pakistan

2.1 Basic Facts

Pakistan is situated in South Asia with borders meeting India, China, Afghanistan and Iran. Covering an area of 803, 940 sq. km it has a population of near 150 million. Literacy rate is around 42.5 % including the national language Urdu literacy. English language literacy is around 20%. Per capita income is around 680 US\$ which has remained near US\$400 till few years back. The GDP growth rates were 8.3% and around 6.5 % respectively for the years 2004-05 and 2005-06.⁹

Like many other countries, IT is being considered as a source of economic growth and faster competitive advantage in Pakistan as well. Government of Pakistan has focused on ICT as one of the four priority areas which are selected to integrate the country into the global information economy.

A special note to be made of before going on is that IT and Telecommunications industries are distinctly defined in Pakistan:

IT Industry generally refers to the computer software, systems design and development and services provisioning. Software Industry and Hardware industry are also further classified.

Telecom industry stands for provisioning of all fixed and wireless telecommunications and data communications services, the infrastructure for same and manufacturing of telecommunications equipment. The status of Telecommunications as a separate industry/sector was formally announced during 2004 by the Government.

2.2 IT & Telecom Policies

A status and of IT & Telecom Policies is included for reference chronologically. Most of the documents are available freely from the Ministry of IT, Pakistan Telecommunications Authority or their attached departments' websites.

- Pakistan Telecommunication Reorganization Act 1996
- IT Policy & Action Plan 2000
- De-Regulation Policy July 2003 (fixed and mobile)
- Mobile Cellular Phone Policy in January 2004
- Telecom recognized as industry in 2004

⁸ Referred from Accenture, Markle Foundation and UNDP, Creating a Development Dynamic, Final Report of the Digital Opportunities Initiative, New York, 2001.

⁹ Further detailed country facts, economic position and other information can be sought from the Federal Bureau of Statistics website available at <http://www.statpak.gov.pk/depts/index.html>

- Broadband Policy 2004 approved and issued
- e-Government Strategy 2005
- GMPCS Guidelines issued in 2006
- Access Promotion Contribution (APC)
- Universal Service Fund (USF) in place
- National R & D Fund in place, contributions by telecom operators
- Number Portability in final stages of being operational
- e-Crimes Act enacted
- Data Protection and e-Signatures Bill and IPR Legislation under improvement

After introduction of the IT Policy and Action Plan 2000, Pakistan has aggressively followed the goals set for Human Resources Development, Industry Development, Infrastructure Development and Strengthening and e-Governance. Hundreds of short range (1-3 years) projects and tens of long-range (more than 3 years) projects were included in the Public Sector Development Programme (PSDP) since 2000-01 onwards in the mentioned areas. Some of these are fully or partially funded by donor agencies or other countries.¹⁰

With a large pool of trained and English-Speaking human resources available, Government of Pakistan (GoP) is looking forward to tap into a larger international IT-based services market like Business Process Outsourcing (BPO), Back-office processing and Customized Application Development (Out-sourcing) with very ambitious targets of \$ 1 billion exports.¹¹

2.3 Overview of IT Industry

The size of Pakistan's IT industry is about US \$ 700 million, with annual software industry turnover of about US \$ 70-80 million. During the fiscal year 2003-04, more than US \$ 200 million were invested by the financial services sector into IT products and services. Furthermore, the total value of some of the ongoing large IT projects of the public and private sector organizations exceeds US \$ 100 million. Software industry is experiencing an annual growth of 40% to 50 %.

The IT professional services (ITPS) industry generates direct employment for over 120,000 people. The total number of IT professionals, call center agents and the

¹⁰ Depending on their type, these projects are hosted at Ministry of IT (www.moitt.gov.pk), Ministry of Education (www.moe.gov.pk) Higher Education Commission (www.hec.gov.pk), Pakistan Telecommunication Corporation (www.ptcl.com.pk), National Telecommunications Corporation (www.ntc.gov.pk), Special Communications Organization (www.sco.gov.pk) the respective beneficiary ministry or attached department. However, majority of IT Projects are being implemented through e-Government Directorate (www.e-government.gov.pk), Pakistan Software Export Board (www.pseb.org.pk), Pakistan Computer Bureau (www.pcb.gov.pk) or by Ministry of IT directly. Federal, Provincial and District Governments and/or Ministries are also involved wherever they are a direct stake holder.

¹¹ Data in this section and next on IT Industry is compiled from Pakistan Software Export Board <http://www.pseb.org.pk> and some internal documents

employees working in other BPO segments in the country is estimated at 75,000, 3,500 and 2,000 respectively.

The number of IT graduates produced each year is 5,500 and there are 45 universities offering IT/computer science programs. The population of people who can understand and communicate in English with varying levels of skills is about 6.5 million.

There are total of 700 IT companies with valid registration in Pakistan. The number of companies providing other BPO services like medical and legal transcription, engineering services, etc, is about 20. The number of ISO 9000 certified IT-BPO companies is around 100. There are seven companies with Capability Maturity Model (CMM) certification.

