Sustainable Development Policy Institute

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Information and Telecommunications Technologies Leading the Way: Pakistan's Response

Brig (Retd) Mohammad Yasin

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Under the Working Paper Series, the SDPI publishes research papers written either by the regular staff of the Institute or affiliated researchers. These papers present preliminary research findings either directly related to sustainable development or connected with governance, policy–making and other social science issues which affect sustainable and just development. These tentative findings are meant to stimulate discussion and critical comment.

Acknowledgement

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Information and Telecommunications Technologies Leading the Way: Pakistan's Response

Brig. (Retd) Mohammad Yasin[1]

Abstract

Global trends in information technology and telecommunications are the adoption of higher speeds, broader bandwidth, optical fiber and convergence. Internet connectivity and mobile cellular telephony have evolved very rapidly. In many countries, including Pakistan, cellular telephones have outnumbered fixed line phones. Four words sum up today's telecommunication market: private, competitive, mobile and global. Pakistan now has a tentative roadmap in the form of policies on information technology, telecommunication deregulation and mobile cellular telephony. A lot of work has gone into improving the telecommunication infrastructure and services in Pakistan. However, the existing infrastructure and services are unfairly distributed. Vast areas in the country remain unserved and underserved. A deregulated and competitive environment with good investment in the field of information technology and telecommunications seems to be picking up momentum. However, because of PTCL's strong standing and its 88 percent ownership by the government, potential domestic investors are fearful of the company.

It was intended to update an earlier paper written in 1998 titled "Trends in Development of Information and Telecommunications." However, because of significant changes that have taken place globally, regionally and in Pakistan, this paper contains a lot of new information.

Introduction

Information technology (IT) and telecommunications play a major role in the economic development of a country. The top ten economies hold 80 percent of the world's IT market. The bottom ten hold less than one percent. Seventy-five percent of the world's telephones are installed in eight industrialized countries. According to a World Bank analysis, countries unable to modernize their telephone networks face economic ruin. During the last two decades, the world's telecom market has surpassed the economic growth. According to the World Telecom Development Report 2002, in 1994, there was one fixed line telephone for every 25 developing country citizens and only around a third of the world had a mobile network or was connected to the Internet. Four years later, there was one fixed line telephone for every 15 citizens, over 90 percent of the world had a mobile network and some 80 percent were connected to the Internet. In 2002, there was one fixed line telephone for every ten citizens in developing countries and almost all countries had mobile and Internet networks.

"The foundation of modern society is based on the availability of an access to information that will drive a thriving economy upward on its course or propel a weak one into a position of power. Today's information is equivalent to yesterday's factories (Schwartau 1994)*."* The advanced economies became advanced because of their richness in the resources of information. They replaced the muscle-based technologies with mechanical technologies and then replaced the latter with computers and information-based technologies. They have continued their search for intelligent technologies. The poor countries neither had adequate resources nor the know-how to keep pace with developing countries in this race. However, countries like Japan, South Korea and Singapore were able to reap the fruits of their better planning through the acquisition

1. **Senior Program Coordinator, Information Technology, Telecommunications and Training.**

and progress in information-based technologies. The vehicle to carry information is the telecommunication infrastructure and services. Effective and responsive telecommunication infrastructure and efficient services are essential components of information sources. This suggests that there is a strong correlation between telecommunication growth and information growth, and in turn between information growth and economic growth. Internet is now exceedingly used for commerce and trade. It has brought companies and customers together. "The death of distance as a determinant of the cost of communications will probably be the single most important economic force shaping society in the first half of the next century (The Economist, September 1995)."

The information revolution, the current obsession, has been brought about by the world trends in the modernization and expansion of telecommunication infrastructure and services. The current trends are higher speeds, higher capacity and broader bandwidth infrastructures. This has been possible by adopting asynchronous transfer mode (ATM), optical fiber cables and integrated services digital network (ISDN). Liberalization, deregulation and privatization have set in strong competition between the service providers, which in turn have lowered tariffs resulting in an increase in the number of users, thus offsetting the losses due to decrease in tariffs.

The convergence of information and telecommunications has enabled information to move at the speed of light. A nation's economic strength is associated to a significant degree with its sources of information and the scope of its telecommunications infrastructure. Economists and strategists analyze information to extract intelligence which, when suitably applied, facilitates the best course of action to achieve the objectives.

Information and telecommunication are now potent weapons of war. The country, which achieves mastery in the unimpeded use of information resources and can manipulate information resources of others, will dominate the latter. Nations enjoying information dominance have always been superior to their adversaries in all fields, be it security and defence or economics and education. History is full of such examples. Information dominance will act as a force multiplier and contribute towards security and economic uplift.

Technologies are emerging to cater the growing needs of the users. Some of the users' needs are:

- Personal needs
- Business improvements
- Research
- Remote data access
- Fast computers
- Information exchange
- Remote shopping
- Entertainments
- Childcare assistance
- Education at work/home
- Interactive communications

The paper has been organized into four parts. Part one looks at the global trends in the modernization and expansion of information and telecommunications infrastructure and services. It looks at the impact of increased competition resulting in lower tariffs. In this part, some of the emerging technologies have also been discussed. Part two describes how the regional countries are adopting the trends, the extent to which they have acquired such technologies and the effect on their revenues. Part three is Pakistan-specific and covers developments that have taken place in Pakistan and the future prospects. It looks at the difficulties being faced by the public and private operators, the areas into which Pakistan must quickly move so as not to be bypassed by rapid developments in information and communications. It particularly highlights the problems of human resource development in telecommunications and software. In part four, some recommendations have been made, which, it is hoped, would facilitate Pakistan's progress in the 21^{st} century.

Vision of the Future

Information is shrinking the world to a global city that will have access to instantaneous communications enabling human dialogue and achieving better understanding. Men and machines will converse with each other. In pursuit of knowledge, one wouldn't have to leave home and the Chinese proverb, "a scholar can learn anything without leaving his home," would become a practicality. The home and office will integrate. There will be less commuting and this hopefully would reduce problems of environmental pollution.

Global Trends

Adoption of Newer Technologies

The world trends in information and telecommunications are expansion, modernization, higher speeds and broader bandwidths, asynchronous transfer mode (ATM), optical fiber cable, video conferencing, integration of computers and communications and integrated services digital networks (ISDN). A number of inter-active services namely, conversational, messaging, retrieval and distribution, are provided over broadband ISDN (B-ISDN) for business, communications, consumer, education, entertainment, health and government services. The ISDN seems to hold the future by integrating computers and telecommunications. The key elements of ISDN are: architecture, structure, interface, standards, networks control, service offerings and tariffs. ISDN encompasses voice, data, fax and such other value added services integrated in the same network.

Downward Trends in IT and Telecommunication Market

During the last two decades, telecommunication market has witnessed an upward trend. However, during the period 2000–2002, it seemed that this upward growth was not sustainable. During this period the growth rate declined. Why this decline? "Twenty years ago, only a handful of countries had private public telecommunication operators. There has been shift in at00tention from engineering (how do we build it?) to finance (what shall we buy?). Today, it is share prices that catch headlines rather than the network development (World Telecommunication Development Report 2002)."

Declining International Tariffs

Presently, international traffic is governed by the international accounting rates. The system allocates the cost of a call between countries. For developing countries like Pakistan, where such calls are monopolized by a single government operator, these payments are an important source of income, which is more important than foreign aid. However, things are changing fast in the rest of the world. The European Commission, for example, wants all countries of the region to be a single market. With this, the whole structure of call rates will change.

The global trend in pricing of telecommunications services in the wake of rising competition is one of downward revision and making the services more and more attractive. In the last decade alone, the service prices have fallen anywhere from seven to 30 percent and even more in Europe and in some countries of Asia. International/long distance calling costs show downward trend in most of the 10 developed countries surveyed by the National Utility Services, an American consulting firm. It observed that the cost of international calls have decreased by 13 percent and domestic long-distance call rates were down by 24 percent.

Although a belated action, fortunately PTCL, during the last about two years, has realized the necessity of following the global trends. It has twice reduced international tariffs and increased the bandwidth for the Internet service providers. PTCL has also reduced domestic long distance tariffs. However, the local call rates have been increasing steadily.

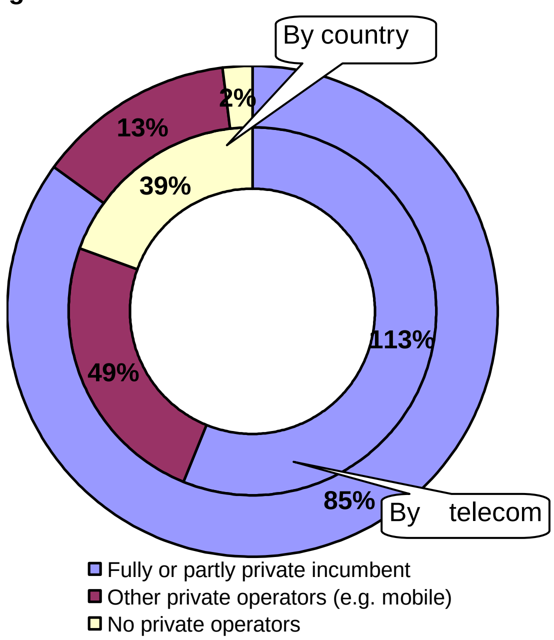
Although software for making phone calls over the Internet computer network is readily available, the users at the opposite ends of the globe are able to talk to each other at the price of a local call. The phone companies are worried because already they are losing revenues because of data communication networks. Most people now prefer email and online computer communication than voice calls, as the former are much cheaper. International calls can now be made over the Internet at a cost far below public switched telephone network (PSTN) tariffs. Quality and convenience is still poor and the Net cannot cope with a massive switch of PSTN traffic. However, the technology is improving rapidly and phone companies are now trying to ban or regulate voice traffic on the Net.

Liberalization, Deregulation and Privatization

"Four words sum up today's telecommunication market: private, competitive, mobile and global (World Telecommunication Development Report 2002)." The move towards liberalization has been rapid and the world has now moved to liberalization, deregulation and privatization of IT, telecommunication and the electronic media. Under a pact signed by the World Trade Organization (WTO), Geneva, the world's leading telecommunications operators will allow foreign companies to compete in the telecom business. Countries signing up the liberalization agreement (Figure 1) have promised to allow foreign companies free access to their markets. There will be a separation of local, national and international accounting and transparent access charges on competitive services. To ensure technology transparency, there will be no preferred buyer, no preference will be given to any country or nation, and standards and specifications will be transparent. Pakistan signed the WTO telecommunications agreement but sought some exemptions up to 2004. However, Pakistan has not signed the WTO agreement on free trade of IT equipment but planned to sign this agreement during its 9th Five Year Plan (1998-2003). The signatories to the IT agreement have pledged to eliminate barriers on computers, software, telecommunications equipment, magnetic tapes and scientific equipment. It is estimated that there would be large scale IT trade.

By 2001, countries that had partly or fully privatized their incumbent telecommunication are shown in the following figure.

Figure 1



Source: International Telecommunication Union's (ITU's) World Telecom Development Report 2002.

Note: The chart is based on 201 countries. "Other private operators" refers to countries that have not privatized their incumbent fixed-line telephone operator but have other private fixed, international or mobile cellular telecommunication companies.

Under Pakistan's WTO commitment, PTCL's exclusivity of basic telephony ended on January 1, 2003. Pakistan's telecommunication market is now wide open, without discrimination, to both domestic and foreign operators. Pakistan's deregulation policy for the telecom sector was announced in July 2003. PTCL's privatization is said to be in an advanced stage.

Governments that made commitments to liberalize their telecommunication market in the WTO Negotiating Group on Basic Telecommunications.

