VISION 2020

Pakistan Telecommunication Authority

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Acknowledgement

Chairman Pakistan Telecommunication Authority (PTA) would like to present his sincere appreciation and gratitude to PTA Officers who were part of this exercise. These Officers contributed to bring on a true value for visualizing and setting required actions for the next 10 years of ICTs in the country. It goes without saying that without their hard work this document would not have been possible. The name of the Officers is as follows:

- **Mr. Wasim Tauqir, Director General (Strategy and Development)**
- **Dr. Muhammad Saleem, Director General (Commercial Affairs)**
- **Mr. Jawad Paul (Director Human Resources)**
- **Mr. Wasi Ullah Khan (Director Coordination)**
- **Mr. Muhammad Amir Malik, Director (ICT)**
- **Mr. Naveed Ul Haq, Assistant Director (ICT)**

Executive Summary

The Vision 2020 of Pakistan Telecommunication Authority [PTA], being unfolded in the following pages, provides the telecom policy makers, regulator(s) and analysts to have a peep at prospective developments in the fast growing sector along with the possible impediments of the way over the next 10 years. The vision has enough in itself to lead the regulator on the path of sustaining consistent growth patterns besides preparing it for smooth functioning amidst technologically converged highly advanced sector. Since the PTA, as an effectual regulator, is to continue thriving in the ever-progressing telecommunication world, the responsible professionals at the authority are supposed to look ahead, understand the trends and forces that can shape the future market, and hence, plan accordingly. In continuance of the journey of achieving landmarks as a regulator since liberalization in 1996 and deregulation in 2004, the PTA not only requires to remain focused but also tailor a "Roadmap" for securing a win together with the market players and the relevant stakeholders.

Improved quality of telecom system and services has become a critical determinant of competitiveness in Information and Communications Technology (ICT). Therefore, the policy makers are focusing on ICT not only as an element of support but also as a driving force of economic growth. Given the state of economy, population growth and other socio-economic indicators, it is envisioned that total telecom investments will reach US$ 2.4 billion by 2020, whereas the Telecom sector revenues would cross Rs. 620 billion by the same year. In the wake of growing trend of the mobile services, it can be predicted that the fixed line subscribers would more or less maintain the 5 million average till 2020, while the broadband subscribers are expected to be 19.5 million. The mobile subscribers are likely to be around 161 million, approximately 89% of the total population.

Most business models for the telecom sector still rely upon subscriber line rentals and usage charges. However, new revenue streams are increasingly coming to the scene in the form of either access (usually to a Web-based service) or carriage charges (usually paid by a content provider) or revenue-sharing with the providers of content and application services. These new revenue streams are expected to come into play especially for fixed line telecommunication market. Moreover, with the emergence of all-IP Next Generation Networks (NGNs), Internet Protocol Virtual Private Networks (IPVPN) will integrate voice and non-voice communications for enterprises. It may be kept in mind that most profitable business for fixed line operators is the enterprise data market yet voice traffic remains a cash cow, a continuing source of liquidity that makes the efficacy aspect of the larger telecom companies.

e-Pakistan is a unique concept that we envision for the next ten years. The notion aims to employ the substantial telecommunication infrastructure both in terms of fixed and wireless for resolving the nation's social issues like literacy and health. These well built communication highways could be utilized to outreach a large segment of masses unable to encompass basic health and education services. The concept also focuses on knowledge sharing in different domains of ICT for development besides facilitating multi-stakeholder partnerships and networking among governments, industry, academia and civil society organizations in the country. A huge wave of local content and applications is to be provided through this infrastructure enabling it to bring apposite values to people of Pakistan way beyond the basic voice and data services.

Broadband 2.0 networks will eventually replace the current broadband networks. Old and new networks may exist simultaneously for a short period of time however, in the longer term, there would possibly be strong business reasons to move to a single and modern network. For owners of the existing networks, effective transition is likely to be one of the keys to long term success in making a financial return on investments. This transformation to the new networks provides the operators a chance to increase efficiency and reduce operating costs in the longer term. Accelerated by the current global economic recession, there are substantial pressures to encourage more use of digital technologies to lower the cost of providing core public services and improve state and national economic competitiveness. Broadband is a key tool to achieve these goals. In short, the next ten years would bring in a ubiquitous personalized communication lifestyle where any service can be run on any device, on any network and at any location through a Broadband connection.

Mobile cellular technology has been primarily focused on the consumer market, acting as a substitute for often unavailable wired telephony. Now visions of 4G and beyond, including established technologies such as WiMAX, are heralding the age of convergence. The most prominent example of convergence is TV on telecom networks. In the wired world, this means IPTV and Web-TV, while in the world of wireless, it suggests mobile TV. Additionally, wire line and wireless networks are converging, and multimedia services are being delivered across all-IP broadband. Mobile phones are now capable of running sophisticated applications and have become an important platform through 3G platforms. In the IP world, consumers are increasingly participating in the creation of content, applications and services by combining available resources and creating value for all contributors. 3G mobile networks will bring along proliferation of applications, generating a burst of data traffic. This would surely facilitate local content distribution and media mobility services, accelerating demand for localized content. Mobile payments would stand as the most demanding service; the PTA's fresh effort in collaboration with the State Bank of Pakistan to shape up mobile banking regulations is a result of the approach to smoothen regulatory framework for mobile payments. Agriculture - a primary sector in national economy - also encompasses huge potential to offer mobile agriculture services to farmers and food production companies.

Frequency harmonization is extremely important to achieve the envisioned progress in wireless technologies in the particular context of mobile broadband development in rural areas. An efficient use of wireless spectrum therefore demands a necessary action in the form of spectrum refarming, reassignment of frequencies from low-value services (public and/or cost benefit basis) and reassignment to high-value services. This is surely a difficult job to do as the occupants of the respective frequencies are likely to be displeased on being reassigned for disruptions to their operations; however, PTA aims to carry out this imperative task and develop a comprehensive regulatory framework on the same subject.

With the advent of New Generation Networks, Internet Multimedia Service (IMS) platforms and Internet Protocol applications, the boundaries between transmission of Data, Voice and Image have vanished by virtue of IP Data, VoIP and IPTV. Telecoms in 2020 will be simpler with fewer service providers, a strong converged regulator, greater span of its regulatory jurisdiction spreading over to Internet, Spectrum Assignment & Allocation, Broadcasting, International communication, and Computers.

The year 2020 will witness Pakistan as a country with 100% NGN infrastructure - the country's Internet backbone and unwavering local and international content utilization. The divisions between voice & data, circuit switch or packet or cellular and fixed-line, telecom or broadcasting would be a thing of the past, and operators will be providing a host of services on a converged infrastructure platform.

In a technology and services-converged environment, global operators have adopted convergence in their networks for the advantages that are brought to the table because of the economies of scale, bundled services, better infrastructure planning, and a one stop-shop scenario**.** On similar patterns policy makers and regulators have started entering converged regulatory regime to facilitate investors and the public at large to benefit. A necessary proposal in this regard has been made to the Government of Pakistan for considering unified regulatory regime.

Given the state of technological developments and future trends, it would require a concerted effort from all quarters ranging from policy-makers, regulator, service providers and other stakeholders besides improvement in the socio-economic landscape of Pakistan**.** The policy-makers will have to look into the downward revision of the Telecom Sector taxation for a positive impact on the future investment. The service providers would not only be required to focus on service quality but also need to create awareness, besides working on attractive tariffs. Similarly the regulator will have to re-focus and act as a facilitator of mergers and acquisitions in order to ease the fierce and intense competition and level the turf of predatory pricing, besides working out the need for additional requirement of spectrum in the wake of increased demand of Broadband, WiMAX and other wireless technologies. The theme, more or less, *one platform is enough to offer all services to subscribers through single pipe,* would not only give a boost to the national economy but also strengthen the country to overcome the effects of catastrophes and natural calamities.

Wishing the PTA a promising journey towards 2020.

THE AUTHORITY

Dr. Mohammed Yaseen
Chairman

Dr. Khawar Siddique Khokhar
Member (Technical)

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Member (Finance)

MISSION STATEMENT

ICT Vision 2020 envisions a fully connected Pakistani Society, backed with diverse, redundant and robust converged ICT networks, where citizens retaining cultural identity, can have affordable seamless access to variety of ICT, Broadband and Multi-media services, in a liberal and competitive market, covering all the nooks and corners of the country. This vision envisages to: enhance investor's confidence, bringing economic efficiency, optimal productivity, developing quality human capital and facilitating widespread reach of citizens to networks of social services, with benchmark that minimum 95% of rural population would have access to these services within 10 K.M of reach. Such networks may encompass access to health, education, enhanced agriculture, livestock, e-banking and financial transactions, including justice, disaster warning and forecast, relief services including, gender empowerment and small entrepreneur developments. The Vision aims at clear forward looking policies inclusive of framework for all three scarce resources, strategies, action plans, comprehensive transparent legal and structurally reformed regulatory regime facilitating harmonious growth of all ICT social and societal services that elevate Pakistan`s level, amongst top 30 countries in WSIS ranking, by year 2020.

Historical Background

During the last few decades, the pervasive evolution of telecommunications transformed not only technologies, networks, services and applications, but also structure of the telecom sector players. Earlier, the sector was characterized by state-owned national companies in monopolistic situation. We have recently witnessed deployment of a competitive environment, withdrawal of the state ownership, emergence of new service providers, transnational service providers and service providers' alliances, and the continuous rearrangement of their ownership structure. The telecom sector thus globally kept evolving during the 20th century in terms of technology, business and regulatory aspects.

TELECOM BOOST IN WORLD

A wave of Telecommunication reforms began in the early 1980s in few industrialized countries, and soon traveled to the countries in OECD. Major changes in telecommunication sector structure emerged in 1984, which led to deregulation of AT&T into seven regional Bell operating companies in USA and privatization of British Telecom in United Kingdom and creation of Oftel, a UK telecom regulatory body in 1981. Japan privatized NTT in 1985 followed by Teleglobe in Canada in 1987. Telecommunications deregulation generated more government revenues, accelerated investment, increased efficiency and led to higher growth. The international organizations such as International Telecommunication Union (ITU), the Commonwealth Telecommunication Organization (CTO), World Trade Organization (WTO) and the World Bank formulated policies that helped the governments to address regulatory, financial, and institutional and management issues that arise in the course of evolutionary process. By 1993, privatization of state owned telecommunication enterprises was successfully completed in many developing countries like Chile, Argentina, Venezuela and Mexico.

Governments gained from the sale of state-owned telecommunication system and consumers had more choice with improved service quality. Regulators introduced new price mechanisms with uniform tariffs for basic telephone service at affordable levels, which encouraged efficient operations preventing exploitative or anticompetitive conduct. By early 2000, more than 106 telecom operators were privatized and 110 regulators were established worldwide.

HISTORY OF TELECOM SECTOR IN PAKISTAN

In Pakistan too, the telecom sector evolved with the passage of time and what we witness today is a story of 63 long years. A lot happened in the telecom sector within the country during this period; however, what took place globally too left impacts on the sector at local level. While mapping the history of telecommunication services in Pakistan, several distinct phases of development were noted. Following is a brief narrative of these eras.

EARLY YEARS (1947 – 1996)

At the time of independence, Pakistan inherited parts of Indian Post & Telegraph Department and with a few thousand copper lines. Later, the Government of Pakistan established Telephone Industry of Pakistan Ltd. (TIP) and Carrier Telephone Industries (CTI). The Special Communication Organization (SCO) was established in 1973 to provide telecom services in Azad Jammu and Kashmir and the Northern Areas. Taking a leap to introduce mobile communication in the country in 1989, the government awarded mobile licenses to the private sector through the Ministry of Communications. The licenses were initially awarded to M/s Paktel and M/s Instaphone. The third mobile license was awarded to Mobilink which became the 1st GSM operator in Pakistan. In 1994, the government transformed the Pakistan Telegraph & Telephone Department (PT&T) into a Corporation. In 1996, the Corporation was restructured into a public limited company titled Pakistan Telecommunication Company Limited (PTCL).