Number of IT companies working in Pakistan	700
IT and ITeS Exports during 2004-2005	US\$ 48.50 million (transacted through SBP)
Percent growth in Exports	45% over Fiscal Year 2002-2003
Export target for the current fiscal year 2005-2006	US\$ 72 million (State Bank transactions)
Annual Software Industry Turnover	Around US\$ 70-80 million
Number of IT graduates produced per year	About 5,500
Number of Universities offering IT / CS programs	45
Total number of IT professionals employed in the country	95,000
Annual IT Market	> US\$ 800 million with growth rate 30%

Table 1: Indicators of Pakistan's IT Sector

Based on the talent pool in Pakistan and the types of work already in progress, Network Security (Monitoring and Management), Telecommunications, Call Center, Banking and Investment, Insurance, eCommerce/Online Retail, Finance and Accounting, Healthcare (incl. Medical Transcription, Billing and Claims Processing), Mortgage and Other Financial Services, Hospitality and Travel, Engineering Design and Petroleum are some of the matured BPO services, in addition to software development.

Amongst its strength can also be counted the fact that Pakistan is becoming known internationally as a country with IT capability, although of moderate quality and quantity. The available tax and other incentives are also at par with the concessions available in the major outsourcing destinations.

Although hardware manufacturing facilities exist in the public sector for a longer time to serve the strategic projects, private sector investments are not significant enough to

strengthen the industry, so hardware manufacturing industry in Pakistan is in fledgling stages. Massive investments in infrastructure by public and private sector in telecommunications and data communications have made the latest cutting-edge technologies and services available but their manufacturing is not indigenized. Machinery and equipment is one of the areas where Pakistan spends the most.

2.4 Overview of Telecom Industry

The vision of the IT policy adopted by the government in year 2000 focused on harnessing the potential of IT as a key driver for Pakistan's sustainable economic development. Massive efforts and investment has been put in for accelerating the development of the country's ICT infrastructure. Further, the de-regulation policy 2004, cellular policy and broadband policy all promulgated in 2004 have entirely changed the scene introducing ferocious competition, raising tele-density by many times, cutting down prices yet maintaining QoS.

The telecom market in Pakistan is facing a continuous expansion at an explosive rate during the past few years. In just three years the total tele-density has jumped from 7 % to more than 24%. Although typical of a developing country the major contribution comes form cellular market where the number of subscribers has increased from under 3 million in 2003 has crossed 30 million mark in 2006. The fixed line tele-density is still low although increasing at good rates after the introduction of CDMA-WLL phones by LDI license holders.

Years	Total Teledensity
2000-01	2.80
2001-02	3.66
2002-03	4.31
2003-04	6.25
Dec-05	17.78
March-06	21.59
April-06	23.07
May-06	24.43

Table 2: Tele-density (Mobile + Fixed)

Total tele-density indicators (number of subscribers per 100 populations) and number of cellular subscribers for Pakistan are presented in Tables 2 and Figure 3 respectively. Currently, there are 6 cellular companies all employing GSM technology.

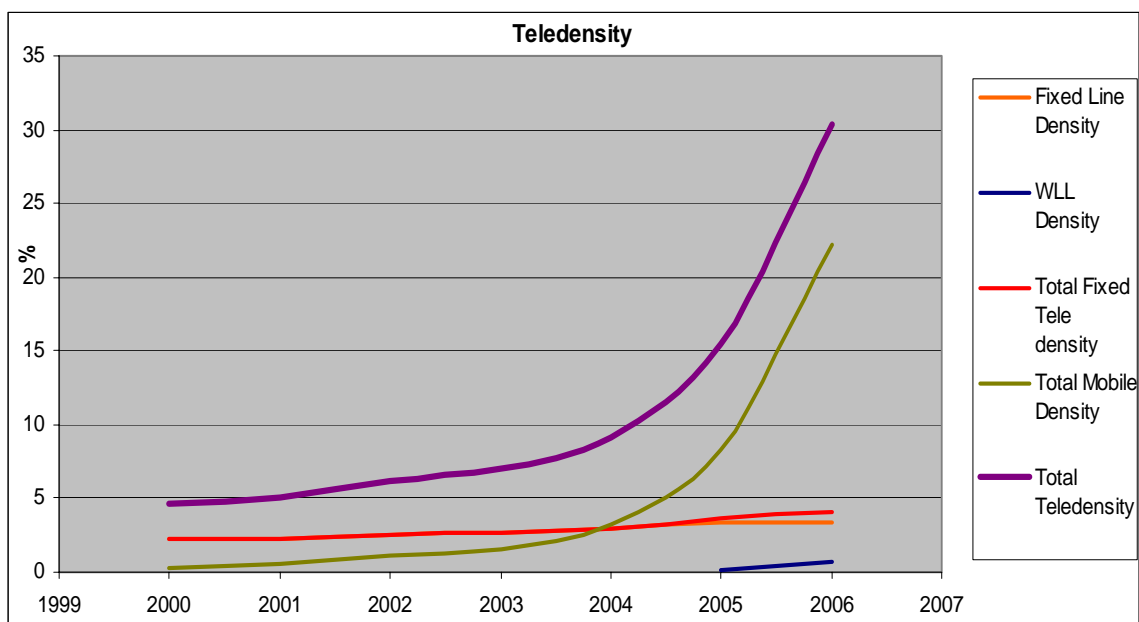


Figure 3: Trends for growth in Tele-density

Growth in Foreign Direct Investment has demonstrated the strength and potential of contribution by the ICT sector into economic growth of the country (See Table 3).