Sr.	Country Name	Sr.	Country Name
1.	Antigua & Barbuda	36	Italy
2.	Argentina	37	Jamaica
3.	Australia	38.	Japan
4.	Austria	39.	Korea, Republic of
5.	Bangladesh	40.	Luxembourg
6.	Belgium	41.	Malaysia
7.	Belize	42.	Mauritius
8.	Bolivia	43.	Mexico
9.	Brazil	44.	Morocco
10.	Brunei Darussalam	45.	Netherlands
11.	Bulgaria	46.	New Zealand
12.	Canada	47.	Norway
13.	Chile	48.	Pakistan
14.	Colombia	49.	Papua New Guinea
15.	Côte d'Ivoire	50.	Peru
16.	Czech Republic	51.	Philippines
17.	Denmark	52.	Poland
18.	Dominica	53.	Portugal
19.	Dominican Republic	54.	Romania
20.	Ecuador	55.	Senegal
21.	El Salvador	56.	Singapore
22.	Finland	57.	Slovak Republic
23.	France	58.	South Africa
24.	Germany	59.	Spain
25.	Ghana	60.	Sri Lanka
26.	Greece	61.	Sweden
27.	Grenada	62.	Switzerland
28.	Guatemala	63.	Thailand
29.	Hong Kong SAR	64.	Trinidad & Tobago
30.	Hungary	65.	Tunisia
31.	Iceland	66.	Turkey
32.	India	67.	United Kingdom
33.	Indonesia	68.	USA
34.	Ireland	69.	Venezuela
35.	Israel		

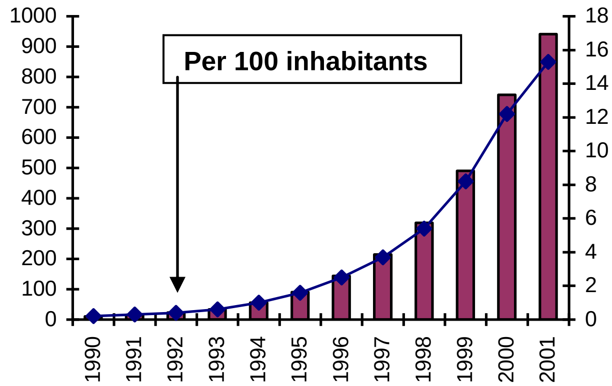
Source: ITU, adapted from World Trade Organization.
Note: Additional countries have made commitments since the agreement was concluded in 1997.

More Mobile

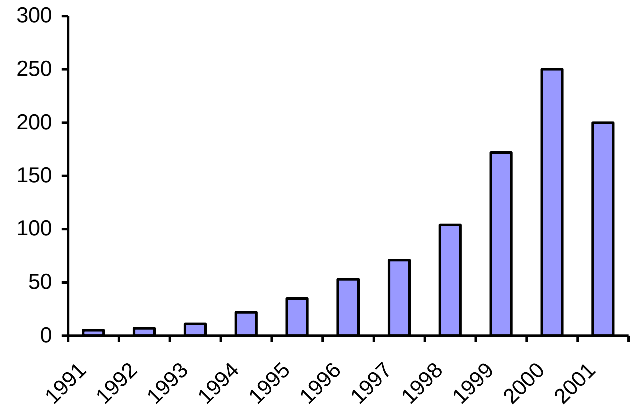
Internet connectivity and mobile telephony have made great strides. Ten years ago only a few countries had mobile telephone and Internet connectivity. Today, almost all countries have both. The mobility trends show that mobile telephone subscribers will surpass fixed-line subscribers. According to the World Telecommunication Development Report 2002, at the end of 2001, there were around 940 million mobile cellular subscribers around the world compared to just over one billion fixed telephone lines (Figure 2). In 2002, one in seven persons around the world had a mobile telephone. In some developed countries the mobile telephone density has reached 100 percent. China has now emerged as the largest mobile market in the world.

Figure 2:

Mobile subscribers, world, millions



Mobile cellular subscribers added world, millions



Source: World Telecommunication Development Report 2002, ITU

The figure shows the mobility trends and how the mobile cellular subscribers have been multiplying.

In Pakistan, there has been a significant increase in the number of cellular telephone use, particularly after the "calling party pays" (CPP) regime took effect. In 1998, there were only 65,000 cellular phone subscribers, out of which 22,000 were in Karachi. In 2001, the number of such subscribers in Pakistan was 225,000, which jumped to 2,250,000 in August 2003 because of the CPP regime.

GEOs, MEOs and LEOs

In recent years, attention has focused on systems using low earth orbit satellites (LEOs). As compared to geosynchronous orbit satellites, which revolve around the earth at an attitude of 36,000 kilometers and medium earth orbit satellites (MEOs) revolving at 16,000 kilometers up, LEOs are at an attitude of about 1,600 kilometers.

Each of the above system has comparative advantages and disadvantages. For three GEOs, we need 15 MEOs and sixty LEOs to cover the globe. For communication via GEOs, there is a delay of half a second for the signal to return but as the LEOs are nearer to the earth, the delay is at least 40 times less. However, in LEOs system, keeping so many satellites moving near the earth will require stringent precautions because abandoned satellites and debris may cause problems. Besides, the LEOs system may be costlier to maintain. However, the LEOs are more suited to rural communications. LEOs are smaller, lighter and need lower transmission power, having better signal to noise ratio and portability. LEOs system is now favored for mobile communications. It can have one telephone number for communicating worldwide. Subscribers' set is nearly the same size as hand held cellular phone and costs about US$100.

(Pakistan's first communication satellite, Paksat 1, has been in geostationary orbit since July 2002. Hughes Global Systems (HGS) leased the satellite, operating in C and Ku bands, to Pakistan.)

From Subscribers Copper Loop to Optical Fibers and Wireless Local Loop

Optical fiber communication systems have made great strides. These have come to the forefront of communications technology. A single fiber could, in theory, transport 25 terabits a second. However, because of some problems (which are in the process of being solved), in practice such a high speed of transmission of data is not yet possible. Fiber optics enjoy a clear advantage over satellite systems; they provide higher data rate or broadband service. A satellite system cannot match the transmission speed of a simple span of optical fiber.

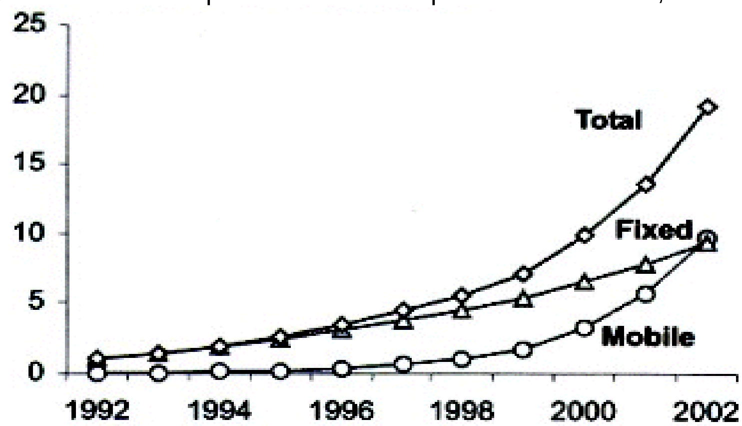
The "last-mile problem" is a major bottleneck for wired networks. Until a couple of years ago, although optical fibers had established firmly in long haul and medium haul communications, these had not entered the subscribers' loop. However, now the trend appears to be changing and in many countries copper cables are slowly and selectively giving way to optical fibers for the subscribers' loops. So, also their application in computers has vastly increased. Before 1989, worldwide installation of optical fibers for data links was only three percent, which has increased significantly now. Along with optical fibers, wireless loops are also becoming popular. Pakistan's Special Communication Organization is successfully employing wireless local loop in Northern Areas. Also, the Pakistan Telecommunication Authority (PTA) will be issuing wireless local loop licenses to private operators.

Development in Asia-Pacific Region

Fast Growing Market

According to Asia-Pacific Telecommunication Indicators 2002, during 2001, the Asia-Pacific region emerged as the largest telecommunication market in the world. "The number of telephone subscribers in the region, fixed and mobile, accounted for 36 percent of the world total, up from 22 percent ten years earlier," the report said.

Figure 3: Telephone subscribers per 100 inhabitants, developing Asia-Pacific economies



Source: ITU World Telecommunications Indicators Database, 2002

During the past few years, there has been a phenomenal increase in the mobile communication. In 2002, the cellular mobiles overtook the fixed line phones in the region (Figure 3). Overall, there were about 339 million mobile users in the region in 2001, compared with just 25 million in 1995 with the annual growth rate at 55 percent.

More on Mobile Penetration

A few years back, very few people in the developing world had cellular telephones. It was considered a luxury. Only the well off could afford. But in recent years because of mobility trends, teledensity in many developing countries has increased dramatically. A number of countries in the Asia-Pacific region have seen mobile phone density overtaking the fixed line density as is shown in the Figure 4:

Figure 4: Making the Mobile Transition

Economies where there are more mobiles than fixed line telephone subscribers, and years the transition took place:

1993-1998	1999	2000	2001	2002
Cambodia	Hong Kong, China Korea (Rep.)	Brunei Malaysia Mongolia Philippines Singapore Taiwan, China	Australia French Polynesia Macao, China New Caledonia New Zealand Thailand	Bangladesh China Fiji Indonesia Japan Lao PDR Maldives Sri Lanka

Source: ITU World Telecommunication Indicators Database

Saturation has occurred in mobile telephony in China and Taiwan. This technology, because of its obvious advantages, is set for a leap forward in the next few years. Pakistan would be no exception. As earlier mentioned, the number of mobile subscribers in Pakistan jumped from 65,000 in 1998 to 2,250,000 in 2003.

Internet Growth in Asia-Pacific Region

There has been a steady growth in the Internet usage in the Asia-Pacific region. The ITU database showed 160 million Internet users in the region in 2001 and forecasted 225 million users in 2002. In some developing countries, the telecommunication infrastructure is not well developed and thus does not support broadband operations.

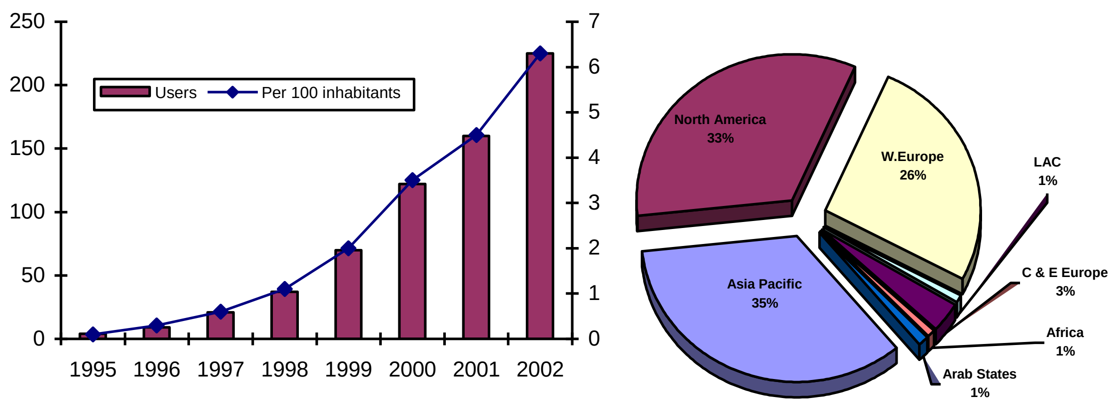
This is particularly the case for subscribers' loop or the last mile. In Pakistan, the problems of last mile are serious and some subscribers have already switched to wireless.

Internet users in Asia-Pacific in 1995-2002 and distribution of Internet users by region is shown in Figure 5.

Figure 5:

Internet users in Asia-Pacific, millions

Distribution of Internet users, 2001



Source: ITU World Telecommunication Indicators Database.

Note: LAC = Latin America and the Caribbean, C&E Europe = Central and Eastern Europe.

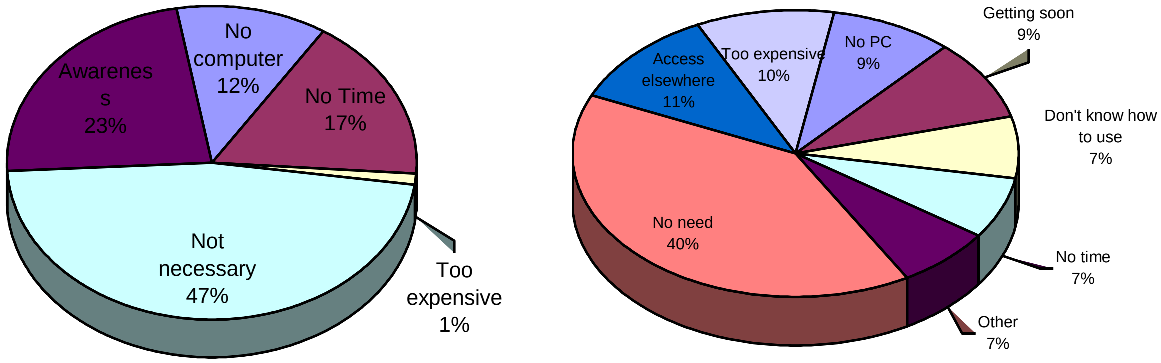
Despite limitations of infrastructure to support broadband operations and the fear of pornographic content, Internet users in the Asia-Pacific region have steadily grown as is apparent from the above figure. The number of Internet users increased from four million (0.1 percent) in 1995 to 225 million (6.3 percent) in 2002.