ENTERING LIBERALIZATION ERA (1997 – 2002)

In 1996, Telecommunication Reorganization Act (No XVII of 1996) was promulgated aimed at reorganizing the telecom sector and bringing it in line with the international trends. Under this Act, Pakistan Telecommunication Authority (PTA), Frequency Allocation Board (FAB), National Telecommunication Corporation (NTC) and Pakistan Telecommunications

Employees Trust (PTET) were established. By 2002, it became evident that in order to end monopoly of the PTCL for provision of basic telecom services in Pakistan, deregulation of the sector was imperative.

DAWN OF DEREGULATION IN PAKISTAN (2002 – 2009)

In pursuance of its commitment at WTO, the Government of Pakistan was required in 2003 to liberalize the telecom sector and introduce competition in each segment of the sector. Introduction of competition in each segment of telecom is explained in the following paragraphs.

FIXED LINE DEREGULATION

The Government of Pakistan and the Pakistan Telecommunication Authority, along with the World Bank Consultants, made concerted efforts to facilitate deregulation. After a hard slog of making simulation models for opening up the market, numerous discussions and consultations, the deregulation policy for Pakistan telecom sector was announced on 13th July 2003. According to the policy, fixed line telecommunication sector in Pakistan was opened, and the exclusivity of the PTCL in basic telephony was abolished. Under the policy guidelines, the PTA issued two types of licenses--Local Loop (LL) and Long Distance & International (LDI) licenses. Both the licenses were unrestricted, technology neutral and open.

MOBILE CELLULAR DEREGULATION

Inefficiency in the mobile market caused by lack of competition in the GSM field had been hampering cellular industry's growth in Pakistan, and a huge unmet demand existed. The government thus decided to award two more cellular licenses, and the first ever Cellular Mobile Policy was announced on 28th January 2004. According to the mobile policy, the PTA was authorized to issue two new national, technology neutral, cellular licenses for 15 years. The policy was not to be reviewed before five years of the notification date. The mobile licensees have the right to their own infrastructure within a the PTCL region and interconnection circuits to other operators. The mobile cellular policy also includes obligation to roll out coverage to at least 70% of tehsil headquarters in four years with a minimum of 10% tehsil coverage in all the provinces.

BROADBAND SERVICES

Broadband services in Pakistan started in 2000; however, the growth remained very slow due to high tariffs, few service providers, weak infrastructure of incumbent operator, little awareness among masses and minimum coverage. In the wake of such a grave situation, the government announced Broadband Policy in December 2004 to provide an affordable, always on, broadband high speed internet service in the corporate and residential sectors. The policy also proposed strategy for removing the existing technical, commercial, operational and legal barriers to the growth of broadband in Pakistan, increasing the choice of broadband technologies (DSL, Cable & FTTx, Wireless, and Satellite) available to the consumer at affordable prices.

OUTCOME OF TELECOM LIBERALIZATION

The PTA started implementing liberalization process in a phased manner both for fixed and mobile services. The Authority auctioned mobile licenses through open bidding and two companies Telenor Norway and Warid Telecom were awarded licenses against auction winning price of US$ 291 million each. Similarly, the PTA auctioned spectrum for award of Wireless Local Loop (WLL) licenses. The PTA issued 92 WLL licenses to 17 telecom companies, and 76 licenses were issued to 35 companies for provision of Fixed Local Loop (FLL) services. The PTA also issued 14 licenses for provision of Long Distance & International (LDI) services in the country.

With liberalization, the country entered into a golden era of telecom sector where the growth patterns were unprecedented. Foreign Direct Investment crossed US$ 6 billion (2005-2010) and the share of services sector in the total GDP reached 2%. Resultantly, Pakistan's telecom growth was taken as a model growth recipe in the developing countries.

Efforts of Pakistan Telecom Authority have been recognized internationally on different fora. The South Asian, Middle Eastern and North African (SAMENA) Telecommunication Councils conferred two awards upon PTA in 2010 for being the Most Progressive Telecom Regulator in South Asia and as Best Telecom Regulatory Leader of the Year. NetSol Technologies awarded ICT Excellence Award to PTA for dedication to initiate ICT usage in the country in 2010. The International Telecommunication Union (ITU) awarded G-REX (Global Regulator's Exchange) award to PTA in 2005 and 2008. The GSM Association awarded the Government Leadership Award 2006 in recognition of transparent, efficient

and forward looking policy for the cellular mobile sector. LIRNEasia awarded PTA for the best online contents of its website among regulators of South East Asia in 2006 and having best regulatory environment in the region in 2007. Another distinguished achievement of PTA was to become the ITU Center of Excellence node in the Asia Pacific Region for Policy & Regulations by ITU. The best regulatory environment and our experiences were shared with a number of countries. The impact of liberalization will be discussed, with future implications in detail in the coming chapters.

CONCLUSION

The process of change is often volatile and responsive to intervention and global circumstances impacting it. It was thus felt that PTA now needs to be more streamlined and be prepared for the future. The Vision 2020 is primed to give the regulator a path towards sustaining consistent growth patterns and for preparing itself to smoothly function in the technologically converged highly advanced sector.

The Vision 2020 is a look forward about the country's telecom sector in the next decade. Advancements in technology are predicted, which are likely to reshape the sector in the coming years, especially with an upsurge in wireless technologies including broadband, 3G, 4G (LTE), WiMax, NGN and Spectrum management, and NGN. Quality of service will be the focal point in these developments. The telecom sector Vision 2020 has been built keeping in view indigenous and exogenous economic, political and social issues that the country would experience in the coming years. The telecom issues that are currently unattended are given due importance and carefully contemplated for a clearer picture of tomorrow. These include Intellectual Property Right (IPR), Cyber Crimes, Unethical Content, International ICT related policies etc. While going through the Vision 2020 exercise, a strategic look into the future requirement of skills and abilities is also made.

The document in its entirety is therefore expected to give the PTA a foresight, which will make it internally ready for all times, enabling it to keep up with the ever changing dynamics of telecom sector.

Chapter 1

Post Deregulation Infrastructure & Technology Development

Before going for visionary decisions, it's pertinent to look into the future scenarios in the telecom sector. While considering the ICT infrastructure, the first and foremost thing that comes to mind is human resource and education followed by several other factors like computer availability, international connectivity, national connectivity, satellite in space, satellite connectivity, local spurs, last mile connectivity, in-premise connectivity and power availability. For assessing an efficient infrastructure, the extent to which these communication highways cover the landscape and / or population is certainly important.

We will tailor our forecast on where we are and where we see ourselves in the next 5 to 10 years, with a sound sense of relief that all concerned stakeholders are working in parallel and delivering their utmost.

INFRASTRUCTURE & TECHNOLOGIES OVERVIEW

Governments around the globe are taking substantial steps to encourage the ICTs in almost all straits of life through private public investments & partnerships. Development in "Communication Infrastructure & Technologies" during the last two to three decades has forced the world to focus more on "IP based networks". Communication Infrastructure like optical fiber, submarine or terrestrial has given a new lifeline to Internet Protocol based services. It has enabled IP networks to qualify for carrying data as well as toll-quality real-time voice. Significant amount of "voice traffic" has already been diverted from the Public Switched Telephone Network (PSTN) to internet. If this phenomenon continues to persist, the landscape of telecommunications will be a far more aggressive than what we have experienced so far.

Several communication technologies are being deployed for broadband proliferation from copper to wireless to fiber, which suit different landscapes. Fiber-optic technologies have proved to be far ahead and cost competitive than its nearest microwave or satellite archrivals in long-haul and transoceanic infrastructure. The PTA is fostering its efforts in nurturing innovation and competition in telecommunication infrastructure, technologies and applications, redirecting assets that influence (e.g. Spectrum) in order to promote investment and inclusions; and optimizing the use of telecommunication services to help achieve national priorities.

LONG DISTANCE & INTERNATIONAL

The Long Distance and International (LDI) segment of Pakistan telecom sector has gone through development and growth phases in a very short period. The LDI when opened to liberalization actually attracted strong investor groups who visualized a high margin opportunity in it. However, the effect of closely integrated telecom services, unexpected market reactions and illegal activities (such as usage of VoIP), resulted in an unsteady development and then growth of LDI segment. The country's LDI infrastructure is offering specialized applications and services including Virtual Network Operations, Switch Less Resale, Toll free and Premium Rate services, Conferencing and Secure Networks.

METRO INFRASTRUCTURE

The PTCL's domestic long distance fiber-optic network extensively covers the North-South span of the country, both along the east and west of River Indus covering the vast settlements, both major and minor, as well as extends to the Western frontier beyond Quetta. Fiber deployment from Karachi to Gawadar is leased through NTC deployments. Total deployments in the back-haul, short-haul and spurs are estimated to be over 22000 Kms with several self-healing rings. PTCL took the initiative of deploying a 'Network Operations Center' system which will help in rapid deployment of resources and rectification of faults on its long-haul links and major exchanges throughout its network. The PTCL's fiber is anticipated to cover more than 30,000+ fiber deployment by 2020.

Multinet has increased its fiberoptic deployment, 48 fibers, from approximately 4000 Km to 6000 Km (50% increase) while still maintaining the four self healing loops with approximate 125 cities. They also have a partnership in undersea cable SMW-4.

Telenor has leased two pairs of fiber from Multinet for the duration of its license. Its fiber covers a distance of approximately 5400 Km – of which 4500 spans its longhaul network while 900 Km in the Metros.

Linkdirect is another LDI which took initiative for laying fiber to fulfill the requirements of its subsidiaries Mobilink and LinkdotNet. To-date, it has laid approximately 6200 Km of fiber, of which 5,729 Km is Long-Haul while the remaining fiber is for spurs and short-haul/metros. Their network consists of 6 self healing spurs.

Wateen, with its extensive and aggressive rollout plans, had successfully deployed approximately 11,000+ Km of fiber both in its long-haul and Metros along with a good number (9) of self-healing rings. It has proven to be a good alternative for domestic leased line services along with the incumbent. Of its total fiber, approximately 2588 Km cable is for Metro short-haul applications. Of the remaining long distance fiber, approximately 3000 Km has been deployed out of Universal Service Fund of which 1900 Km is in the process of being laid. It is expected that if Wateen continues to grow with the same rate, by 2020 it will have covered an area equivalent to that of its archrival – the PTCL.