Years	Total FDI	FDI in Telecom Sector	Contribution in Total FDI (%)
2001-02	484.7	6.1	1.26
2002-03	798	13.5	1.69
2003-04	979.9	207.1	21.13
2004-05	1524	494.4	32.44
2005-06 (Jul-Mar)	2224.7	1007.6	45.29

Table 3: Foreign Direct Investment in Telecom Sector (US \$ million)

PTCL was privatized in January 2006 and UAE based Etisalat has taken over the management control during April 2006. At the moment, there are 6 Cellular Operators including Mobilink, Ufone, Paktel, Telenor, Warid Telecom and Instaphone. All employ GSM technology.

Besides multinational giants like Siemens, Alcatel, Nortel, Ericsson, ZTE, Huawei Technologies are present in the country and very actively contributing to the design and deployment of next generation technologies for the new entrants. ZTE is into active research on NGN technologies with huge R&D centre in Islamabad.

At the end of first phase of de-regulation the issuance of 2 new mobile licenses, 12 Long Distance and International (LDI), 76 Fixed Local Loop (FLL) and 92 Wireless Local Loop (WLL) licenses has been completed. 2G, 2.5 & some 3G services are widely being used in the country including WAP, SMS, and GPRS. There are around 2.5 million PCOs in the country.

2.5 ICT Diffusion and e-Readiness

The metrics and data on the situation of IT diffusion available from different sources indicate a poor status and readiness on the use of ICTs. On ITU's ICT Diffusion Index among 180 nations it has moved down from 152nd position to 165th between the years 1997 to 2004. The Digital Access Index rates Pakistan at low access of 0.24 during 2004.

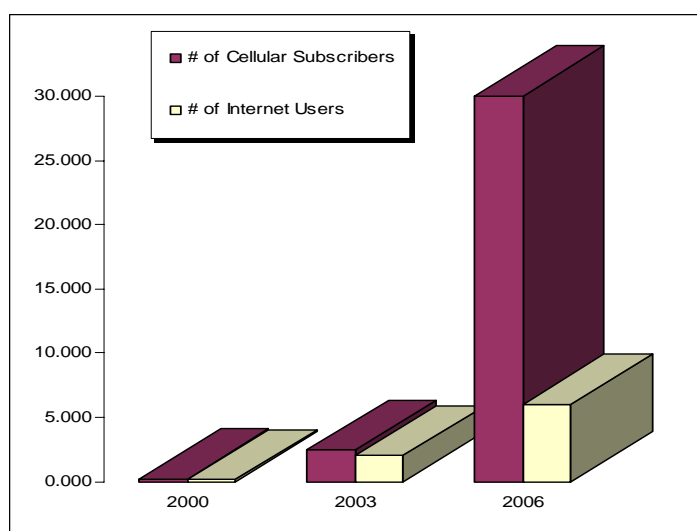


Figure 4: Trends for growth in Mobile and Internet Penetration

The Internet is being used widely for business communication and individual use. The Universal Internet Access Plan has dramatically helped the number of cities connected to the internet backbone from just 32 towns in 2000 to more than 2000 towns in year 2006. There are more than 6 million internet subscribers while it is a guestimate that the real number of subscribers is way up 10 million at the moment. The use of broadband services has started to grow in homes and offices located in major cities. This trend is expected to accelerate.

The initiatives to develop local online content and promote the use of local languages online also gained momentum. There will be a case study included on the Centre for Urdu Language Processing (CRULP) and their achievements in the Case studies section so it is not covered here in detail.

3 International Cooperation in ICT

3.1 Why is it important?

International Cooperation is important for many reasons, primary of which are:

- a) It is helpful in making funds & financing available, which is the most challenging part for most of the developing countries, i.e resources
- b) The beneficiary can start higher on the learning curve, hence avoiding common pitfalls of developing and applying technologies
- c) Collaboration & knowledge retention is made possible
- d) Better project management & tracking is possible. Many public sector development projects fail to achieve their objectives for the reasons of bureaucratic lethargy, limited knowledge and skills or corruption.

3.2 Issues of international cooperation in ICT

International Cooperation is not without its issues. I have tried to identify the most common ones:

- a) Conflicts on projects involving policy: Sometimes there is a conflict between public servants and the project management organization (if it is from the cooperating agency) on policy issues or for projects which significantly involve policy development and revision
- b) Private sector sometimes wants direct benefits: Private sector comprised of for-profit organizations sometimes clearly or invisibly wants the return on investment. Making contributions or training individuals require the use of a particular set of technologies. That is also one of the main reasons behind growth in usage of Open Source Soft wares for public sector use.
- c) Lack of local expertise in project management: Sufficient or up-to date project planning, tracking and control skills are usually not available in the beneficiary countries.
- d) Lack of local research & content: This is one of the most significant hurdles in improving the access and awareness.
- e) Social & cultural settings: The effective people among target communities and populations react unpredictably and sometimes negatively to the cooperating partners and their efforts under different religious, cultural, social behaviors and sometimes personal interests.

Tipson and Fritelli have noted that “despite their critical role in facilitating the application of ICTs to development problems, the role and contributions of enterprises outside of national boundaries are seldom directly incorporated into national strategies. While international organizations, multilateral and bilateral donors, multinational corporations and NGO’s may play important, even indispensable roles in national development programs, most resist long-term commitments that reduce their independence or otherwise link them with domestic political agendas. Often they also

insist on special relationships or public profiles that distinguish their involvement from other outside participants. For their part, national leaders are often reluctant to specify roles for outside entities that might suggest dependencies or otherwise add to the powerful leverage already exerted by global enterprises. As a result, while outsiders are eager to give advice or offer criticism of national strategies, they seldom participate as effective collaborators in the formulation of national initiatives.”