In Pakistan, the number of Internet users increased from 0.2 million in March 2000 to 4.5 million in June 2003. What are the future projections? According to Asia-Pacific Telecom Indicators 2002, “although the region has experienced rapid growth of the Internet, there are some signs that the growth is tapering off. This is partly due to the more advanced economies, like the Republic of Korea, reaching saturation. In such economies, surveys suggest that those who remain off-line do not necessarily want to be connected.” Please see figure below:

Figure 6:

Reasons for not using the Internet in the Republic of Korea, 2002

Reasons for not having home Internet access in Singapore, 2001

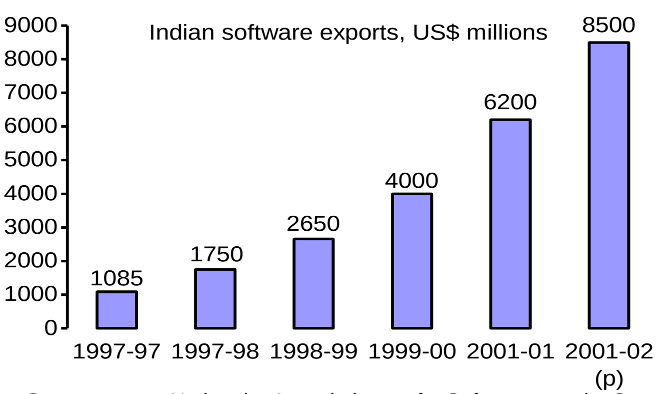


Source: ITU adapted from Korean Network Information Centre (KRNIC) and Infocomm Development Authority of Singapore.

E-business

A number of countries in the Asia-Pacific region are trying to enter the e-business. Indian software exports totaled US$ 6.2 billion in 2001. There has been a linear rise in Indian software exports.

Figure 7: Revenue from Indian software exports, in US$ million, 1996/97 to 2001/02 and Indian software exports as a percent of total exports.



Source: National Association of Software and Service Companies (NASSCOM).

Note: In the chart (p) = projection

Progress in telecom technology plus the falling cost of bandwidth and speed has given a boost to the manufacture of software in many countries of the region. Software and IT parks are now a common phenomenon. The market is getting increasingly competitive.

Pakistan has made some progress in e-banking. The number of online bank branches increased from 222 in December 2000 to 994 in June 2003. Similarly, the number of ATMs, 207 in December 2001, rose to 444 in June 2003.

For the fiscal year 2002–2003, total exports from

Pakistan were about US$ 10 billion. It is very difficult to exactly quote the software exports but estimates range from US$ 20 million to 100 million, a wide difference to reconcile.

Human Resource in IT and Telecom

Developing countries in the Asia-Pacific region lack training facilities for ICT manpower. Very few can afford to go abroad for training. Most of the students who go abroad do not return. The regional countries have few quality training institutes. A large number of ICT professionals from the region leave to work in developed countries for higher salaries. This results in a continuous brain drain.

There is worldwide shortage of skilled ICT manpower. According to Asia-Pacific Telecom Indicators 2002, "worldwide shortage of networking professionals will approach 1.4 million by 2003. The Asia-Pacific skills gap will increase by 48 percent and will result in a shortage of almost 200,000 in 2003."

Some regional countries like India, Malaysia, Singapore, Philippines and China are squarely facing the above challenges by establishing IT hubs like IT parks and opening up specialized training facilities to absorb the trained ICT human resource. India's Silicon Valley, Bangalore, employs 80,000 IT professionals. The other known IT parks in the region are Malaysia's Multimedia Super Corridor, which is home to 18,000 IT professionals. Similarly, Singapore, Thailand and Philippines have IT hubs. Most IT parks/hubs have training facilities affiliated with universities.

Future Trends

Since early 2000, the global telecom industry has been in recession as the Asia-Pacific telecom industry was in some crisis in late nineties. However, Asia-Pacific countries are fast moving towards deregulation, liberalization and privatization. Countries like Malaysia and Singapore have moved towards converged regulatory bodies, bringing together the different elements of computing, telecoms and broadcasting under one roof. Other countries are copying this model.

Pakistan has recently announced its deregulation policy for the telecom sector, opening the field for the private sector. The government is also planning to split the present incumbent, PTCL, into functional entities for privatization.

Status of IT and Telecommunications in Pakistan

A lot of work has gone into improving the telecom infrastructure and services. The telephone density has increased from 2.45 percent in March 2002 to 2.9 percent in June 2003. According to Pakistan Telecommunication Authority (PTA), in 2000, Pakistan Telecommunication Company Limited commissioned 265,026 digital lines at around 319 sites. Of these, 197,640 lines were installed at 133 urban sites, whereas the remaining 67,386 lines were installed at 186 rural sites. Nation-wide dialing (NWD) facilities were extended to another 181 new stations bringing the total to 1,646 stations.

Unfortunately, the existing infrastructure and services are unfairly distributed. More than 80 percent of the infrastructure is concentrated in urban areas, serving 32 percent of the population and 70 percent in only four major cities with about 18 million population. We are still far from bringing the 68 percent of the rural population in the mainstream information and communications. Fortunately, we are picking up momentum. But will this momentum continue? PTCL's monopoly on basic telephony ended on January 1, 2003. The telecom field is now open to private investors, both domestic and foreign. However, PTCL being the largest single operator remains in firm control and virtually the monopoly holder. PTCL, more or less, continues to be managed by the same people who once were and continue to be government employees (the government owns 88 percent of PTCL). Old habits are hard to change. Will the customers get a fair deal? This remains a moot question.

Telephone Network and Capacity Utilization

In March 2002, digitalization of telephone exchanges in Pakistan stood at 90 percent and in June 2003, it had reached 100 percent. Digital exchanges means good quality transmission and reception of information. Figure 8 summarizes the trends of growth in terms of capacity installation and utilization over the period 1995–2001.

Figure 8: PTCL's Basic Telephone Network and Capacity Utilization

Year	ALI (Million)	ALIS (Million)	Capacity Utilization (%)	Growth in ALIS (%)
1995	2.83	2.127	75	
1996	3.20	2.366	74	10
1997	3.79	2.558	78	8
1998	3.47	2.757	79	8
1999	3.70	2.986	81	8
2000	4.29	3.053	71	2
2001	4.49	3.252	72	7

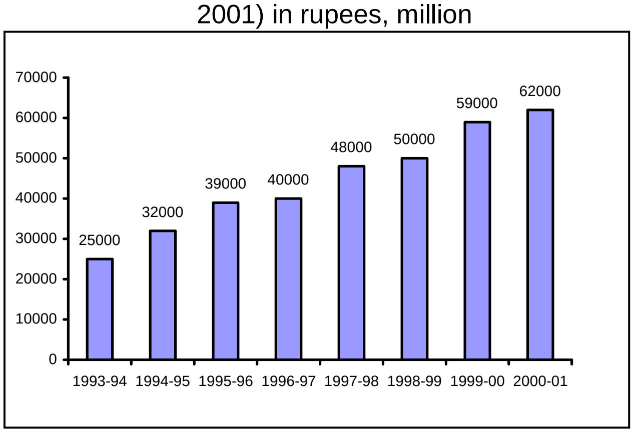
Source: Pakistan Telecommunication Company Ltd.

Rising Revenues

Data provided by PTCL shows increasing revenues. Its revenue increased from Rs 25 billion in 1993 to Rs 62 billion in 2000–01 (Figure 9). The international share was about 64 percent and domestic share around 36 percent.

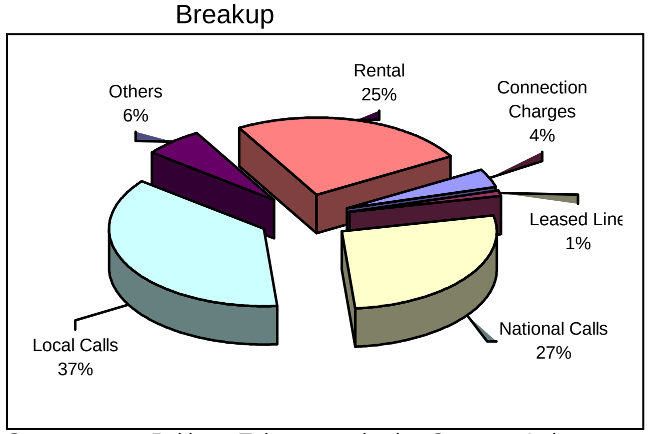
From its international traffic, PTCL earned 19 percent revenue from outgoing calls and 81 percent from incoming calls. Local calls remained the major source of PTCL's domestic revenue (Figure 10).

Figure 9: PTCL's Revenue Trend 2001) in rupees, million



Source: Pakistan Telecommunication Company Ltd.

Figure 10: PTCL's Domestic Revenue (1993 – Breakup



Source: Pakistan Telecommunication Company Ltd.

Although NWD and international call charges were reduced from 15 rupees per minute in 2000 to 5 rupees per minute in 2003, the benefit of increased revenue was not passed on to the local callers. This is one reason that PTCL's local calls per subscriber per month fell from 194 in 2000 to 184 in 2001. Despite this fall, PTCL earned 11 percent more from domestic calls during the same period due to increased local call rates. Over the years, local calls rates have been periodically increased, hitting the local callers hard. This practice of PTCL and the government has been contrary to international trends. In most countries, local calls are now free. Unfortunately PTA, the watchdog on prices, has been allowing such increases (Figure 11).

Recently, the government has announced some more reductions in international and domestic long distance call rates. Local calls made between midnight and 6 a.m. will not be charged. However, the latter facility is unlikely to be of help to local callers because of oddity of timings.

Figure 11: PTCL's Local Traffic and Calls per Subscriber

Year	Total Local Calls (000)	Total Subscribers (000)	Calls/ Subscriber/Month
1995	4,955,200	2127	194
1996	5,414,400	2366	191
1997	5,776,800	2589	186
1998	6,075,000	2757	184
1999	6,669,000	2986	186
2000	7,111,480	3053	194
2001	7,192,040	3252	184

Source: Pakistan Telecommunication Company Ltd.

Improved Telecommunication Infrastructure and Services

External Access

A couple of years ago, Pakistan, for its external communication and Internet connection, relied on AsiaSat series. Some pressure groups in Pakistan, including the SDPI's Study Group on Information Technology and Telecommunications, urged PTCL and the government to enter the information superhighways. Consequently, two memoranda of understanding (MoU) were signed with the Tran-Asia-Europe optical fiber passing through the Central Asian States. Pakistan had planned to enter this cable at Ashkabad in Turkmenistan through Quetta and Chaman. In view of the adverse situation in Afghanistan, this has so far not been possible. Another MoU was signed with the South East Asia-Middle East and the Western Europe submarine cable system. Pakistan is now connected with the latter information superhighway (Annexure A).

National Information Infrastructure

Pakistan has an optical fiber system running from Karachi to Peshawar backed up by microwave system. Optical fiber now runs on both sides of Indus which gives it good redundancy (Annexure B). Optical fiber connectivity is now available to 380 cities and towns. Currently, the system is synchronous digital hierarchy (SDH) that can support 5.5 Mb/sec. This backbone is expected to be upgraded to dense wavelength division multiplex (DWDM) which will enhance the capacity to 10 Gb/sec. It was planned that by June 2004, optical fiber would connect 600 cities and towns.

Pakistan's Communication Satellite – Paksat 1

Background

It was about 30 years ago when SUPARCO was mandated to commence its satellite-launching programme. This involved the establishment of satellite ground stations, design, assembly/fabrication and launch of communication satellites in geosynchronous orbit and experimental satellites in near earth orbit. The project was conceived as a result of the Indian programme, INSAT. In 1983, under a directive of the federal government, SUPARCO, in collaboration with Messrs Huges Communications International of USA, prepared a feasibility study for the establishment of communication satellite system, envisaging fabrication and launching of a 12-transponder satellite system at an estimated cost of Rs 1,348 million. This system was to provide facilities for direct television broadcast, telephone and data transmission services. The plan was to augment the existing telecommunication services and also provide new services considered essential for the socio-economic development of the country. Accordingly, the International Telecommunication Union (ITU) allocated orbit satellite slots to Pakistan.

The project was reviewed in 1989-90, and in view of non-utilization of the allocated slots, high cost and lack of demand, it was decided to offer the project to the private sector. Although the government received proposals from four consortiums, it did not award a licence to any of them. There was a danger that ITU might withdraw the slots from Pakistan if they were not utilized. Many Asian countries went ahead with their communication satellite programmes but Pakistan continued to procrastinate on this vital issue.