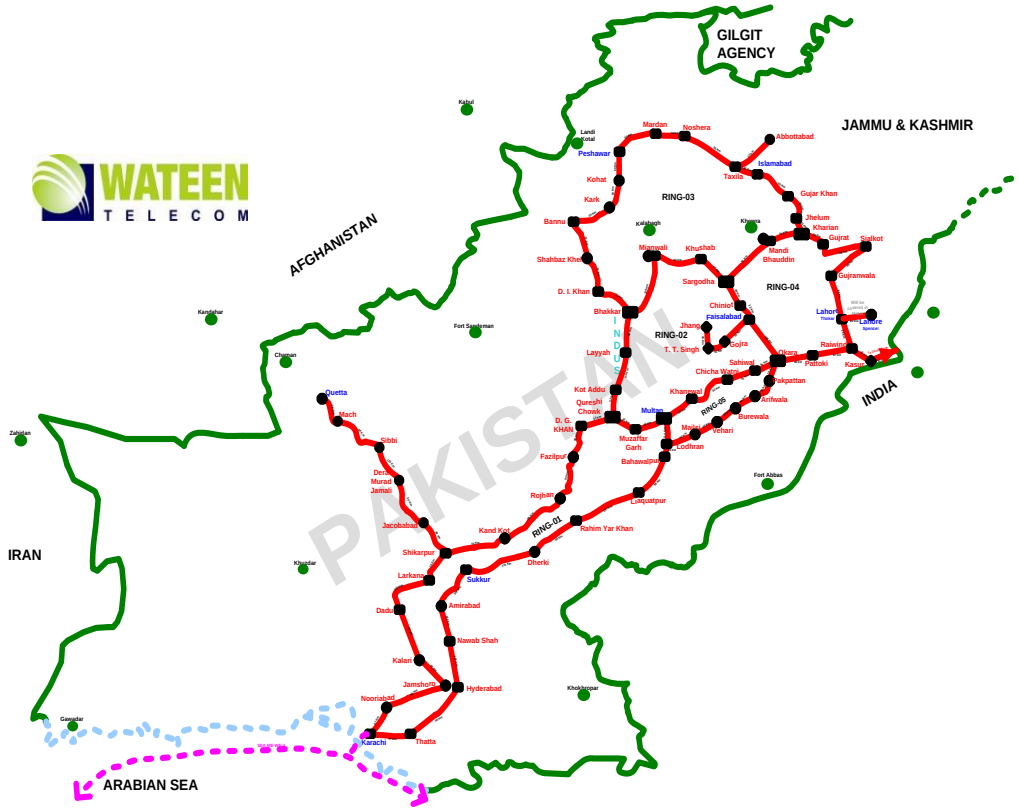
The following summarizes the domestic fiber infrastructure:

Fiber Optical Back Haul

(a) PTCL	5500 Km
(b) Wateen	5500 Km
(c) Multinet	4500 Km
(d) Link Direct	5000 Km

Access Network

(a) PTCL	12000 Km
(b) Nayatel	2300 Km
(c) NTC	637 Km
(d) World Call	558 Km



Currently, metro connectivity arena is witnessing a mix of GEPON, GPON, active Ethernet, Carrier Ethernet Technology and Wimax services. Each service has its unique set of advantages, challenges and customer acceptability.

G/GEPON has been deployed by a few operators with limited success. The technology allows for greater utilization of a limited number of optical fiber cables present under the ground. However, since part of the spectrum is shared by the end users, the service is not always deterministic in nature and can become unacceptable for certain business applications.

The Carrier Ethernet Technology has excellent performance parameters and offers greater capacities for specialized business requirements. However, involvement of active business components in the CET domain makes it costly for the operators who need to establish and run points-of-presence where active equipment in the access level has to be deployed closest to the subscribers.

EXTENDING THE FIBER – ADDRESSING THE UN-SERVED

The Universal Service Fund (USF) program on Optic Fiber Connectivity aims to extend the reach of fiber to un-served Tehsils, building information hi-ways to connect the country. Out of approximately 400 Tehsils in the country, presently 30% Tehsils do not have any fiber connectivity. Extending fiber cables to them will help the telecom service providers in providing all kinds of telecom services to the have-nots. The following projects when completed will account for approximately 6000Kms of additional long haul fiber-optic network to be deployed in the un-served areas of Pakistan through Universal Service Fund, which otherwise was not considered to be affordable by competing operators.

Sindh Package

18 out of 91 Teshils in Sindh are without fiberoptic access. Through fiber deployment of nearly 703Km, an un-served population of 3.5M will benefit.

Baluchistan Package

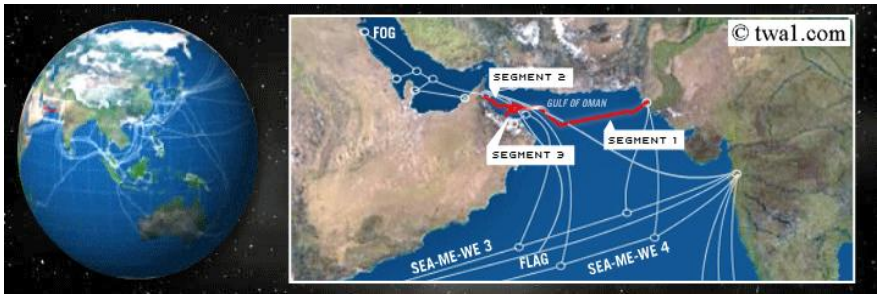
A population of around 0.34M people residing in 5 Tehsils will benefit provision of 900 Km of optical fiber connecting Dasht, Noshki, Dalbandin, Mashkhel and Taftan Tehsil HQs, including Dringar, Ahmadwal, Nokundi and Chaghi. The planned 1,166-km optical fiber to Bela, Pasni, Turbat and Hub Tehsil HQa, including Jhal Jao, Awaran, Dureiji, Peerdrk, Dasht, Mehnaz, Buleda, Kalag,Jiwani, Kalatuk, Nodaiz, Hoshab, Nasirabad, Bilecha, Tump, Gwadar, Uthal, Duddar, Kanraj cities will serve approximately 1M population. Tehsils of Barshor, Musa Khel, Zhob & Ziarat Tehsils having a population of 1.7 Million will benefit from 1,108 kms planned optical fiber cable.

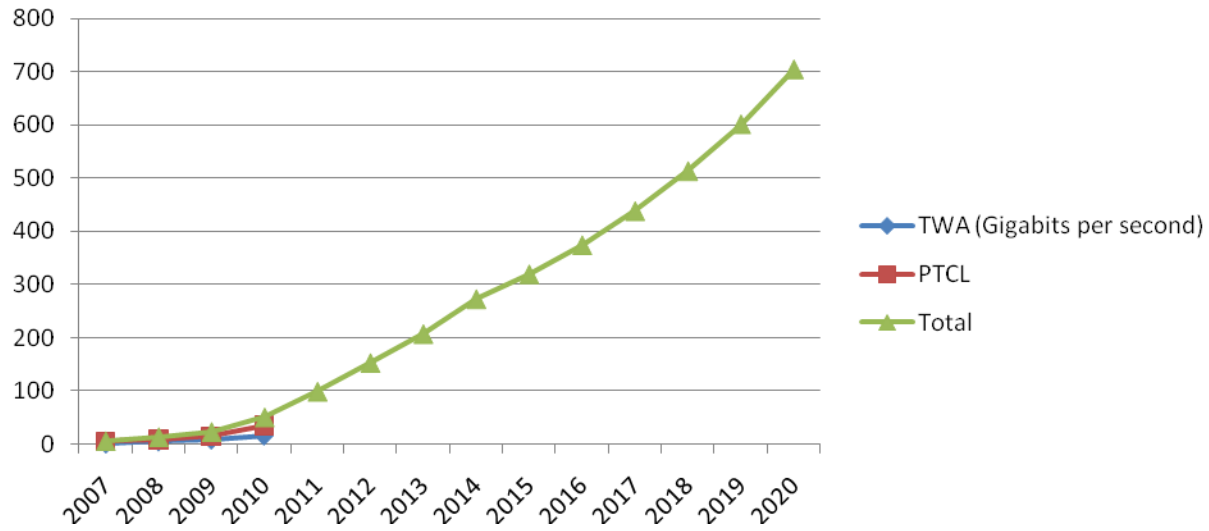
Baluchistan- Punjab -Package

The provision of planned 1,069-km long Fiberoptic Connectivity to un-served tehsils of Surab, Kharan and Bahawalnagar, including the cities of Basima, Awaran Saleemabad, Khuzdar, Nal, Gidder, Nag, Panjgoor, Zehri, Dogan, Hoshab, Chowkazam, Chobara, Quaidabad, Addhi Surgul, Aadhi Kot, Rangpur Bakhor, Nurpur, Minchinabad, with a a population of 692,365. will help the locals benefit from high speed connectivity. Through 818 Km of fiber, 1.45 million un-served people in Bhag, Dera Bugti, Jand, Jhal Magsi, Kotli Sattian & Sui tehsils will benefit.

INTERNATIONAL INFRASTRUCTURE

Pakistan is connected with other countries either through Submarine cable systems or Terrestrial system connectivity, particularly for the neighboring countries or satellite systems for connectivity across the globe. Our international connectivity requirements have increased manifold in the recent years, and are continuously increasing. Owing to the cumulative impact of increased usage of Broadband for various growth drivers, one of the landing station operators has witnessed an increase in international bandwidth demand amounting to 1200% from 2007 to 2010. Existing Submarine cable connectivity and the projected bandwidth requirements have been graphed as follows:





A more conducive environment will have to be in place for offering 'Landing Station' rights, with regulatory intervention in making LDI co-location mandatory and simplified.

A significant part of the developing world distinguishes between data and voice services as in Pakistan. However, this may change in the new integrated policy anticipated in 2010.

VISION 2020

The next ten years are expected to bring a total new set of telecommunication technologies and infrastructure deployment in the country. We may go through a process of redefining the boundaries and practices of the industry on the basis of following four opposing forces.

CO-MODIFICATION AND INNOVATION

The co-modification of infrastructure, and especially domestic connectivity, has been amplified by the economic decline. This could lead to a situation where only players that can sustain will be able to compete on the basis of infrastructure. Operators not in a position to produce major infrastructure investment would be shifting their focus, still playing for the competition with innovative services and technologies.

INTERNATIONAL CONNECTIVITY EXPANSION

The PTA hopes the overall capacity requirements of both voice and data services will increase three times and five times respectively. Specialized business requirements for data services will grow at a much greater pace than the voice services which have already seen a penetration level of close to 50% in 2010. Consumptions of both voice and data services are being projected to higher levels due to the positive outlook on the political and economic fronts.

Cost Reduction

There is a clear need for the country to ensure that maximum amount of efforts are put in place so that unnecessary foreign exchange based costs are brought down. In the telecommunication domain, unnecessary traffic should not be routed out of the country which can easily be cleared within the borders.

One of the proven ways of ensuring greater traffic localization is the establishment and flourishing of local bandwidth and voice traffic exchanges. The PTA will strive to ensure that sufficient number of Internet and voice clearing houses are available at regional and national level to curtail any unnecessary international traffic and promote local traffic of both voice and data services.

Resiliency

As reliance of the daily life on telecommunication services increases day by day, the The PTA clearly sees the life-line-grade criticality of the telecommunication infrastructure in 2020 and ahead.

Stiff competition is one way of ensuring that multiple services are available to the end subscribers from multiple providers. However, there are possible scenarios where only one service provider would be extending telecommunication services to a given set of subscriber population. In such cases, it is critical that network resiliency should be ensured by each service provider so that daily life of the telecommunication dependent population is led in the smoothest fashion.

Reselling of Services

By 2020, the PTA envisages a very well connected Pakistan by means of both terrestrial as well as submarine cables. This state of connectivity will, on one hand, serve the local market for its demand of internet and international business connectivity and on the other hand, it would allow Pakistan to export and resell services to its western neighbors – Iran and Afghanistan, both of whom are projected to be high-demand markets for e-services by 2020.

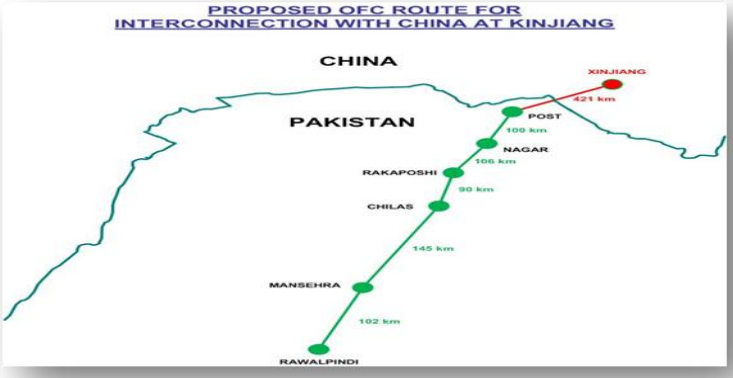
The PTA sees Pakistan connecting to its all immediate geographical neighboring countries extensively over either terrestrial or submarine cables.