They further explain “because the priorities and preferred approaches tend to shift over time with changes in leadership or in the layers of political and parliamentary supervision (as well as the changes in “fashion” among development strategists), there can sometimes be a tentative and fitful quality to the behavior of donor agencies. One practical consequence is that few agencies are willing to assume subordinate roles or commit themselves to long-term support. But another consequence is that “strategies” formulated by national governments are often more akin to “donor catalogues” of programs and projects tailored to fit into generic parameters or otherwise designed to attract financial support rather than integrated combinations of initiatives”.¹²

3.3 International Cooperation in ICT with Pakistan

There is a long list of partners of cooperation in ICT with Pakistan at various levels. There are four levels of cooperation, between governments (usually bilateral but sometimes these can be multilateral), by International Organizations, by Country Based Development Organizations and by Private Sector Organizations or NGOs.

The most significant ones with their major areas of cooperation are:¹³

1. Between Governments
2. Donor Agencies and International Organizations:
 - a. UN: SDNPK, UNESCO, APDIP, UNCTAD
 - b. USAID, WB, APT, PAN, ITU
3. Country-Based Development Organizations:
 - a. IDRC, Canada (PAN Projects)
 - b. KIPA, KADO, Korea
4. Private Sector Organizations or NGOs:
 - a. Development Gateway Foundation, CISCO, Oracle, IBM, Microsoft

3.4 Cooperation with Republic of Korea

¹² Markle Foundations’s “Global Digital Opportunities, National Strategies for ICT for Development” is available at : http://www.markle.org/downloadable_assets/gdoi_1223.pdf

¹³ The list of cooperating organizations and their areas was compiled from many sources including Government publications, press, reports and world wide web. The data was comprehensive but omissions or errors were expected due to the reliability. Hence, the brief categories and most significant cooperation efforts are listed of which most will be used in the case studies section. Author intends to carry out this work further in a later effort.

The relationship of Korea and Pakistan dates back to Jan. 15, 1968 when they agreed to establish consular offices which became the Consulate General of Korea in Islamabad on Apr. 22, 1968. Another Consular office was established in Karachi on Aug. 01, 1969. In 1980, Pakistan established its Consulate General in Korea. During 1983 the bilateral diplomatic relations were fully established and the Embassy of Republic of Korea was opened at Islamabad and during the same year the Consular Office in Karachi changed its status as the Consulate General.

The trade agreements were made during 1968 while the Agreement on Economic, Technical and Scientific Cooperation and Trade Promotion was signed during 1985 which also included cultural and VISA abolition agreements. During 1987, convention was agreed to avoid double taxation and provisions on income tax. 1990 was the year when Agreements for the Promotion and Protection of Investments was made. Air Services agreement was signed during 1996.

First Motorway in Pakistan M1 was constructed by Daewoo Corporation during mid 90s connecting Lahore to Islamabad.

The total annual trade volume between Pakistan and South Korea was over US\$1 billion in 2005. Samsung, LG, Cell Phones & Electronics as well as Hyundai and Daewoo automobiles are very popular and are widely used in Pakistan.

The specific cooperation between Korean and Paksitani agencies follow.

3.4.1 Korean International Cooperation Agency (KOICA) & Korea Agency for Digital Opportunity and Promotion (KADO)

Between 1991 and 2003, KOICA provided a total of \$7.4 million in development assistance to Pakistan. Development assistance included Training, Volunteer Service, Expertise Sharing, Aid in Kind, Project Aid, and Emergency Relief. Nevertheless, the majority of aid focused on the invitation of trainees and the dispatch of Korean overseas volunteers and experts. Between 1991 and 2003, KOICA invited 323 trainees, dispatched 10 experts and 20 KOVs. It also provided equipment worth \$455,000 and emergency aid worth \$4.2 million, and implemented two projects worth \$811,000. In 2004, development assistance to Pakistan totaled \$334,400 and continued to focus on the invitation of trainees and dispatch of Korean volunteers. KOICA spent \$93,200 inviting 32 trainees for 26 programs.

KADO has trained many public sector employees on ICT technologies over the past years and has provided EGD with KIV for support on e-Government projects.

3.4.2 GePS by Korean IT Promotion Agency (KIPA)for EGD, Pakistan

In 1998, Korea's Ministry of Information and Communication (MIC) formed the Korea IT Industry Promotion Agency (KIPA) to narrow the digital divide for Koreans and to connect the rest of the world to the rapidly developing Korean ICT industry. KIPA

invests close to US\$300 million annually in various outreach programs and activities that are aimed at elevating Korea into a world-class, technologically advanced country. KIPA works closely with the private sector to create a vibrant environment for the import of new IT ideas as well as for the export of Korea's ICT expertise.

Electronic Government Directorate in Pakistan is spearheading the e-governance initiative in Pakistan. One of the key partnerships between EGD and KIPA is on Government electronic Procurement system GePS. As it is discussed in a later section as a case study it is not discussed further here.

3.4.3 Korean Software Industry Promotion Agency (KIPA)

Pakistan Software Export Board (PSEB) has signed an MoU of cooperation with KIPA including many bi-lateral activities for IT Industry promotion.