In 1998, the Ministry of Communications signed a contract with Alcatel, a French company, to launch a satellite over Pakistan on build, operate and transfer (BOT) basis. This was an important step in the modernization and upgrading of our information and telecommunications infrastructure. However, no satellite was launched.

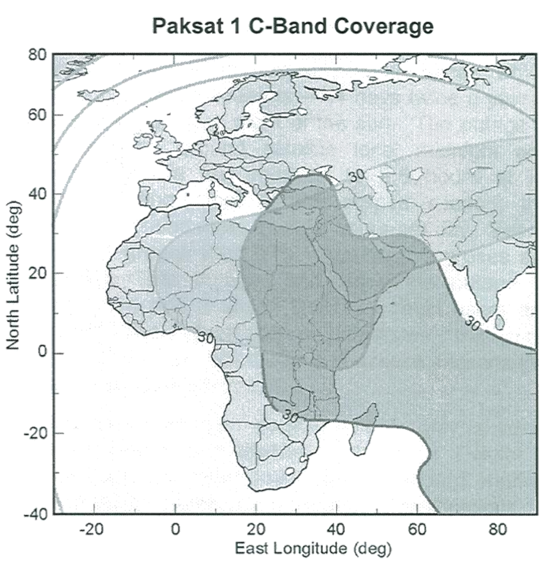
Even till 2002, Pakistan could not utilize the slots. This resulted in cancellation of all slots, except one, by the ITU because some other countries had requested the ITU for slots.

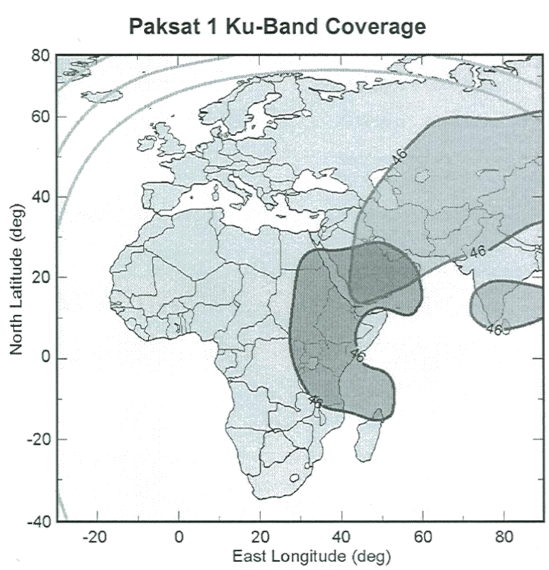
In 1994, the SDPI's Study Group on Information Technology and Telecommunications had drawn the attention of the government to the seriousness of the situation because of non-utilization of slots and their likely cancellation.

Pakistan Launches its Communication Satellite

It was in 2000 when Dr. Ata-ur-Rehman became the minister for science and technology that the government became serious to utilize the only available slot and launch its own satellite. Eventually, in July 2002, Paksat-1 was launched in geostationary orbit. The satellite was leased to Pakistan by the Hughes Global Systems (HGS). The technical details:

Paksat 1





Description of Services

Paksat 1 provides low cost, high quality satellite communications services in both C-and Ku-bands to Pakistan, Africa and the Middle East.

Paksat 1's 30 C-band transponders and 4 Ku-band transponders provide the total range of satellite communications capabilities. The satellite is in a geostationary orbit at 38º East Longitude, and carries high power payload in both bands.

Paksat 1 transponders are priced well below market rates. The satellite is ideal for use by businesses looking for low cost-of-entry to the satellite service market or to leverage the advantages of satellite communications. ISPs can use the satellite as a highly cost effective means to access the European or American Internet and to extend their reach into remote areas where broadband terrestrial capacity is not available. The satellite is also well suited for video contribution and distribution.

Applications

- **Internet backbone extension**
- **Point-to-point data services**
- **Remote Internet access**
- **Broadcast services (video and data)**
- **Business VSAT networks**
- **Direct-to-home**
- **Thin route telephony support**
- **Shipboard communications**

Background

Hughes Global Systems leased the satellite to the Government of Pakistan in July 2002. The satellite is in position at the Pakistani-licensed orbital location, 38º East Longitude. Paksat 1 is operational and is ready to offer services.

Discussion of Services Characteristics

Paksat 1 has a scheduled services outage, which occurs during eclipse seasons – 44 days twice a year – when the satellite loses sight of the sun. The outage is always centered around satellite local midnight and ranges between a few minutes to 2.5 hours at its maximum. During most of the eclipse season, the satellite can be used more than 22 hours per day. Yearly availability is greater than 97%. Business day uses are unaffected by the outage, and since the outage is between 1 am and 3 am in Pakistan, most users are unaffected. The chart below illustrates the high availability of the service. Outside of eclipse seasons, the satellite is available 24x7.

While the scheduled outage reflects only a small degree of service unavailability, pricing for Paksat 1 bandwidth will be much lower than standard market rates, and will be highly competitive for all applications.

Source: National Telecommunications Corporation

Paksat 1: Technical Characteristics

C-Band Payload Characteristics	
Number of transponders	24 in standard C-band 6 in extended C-band
Redundancy	All redundancy available
Channel bandwidth	36 MHz
Uplink frequency band	5925 MHz – 6665 MHz
Downlink frequency band	3400 MHz – 4200 MHz
Beams	Southern regions Northern regions
Beam connectivity	All transponders can be switched independently to downlink in the southern beam. Many transponders can downlink in the northern beam. All transponders can be switched independently to uplink from either beam
Polarization	Linear crosspol
EIRP (at peak of beam)	38 dBW
G/T (at peak of beam)	+2 dB/K

Ku-Band Payload Characteristics	
Number of transponders	4
Redundancy	All redundancy available
Channel bandwidth	72 MHz
Uplink frequency band	13754 MHz – 14486 MHz
Downlink frequency band	10954 MHz – 11686 MHz
Beams	Southern regions Northern regions
Beam connectivity	All transponders can be switched independently to uplink or downlink in either beam
Polarization	Linear colpol
EIRP (at peak of beam)	52 dBW
G/T at peak of beam	+5 dB/k

Pakistan is still using AsiaSat series for information transmission and Internet connection. Pakistan Television (PTV) uses 1 X 36 MHz C-band transponder on AsiaSat 3 for airing eight planned TV channels. The defence services use 21 MHz on AsiaSat 2.

The Virtual University is using Paksat 1 for its two video channels in C-band. Mashriq TV is the other domestic user. It may be noted that a large capacity of this satellite remains unused.

Internet – User Growth in Pakistan

During the last two to three years, there has been remarkable increase in the Internet connectivity. From 29 cities in March 2000 and 802 cities and towns in June 2002, Internet is now available in 1,600 cities and towns (as of June 2003). Internet connectivity is available from these cities and towns at the price of a local call. In June 2000, there were 130,000 Internet users in Pakistan but in August 2003, the number had increased to 6.4 million. Although the growth has been phenomenal and the highest in the region (Figure 12), the rural population has not come on the mainstream information and communications.

Figure 12: Telecom, Computer and Internet Diffusion in South Asia (Per 1000 people)

Countries	Telephone Mainlines	Cellular Phones	Personal Computers	Internet Users
Bangladesh	3.4	1.2	1	0.2
India	26.6	1.9	3.3	4.5
Nepal	10.6	--	2.6	1.4
Pakistan	22.2	2.1	4.3	8.5
Sri Lanka	36.4	12.2	5.6	3.4

Source: International Telecommunication Union (2000)

Telecom Infrastructure and Services Make Progress

The PTCL has been systematically enhancing the telecom infrastructure and services in Pakistan. In this respect tangible progress has been made. This is apparent from the data below:

Details	Units	March 2000	June 2002	June 2003
• Universal internet	Cities	29	802	1600
• Bandwidth	Mb/s	32	410	580
• Bandwidth Tariff Red’n	US$/E1.MO.	87,000	11,250	5,400
• Fiber connectivity	Cities	53	210	380
• Cities on internet	Cities	29		1600
• Redundancy and technology on backbone		PDH/SDH non redundant		DWDM total redundancy in five loops nationwide
• Cell phones	Number	210,000		2,300,000
• Internet users	Numbers	200,000		4,500,000
• PTCL profitability	Rs. (Billions)	13	19.2	21.2 (F)
• Digitalization	%	90	100	100
• NWD locations	Cities	1,400	1,700	1,900
• Installed fixed lines of PTCL (ALI)	Millions	3.88		4.94
• Teledensity	%	2.45%		2.9%
• Price reduction call charges NWD and international	Rs. Weighted average	Rs. 15/min		Rs. 5/min

Continued…

Details	Units	March 2000	June 2002	June 2003
• Monthly price for 2 MB ISPs	US $	32,325	15,000	5,00 (IP) 6,000 (IPLC)
• Free bandwidth for redundancy		Nil	Nil	Free: including pick up of bandwidth costs for VSAT links of IT enabled services
• Monthly price /2 MB	US $	24,208	11,250	5,400 (IP) 6,000 (IPLC)
• Bulk bandwidth rates	US $/ month	NA	NA	2M - $5,400 8M - $19,500 12M - $29,250 16M - $36,800 34M - $72,000 45M - $95,295

Source: Data presented to the SDPI's Study Group on IT and Telecom by an official of the Ministry of IT on August 25, 2003.

Government Policies

In 1994, a policy document envisaging development of telecommunication sector was prepared by the Government of Pakistan. The outcome of this framework was the enactment of Pakistan Telecommunication (Re-organization) Act 1996, the establishment of Pakistan Telecommunication Company Limited (PTCL), the Pakistan Telecommunication Authority (PTA) and the Frequency Allocation Board (FAB). The policy aimed at:

- Improvement and expansion of the existing telecommunication infrastructure to provide services to every segment of society at a reasonable cost.
- To encourage development of local telecommunications expertise to promote local research and manufacturing to create an indigenous industrial base for telecommunications in Pakistan.

Since then, the government, in order to liberalize, deregulate and comply with the WTO agreement, has issued the following policies:

- Information Technology Policy and Action Plan (Annexure C)
- Deregulation Policy for the Telecommunication Sector (Annexure D)
- Mobile Cellular Policy (Annexure E)
- Broadband Policy for Pakistan (Annexure F)

The policies were discussed by the Study Group on Information Technology and Telecommunication in its various meetings. For comments of the group and recommendations submitted to the government, please see the annexure.

Software Industry in Pakistan

From US$ 90 billion in 1997, the global software market is expected to grow to about US$ 900 billion by 2008. Although the Pakistan Software Export Board gives a rosy picture, Pakistani industry is handicapped because of the shortage of trained human resource to deliver quality software at competitive rates. Pakistan has only a few quality institutions offering computer science programs, and these too are not adequately staffed. Besides, the industry continues to suffer from "brain drain." It is difficult to know the exact figures of software export but the estimate ranges from US$ 20 million to 100 million annually.

"In the traditional brick and mortar industries, anything that is exported has to be physically transported, along with the required documentation, across the borders. This means that keeping track of the number of items exported, along with the actual revenues received within the country, is a straightforward task. Not so in the software industry, where the finished goods are sent electronically over the Internet directly by the exporters. There is literally no mechanism that allows this export to be regulated, neither of course it is desirable to even attempt to do so (Leghari 2003)."

With the telecommunication infrastructure and services making steady progress and the encouragement from the government to the software industry, better results should accrue. Wider bandwidths at reduced rates are now available to the industry. For example, 32 Mb/s that was available in 2000 went up to 580 Mb/s in 2003. The cost dropped to US$ 5,400/E1 in 2003 from US$ 87,000/E1 in 2000. With the deregulation of telecommunication infrastructure and the ongoing improvement in the quality of IT education, the software industry should be able to convert its initial disadvantage into an advantage. It would require meticulous and long-term planning setting achievable targets. The Pakistan Software Export Board will have to play its due role in a dynamic fashion to achieve any breakthrough in exports.

The National Language Authority has been working on Urdu software for the last eight years. So far, only the keyboard has been standardized. Unfortunately, full standardization has not yet been achieved because no one appears to be serious about it. The other difficulty is that computer technicians do not know Urdu and Urdu knowing persons are not even computer literate.

- Computer technicians should be encouraged to master the Urdu language and use Urdu software. Appropriate workshops for this purpose should be organized.
- To bridge the digital divide, the Urdu language should be promoted. Urdu software should be standardized and adopted. This will open up employment opportunities. Because of the use of Urdu software, NADRA has employed 15,000 data entry operators.