India

Towards the east, Pakistan would connect to India for commercial internet traffic and the ever increasing BPO/CC industry traffic via terrestrial link at Wagah border and via SMW3 and IMW cables.

China

Towards the north, Pakistan will connect to China by laying 820 km of Optical Fiber Cable (OFC) along the Karakaram Highway, from Rawalpindi to Khunjrab Pass (Chinese border via Mansehra, Chilas, Danyore

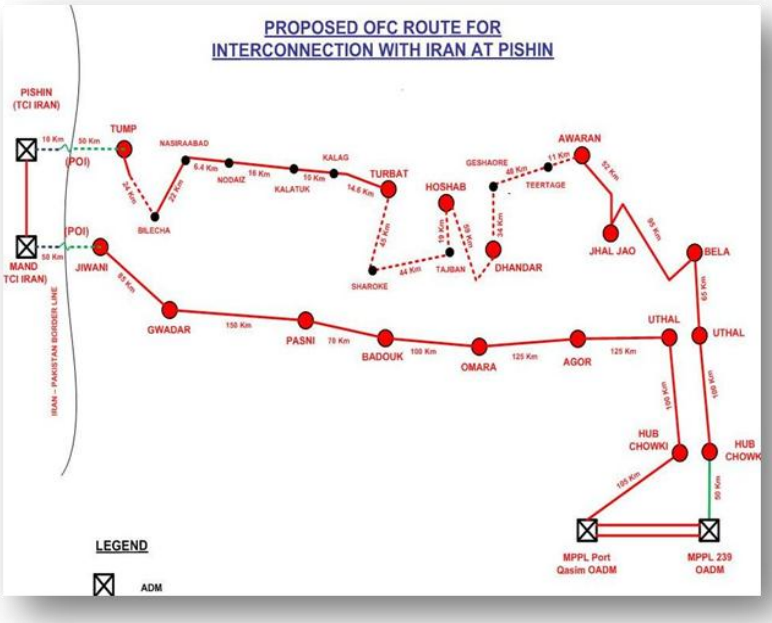


(Gligit), Karimabad and Sust). This connectivity will ultimately provide redundancy to Pakistan with respect to its voice, data & internet traffic as it will be linked to Trans-Asia Europe (TAE) cable in China, which would enable both Pakistan and China to have alternative routes for their international telecom traffic.

This connectivity will bring Pakistan's direct telecom access to China and other Central Asian States including Russia.

Iran

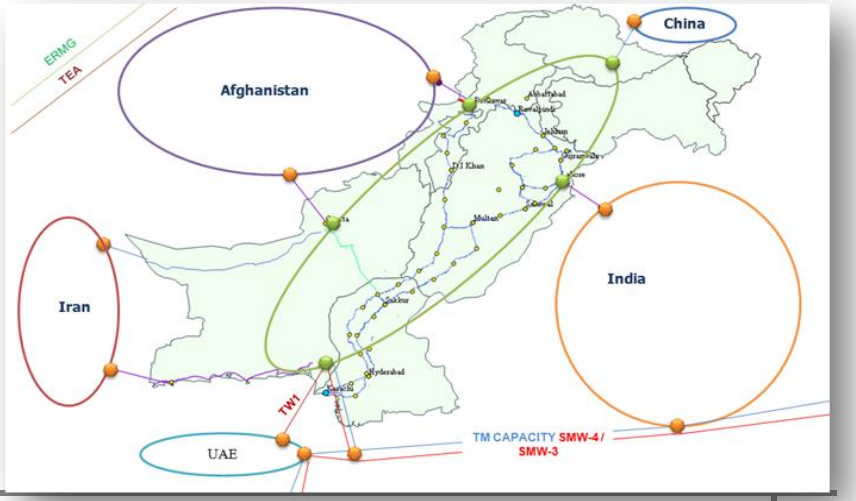
On Pakistan's west, there lies Iran. Ring connectivity will be established from Karachi to Pishin (Iran) on DWDM with 18 OLA sites covering around 1710 kms all the way from Pakistan to Iran. The route would be via Hub, Uthal, Bela, Jhal, Jao, Awaran, Dhandar, Hoshab, Turbat, Tump, Pishin (Iran), Mand (Iran), Jiwani, Gwadar, Pasni, Badook, Omara, Agor & Hub).



Afghanistan

High capacity SDH over Microwave links would be established between Peshawar and Gerdi (via Charsadda, Tarsar, Torkham & Gerdi), eventually reaching Jalalabad & Kabul.

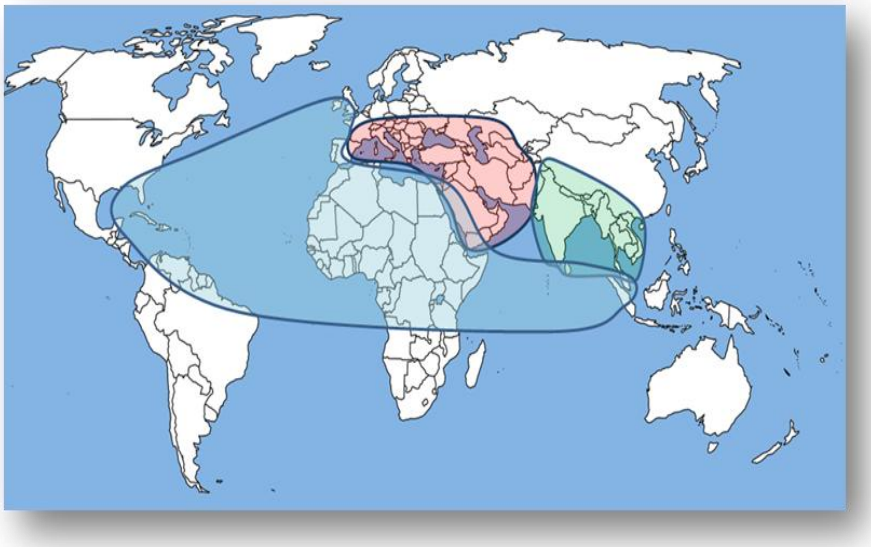
In the big picture, Pakistan's connectivity to



the outside would be resilient as well as strategically well positioned to serve both domestic and international market to exploit maximum benefit for Pakistan till 2020.

Submarine Connections

Submarine connections of SMW3, SMW4, TW1 and IMW will allow four-way connectivity to Pakistan to connect to the outside world for Internet and other IPLC requirements. The PTA will also work closely with players who have the potential of establishing new landing station in Gawadar so as to bring competition to the submarine capacity sector and provide regional redundancy as currently Karachi city is the single point of failure where all four submarine cables are landing.

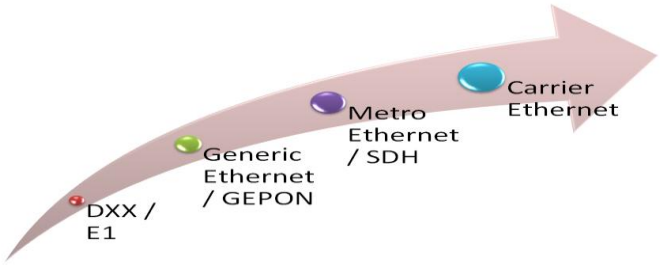


CONSOLIDATION AND DISINTEGRATION

The commoditization taking place within the industry will be forcing large infrastructure providers to consolidate even further. Domestic operators will be looking to plan out how to improve their OPEX position by consolidating infrastructure. The positive sign would be appearing for niche players to perceive opportunities to assume their market place, based on a combination of innovative technology and business models.

MERTO CONNECTIVITY

At the metro level, the PTA expects the Carrier Ethernet Technology to take over the G/GEPON technology due to its superior control plane and more



capacitive nature that suits the future data intensive applications well.

Since CET is based on active components which require carriers to establish many points-of-presence that are close to the end-customers, The PTA intends to declare a special class of telecommunication facilities called 'mini-metro-POPs'. These points could be shops, business points or other common place establishments that help the providers realize close-to-customers presence and will enjoy special status in terms of regulation and facilitation by the Authority.

Keeping in view the drastic impact of ad-hoc optical fiber installation (also called aerial optical fiber) that has been extensively deployed by service providers to extend their reach to far-flung areas of the major cities, the PTA intends to regularize and facilitate this mode of infrastructure to ensure a balance between benefits and drawbacks in the telecommunication sector. A special class of licensing is envisioned to help smaller local players evolve high-capacity optical fiber for bigger licensed players to make use of in order to reach the end customers.

RIGHT OF WAY

When communication services' infrastructure is put in place, the issue of Right of Way (ROW) always props up as a painful one. The PTA is well aware of the key role that this issue plays in making or breaking telecommunication based environments.

In our vision of 2020, the PTA aims to work very closely with peer authorities and other governmental agencies such as municipal corporations and city governments to bring down the current ROW charges down. At the moment, ROW charges in city areas are as high as Rs 1200/m, which are literally holding telecom advancement, negatively impacting the overall environment. These high rates have also encouraged illegal and semi-authorized use of aerial optical fiber which is both short-term, unstable and even unpleasing to the sight and is quickly becoming an eye sore in all the major cities of Pakistan.

The PTA aims that by the year 2020, the ROW charges would be brought down radically to Rs 100/m for all infrastructure license holders.

DE-REGULATION AND RE-REGULATION

We have observed the six years of liberalization and deregulation, where market forces were thought to be the best way to shape the course of the industry. The upcoming era may

challenge us to face a complex scenario: On one hand, the regulator would continue promoting competition; and on the other, we too have to realize that market forces alone will not be in a position to put significant investments in new infrastructure. Our role of building the mass-market broadband network of the future should continue. The role of public funds in promoting investments in national telecom infrastructure as a means of supporting present and future growth would stand as a vital factor.

The ICTs and Pakistan's preparedness towards it in all the sectors of the society will certainly play a major role in coping with its economical success in the year 2020 and beyond. A new kind of workforce is needed to achieve substantial growth. It will require a shift from the convention to a more proactive approach. It calls for a cohesive umbrella management and regulatory framework which should have the will and determination to integrate all sectors and government functionaries and reorganize the the ICT and Broadcast regulatory landscape. Pakistan will soon be entering into FMC (Fixed Mobile Convergence) arena. Bringing Short Range Devices in the regulatory regime, rationalizing spectrum charges, focusing on digital dividend, and effective use of spectrum utilization will need concerted efforts for change to happen for better economic activity. The NGN-based business model needs more upfront investment it provides low cost converged services which will help create a competitive environment requiring new charging mechanism & regulations in Interconnects among operators. Moreover, international bandwidth demand is expected to exceed 700 Gb/s by 2020.

Pakistan, with an estimated population of over 180 million by 2020, ninety percent of which will be below 65 years of age, will be a very attractive market for any 3G or higher generation mobile wireless broadband technology. We will also be observing large coverage of Fiber to the Home infrastructure in all major metropolitans of the country. The very different environment that telecom industry leaders will face once the current recession ends and recovery starts demands that every player makes a conscious decision about its future role in the industry and the corresponding capabilities it will need to succeed. The statement would play a more appealing role in case of CMTOs. The PTA has to keep an eye on all involved aspects before a technology transformation decision is applied in mobile wireless market.

Having conducted studies and analyses the PTA believes that WLL segment can be revived through a policy change and favorable regulatory interventions. What changes could be brought in which improvements is by itself a lengthy discussion that might be outside the scope of this document. However, based on right incentives Pakistan's WLL industry has the potential to grow due to the fact that the operators have deployed the latest and state of

the art networks and technologies. With appropriate change in policy the industry could be or part of the leading mobile and wireless broadband providers.