3.4.4 KERIS: Global Partnership for ICT in Education

The Korean project for supporting educational informatization in developing countries is part of the national project 'Overcoming the Digital Divide (Support for Informatization of Developing Countries),' which is part of an initiative to encourage participatory government. Over the past years, 626 refurbished PCs have been donated and 80 teachers from 7 different countries have been invited for training.

MOE & HRD plans to centralize the channels of the project for supporting informatization of education in developing countries and systematically expand the project as requests for support from these countries are increasing quickly. Incheon Education Office has been designated to coordinate with Pakistan for cooperation under this program.

3.4.5 Hyundai and IT Deptt, Government of Sindh

Sindh is the second largest populated province of Pakistan with Karachi as the metropolitan city and hub of all trade. On May 14, 2006 Karachi provincial Information Technology Department and the Hyundai IT Company of Korea signed a Memorandum of Understanding (MoU) for mutual collaboration and cooperation in a number of areas of IT. The government's objective is to make the lives of the common man in the province comfortable moving towards paperless office and that the cooperation between the two parties will lead to good governance. Korean Government has also agreed to provide soft loan to government of Sindh for hiring consultant, procurement of hardware, development of software and training for the paper less office projects.

3.5 WWW.SDNPK.ORG

Sustainable Development Networking Programming of UN in Pakistan (SDNPK) was probably the first formal cooperation in ICT after the internet coming into public use

during mid 90s. These are among the pioneers in email and networking services in capital city in Islamabad since early 1990s. They have trained and helped hundreds of organizations and individuals in IT, networking and computer usage. Indirectly they also cultivated human resources for the first ISPs in the country.

3.6 ICTs for Rural Development in Mountainous & Remote Areas of Northern Pakistan

A rugged, glacier ridden mountainous region with Karakorums and Himalyas around, it is one of the most economically and politically isolated areas of Pakistan. With a population of about one million in about 600 villages people generally depend on agriculture and tourism; making livelihood and improving living standards is difficult. Much of the land is not cultivatable. For many of these people, quality health care, agricultural information, and formal education are simply out of reach.

Initially during the late 1990s COMSTAS was supported by IDRC?PAN funding to setup an ISP facility in the Northern Areas of Pakistan provising internet access and awareness to the people around there. This project was successful in generating awareness through connectivity and access to s a lot of information.

In 2004, IDRC funded this larger project targeting at use of ICTS for poverty alleviation and sustainable livelihood of locals through access and education about economic opportunities. The project makes special efforts to improve the livelihoods of women in the area, through the provision of specialized health services and more accessible education. It targets at promotion of sustainable livelihoods and extradition of extreme poverty in the remote areas of Pakistan through action research in the application and integration of ICT. More specifically, the project aims to ¹⁴:

Provide access to relevant information through ICTs and the Internet for the remote populations living in Hunza and Baltistan

Document the action research experiences of all the partners while implementing the project so that the successful experiences can be replicated in other areas of the region, as well as other parts of the country

Promote ICT benefits experienced in this project among governments, donors, other policy makers and stakeholders by sharing and sending recommendations on best practices to the appropriate parties

To introduce ICT as a possible means of providing employment exchange services in the remote Northern areas of Pakistan

Three separate institutions in Pakistan Karakoram Area Development Organization (KADO), COMSATS, and Baltistan Health and Education Fund (BHEF) are working together in collaboration with the Aga Khan Rural Support Programme (AKRSP).

The outputs and results of this project had been amazing over the years. These include:

¹⁴ http://www.idrc.ca/en/ev-51829-201-1-DO_TOPIC.html

- KADONET (www.kado.net.pk), One of the only ISPs in the area (besides COMSATS Internet Services) providing connectivity, training and help on use of ICTs for multiple purposes in Hunza, Gilgit, Baltistan and Nagar Valleys.
- Karakorum Handicraft Development Programme (KHDP), a project helping start SMEs in traditional handicraft manufacturing especially thread net
- TNH, Threadnet Hunza (www.threadnethunza.com.pk) a small enterprise selling thread net, the traditional embroidery and products to the world through internet successfully. KHDP made Rs 3.48 million sales during 2004 selling thread net products.
- As of July 2005, computers and networking facilities have been installed in two schools. Students, teachers, and school management of these schools have started using information and communication technologies to access low cost, effective, and high quality learning material. In addition, 270 people have benefited from training in ICTs. Local youth are taking an especially keen interest in the training sessions.
- A full-fledged Tele-health centre with link to Islamabad is functional. Hundreds have benefited majority being women.
- E-village resource centers have been established in two villages (as of July 2005), and E-village resource persons have been trained to ensure that the village organizations have necessary capacities to
- run these centers on their own.
- E. School and distance learning had been initiated
- The capacity building that has resulted from this project has been recognized by the Pakistani government.



3.7 Urdu Lexicon and PAN Localization project at CRULP

Urdu is the national language of Pakistan which is understood across the country although there are four other provincial languages and many dialects available for these.

Based at FAST National University of Computer and Emerging Sciences (NUCES) Centre for Urdu Language Processing (CRULP) under Dr. Sarmad Hussain a Natural Language Processing expert had successfully initiated the developed of Urdu lexicon, speech recognition system and fonts abck in 2000-01. The CRUPL was found with following objectives:

- To evolve computational models of Urdu and regional languages

- To participate in standardization efforts in Urdu and regional languages
- To conduct research in the linguistic aspects of Urdu and regional languages
- To promote and assist in content development for Urdu and regional languages

Government of Pakistan joined in 2003 and supported their projects through which he succeeded in achieving the objectives of his projects in various phases and directions. Now a full fledged Urdu Lexicon is ready, with an Urdu speech recognition system in the final stages. This will help revolutionize the Urdu Content Development in the country which was merely depending on Arabic processors before this.