Cellular Mobile Industry in Pakistan

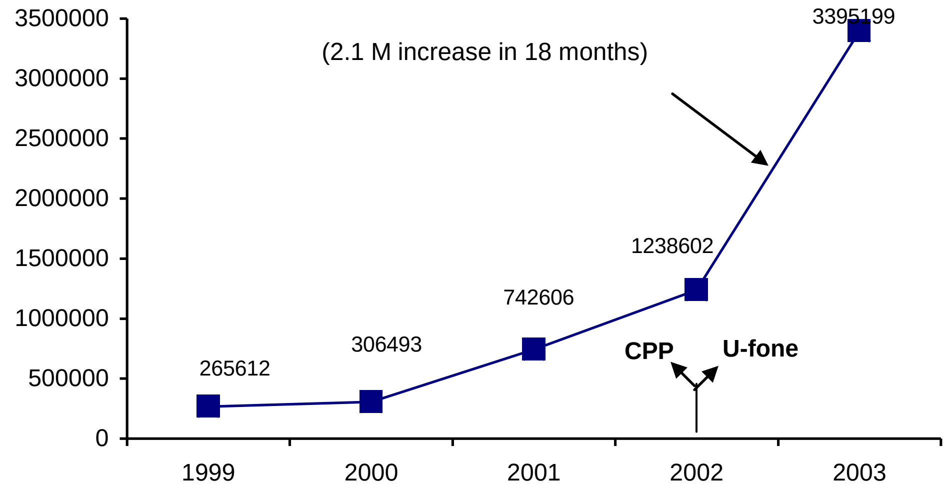
There has been a remarkable growth in the cellular mobile phone industry in Pakistan. From 0.21 million in March 2000, the subscriptions reached 2.3 million in June 2003. After the calling party pays (CPP) regime, introduced in November 2000, the growth has been phenomenal. In December 2003, there were 3.4 million mobile cellular phones in Pakistan (Figure 13). In a couple of years, the number of cellular mobiles would surpass the fixed line phones. This has happened in a number of countries.

Figure 13:

Year	Instaphone	Mobilink	Paktel	PTML	Total
1995-96	20,950	16,385	30,703		68,038
1996-97	43,029	52,600	39,398		135,027
1997-98	53,184	82,912	60,000		196,096
1998-99	108,058	87,556	70,000		265,614
1999-00	112,000	114,272	80,221		306,493
2000-01	220,000	309,272	96,623	116,711	742,606
2001-02	330,000	800,000	218,536	350,000	1,698,536
2002-03	420,000	1,115,000	319,400	550,000	2,404,400
Dec.03	491,011	2,015,647	333,169	555,372	3,395,199

Source: Pakistan Telecom Authority (PTA)

Growth of Mobile Subscribers in Pakistan



Source: PTA

There are four operators (2 GSM, 1 D-AMPS and 1 AMPS) providing service in Pakistan. The table provides an overview of the subscriber base of the operators. The PTA has recently awarded two new licenses. The Ministry of Information Technology estimates a potential demand of 25 million cellular phones by 2018.

Like the fixed line phones, the cellular phones are also concentrated in big cities because the existing operators have built their networks in cities and towns. Large rural areas remain uncovered. Therefore, the "digital divide" has not yet reduced. With the stringent conditions, laid down by the government, requiring licensees to provide 70 percent coverage in tehsils might bring a "breakthrough."

Problems of the Trained Human Resource in Telecommunications in Pakistan

Telecommunications is not recognized as a separate discipline in engineering. The subject is generally merged with electrical engineering where various aspects of telecommunications are covered only superficially. Sometimes this discipline is included in curriculum for electronics or electrical engineering. In either case the electrical or electronics engineers turned out by the public sector universities in Pakistan possess at best a tertiary knowledge of telecommunications engineering. Given the poor quality of education in Pakistan and the unfair means allowed or used in the examinations, the graduating engineers are unable to become effective to the engineering profession. It was as early as in 1987 when it was felt in France to initiate a masters programme for systems engineering in telecommunications by merging together electronics and computer science. A balanced syllabus of telecommunications systems education and computer communications software was included in the programme. A pre-requisite of the course was bachelors' degree in electronics and computer science. The programme has proved a great success with the industry and government organizations in Europe.

We continue to follow old and outdated curricula. The graduate engineers turned out by the universities are only fit to be absorbed by the government departments, because they are not fit for the industry and for research and development. Industry prefers to employ technicians, rather than fresh graduate engineers, and teaches them skills on the job. As a result, there is massive unemployment of engineers in the country. There is no concept of "on the job training" like for example the "house job" for the doctors. Recently, some engineering institutions have made it compulsory for the graduating engineers to undergo six months of internship with relevant industrial units. The obvious solution is to revise, revamp, modify and update the curricula to ensure that these are more focused and their quality is comparable to such programmes in the developed countries. The number of graduates produced in one year is not important. What is important is that these graduates are equipped with necessary skills to accept real life challenges.

"The linkage between universities, industry and government (the technology triangle) is non-existent. The technology triangle is determined by the characteristics of the education system. If the system is poor, the technology triangle will also be poor. The overall education system is itself shaped by its 'inflow/outflow' conditions. This means that primary school determines the quality of secondary school, college and university education. The education system is a chain of interconnectedness. It can be as good as its weakest elements. **Overall the education system constitutes the basic investment in human resource development** (Chourci and Moavenzedeh 1993)."

The Military College of Signals, affiliated with the National University of Science and Technology (NUST), is perhaps the only institution in Pakistan where telecommunications engineering is taught as a discipline, but NUST does not award degrees in telecommunications engineering. This specialization is covered under electrical engineering. Besides this, the army trains its telecommunications technicians in the Signal Training Centre, Kohat, and the Army Apprentices Schools near Murree. Apart from this, the PTCL has their Staff College in Haripur and their technicians are trained in their regional training schools. The Pakistan Telecommunication Company Limited (PTCL) is also managing an Institute of Information Technology in Islamabad. The problem with NUST courses is that there are a limited number of seats for the civilian students and the courses are very expensive. Deserving but poor students cannot hope to enter NUST. Recently, the COMSATS Institute of Information Technology, Islamabad, has also started teaching telecommunication.

Pakistani engineering institutions provide vastly varying levels of education. Public sector universities/colleges produce poor quality engineering graduates. Private universities/colleges, (a few elite government-sponsored institutions like NUST or GIK) provide quality education.

The Process of Deregulation in Pakistan

Early 1993, the Study Group formulated some important recommendations for the federal government for an overall improvement in the information and communications sectors. The group felt that data networks in Pakistan needed urgent enhancement and improvement to enable Pakistan to reap the fruits of information revolution, particularly the Internet. Accordingly, the Study Group sent the following recommendations to the government:

a. The country is in dire need of establishing "ELECTRONIC HIGHWAYS" with zeal comparable to the interest in building modern motorways and road networks.
b. The private sector should be allowed free participation in the establishment and operation of private and public data networks to cater to a potentially very large demand for such services, which is presently suppressed due to poor service in this area.
c. Rationalize existing data tariffs of the PTC (now PTCL) for data transfer, which are extremely exorbitant by international standards and improve its service, which is unreliable at best.
d. Encourage the use of electronic information interchange by government agencies and facilitate the use of these services by the private sector, banks, travel and hotel businesses, and traders. Establishing network links between universities, research establishments, and libraries would be an important step in strengthening our abysmal educational facilities and is a prerequisite for supporting first-rate academic and scientific research.
e. Government policies on computer and communication equipment must be further rationalized. The present surcharges on equipment and duties on spares should be removed in order for the country to truly benefit from the electronic revolution, which can immediately open up enormous economic and employment opportunities.

The response of the government was positive. Since then the process of liberalization and deregulating has slowly moved forward. Till June 2003, the status of licenses issued to the private sector was as follows:

Licenses Issued for Value Added Services

S. No.	Name of Services	Total Licenses issued upto June 2003	Licenses issued in 2002-2003
1.	Audiotex Services	9	02
2.	Burglar Alarm System	1	-
3.	Car Pay Phone Services	175	71
4.	Data Communication Network	24	-
5.	Digital Radio Paging Services	1	-
6.	Electronic Information Services	119	17
7.	E-Mail Services	11	-
8.	Mobile Telephone	4	-
9.	Non Voice Communication Network Services	24	09
10.	Stored and forward Fax Services	9	02
11.	Satellite Services	8	-
12.	Special License	4	-
13.	Basic Telephony	3	-
14.	Trunk Radio Services	12	-
15.	Video Conferencing Services	1	01
16.	Voice Mail Services	2	-
17.	Vehicle Tracking System	3	-
	Total	**410**	**102**

Source: Pakistan Telecom Authority

Under the WTO agreement, monopoly of PTCL ended on December 31, 2002. The telecom sector is now open to the private investors.

The telecommunication, deregulation, mobile cellular and IT policies have been framed and are being implemented.

Problems of the Private Sector

Because of PTCL's strong standing and its 80 percent ownership of the government, potential domestic investors are fearful of the company. There is a strong feeling among the private sector that the deregulation policy is biased in favor of the PTCL.

The deregulation and mobile cellular policies have been made static for the next five years. The private sector feels that there should be built-in flexibility in these policies and suggestions beneficial across the board should be incorporated.

Although the PTA is now under the Cabinet Division and theoretically strong and autonomous, the private sector feels that it still has some tilt towards the well being of PTCL.

For mobile cellular licensees, the policy lays down that they will be obliged to provide 70 percent coverage of tehsils during the next four years. This means that in 208 tehsils, 1000 (plus) cell sites will have to be established, which would mean a cell site every 35 hours. This is an unrealistic target. A survey shows that on average, a person can only spare 30 percent of his/her income for telecommunication needs. With the per capita income of US$ 495, a person can spare only US$ 148 for all telecom services. With every third person in Pakistan living below the poverty line, it will be almost impossible for private investors in rural areas to recover their investment.

The deregulation policy is silent on inter-ministerial framework to address hot issues of competition, convergence and dispute settlement.

There is no anti-competition mechanism. In the absence of such mechanism, PTCL, a strong player, can outdo other investors through unilaterally lowering their tariffs and offering discounts.

Conclusion and Recommendations[2]

1. The Digital Divide

- Although Pakistan is making steady progress in information technology and telecommunications infrastructure and services, in content and quality, our rural population (68 percent), by and large, remains deprived of the "mainstream" access to the benefits of IT revolution. With the entry of private investors in the field and obligations under the relevant policies, the unserved and underserved areas may benefit. The government must fully involve itself in this venture.
- Access promotion contribution and the Universal Service Fund must be utilized under an appropriate strategic plan to enhance telephone density in rural areas.
- Under the deregulation policy, PTCL, in lieu of contribution to the Universal Service Fund, is obliged to roll out 83,000 new lines every year for unserved and underserved areas. This must be closely monitored and implemented by the PTA.

2. Fear of PTCL in the Deregulated Regime

- Potential domestic investors remain fearful of PTCL because of its strong standing which could jeopardize the entry of new competitors as the incumbent may charge high prices from the new entrants for use of its infrastructure. Also, PTCL may, at will, reduce its tariffs for its consumers, economically hitting the new entrants. The PTA should issue "anti-competition" rules to safeguard the interest of new operators in the field.

3. Policy Revisions

Although the government has good reasons for not making any changes in the policies for five years, suggestions that would benefit all licensees, present and future, should be incorporated rather than maintaining the status quo for five years.

4. Affordability

PTCL has, over the last of couple of years, increased the bandwidth for service providers. It has also reduced international and domestic long distance tariffs. However, local call rates have been on the increase. With the common person making mostly local calls, these rates must be reduced. In a number of countries, there is no charge for local calls.

5. Human Resource Development in Telecommunications

- *Telecommunications as a Separate Discipline*

  Rapidly evolving telecommunications technologies require specialized staff. To cater to such requirements and fill the gap of trained personnel, telecommunications engineering should be declared as a discipline of engineering and should be introduced in the engineering universities.

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2 . Some of these recommendations were sent to the government from time to time.

- *Curricula for Telecommunications*

  A committee(s) of experts, including experts from the industry, may be constituted to lay down curricula for bachelors and masters of telecommunications engineering. The committee may also consider the programme followed by NUST and in developed countries like France who have excelled in this discipline.

- *Training in Software Engineering*

  The world software market has touched US $ 1 trillion. Pakistan should immediately launch training programmes in software engineering. In this connection:
  - Computer science curricula being followed by various universities must be reviewed and brought in line with the one followed in advanced countries.
  - University faculties should be strengthened by inducting competent computer scientists and software engineers at high salaries.
  - As it would take 3 to 4 years to produce software engineers, therefore, it is necessary to organize retraining of engineering and science graduates.