While we look ahead to ubiquitous technologies including smart cars, smart buildings, location and self-aware devices, personalized services and wearable devices, the requirements of personal identifying information and the protection of privacy are upcoming regulatory challenges to address. There is a future of a fragmented global telecommunications infrastructure and unrealized technological potential. The environment is converged, wireless and highly persistent -- an environment where a virtual world has as much importance to people as the physical world.

Although market forces will make the transition from conventional to NGN yet for the transition to be smooth & effective the policy maker and the regulator will have to intervene and establish a working environment to resolve the following:

- Renewed level of obligations on all sectors of licensing.
- Future of SIP telephony, it's tariffs and numbering plan
- Quality of Service of Service Regulations for Consumers and mandatory QoS SLAs between operators for all licensed regimes including but not limited to landing station operators.
- Regulate tariffs especially floor pricing against an optimum level of Quality of Service
- New definitions of SMP.
- Spectrum availability
- SRD & Near Field Communication Regulations
- Policy for Machine-Machine Applications
- Addressing and amicably enforcing justified RoW regulations.
- Policies on segregation of national, international traffic
- Defining Voice and Data traffic
- Removing overlap between different licensing regimes
- Resolving interconnect issues between the infrastructure (LL, CMTO and LDI) and content service provider
- MVNO and Mobility need to be offered extended reach and new service offering.
- Develop new approach to NGN regulation by addressing regulatory challenges for the promotion of competition, interconnection, consumer protection, numbering, universal service and security concerns.
- Policies for SPAM control and other cyber threats.

- Interoperability standardization in interconnect among multiple services **e.g**
- Interoperability of multiple services.
- Proprietary signaling or incorrect signaling mappings.
- Session control.
- Cost bearing for incorrect calls / sessions etc.
- Protocol compatibility.

The multiple, IP-based telecommunication networks of the future are likely to be combinations of optical fiber cable, fixed, mobile and ad-hoc wireless. Lower-cost digital satellite systems and broadband over power line communications are evolving and may play their role in the country at a point of time in the next ten years. Advances in digital subscriber line (DSL) capacity may help in supporting the copper network.

Radio networks play an important role in all of our scenarios. Wireless provides internet connectivity on the move and away with the convenience of being always on, always connected. Deployment of wireless networks in home, car, public areas and road networks, as well as in buildings and the environment, are likely to bring ubiquitous connectivity. Although wireless has significantly lower capital costs than fiber, we have to take in concern viability of wireless business models. It is likely that wired infrastructure will continue to play an important role. Even in case of wireless communications, playing a larger role, need for a core network such as one using optical fiber cable will climb and existing fiber networks would continue to be employed.

Chapter 2

Broadband

Broadband connectivity is globally recognized among basic necessities of daily life. High capacity broadband communication is considered a powerful tool that significantly improves quality of life, global competitiveness, and access to economic opportunity. This is what we visualize for all Pakistanis as we go to predict the future vision for broadband inside the country. Broadband in Pakistan is yet to reach the first stage of its usage. Only 0.73% of our population has attained subscription to broadband. This leaves a huge opportunity for including a large segment of our livelihoods inside this important sphere within next few years.

Telecommunication sector has historically been characterized by steady growth punctuated by an occasional leap forward via new technological innovations. In the latter part of the twentieth century, the almost simultaneous arrival of two major innovations—mobile phones and broadband —not only changed the way people communicate but also have left a noteworthy impact on economies of scale.

High capacity broadband telecommunications is a powerful tool that significantly improves quality of life and access to economic opportunity for all Pakistanis. With adequate funding, good leadership, and a willingness to work together, affordable broadband services can be universally available throughout the country. Consumers can select among multiple broadband technologies to obtain a service with the price and capability that best meet their needs. The broadband vision 2020 sketches baseline for coming ten years of broadband growth inside the country, focusing on areas of concentration and actions required in this regard.

PRESENT AND FUTURE

Before we explore the present market situation of broadband inside the country, one should concur the impact of social indicators like literacy rate, computer penetration and

economical power a common citizen on the overall proliferation of broadband in an economy. These factors may not be neglected while we discuss the status of first 10 years and envision the next 10 years of broadband in Pakistan.

Broadband had been available in Pakistan for almost a decade starting in 2000 when a private operator launched HFC based broadband service in Karachi. This was followed by launch of the county's first ever xDSL service in 2002. In 2004, a comprehensive national broadband policy was announced by the Ministry of IT setting targets for five years. The same year, the PTA carried out market de-regulation where a number of operators acquired wireless broadband spectrum through open auction.

With almost ten years of its introduction, Broadband subscription levels remained at a very low side during the first seven years. Statistics reveal that in the span of first seven years (June 2000 – June 2007), the total number of broadband subscribers in the country was just 45,000. Till that time, we had a number of broadband operators offering connections over xDSL (Digital Subscribers Line) and HFC (Hybrid Fiber-Coaxial) technologies. On an average base, we had approximately *6500 subscriptions per year*, which truly depicts a slothful situation. The following table depicts the market situation till June 2007.

Total Subscription	***Available Technologies***	***Average per month cost of 512kbps subscription (unlimited)***
45,000	*xDSL, HFC, FTTH*	*USD 55*

Pleasantly, the situation turned all the way around during the last four years (June 2007 – March 2011) while according to Point Topic's (a renowned international broadband research company), Global Broadband Report for quarter 4 2009, Pakistan remained among the top ten countries for annual Broadband subscription growth. The total number of Broadband subscribers inside the country has reached an encouraging figure of 1,292,897 by March 2011. This earns a grand addition of approximately 1,247,897 subscribers during the last 45 months showing an average of about 27,731 *subscriptions per month***,** quite astonishing when compared with per year subscription rates of the first seven years. The following table shows market situation as of March 2011.

Total Subscription	*Available Technologies*	*Average per month cost of 512kbps subscription (unlimited)*
1,292,897	*xDSL, HFC, FTTH, WiMAX, EvDO*	*USD 10*

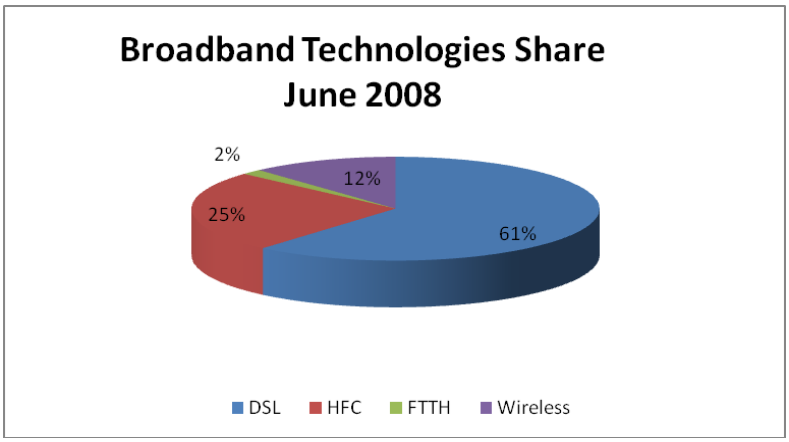
If we explore the primary reasons behind this fruitful proliferation, they are threefold, starting from the launch of Broadband services by the incumbent operator (PTCL) in June 2007 starting from basic xDSL offers. This long awaited entry by the PTCL brought several attractive offers for the subscribers such as increase in broadband coverage, massive reduction in broadband prices and improved competition.

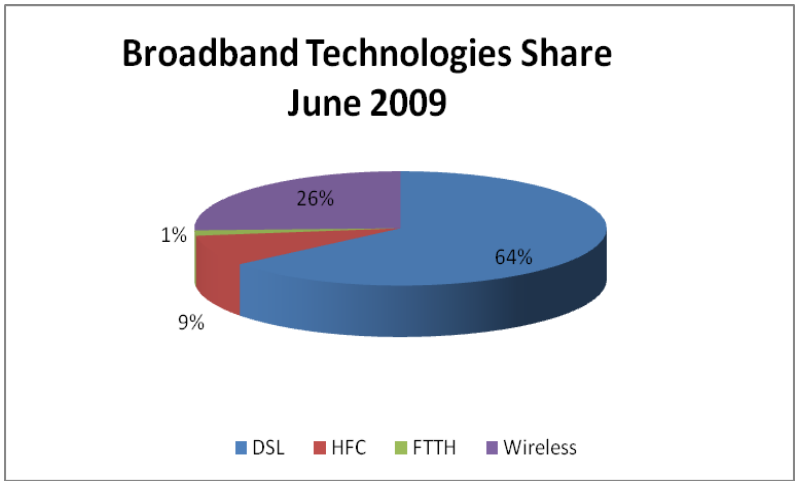
Another factor behind this amazing escalation is commencement of wireless broadband services in reference with the market de-regulation and open spectrum auctioning carried out by the telecom regulator (PTA). This noteworthy change occurred in December 2007 while Wateen Telecom commercially announced its WiMAX (Worldwide Interoperability for Microwave Access) service in various cities. This marvel of wireless broadband brought in an excellent alternative to copper-based broadband coupled with convenience of mobile internet through smart USB devices. Consumers perceived this attraction as this edition of broadband is showing an upbeat progress.

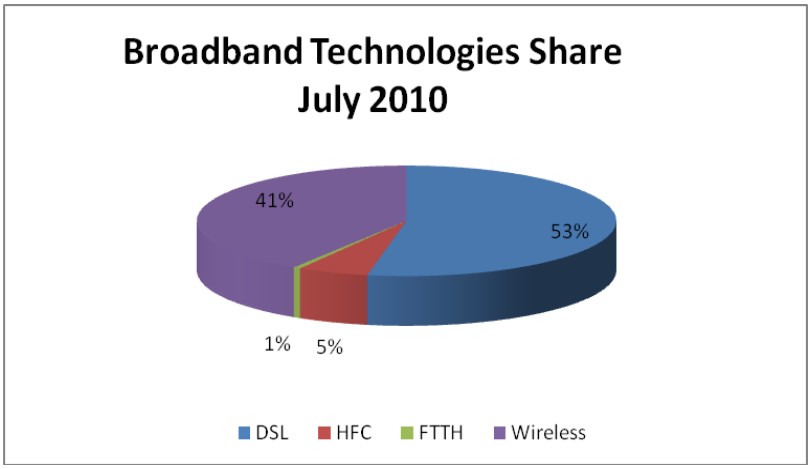
Subsequent to Wateen Telecom, Mobilink started its WiMAX under 'infinity' brand in the last quarter of 2008, followed by WiTribe's WiMAX commercial launch in the second quarter of 2009. The latest market entrant in respect of WiMAX is Sharp Communications (Private) Limited - a wholly owned subsidiary of Augere Pakistan (Private), starting their WiMAX services since September 2010 in four major cities with the brand name of 'Qubee'. This makes a total number of four (4) large WiMAX operators in the country.