PAN has supported “PAN Localization project” which is a regional initiative to develop Local Language Computing Capacity in Asia. The project is being coordinated for seven Asian languages at CRULP including Bangla, Dzonkha, Khmer, Lao, Nepali, Pushto etc.

Following are some of the outputs of the CRULP for Urdu.

- Nafees Nastaleeq font
- Nafees Naskh with aerab support
- Nafees Pakistani Naskh
- Nafees Web Naskh (Updated)
- Phonetic Keyboard layout (Windows) (Updated)
- Microsoft Windows Urdu Keyboard Layout (Updated)
- Inpage Monotype Urdu Keyboard Layout (Updated)
- Phonetic Keyboard layout (Linux)
- Hindi to Urdu Transliterator
- Urdu Spell Checker
- Speech Translator

CRULP was also able to attract Microsoft Localization R&D Grant by Microsoft Pakistan, 2002-2003 which was utilized for extending the Nafees Naskh font for Aerabs (diacritics).

3.8 EGD-KIPA

In the IT Policy and Action Plan 2000, Government of Pakistan has emphasized heavily on the e-Government & e-Commerce enablement with significant investments into projects over the following years. Corruption and bureaucratic lethargy are a big source of wasting of public money. Improvements in the public procurement process had been made through instituting a Public Procurement Regulatory Authority (PPRA) which had already issued PPRA Rules 2004.

Public Procurement Service (PPS) of Korea had been declared the world's best e-Procurement practice by UN.

Government of Pakistan has collaborated with Republic of Korea to develop and acquire the Government electronic procurement system on the same lines as being used in Korea. In this regard, MoU was signed in Feb 2005 between electronic Government Directorate of Pakistan (EGD) & Korea Software Industry Promotion Agency (KIPA). During May 2005 Korean experts visited Pakistan and developed the feasibility study for a GePS keeping in view the following objectives:

- To minimize corruption through transparency
- Implement the best practices and ICT in Public Procurement to increase efficiency and waste of resources
- Make it a part of ICT in Good Governance initiatives

The Financial & Technical proposals submitted by South Korea are under consideration of GoP at present.

3.9 ESRA

US-AID had allocated US\$ 100 million over 5 years for the education sector reforms in Pakistan. An integral part of this assistance is Pakistan's Education Sector Reforms Assistance (ESRA) Program implemented into a four year (2003-2006), US\$ 72 million project through a consortium of organizations led by the Research Triangle Institute (RTI).

ESRA's overall goal is to achieve systemic and sustainable improvements in education by supporting activities and initiatives in many areas of policy, planning, professional development, youth and adult literacy however only ICT is elaborated keeping with the scope of this paper:

- Information and Communication Technologies (ICT)
 - Demonstrating the use of context-specific, low-cost technologies in enhancing the quality of and access to education.
 - Formulating policies for the use of educational technologies based on ESRA Plus experiences.

3.9.1 National ICT Strategy for Education

A portion of USAID assistance is also being used for developing the National ICT Strategy for Education.

The basic aim of the National ICT Strategy is to formulate a long-term strategic plan that is designed to reap maximum benefit from the advantage of ICTs in education. The NICT strategy has a twofold objective that envisages:

- Enhancement of teaching, learning, and education administration through ICTs.
- Provision of equitable access to quality with intelligent ICT solutions and also attempt to overcome the digital divide by improving access to ICTs.

This strategy is being prepared in consultation with an Advisory Committee (AC) comprising experts, representatives of federal and provincial governments, and other stakeholders. The entire process is being facilitated by ESRA and the Ministry of Education (MoE), Government of Pakistan. In December 2005, the NICT Strategy document was approved and passed to the MoE's Planning Wing for finalization. This is near final approval now by the cabinet, and will help revolutionize the use of ICT in tertiary education in Pakistan as well teaching of ICT as a subject. Recommendations for this have also been submitted to the Prime Minister's office.¹⁵

3.9.2 School Improvement Plan (SIP), Multimedia Resource Centers (MRC)

Initially, 65 government primary schools located in Islamabad were targeted for the Infrastructural enhancement.

During January 2005, a Multipurpose Resource Center (MRC) had been established in the FG Girls Middle Model School, Bhara Kahu being equipped with latest desktop computers, photocopier machine, scanner, television set, audio/CD/cassette player, video recorder/player, and other teaching and learning reference and resource materials.

Name of Resource Center	Current Users	Rise%
Rawal Resource Center, FG Girls Middle Model School, NIH	2679	6 %
FG Boys Secondary School, Pind Begwaal	1843	155 %
FG Boys Secondary School, Chattar	1977	4 %

Table 4: Increase in users in USAID/ESRA Resource Centers in ICT

The advent of this facility has enabled community members; teachers, of the MRC School as well as those from the remaining 64 schools in the surrounding areas of Bhara Kau to benefit from these available resources, thereby enhancing their learning and teaching skills. The Center is also providing the target audience with an opportunity to access online and offline technology related resources.