- *Creation and Maintaining Technology Triangle*

  Strong linkages between the universities, industry and policy making should be established. Industrial establishments should be linked with universities through law. Graduate engineers should be required to complete a year of internship (as for doctors) before being awarded degrees.

- *Scholarships for Studies in Quality Institutes*

  Liberal scholarship schemes should be initiated for deserving but poor students who wish to undertake studies in prestigious institutes like NUST and GIK Institute of Engineering Sciences and Technology.

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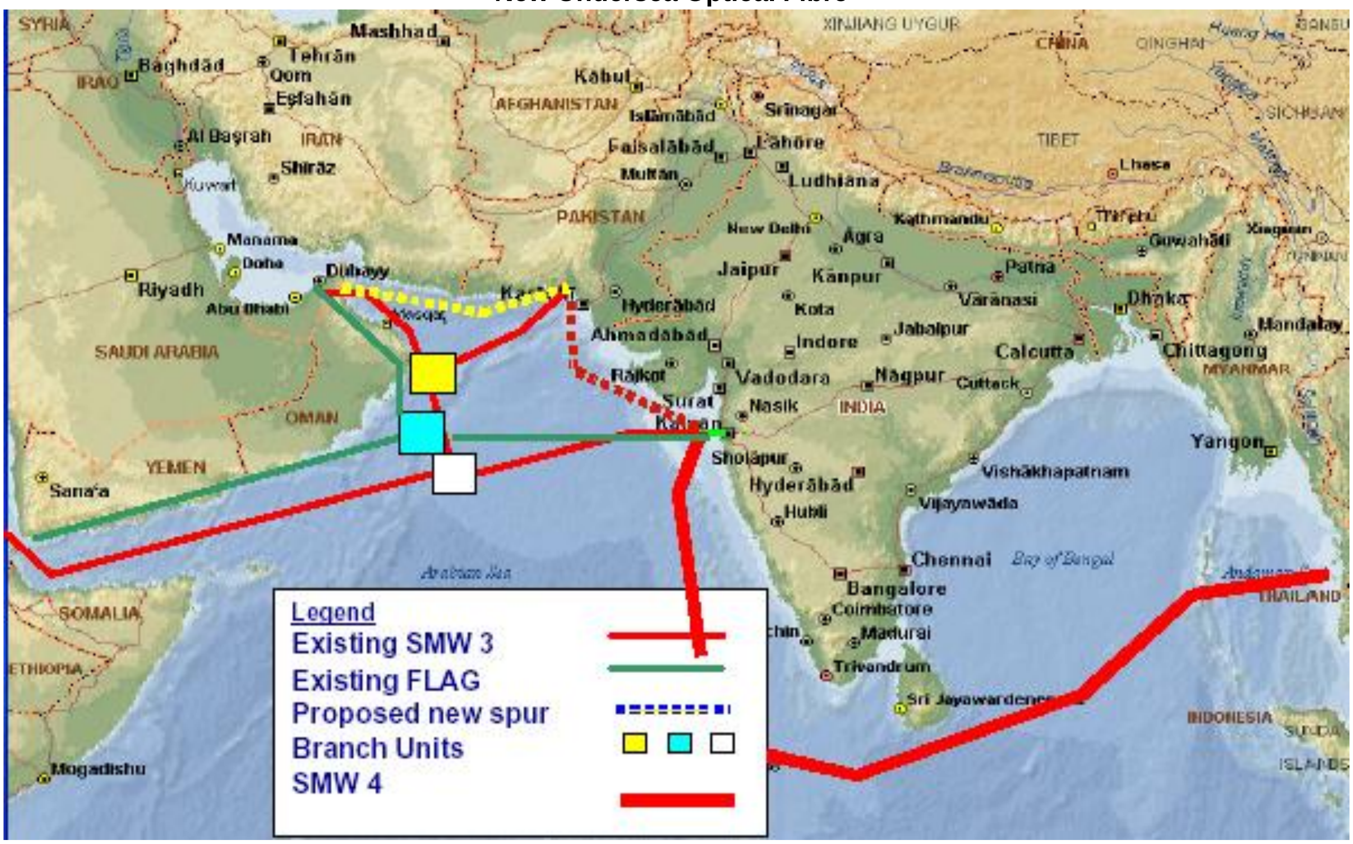
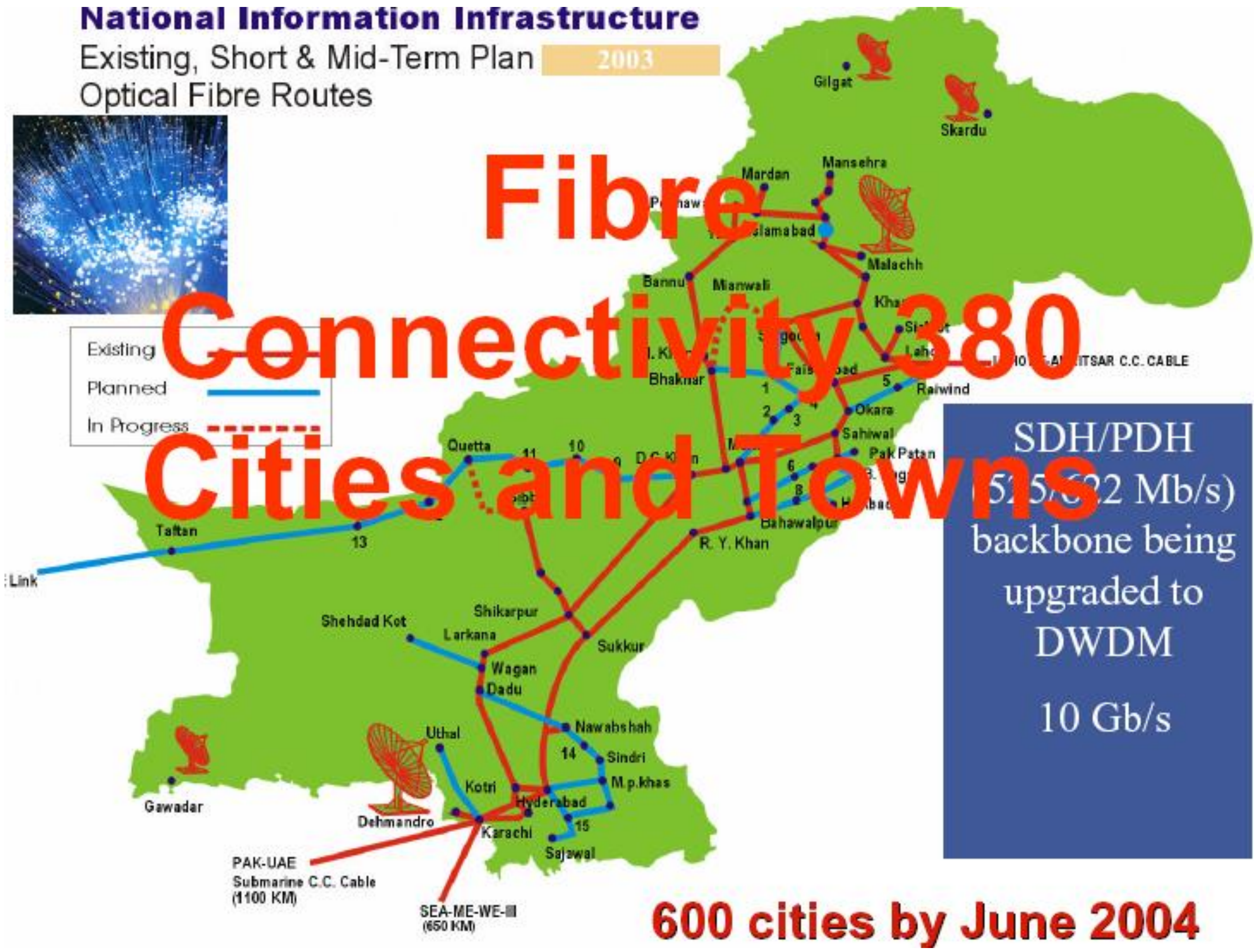
Annexure A

New Undersea Optical Fibre



Annexure B


National Information Infrastructure
Existing, Short & Mid-Term Plan
2003
Optical Fibre Routes
Fibre
Connectivity 380
Cities and Towns
Existing
Planned
In Progress
SDH/PDH
backbone being
upgraded to
DWDM
10 Gb/s
600 cities by June 2004
Gilgat
Skardu
Mardan
Mansehra
Malachh
Bannu
Mianwali
Bhakkar
Raiwind
Okara
Sahiwal
Pak Patan
Quetta
Bahawalpur
R. Y. Khan
Taftan
Shikarpur
Shehdad Kot
Larkana
Sukkur
Wagan
Dadu
Nawabshah
Uthal
Sindri
M.p.khas
Kotri
Gawadar
Dehmandro
Karachi
Sajawal
PAK-UAE
Submarine C.C. Cable
(1100 KM)
SEA-ME-WE-III
(650 KM)

Annexure C

Information Technology Policy and Action Plan
August 2000

Main Points

Formulated in August 2000, the guiding theme for the policy is that the government shall be the facilitator in IT and telecom. Core IT policy strategies were proposed in the following areas:

- **Human resource development**
  To develop a pool of appropriately qualified manpower, it was planned to establish four new IT universities, virtual IT university, national testing and accreditation services, educational intranet, strengthening of existing IT institutions and hiring of faculty from abroad.
- **Infrastructure development**
  It was planned to develop broadband infrastructure, IT parks and incubator areas in the country.
- **Software industry development**
  It was decided to provide encouragement and incentives to software industry.
- **Hardware industry development**
  The policy envisaged waiver of duties and taxes on hardware, incentives to reduce the cost of raw material, encourage and fund R&D in the universities.
- **Internet**
  Encourage competition, avoidance of unnecessary regulations, provision of low cost broadband access and free Internet access to universities.
- **Incentives**
  The strategy focused on promotion of venture capital, recognition of software development as priority industry for financing, and to allow the technology companies to be listed on stock exchanges.
- **Legislation**
  Actions were to be initiated in areas of digital signatures act, intellectual property and copyright act and consumer protection act.
- **Regulation**
  In devising a useful regulatory framework, the focus would be on creating a fair, equitable and competitive environment based on the principle of free market and open access.
- **Implementation of the above policy**
  The formulators of the IT policy did a good job to include an action plan in the document. It included priority areas, specific projects to be conceptualized, mechanism for funding, appraisal, monitoring and evaluation. Six-monthly review of the IT policy and action plan was built into the policy document.

Comments

The IT policy purported to bring about progress in human resource development, IT and telecom, infrastructure, Internet access, legal framework and e-government to name a few areas. Implementation of the IT policy has resulted in the following outcomes (based on the review by the SDPI's Study Group on IT and Telecom, October 23, 2002):

- There has been a significant increase in financial allocation for the IT sector.

- Increased bandwidth with significantly reduced cost is now available to the Internet service providers.
- Internet access is available to 820 cities and towns.
- A number of IT training programs are being implemented.
- Software exporters enjoy fiscal incentives.
- Software technology parks are being established and such parks are now on ground in Karachi, Lahore and Islamabad.
- An e-government directorate has been established in the Ministry of Science and Technology.
- Virtual IT University is operational.
- An IT Division has been established in the Ministry of Science and Technology.
- Some 3000 schools and 200 colleges are imparting computer education in Punjab.
- Electronic Transaction Ordinance has been issued.
- Under the WTO agreement, PTCL's monopoly will end on December 31, 2002 but we still have not prepared and issued a deregulation policy (The policy has since been issued).
- Very little has been done to computrize the land records and make them available online to the public. Some work in this regard has been done in Punjab and Balochistan.

This Study Group on IT and Telecom also made the following recommendations:

- Greater attention should be given to international marketing that includes export of software, human resource and hardware.
- In the past, a number of projects were shelved because of change of governments. Successful implementation of IT policies will require continuity of policies.
- Our telecom and IT infrastructure must be continuously updated and improved. At present its efficiency is below the desired level because of excessive line losses, poor maintenance of equipment and substandard service.
- We need to improve the quality of our IT and telecom, manpower and produce leaders with good management skills.
- Currently the IT and telecom sector the world over is hit by recession. The policy makers will have to work hard to minimize the effect of this recession.
- Our transportation system has not yet fully adopted the IT technology (intelligent transportation system).
- Very little has been done on the e-governance and information databases to enable public to access information.
- Copyright issues are yet to be resolved.
- The government should adopt modern technologies.
- To take stock of the progress of implementation of IT policy, the Ministry of Science and Technology should organize a series of review sessions.