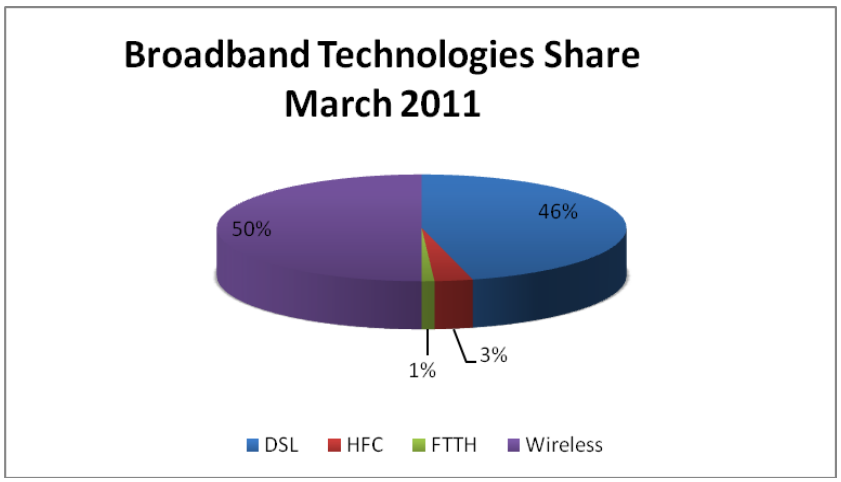
The competition inside wireless broadband market of the country incorporated yet another technology when the PTCL announced availability of EvDO (Evolution-Data Optimized) service in May 2009. These wireless versions have gained a splendid success over the last two years and by March 2011, a total of 390,351 broadband subscribers were utilizing WiMAX and 236,938 were enjoying EvDO wireless broadband service. This makes a sum of 627,289 wireless broadband subscribers in Pakistan, the largest technological segment after xDSL.

The following pie charts depict the market share growth of wireless broadband technologies from 2008 onwards.









The third contributing factor to bring about this notable growth has been the special initiaves undertook by the PTA to escalate augmentation of broadband. Broadband is among the top priority subjects as the PTA has put across a number of programs to assist the industry as well as the policy makers. In August 2007, the PTA released a detailed action plan on various broadband issues. Consequently, the PTCL and Internet Service Providers have mutually finalized a comprehensive Standard Operating Procedure (SOP) for broadband services and Service Level Agreement (SLA) for Broadband bandwidth provision.

The PTA has signed Memorundum of Understandings (MoUs) with National University of Science and Techlonogy (NUST) and COMSATS Institute of Information Technology (CIIT) to enhance mutual cooperation for research in various broadband fields. In order to assess and compare broadband tariffs previaling Pakistan with other countries and to identify the areas where further improvements can be made for the benefit of operators and users, a benchmark study of Broadband tariffs was carried out. The PTA also recongnizes importance of innovative applications and services for growth and adoption of Broadband in the country. To this effect, a number of intiatives and conferences have been organized in collaboration with the industry players to broadcast and encourage the broadband applications.

Recently the PTA issued an action plan on the SMP for broadband market. The primary objective behind this is to safeguard the profit margins and Return on Investment (RoI) of broadband operators. The determination shwon in the plan will assist the regulator in maintaining its focus on market liberalization, transparent regulatory framework for broadband and a level playing field in which the market forces could work effectively. Moreover, the PTA is presently working on account seperation for all services offered by

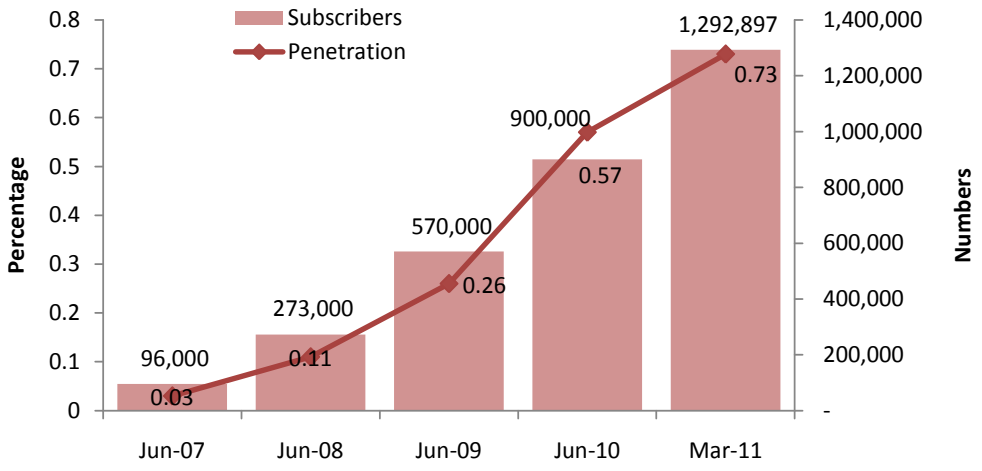
the incumbent operator (declared as SMP) as another step to discourage any anti-competitive behaviour thus ensuring confidence of other market players.

Besides, the PTA undertook several other broadband initiatives including preparation of comprehensive review document (July 2008) on existing Broadband policy and future policy endeavors, holding of an exclusive brain storming session (November 2008) on 'Potential and Prospects of Broadband in Pakistan' and formulation of a multi-stakeholder group on broadband which prepared its final report (June 2009) for the policy maker. The report highlighted the functioning areas of Broadband Eco System with a set of policy and regulatory suggestions to improve Broadband. Another one-day conference titled 'Promoting ICT Sector' was organized in February 2010 with a view to encourage local content and application development. A broadband subscribers survey is underway to attain different prospective of broadband usage in Pakistan.

The following graph shows the broadband subscription and penetration growth over the last four years.

June 2007 – March 2011

Broadband Subscribers and Penetration

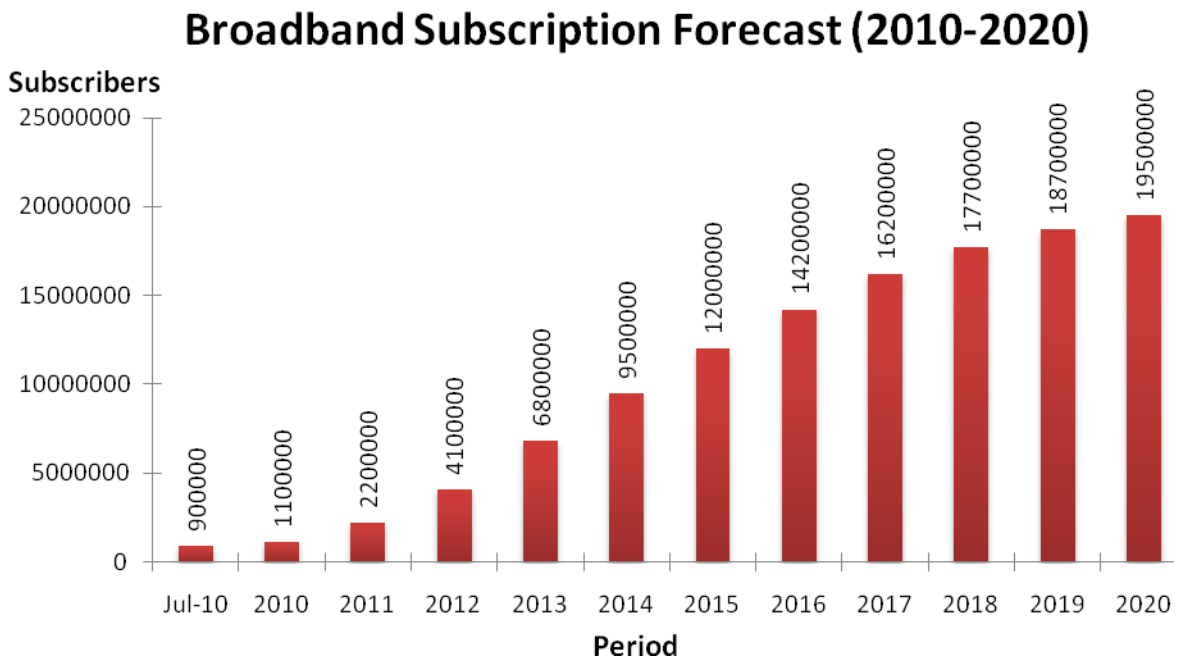


The emergence of Broadband in the world was led by the fixed line technologies, mainly the copper based Digital Subscriber Line (DSL) service. It was quite natural since the telecommunication services were moving from analog to digital with copper as the only access medium available. This however followed a rapid revolution of mobile wireless broadband technologies, copper still remains the most popular broadband media by far, and according to point topic global broadband statistics xDSL via copper loops was subscribed by over 64 per cent of the global broadband market.

The condition of copper lines in Pakistan has not been encouraging over the years; a single operator still owns the whole copper access infrastructure with total installed capacity of around 5 million. These copper lines didn't go through any up-gradation and broadband services are being offered on the same infrastructure running for years. The ISPs of the country also depend on the PTCL for copper line access to provide broadband services. Probably this is a reason behind a constant downfall of copper as a broadband medium over the last four years. The introduction of wireless broadband technologies has really supported the market growth and stabilization in the country, serving to overcome the menace of poor copper conditions.

In the light of the existing trends, it can be predicted about the future Broadband trends that wireless broadband technologies would overcome fixed-line xDSL services within a span of one year. With an average increase of 10% market share, both WiMAX and EvDO will achieve a market share of over *50% by end 2011 resulting in dominance over xDSL*. This indeed is a positive sign of the popularity in view of our present fixed copper infrastructure. Moreover, as for the number of subscribers by 2020, we believe that within next four years (till 2014) our market would witness a growth rate of nearly 70-85% per annum. This forecast would take us to approximately *9.5 million broadband subscribers by 2014*. This would be followed by a steady growth rate of 5-25% in the next six years taking the total number of Broadband subscribers to 19.5 million by 2020.

According to an estimate, Pakistan would touch 195 million population figures by 2020. Calculating the broadband penetration presently at 0.57, it is predicted that broadband penetration by 2020 will reach to 10 subscribers per 100 inhabitants. It may be kept in mind that these figures are estimated for broadband subscription, not the broadband usage in the country which surely would be quite high. Roughly, if a multiple factor of 4 users per a single broadband connection is calculated, total broadband users in the country would be 78 million by 2020. The following bar chart estimates the broadband subscription forecast in next ten years.



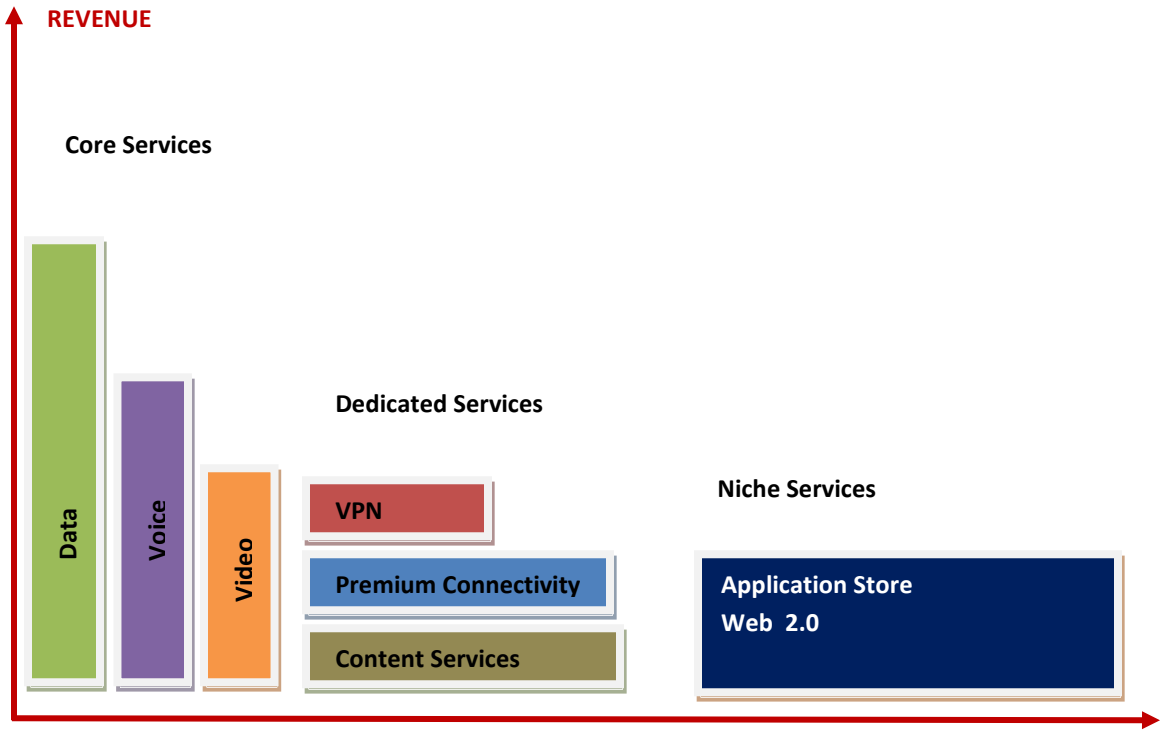
BROADBAND 2.0

Telecommunication networks have evolved from dedicated links used mainly for narrowband telephony applications to a common broadband network, the resources of which are shared by a multitude of end users who compete with one another for quality of service (QoS). In this new context, broadband service providers would have to provide a high-performance network that delivers highly rewarding multimedia experiences, encourages long-term customer engagements, and supports market-differentiating services.