3.9.3 Educational Management Information System (EMIS)

The Educational Management Information System EMIS was established by Government of Pakistan during previous decade with the help of donor agencies like UNESCO to take the stock of education effectively as a result contributing to improved planning and resource utilization for improvement in literacy levels. The use of latest ICT for the same purpose and to incorporate the effects of devolution initiated by Government of Pakistan during 2001, ESRA is also supporting strengthening of a well-

¹⁵ Information compiled from ESRA publications & quarterly progress reports and Ministry of Education , Government of Pakistan's website, www.moe.gov.pk

structured National EMIS. SOPs are being devised with training at all levels for collection and compilation of information and data. EMIS is already in operation resulting in very timely, reliable data and statistics available now from relevant authorities and Ministry of Education website.

3.10 PANdora

Owing to hi-population densities in Asia which are still growing, existing educational institutions and facilities are very much constrained. It is understood that current systems are not well-equipped to handle the growing demand for education. The costs of education are soaring in all countries which is other important hindrance to achieve the Education for All objectives. Undoubtedly Asia needs to develop a more effective, accessible, and inclusive system of education¹⁶.

The Project is funded by IDRC Canada and targets at networking Distance Learning Technology Engines for Research. It is based at Virtual University, Lahore, Pakistan a flagship ICT based distance learning education institution providing undergraduate level education in ICTs. The project is being lead under the leadership of Dr. Naveed A. Malik, Rector of Virtual University of Pakistan.

The project initiated during March 2005 covers Cambodia, Hong Kong, India, Indonesia, Lao PDR, Mongolia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam. The main objectives include supporting tertiary education that deploys appropriate emerging distance learning technologies (DLTs) to deliver affordable distance education, which is accessible to the masses. More specifically, the project aims to:

- Conduct research into the effectiveness of DLTs in different situations relating to ICT access: geographic, socio-economic, gender, pedagogical and cultural
- Foster collaborative research efforts among DLT specialists and institutions in the region incorporating lessons learnt from previous and ongoing projects
- Develop access models for distance education provision
- Develop shared resources (including software) for distance education
- Investigate the effectiveness of instructional procedures for specific DLTs
- Provide training in the practices of DLT research, evaluation and content development
- Learn, exchange, collaborate and share DLT-related information with major tertiary institutions in developing countries working in distance and flexible learning
- Prepare policy guidelines and/or standards for ICT-supported distance education in the region

¹⁶ Extracted and adapted from PANdora's introduction online available at: http://www.idrc.ca/en/ev-67360-201-1-DO_TOPIC.html

At the moment, there are ten sub-projects being run in partnership between ten developing countries. The details of these projects are available on the project website¹⁷. Development Impact is difficult to measure at this point of time however; many training workshops, annual forums and more than ten research publications have been generated by the partnering institutions. New multi-media based tools and technologies are nearing completion for effective DLT. Above all, it has brought many institutions in the region closer sharing their visions, problems and methodologies.

3.11 Pakistan Research and Education Network (PERN) www.pern.edu.pk

Pakistan Education & Research Network is a nationwide educational intranet connecting premiere educational and research institutions of the country. PERN focuses on collaborative research, knowledge sharing, resource sharing, and distance learning by connecting people through the use of Intranet and Internet resources. This was we use technology to overcome faculty shortage, the cost of traveling for education and collaborative research and provide access to remote areas hence lessening the digital divide.

Although it is a fully funded project by Higher Education Commission of Pakistan but considerable advice and ideas are drawn from international research and education networks. Also, collaboration for research and development with international partners is one of the core on-going activities of the PERN. The Network Architecture is shown in figure 6. The project has two main parts:

- Infrastructure (PERN)
- Services
 - Inter-University Video Lecturing/Streaming
 - Digital Library
 - Collaboration between researchers

For the first part hi-speed optical fibre bandwidth for each university is the provisioning through the most feasible technology. The second part included equipment provisioning, installation and training for the services including video-conferencing, remote video lecturing and provision of infrastructure for the digital library services. Digital Library of Pakistan is a separate project presented in the next section.

Much guidance and encouragement has been provided to development of this network by many international research centres and networks like CERN, APAN, AARNET, CARNEI and Internet 2.

It is fully operational now with 60 sites connected including all 59 Public Sector Universities. Recently, IP-based Video Conferencing facilities at 19 universities for lectures from prestigious local and foreign institutions have been launched during 2006.

¹⁷ <http://www.pandora-asia.org/>

The Communities of Interest (COIs) has been another interesting component in the form of blogs or discussion boards for research collaboration on specific subjects.