(The policy envisages six-monthly review of the policy and the action plan but so far no review has been carried out.)

Annexure D

Deregulation Policy for the Telecommunication Sector 2003

Issued by the Government of Pakistan, the salient points of the deregulation policy are:

Policy objectives

The policy is designed to achieve the following objectives:

a. Increase service choice for customers of telecommunications services at competitive and affordable rates;
b. Promote infrastructure development, especially infrastructure that will increase both teledensity and the spread of telecommunication services in all market segments (including voice, data and cellular etc.);
c. Increase private investment in the telecommunications sector and encourage local telecom manufacturing/service industry;
d. Recognizing the challenge to incumbent, minimize the risk to Government's revenue base;
e. Accelerate expansion of telecommunication infrastructure to extend telecommunications services to unserved and underserved areas;
f. Gradually liberalize the telecommunications sector by encouraging fair competition among service providers;
g. Maintain an effective and well defined regulatory regime that is consistent with international best practices; and
h. Maintain consistency with the Pakistan IT and Internet promotion policy of low prices for bandwidth and Internet access.

Number and types of fixed line telecom service licences

- *Local loop (LL)*
    - Upto three LL licences per PTCL region will be awarded. There are 13 regions.
    - Licences to be awarded through open and transparent bidding.
    - No floor price will be fixed.
- *Long distance and international (LDI)*
    - Upto three LDI licences for Pakistan will be allowed.
    - Open bidding.
    - Floor price will be fixed.
- *Licencees obligations*

LDI

- Start roll out by building at least one point of interconnection in each of thirteen PTCL regions within one year of award of licence and in all PTCL transit exchanges (currently 36) within 3 years.
- The operators will be permitted to lease infrastructure from PTCL or any other infrastructure owner on mutually agreed commercial terms, non-discriminatory to other licensees seeking the same facility. The operator must own a proportion of the transmission systems and cables

comprising its networks. The proportion will be 10% in year 1, rising to 30% in year 2 and 50% in year 3 measured in 2 Mbit/s x km. A long-term lease of 5 years or more will be acceptable in lieu of ownership. The operators will provide a performance bond of US$ 5 million in respect of infrastructure and rollout targets in the form and substance acceptable to the Government and provide incoming and outgoing interconnection services, both for voice and IP data traffic, to all who may request it.

LL

- Start operations with one Point of Interconnect within the prescribed period and in each licensed PTCL Region where they operate ("Points of Interconnect" are premises at which other licensed operators can send to or receive from the LL licensee voice or data traffic originated by or destined for the LL licensee's customers) at acceptable technical and quality standards.
- In the event that another operator considers that an LL licensee's termination prices are inappropriate, the PTA has the power to resolve the dispute and impose cost-based prices.
- Provide free of cost directory services to its own customers, access to emergency services, operator assistance and any other similar support services as required by PTA.
- LL operators will not be permitted to carry voice calls between PTCL Regions (other than metro regions) or long distance/international traffic. They may carry voice calls between municipalities, but only within a single region.

Both licensees

- Both types of licensees will be required to provide regular reports to the PTA on quality and network implementation. These will include but not limited to the number of voice lines and broadcast channels, and revenues from line rentals. They will also detail revenues and minutes from local, long-distance and outgoing international and incoming international separately. LL operators will file separate reports for each PTCL Region in which they operate.
- Both types of licencees will be penalized for failing to meet license obligations, or failing to make use of radio spectrum that is allocated to them. In addition, the licensees may be obliged to provide services as may be mandated to achieve above defined policy objectives.
- Operators will pay to PTA a fixed annual fee, approved by the Government, to reasonably cover the costs of regulation. The annual fee shall not exceed 0.5% of last year's gross revenue minus inter-operator and related PTA mandated payments.
- Operators will devote 1% of gross revenue minus inter-operator and related PTA mandated payments to qualified research and development.

- *Other Licenses*

  - Following the initial licensing of LL and LDI operators, the Government intends to formulate separate policy for corporations that wish to establish intra-corporate networks.

- *Access promotion contribution (APC)*

A portion of the international tariff from incoming traffic will be used to promote network expansion. This will be supervised by PTA. APC may be given to LL licencees. Cellular operators will not be eligible.

- *Interconnection*

  PTCL will provide interconnection to both licencees on prices as initially notified by PTA.

- *Obligations of PTCL*

  - Upgrade its switches
  - Provide interconnections
  - Provide co-location facilities to licencees

- *Universal service*

  - The government will work towards providing connectivity to unserved areas.
  - A Universal Service Fund (USF), to be contributed by licencees, will be created for universal service.
  - USF will be limited to 1.5 percent of gross revenue minus the PTA mandated payments.

- *The policy will be reviewed after five years.*

- *Deregulation Facilitation Unit*

  This will be set up in the Ministry of Information Technology comprising senior professionals to facilitate implementation of the policy.

Comments

The SDPI's Study Group on Information Technology (IT) and Telecommunications (telecom) met on January 29, 2003 with 35 participants, representing the private sector organizations, media, stakeholders, Pakistan Telecom Authority, PTCL and academic institutions. The group discussed the following issues:

- Government's draft deregulation policy
- PTCL's strategy and role in the deregulated regime

The following were sent to the Government as policy recommendations:

- The participants were of the view that the draft deregulation policy is heavily tilted in favor of PTCL and the main aim of the government appears to be to safeguard its revenue base because it owns 88 percent of PTCL shares. The main aim of the policy should be the interest of the consumer and fair competition between all the operators.
- Potential domestic investors remain fearful of PTCL because of its strong standing which could jeopardize the entry of new competitors as the incumbent may charge high prices from the new entrants for the use of its infrastructure. Also, PTCL may, at will, reduce its tariffs for consumers, hitting the new entrants economically.
- The PTCL was of the view that it is well-poised and prepared to play its role effectively in the deregulated regime. It would welcome competition from the domestic and foreign entrants. It would fulfill all its obligations as contained in the deregulation policy. To meet its obligations, PTCL is engaged in organizational restructuring, marketing and customer care strategies and adoption of new technologies.
- High licensing fees, performance bond, R&D fund and Universal Service Fund are too high and should be revised downward to encourage competition.
- PTA said that it has done the required homework to implement the deregulation policy, in letter and spirit, when it is announced.
- The PTA felt that the deregulation policy should be announced as early as possible to allow them to complete actions required during the run-up to biding and licensing (The policy was announced in July 2003).

- On the number of licences for local loop (LL) and long distance/international (LDI), the opinion was divided. Some felt that there should be no restriction on the number of licences and non-serious investors can be kept out by reasonable licence fees and performance obligations. Others felt that the number of licences should be restricted as has been done in the present deregulation policy.
- The PTA should be made independent, responsible directly to the cabinet. This would enable it to play its role effectively (The PTA is now responsible to the Cabinet Division).
- In the initial years, the new entrants should be protected to sustain competition with PTCL.
- Cellular and wireless industry should also be included in the deregulation policy (The Mobile Cellular Policy was announced in January 2004).
- Obligation to build transmission systems by LDI operators should be re-considered.
- It should be ensured that the Access Promotion Contribution (APC) and the USF are utilized to reduce the digital divide.

Annexure E

Mobile Cellular Policy
2004

Main Points

The following are the salient features of the Mobile Cellular Policy (issued on January 28, 2004):

- ***Mobile Policy Objectives***

  In addition to the broad telecom sector objectives, as outlined in the Telecom Deregulation policy, the following objectives specific to mobile cellular sector are expected to be achieved through this policy:

  i. Promotion of efficient use of radio spectrum;
  ii. Increased choice for customers of cellular mobile services at competitive and affordable price;
  iii. Private investment in the cellular mobile sector;
  iv. Recognition of the rights and obligations of mobile cellular operators;
  v. Fair competition amongst mobile and fixed line operators;
  vi. An effective and well-defined regulatory regime that is consistent with international best practices.

- ***Market***

  - Current coverage is a constraining factor in the growth of mobile penetration. Since the existing operators have essentially built their networks in the cities and towns, current policy aims to accelerate coverage for rural areas by putting coverage obligations and by creating a Universal Service Fund.
  - Assuming that future cellular coverage reaches 95% of all urban population and 30% of rural population and taking into account the relative geography and population density of each Province, there is a potential demand of approximately 25 million cellular subscriptions by 2018.

- The Government of Pakistan wishes to encourage efficient use of the radio spectrum. As such the frequency usage charge will be set at such a price so as to encourage effective use.
- Assignment of spectrum to all fixed links will preferably be on a link-by-link basis.
- Unused spectrum allocated to any licensee may be withdrawn if the licensee fails to begin operations within eighteen months of award of radio spectrum. The licensees may not assign, lease or sell the rights of use of spectrum allocated to them.
- The PTA will issue new national, technology neutral, Mobile Cellular Licenses for 15 years tenure. Existing mobile cellular licensees will not be permitted to bid for these licenses.
- The mobile cellular spectrum will be auctioned in blocks. The size of these blocks will be sufficient to support the creation of commercially viable services.
- The standards employed for licensed blocks of Spectrum shall conform to recognized international standards.
- The licensees will also be entitled to bid for additional spectrum in the 2100 MHz (3G) band when it becomes available.

- If there is additional spectrum which is not required by licensees and if any other applicant requests its use for non-cellular services, subject to confirmation of spectrum by FAB, PTA may announce an auction within a reasonable time of the formal request.
- After an initial payment of 50% of bid price as down payment of acceptance of bid, the Spectrum Price will be paid by the licensee(s) in equal annual installments over next ten years.
- The Mobile Cellular License under this policy will replace the existing licenses as soon as possible or at least upon expiry of the current licenses.
- The fees for the renewed licenses will also be paid using the same payment profile and be based upon the same per MHz per annum price as determined in the auction.
- Mobile Operators will be eligible for LDI and LL Licenses.
- The 3G spectrum will be sold by auction. Both the licensed mobile cellular operators and the new parties interested in 3 G licenses will be able to participate in the process.
- The retail price cap on mobile licensees, fixed from time to time, by PTA will continue till such time the market, in the view of PTA, becomes sufficiently competitive.
- The PTA will regularly undertake a review to determine the relevant markets for the telecom industry and in turn the significant market power operators for the relevant markets. PTA should complete the first review within six months from the policy notification.
- The mobile licensees will have the right to provide their own infrastructure within a PTCL Region and to also provide their own interconnection circuits to other operators.
- In the event that an LDI operator is unable to provide a circuit within 3 months from request or the Quality of Service (QoS) falls below international standards the mobile operators will have the right to self provide inter regional circuits.
- Licensees will have the right to contract for the “Right of Way” (RoW) they need to construct their networks, subject to conditions laid down by the concerned agencies.
- The Mobile Cellular Licenses will include a coverage obligation against which a licensee will be obliged to submit a Performance Bond with the PTA. The performance bond will be linked to the rolling annual capital investment requirements to meet the coverage obligations over a 4 years period.
- The licensee will provide a set of reasonable QoS measures against which the performance of licensee will be measured on a regular basis.
- All licensees are encouraged to implement infrastructure sharing in accordance with the guidelines issued by the PTA and FAB.
- Licensees are encouraged to offer National Roaming with the other licensees offering reciprocal services in accordance with the guidelines issued by PTA.
- The new licensee(s) will have the right to interconnect its network with other licensed mobile and fixed networks in Pakistan.
- Mobile Interconnection termination charges will not exceed the existing level until cost-based rates are available for both fixed and mobile operators. PTA will set rates before the end of 2004 based upon its view of termination costs by existing operators.
- PTA will immediately undertake a consultation process on the implementation of Mobile Number Portability with the aim to implement number portability within two years of policy notification.
- All licensees are encouraged to publish a Customer Charter, to be approved by the PTA.
- The Mobile Cellular Licensee shall submit a Standard Customer Contract before the commencement of its services to the PTA for approval.
- Operators should put in place mechanisms to prevent abuse of the systems which result in customers receiving unsolicited or fraudulent communications.
- Mobile licensees will contribute 0.5% of gross revenue minus inter-operator and related PTA/FAB mandated payments to the Research and Development Fund.
- Mobile licensee shall pay a USF charge limited to 1.5% of gross revenue minus inter-operator and related PTA/FAB mandated payments as determined by the government.
- Mobile operators shall be eligible to apply for money from the USF in order to cover rural and underserved areas as per guidelines for utilization of USF to be notified separately.