The desire for operators to offer the ever fast services and for customers to use the applications or services shows no sign of reducing. We are now very close to a new and potentially more fundamental development –move to 'super-fast' or very high speed broadband in the coming ten years. The era of 'Broadband 2.0'.

We may not think that the move to new, Next Generation Broadband Access Networks mean we need to fundamentally change our current regulatory approach. We will continue believing that competition at the deepest level that is sustainable and supported by equivalence of access, is the right approach. This is especially true for fixed Next Generation Broadband Access Networks that are likely to display the characteristics of enduring economic bottlenecks especially while installing fiber to new premises.

Broadband 2.0 networks will eventually replace the current broadband networks. Old and new networks may continue operating simultaneously for a period of time, but in the longer term, there will be strong business reasons to move to a single, modern access network. For the owners of current networks, effective transition is likely to be one of the keys to long term success in making a financial return on investments. Moving to these new networks offers the chance to increase efficiency and reduce operating costs in the longer term for network operators. The following is a predictable view of revenue streams with respect to services likely to be provided through Broadband 2.0 networks in the upcoming ten years.



Broadband 2.0 --- Expected Revenue streams and Services

The core services to be delivered through the broadband networks would remain surrounded by data, voice and video segments. Data services primarily enclosed by bundle of online internet services are expected to be the largest source of revenue for the service providers. In the context of NGN (Next Generation Networks) where the application layers would be working independent of the access layer, the entry of various application service providers would be witnessed. The dedicated set of online portals from the broadband operators attracting the consumer towards a number of online data services, coupled with online

services availability from other stakeholders like Government, Banks, Utility Companies and general industry would also have a deep impact on this future data revenue generation. Voice and Video services are also expected to show their existence with operators offering dedicated high quality video channels. These sorts of offers have been given by operators in various economies, and in Pakistan, such triple play offers are made available by a number of operators.

Wire line and wireless networks are converging, and multimedia services are being delivered across all-IP broadband. Mobile phones are now capable of running sophisticated applications and have become an important platform through 3G platforms. In the IP world, consumers are increasingly participating in the creation of content, applications and services by combining available resources and creating value for all contributors. In short, the next ten years would bring in a ubiquitous personalized communication lifestyle where any service could be run on any device, on any network and in any location through a Broadband connection.

Broadband has started showing its presence inside the businesses and residential segments of our economy. The present penetration level is 0.73%; however, we envision to take this to 8-10% by 2020 with a subscriber base of at least 19.5 million or above. Though this claim is not easy to materialize as it requires an incessant effort from all actors of Broadband Eco-System yet we foresee a wide window of opportunity to encompass our youth (approximately 50% of the population) inside the amazing sphere of Broadband.

We take ourselves fortunate to have a number of facts, assets and resources to use for bringing about a positive change through expanded deployment and subscription of broadband. Some key assets include:

Industry Leadership – Our Ministry, Telecom Regulator along with a long list of leaders from the private sector, are real winners for broadband communication. We stand as one of the few countries in the world with present market of five simultaneous broadband technologies (xDSL, HFC, FTTH, WiMAX, EvDO) while 3G will shortly join this plate. For the next 10 years, entry of LTE as a broadband technology cannot be ruled out.

Abundant Funding – Under 'The Lisbon Consensus', adopted at the 4th International Telecommunication Union of World Telecommunication Policy Forum on April 24, 2009, the intervention of government for broadband penetration was endorsed.

We have successfully announced utilization of USF (Universal Service Fund) towards outreaching broadband to the un-served areas, presently contracts for provision of subsidies to broadband operators in under-way. This colossal availability of public funding

is a real asset to achieve the goal of broadband access across the country. More access, cheap service would result into more usage.

Social Change – Our society is in process of getting familiar with digital literacy, accessing digital services and ICT applications. This provides a ray of light to embrace our communities as an information-based society by means of high speed communication highway; Broadband.

Our potential for broadband success in future is driven by a number of forces. The PTA as a regulator has an imperative role in ensuring continuous augmentation of broadband in Pakistan. Though the principal duty in regard to broadband is to maintain a competitive broadband market, yet to be successful, regulatory actions and strategies regarding broadband are supposed to reflect on the following driving forces:

Technological Change – Keeping an eye on new communication technologies as they continue to progress providing consumers with more easy and cheap options.

Consumer Awareness – Increasing awareness of prospective broadband usages, especially among young tech-savvy consumers.

Creating Demand – Perceiving the content and application demand of various consumer segments, putting a broadband connection among the basic requirements for daily life activities.

Ensuring Quality of Service – The core reason behind broadband subscription is availability of high bandwidth, as the market would absorb more consumers' issue of service quality would arise. Ensuring quality would be foremost activity for retaining consumers and building their confidence.

Improvising Value Addition – The amazing wealth of delivering bunch of services makes a broadband connection a real value for consumers. Increasing value addition inside the Network (Intelligent Networks) and services (xplay phenomena) would remain an outmost priority area.

Addressing Economic Pressures – Accelerated by the current global economic recession, there are substantial pressures to encourage more use of digital technologies to lower the cost of providing core public services and improve state and national economic competitiveness. Broadband is a key tool to achieve these remedial actions.

Unethical Content and Information Security – Together with telecommunication developments and the expansion of global information space, new types of security threats

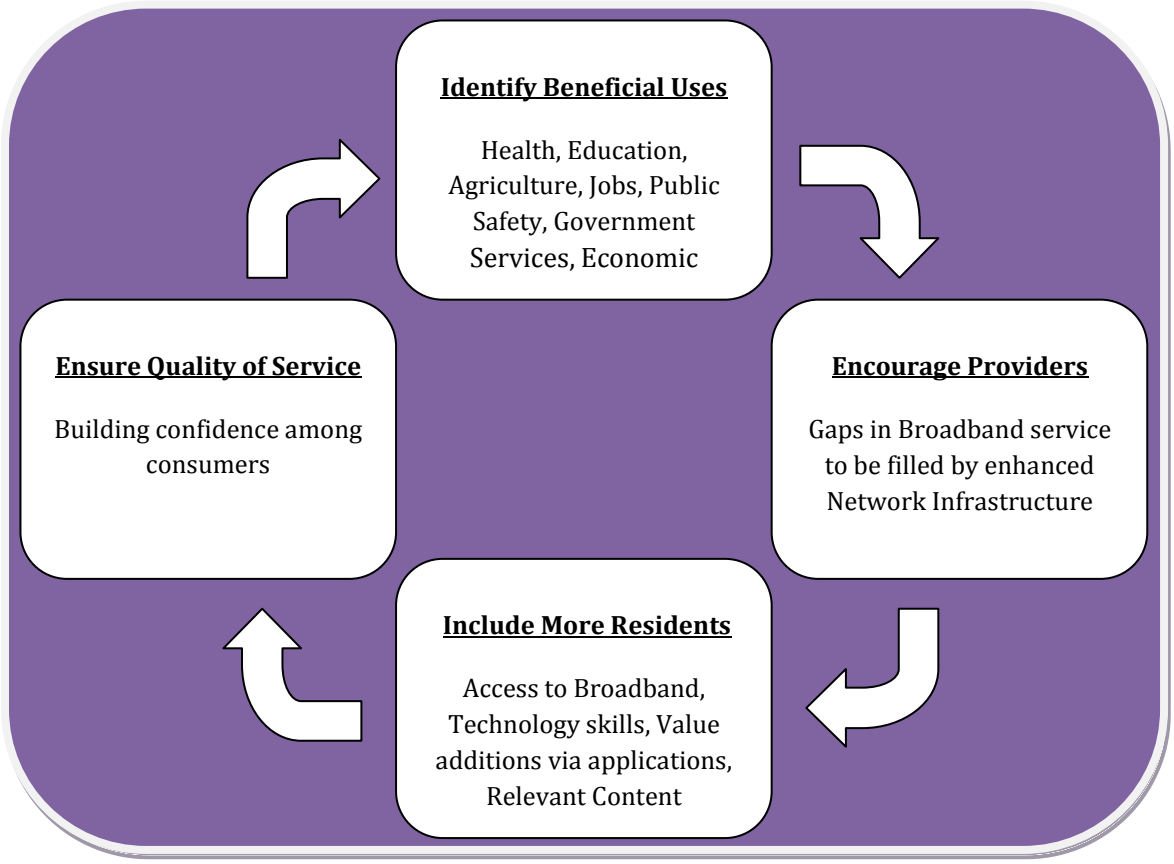
have emerged. Especially in the era of globalization, rising mobility and growing dependence on information and communication technology by nations, the need for information security is becoming ever more pronounced. Increased vulnerability and the threat of massive financial damage as a result of ICT problems are augmenting the pressure for an action to prevent damage and minimize the residual risk through active ICT security management. The PTA has initiated necessary steps in broadcasting its message of addressing security requirements to the industry. The formulation of an industry-driven expert group and drafting exclusive Information Security Guidelines for the telecommunication sector are among the major accomplishments.

Broadband has primarily brought a high speed access platform for the internet. Internet has become an essential part of the global information society, enabling overall economic growth, creating new jobs, encouraging modernism and improving national competitiveness. Internet is often described as the last frontier for free speech and expression, and an anarchic and chaotic space for irrepressible political, religious, sexual and personal expression.

Debates on content regulation have been part of national and international processes on internet governance. Numerous governments around the world have been addressing the problems of material on internet that is illegal under their laws, and also that is considered harmful or otherwise unsuitable for society and minors. The countries like China, Australia, Saudi Arabia, South Korea and Singapore have defined specific **'Internet Code of Practice'** to regulate the internet content to be hosted or viewed inside the country.

Pakistan has a total number of 20 million internet users. As a part of global internet community, the 'dark side' issues pertaining to internet are very much similar for our users. Our citizens are posed to harmful sexual content. Open availability of hostile Islamic, immoral public and anti-state propaganda material on internet is seriously damaging our national cultural and communal values. With an inherited open to share structure, internet is becoming a media of sharing abusive videos of public office holders, photographs of domestic violence, unauthorized literature of nationalists and intolerable blaspheming of Holy Prophet (P.B.U.H). Availability of such internet content is objectionable on the grounds of public interest, morality, order, security and national harmony. The situation requires an immediate attention to address this growing concern of unethical internet content hosted or viewed inside the country.

Increasing Demand and Encouraging Providers



At present a large segment of residents has no available option to subscribe for broadband services. Even among those who have broadband availability, a large number of people prefer to rely on dial-up or no internet access at all. Our possible actions to increase the number of Pakistanis who are able to take advantage of broadband services revolve around four broad categories:

- Expand access.
- Enhance citizens' digital skills and awareness.
- Promote relevant local content.
- Improvise value addition

Enhance Digital Skills and Awareness

a) Educate citizens on beneficial broadband opportunities by engaging academia, media advertisement and workshops.

b) Offer public computer and digital skill training through existing rabta ghar scheme and partnerships with Universities / HEC.