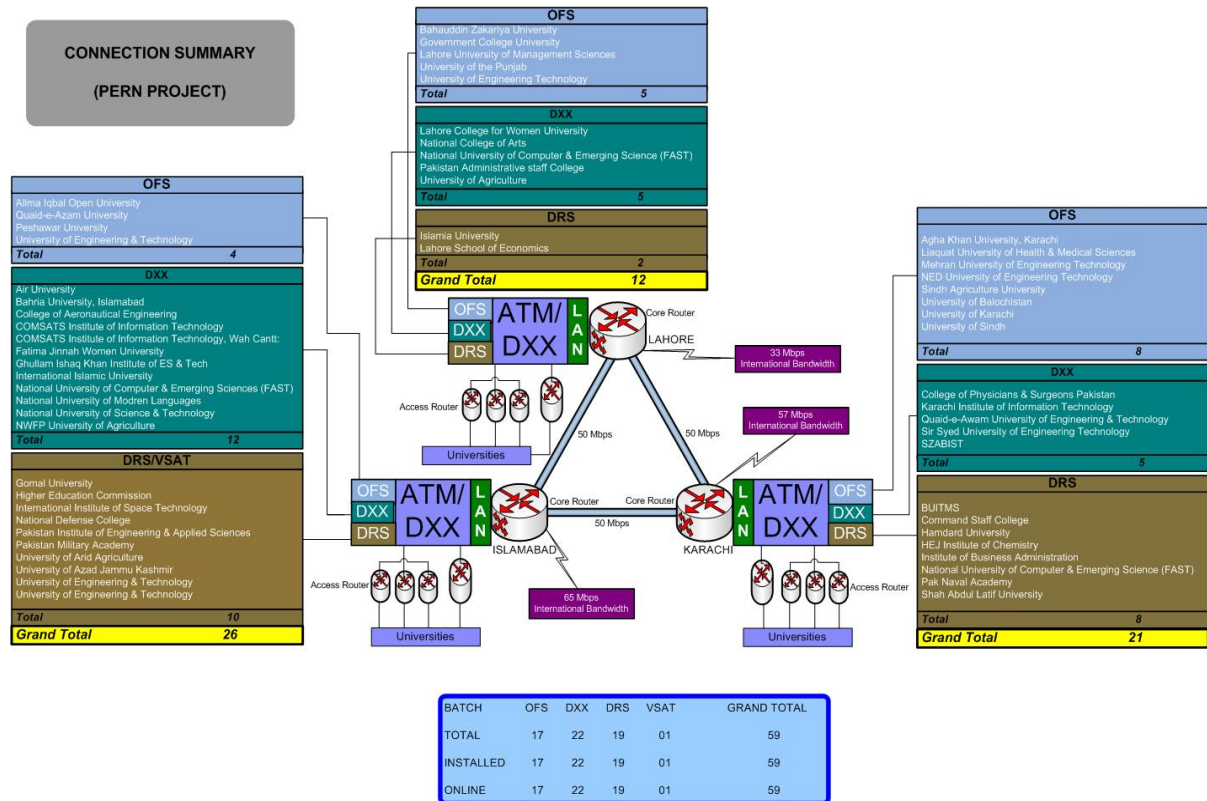


Figure 5 : PERN Network Architecture ¹⁸

3.12 Digital Library of Pakistan ¹⁹

Digital Library of Pakistan is a project of Higher Education Commission of Pakistan initiated in February 2004 providing free of cost access to the latest R & D publications and materials to the researchers and university students in Pakistan. This is not a unique idea but to the extent that probably for the first time National Level Access to the full-text references in indexed journals has been negotiated and obtained under special agreements with international partners and publishing houses.

Understanding the need of development and importance of this aspect, INASP has been able to successfully negotiate licenses and access with the publishers linking cost of resources to the GDP of Pakistan resulting in approx. 87% discount from list prices.

¹⁸ Obtained from website of PERN: <http://www.pern.edu.pk/>

¹⁹ Online available at : <http://www.digitallibrary.edu.pk/>

At the moment there are 250 participating institutions for this program including public sector universities, private sector universities, research institutions and public planning and development organizations. The library provides access to over 20000 full-text journals of the highest quality in the world from over 30 databases from leading publishers like Elsevier, Science Direct, Springer Link, Oxford University Press, IEEE and ACM. The success of the programme can be gauged from the fact that 1 million downloads had been recorded during 2005 from the Digital Library of Pakistan.

Although the project was funded primarily by Government of Pakistan and used the infrastructure of PERN but the international cooperation came into play when 87% of the costs were subsidized as well ability to access electronic created databases online by using ICTs.

4 Summary & Conclusions

The creation of Digital Opportunities within all sectors as a long term approach is essential for socio-economic development of a country or region. International Cooperation and efforts in these directions over the past years have started to bring the results by narrowing the digital divide in Pakistan and other developing countries. It has been quite rapid because of the benefits attained from sharing the knowledge and collaborating. It requires even more efforts and cooperation to sustain as well as keep up with the pace of narrowing the Digital Divide although all of the following areas are visibly improved:

- Access,
- Education,
- Research & Development,
- Attractive multimedia based curricula, pedagogy,
- Local content ,
- Efficient production and business processes,
- Delivery of public services,
- Reliability of data collected and disseminated in all sectors for better planning

It is obvious that these may be the areas which do not directly contribute to the economic growth but indirectly these are the areas which will help in eradicating poverty, creating and accessing economic opportunities and at the same time sustainability and adaptation, which is the key for success in the Knowledge Economy. A simple set of factors to be considered by developing countries while planning and developing cooperation in ICT is concluded and laid down for reference.

Concerns	To use/achieve	Actions/Remarks
Goal	Economic Prosperity, Development & Global Positioning in the Knowledge Economy	Social Welfare
Scope	Scarce resources for the growing population	The Challenge
Target Value	Knowledge Organizations &	The Solution: Develop

	Workers	Human Resources and Knowledge Management Systems
Core Competency	Information & Communication Technologies (ICT)	Faster Access & Enhanced Productivity
Tool	Collaboration	International Cooperation
Synergy	Sectoral Cross-Cutting Plans & Strategies	Integrate planning for development
Timelines	Shorter	Share lessons learned globally
Key to success	Sustainability	Innovate & adapt
Primary Stakeholders	Public, Firms and direct beneficiaries	Create awareness and involve

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