- Fees collected by PTA and FAB from telecommunications licensees, which are in excess of administrative costs, shall be deposited into the Universal Service Fund.
- The APC shall not be available to cellular operators. Premium of APC on current cellular termination rates would be mopped up and diverted to Universal Service Fund (USF).
- The telecom sector, including mobile cellular operations, will be classified as an Industry.
- This policy will not be reviewed before five years of notification date.

Comments

- The Sustainable Development Policy Institute's Study Group on Information Technology and Telecommunications at its 50th meeting on April 7, 2004 discussed the Mobile Cellular Policy. The meeting was participated by the incumbent operators of cellular service, the bidders for cellular licences, IT and telecom providers, academics, policy makers, regulators and other stakeholders. The Study Group expressed the following views (these were sent to the government as policy recommendations):
  (i) Although the government has good reasons for not making any changes in the policy for the next five years, such policies should have built-in flexibility. Any suggestions that would benefit all licencees, present and future, should be incorporated rather than maintaining the status quo for five years.
  (ii) Classifying the telecom sector including the mobile cellular operations as an industry is under consideration of the government. It is suggested that it should be classified as high-tech industry.
  (iii) To make payments to foreign operators for using their network services, the Pakistani mobile operators have agreements with a number of foreign operators. This requires monthly payments to foreign operators against their bills. Each payment requires approval of the State Bank of Pakistan on monthly basis. It is a cumbersome procedure causing delays. It is recommended that mobile operators be given approval on annual basis separately against each agreement. This approval can be given on estimated payments subject to adjustments at the end of the year.
  (iv) The application of performance bond as laid down in paragraph 6.2 of the policy needs to be further clarified for the incumbent operators.
  (v) The policy requires coverage of 70 percent of all tehsils by the licencees. The target seems unrealistic and should be reviewed. Similarly, the potential demand of 25 million mobile phones by 2018 is not realistic.
  (vi) When the PTA issues anti-competitive rules, it should be ensured that no licencee is allowed to offer any discount.
  (vii) Mergers and acquisitions are now a common phenomena but the policy is silent on such issues. A suitable provision on this matter should be incorporated in the policy.
  (viii) The PTA should establish and enforce specific directives dealing with infrastructure sharing and national roaming. The provision should apply to both old and new mobile operators.

Annexure F

Broadband Policy for Pakistan
2004

Main Points

Policy Objectives

The broadband policy is designed to achieve the following objectives:

1. Spreading of an affordable "always on" broadband high speed Internet service in the corporate and residential sector across Pakistan.
2. Encourage the entry and growth of new service providers while stimulating the growth of the existing ones at the same time.
3. Encourage private sector investment in local content generation and broadband service provision.

The policy proposes the following strategy for the achievement of the above objectives:

a. Removing the existing technical, commercial, operational and legal barriers to the growth of broadband in Pakistan.
b. Increasing the choice of broadband technologies available to the consumer at affordable prices.
c. Encourage the development and hosting of local content so as to reduce reliance on the expensive international bandwidth.
d. Promoting the sale of terminal equipment.
e. Obligating a pro-active and facilitating role by the largest infrastructure provider PTCL for the growth of broadband in Pakistan.

Broadband Targets

Broadband in Pakistan will be defined as "always on Internet connection with a download speed of at least 128kbps in case of shared connectivity and at least 256kbps in case of volume based connectivity." These download speed targets will be subject to an increase as the bandwidth prices reduce, local content becomes available and there is a general increase in awareness of broadband.

Content Facilitation

- The telecom operators, both fixed and mobile, will be encouraged to provide easy access (such as short access codes) to their networks for third party content providers.
- An e-commerce wing will be set up in the Ministry of IT to encourage the growth of broadband services in the country. This wing will propose and implement strategies for e-fraud prevention, verification of company authentication certificates and reliable services such as money back guarantees.
- In addition to the traditional credit card payment method over the Net, all e-commerce content providers could encourage a payment model where their services are charged from the consumers through the broadband service provider monthly bills.
- Facilitation on co-location of space and bandwidth will be given to companies which will set up hosting facilities of 1 Tera Byte or more in Pakistan. The total storage to be set up at one time and can be in more than one location.

- Holding of a series of training workshops to teach the mechanics of developing Urdu language websites using the Unicode based standard.
- To promote this concept, the policy envisages a sustained and targeted media campaign run in conjunction with both the state as well as the private electronic media channels.
- To spur growth in local content, the government will encourage hosting services for any website developed using the Urdu Unicode standard.

Backhaul Facilitation

- The existing IP bandwidth prices will be lowered to a level where the annual broadband user targets stated in this policy would be completely achieved by the service providers.
- The existing domestic bandwidth prices will be lowered to a level where the service providers will be encouraged to use local and national peering services and generate local and nationally hosted content.
- The PRI charges will be lowered to a level where the gap created in the dial up infrastructure usage by the dial up users switching over to broadband services will not make the operational and capital expenditure in the PRI service a liability for the Internet service providers.
- Establishment of National and Local peering points that connect and switch the domestic traffic between all the ISPs and promote the creation of a national Internet that provides domestic IP network services, would be encouraged.

Broadband Delivery Facilitation

- There will be no restriction on the number of broadband service providers in the market. Any company or entity shall be able to provide broadband services provided that it has met the terms and conditions given under the section “regulatory framework”.
- PTCL will offer the content service provider (ISPs, Multimedia content providers) data stream access to the customer. Rather than a potential content provider having to obtain leased lines from PTCL. In order to ensure efficient and fair use of PTCL's resources and space for all service providers, the incumbent will offer wholesale services to retailers in exchanges for which the retail service providers have provided a viable business plan.
- PTCL will offer non-discriminatory shared access to its last mile copper, i.e. the service providers can install equipment in PTCL's exchanges. The line will be available to other operators for data services only (as the policy's aim is to promote broadband). PTA will monitor the shared access for fair competition.
- PTCL will have sufficient dedicated staff for the facilitation of the access to its exchanges in order to ensure speedy provisioning of the service to the broadband service providers. The PTCL will be required to provide the service within a predetermined timeframe.
- Service level agreements will be signed between the ISP, the local loop operator and the broadband service provider in case they are all separate entities. Service level agreements will also need to be signed between the wholesale service provider and the retail service provider.
- PTCL will reduce the monthly rental charge for copper loop in order to make it viable for the service provider to offer broadband services at an affordable level and contribute to achieving the policy subscriber targets for broadband growth.
- Service level agreements stating benchmarks for quality of service (QoS) will have to be signed between customers and broadband service provider.
- Service level agreements need to be signed with the licensed local loop and LDI operators in case the broadband service provider wants to offer value added services such as video conferencing and call center connectivity.

- PTA will be authorized to impose penalties on PTCL in case it does not deliver the co-location and copper pair services to the broadband service provider in the predetermined timeframe.
- The broadband service provider in all of the above cases will require separate registration with the PTA prior to commencing its services. In case the broadband service provider is proved to be involved in running illegal operations through its service, PTA will have the right to cancel the registration and the right to direct its licensed service operator to terminate its business contract with the broadband service provider. Copies of all the above agreements must be submitted to PTA as well.
- To ensure fair promotion of broadband, PTA on bi-annual basis shall review wholesale and retail facilitation provided by PTCL and intervene to correct if any need arises.
- The government has put time limits for replies on right of way (ROW) applications with detailed explanation in case of rejection for ROW, as per the Telecom Deregulation policy
- The government would encourage commercial complexes, local area authorities and operators not to enter into exclusive agreements, which would prevent others from serving potential customers in those areas.
- Service level agreements stating benchmarks for QoS will have to be signed between customers and broadband service provider.
- In order to streamline frequency management and allocation plan for Pakistan in accordance with the international standards, a high level committee with representations from MoIT, PTA, PEMRA and FAB will be formed. The committee will consider measures with the objectives of making appropriate frequency spectrum available to the broadband service providers in Pakistan. All the licensed and unlicensed frequency bands internationally recommended by ITU for broadband wireless access would be analyzed and offered to promote the service.
- Service level agreements stating benchmarks for QoS will have to be signed between customers and wireless broadband service provider.
- PTA will provide a regulatory framework for the unlicensed bands users that includes concerns such as setting of the maximum permissible power levels and protection of users against the violators.
- PEMRA will be required to consult FAB before publicizing and committing any frequency resource bands for broadcast, VoD (Video on Demand) and other Multimedia/ TV service.
- PTA and FAB will explore alternative spectrum bands, which are not in the high demand, that could be used for deploying broadband services and develop pricing incentives for their usage.
- Satellite broadband services can be provided by ISPs and service providers using VSAT technology, provided they have signed a service level agreement with the licensed “Non-Voice Data Communication Network” service provider or with a local loop and LDI licensed operator in case of offering voice oriented services such as video conferencing.
- Satellite broadband services can also be provided by the DTH operators provided they sign service level agreements with the ISPs, local loop and LDI licensed operators, in case they are all separate entities.
- The Government will encourage the use of PAKSAT for the delivery of broadband services via VSAT and DTH technology.
- Service level agreements stating benchmarks for QoS will have to be signed between customers and broadband service provider.
- Copies of the above agreements must be submitted to PTA. The broadband service provider in all of the above cases will require separate registration with the PTA prior to commencing its services. In case the broadband service provider is proved to be involved in running illegal operations through its service, PTA will have the right to cancel the registration and the right to direct its or PEMRA’s licensed service operator to terminate its business contract with the broadband service provider.

- The government would require installation of facilities that enable broadband communications in new buildings built by the state, municipalities and government enterprises.
- The government will play a proactive role in development of ICT and broadband services in the underserved areas of Pakistan. The roadmap for the USF also includes plans for ICT in the underserved areas. This will pave way for information and dissemination of broadband services in the rural areas of Pakistan.
- The government will encourage the co-existence of all the Broadband delivery technologies in the most efficient manner possible such that no artificial hurdles suppress one technology and maximum competition in the sector is allowed to grow.

End User Terminals Facilitation

- Annual depreciation on PCs and broadband terminal equipment will be brought in line with best international practices.
- Incentives for organizations and individuals who donate their PC's and other broadband related equipments to designated institutions like schools run by government and other charitable organizations will be devised.
- Pakistan Government will introduce low interest rate loan facilitation through "own a computer initiative", for the purchase of PCs and broadband customer premises equipment.
- Import duties levied on inputs (parts, components and spares) and finished products used in providing broadband services will be treated same as IT networking equipment.

General Points for Regulatory Framework

- Cost of Conduct, covering relevant aspects of policy and after reviewing best international practices in the context of narrow and broadband services would be published. PTA will specify this code for the registered service providers.
- The Code would also specify the grounds for violation resulting in potential termination of registration. The record of violation/breach of conduct would be maintained by the authority. It will be reviewed from time to time and would be applicable after serving of show cause notice.
- The terms and conditions of registration (as per the criteria set by PTA) would be made public within three months of issuance of the policy.
- Registration fee would be kept to a minimum level and would cover the cost of documentation and relevant administrative costs. Exact amount of this fee would be determined by PTA. Royalty charge and annual fee would also be reviewed by PTA and would be determined while protecting licensees' interest and consumer rights.
- PTA, after studying various options/solutions, will specify parameters to ensure quality of service. QoS would cover entire range of services and would aim at protecting consumers' interests. The QoS standards would be reviewed periodically and these would be available on the website after a process of consultation and keeping in view the technological changes, international standards and best practices.
- Right of existing licensees, e.g. Electronic information service, ISP, Data network operators etc., would be protected and these operators will be allowed to operate under the original terms and conditions of their licenses till the expiry of the same. In the meantime, these operators will also have the option of adopting the new regulatory regime, while adoption would become mandatory after the expiry of their existing licenses.

Broadband Promotion and Awareness

- The MoIT in collaboration with the industry will carry out countrywide broadband awareness campaigns through series of seminars, workshops, media advertisements and live demos, spreading the importance of high speed Internet in critical and attractive applications such as telemedicine, stock trading and e-learning.

Comments

The SDPI's Study Group on IT and Telecom sent the following comments on this policy to MoIT:

- It is good initiative. It would facilitate e-business and e-governance in the country. The minimum download broadband speed should be taken as 256 kb/s and not 128 kb/s.
- The broadband cost will have to be lowered to make it affordable for a majority of consumers, otherwise the broadband subscribers will remain restricted to major cities.
- There is some overlapping in the jurisdiction of PEMRA and PTA. Licensing part should be with PTA and the content with PEMRA.
- For broadband applications, will the existing "last mile" copper cables support the "always on" system?
- Convergence issues have not been adequately dealt with.
- Provisions under "General Points for Regulatory Framework" should have been left to the PTA to work out and implement.

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