Promote Relevant Local Content

a) Reveal the so far hidden content development market to partner with operators.

b) Encourage operators to link their broadband portals with various public services.

c) Provide parents with knowledge and tools for protect children from undesirable online content.

Expand Access

a) Concentrate on spending of USF for available broadband grants to help finance the deployment of broadband services in un-served areas.

b) Ensure federal and provincial plans include broadband as critical infrastructure along with energy, water and transportation.

c) Consult with service providers on probable areas of required policy and regulatory facilitation.

d) Encourage inclusion of cable operators by acquiring necessary license / registration to offer broadband to masses at low cost.

e) Create publically available broadband access locations convenient to local community.

Improvise Value Addition

a) The competition inside broadband market is increasing. It would be pushed by the introduction of 3G mobile broadband.

b) Operators would bring along add value additions inside their networks. Deploying Intelligent Networks (IN) is going to be a crucial element of success for them in future.

c) Offering xPlay services, bundled offers and attractive applications would be required by the service providers in order to retain their market existence.

d) Regulatory and Policy framework should continue their support and keep consultation with service providers on value additions subjects.

While we would focus on public service areas connected with increasing broadband usage and identifying beneficial usage of the same, the following main areas would be targeted to open new horizons of effective broadband usage of general public.

Health

- Engage rural health professionals in creating solutions that address obstacles to e-health.
- Encourage use of information technologies over broadband for health education.
- Support e-health technologies for critical applications such as home based health care systems.

Agriculture

- Efficient communication over Internet with suppliers and customers around the globe.
- Improved competitiveness through computer based production facility monitoring and automation.
- Access to expert consultation over Internet.

Cyber Security and Undesirable Content

- Engage the Industry players in improving the security of information flow over networks.
- Devise mechanism to develop a national infrastructure to block unethical Internet content in the country.

Education

- Encourage use of video and internet technologies in rural schools to prepare next generation of digital literates.
- Leverage e-education media to provide opportunities for youth and adults to gain knowledge.
- Apply technology to strengthen parental involvement in their children's education.

Public Safety

- Leverage community broadband systems to strengthen local police enforcement.
- Advance community safety through use of broadband enabled technologies to deliver education to prisoners.
- Immediate reliable communication to coordinate emergency response.

Government Efficiency and Services

- Identify federal and local government best practices in the use of information technologies to reduce cost of public services and improve openness.
- Support federal and local government to implement innovations in the use of technologies.

Economic Development

- Identify business sectors with potential to successfully demonstrate uses of broadband to support business development.
- Develop strategies to enhance rural business opportunities that could be built upon through broadband communications.
- Assign regional teams to create strategies to expand use of broadband to improve on-farm and

ICT VISION 2020

All over the world, information and communication technologies are changing the way people do business, interact with government and entertain and educate themselves. It has not only enriched the lives of people but also become indispensible in increasing productive capacity and social uplift of societies. At the same time, governments are becoming more responsive and transparent as a result of computing and communication technologies. We envision that by the year 2020, an integrated ICT vision of the country would have taken shape, and results elsewhere achieved in the world, would also be secured in the Pakistani society.

In Pakistan, tele-density of mobile communication has seen unprecedented growth in the last decade. As a result to the government's policy of liberalization and inviting investment under the PTA's umbrella, the cellular base has increased from 0.7 million in the year 2000 to over 100 million in 2010. This alone has brought tremendous value to businesses and unprecedented growth in personal productivity. This is just the beginning; with the deployment of 3G and 4G technologies in the country, the handsets of today will be transformed into a personal computer, entertainment and educational device instead of a mere phone and text SMS device. The possibilities are simply limitless. The 3G and 4G technologies area is all about content delivery and a two-way multimedia interaction. With a rural population of over 70%, the possibilities for pushing educational content and e-Health applications to the underserved are limitless. Pakistan can lead the charge in demonstrating to the world how the digital divide can be bridged and pressing problems facing a society with growing young population addressed. The needed components are already in place with Pakistani companies working on products and services that are well suited to be delivered through faster 3G and 4G networks. A Pakistani company is building a networked enabled ECG machine, the first step in diagnosing heart disease, which can be attached to a patient by a technician and the data transmitted in real time, over a 3G network, to a teaching hospital showing the ECG to the specialist. This literally brings the heart specialist into a small village without the specialist having to leave his office. A Pakistani sports company is making the official on-line cricket game for the Cricket World Cup 2011. This bodes well for local animated content to be delivered to a variety of devices including traditional television as well as handheld devices including phones and computer tablets. In the brave new world of tomorrow, the choice of content to view will be determined by the user on demand and not what is scheduled on a TV channel at a specific time of the day. These examples illustrate that there is tremendous potential and talent in

Pakistan to solve key problems facing the nation and ignite a local content generation and delivery eco system based on local languages while taking into account local cultural sensitivities. This is also essential to preserve the value system and traditions of our culture which is increasingly at the mercy of global media productions compromising national harmony, culture, context and coherence. The mobile ICT technologies also have relevance to providing key health care and educational delivery systems. These technologies can also increase productive capacity of the nation resulting in national wealth creation and increased prosperity.

While all the components are in place to achieve these desirable and achievable goals, a set of coherent national policies and priorities needs to be introduced to facilitate materialization of the goals. The Content and Communication segments have to start working closely with each other. This has started happening with innovative products based on SMS and other 2G technologies developed by local content providers and deployed by mobile phone companies. This cooperation needs to be enhanced to facilitate a wider variety of content generation and creation of innovative business models that provide a fair return of investment to both the content provider and the content delivery platform, namely the telecommunication companies. New licensing models need to be worked out between traditional television and film content producers and mobile and telecommunication companies delivering this content to mobile and wireless devices. The signs of a robust mobile data delivery platform taking hold in the country are already emerging. In fact, the wireless internet growth in the country far surpassed the fixed line hi-speed internet connections in the year 2010. The content currently viewed on these hi-speed wireless Internet connections, however, is largely of foreign origin and mainly delivered in English depriving a majority of population of reaping the true benefits of a content delivery platform. This also hinders the telecommunication provider from expanding the revenue base by tapping into the needs of a large segment of the Pakistani population, and resultant economies of scale.

The PTA as a regulator, facilitator and enabler of the framework in which all the stakeholders can cooperate with each other and make this integrated vision possible has a key role to play in crafting a vision for the nation in the coming decade. Our vision for 2020 outlines an integrated vision to create an enabling environment where a true well connected society can start to reap the benefits of Next Generation technologies. In this vision, the telecommunication operators will be working seamlessly with the content providers and value addition application developers to create a true ICT ecosystem. This integration will need to be so seamless and unifying that it dissolves the boundaries between content production and delivery. Telecommunication companies will have to think outside the box beyond simply providing voice connections and text SMS to

provisioning high value add content for business, education, health and entertainment needs of the society. Given the role telecommunication companies have played in exponentially increasing the reach to Pakistani population, the time is right for these companies to play even a larger role by inviting and encouraging content developers to build applications and content for enrichment and uplift of their customers. This vision will need looking beyond a quarter to quarter revenue and profit growth and adopt a long term strategy of continuous renewal of products and services base instead of merely concentrating on increasing the number of customers, which is increasingly becoming less profitable and highly expensive as simple voice/SMS revenues are reaching saturation.

In layman's terms, the ICT technologies, enabled by Next Generation of content rich applications, have deep relevance to how people learn, work and entertain themselves. To be afforded the chance to get educated and learn is one of the most fundamental rights of an individual in a welfare state. It is a basic component of ICT4D (ICT for development) initiatives. The fast growing population which is primarily young can become a workforce and hence entrepreneurial if it is educated; however, it can be a drain on resources if left uneducated. With a majority of population living in rural areas, which have largely not seen the benefits of recent advancements in educational system, rich educational content delivered at school level (on demand or during school hours) offers a tremendous opportunity to make a difference in the lives of many. Science teachers were scarce in the rural areas to begin with, now they are even scarcer with increasing lucrative opportunities to teach the O' Level and A' Level students in cities. This has led to an expanding rural-urban divide and has increased the velocity of migration from rural areas to cities for those who can afford an education in the city. It also deprives many talented individuals from the countryside of opportunity to get involved in scientific pursuits. 3G and 4G networks coupled with a structured educational content delivered to a low cost PC or tablet can revolutionize the concept of learning in the rural areas of Pakistan.

Similarly rich content on crop cultivation, management and market information can revolutionize the life of peasants and farmers in the country side. Equipped with latest information on new fertilizers, seeds, pesticides and techniques for advanced cultivation, the farm productivity in the country can be taken to the next level. Imagine the overall farm productivity increasing by 10% as a result to this information available on the fingertips of the farmers and the subsequent prosperity for the farmer and increased food security and wealth generation for the country.

Access to cost efficient health care remains a dream for everyone in the rural communities and small towns. While invasive surgical procedure do need a visit to a larger medical facility, common ailments and initial diagnosis can be efficiently carried out using a two

way audio-visual channel enabled by Next Generation Communication Networks and smart mobile devices. As pointed out earlier, using the example of a remotely enabled ECG machines, the physical proximity to a doctor will be no longer necessary. Innovative business and service delivery models are becoming a reality with the cost of bandwidth coming down drastically. Talented individuals have already started to experiment delivering health care related information and preliminary diagnosis on the phone, via SMS and other 2nd generation cellular technologies. This will be revolutionized when two-way communication enabled by 3G and 4G networks is operationalized in the country. With appropriate policy and government support, Pakistan can become the leading country in the world in delivering a mass scale e-Health and tele-Health system to a large segment of its population. Next Generation information and communication technologies can reduce rural-urban divide and level the playing field by making Pakistan a true meritocracy giving everyone an opportunity to excel. This will also enlarge the pool of talented individuals in each sphere of life.

All over the world, small businesses are the backbone of any economy. While everyone knows the names of Fortune 500 companies, small enterprises defined as businesses consisting of less than 50 people employ more than 60% of workforce in developed economies of the world. No country can make progress and spread prosperity to the masses unless it strengthens a large number of small and medium sized businesses. Owing to widely dispersed rural communities in Pakistan, such inclusion in the national economy means that entrepreneurs and businesses in small rural communities must be linked to the information super highway. “The world is becoming a global village” sounds like a cliché but its true meaning comes to light when one looks at the possibilities unleashed as a result to putting rural entrepreneurs and small businesses on the world map. Imagine that a pottery maker, master in his craft, is displaying his wares across the world, accepting orders from half way around the globe and getting paid through an electronic wallet on his mobile phone. A wood carver making hand-made intricate furniture and fixtures in remote mountains could sell her products to rest of the world. Such solutions need an efficient and low cost payment processing mechanism available to individual and entrepreneurs.

The PTA itself has launched a National Rabta Information Portal which aggregates the forms and information related to over 70 different services needed by citizens. This is just the beginning; in Next Generation of e-Government applications, the citizens will not only be able to download forms and print them but also submit the forms electronically to receive a service. In its true form, e-Governance can become so pervasive that citizens in Pakistan will also be able to monitor the progress of their application over the internet and a true two-way communication channel will be established between the government and the citizenry. The possibilities are simply endless. Imagine getting a notice for registration

renewal for your car on-line and the ability to electronically pay the token fee right from one's mobile phone. Imagine getting an electronic notification from the Court a day in advance that the scheduled hearing of your case is postponed and intimating the respondent and defendant about the new scheduled dates. In today's world, poor farmers and those living in far flung areas sometimes travel hundreds of miles incurring thousands of rupees to reach the district headquarter only to find out that the scheduled hearing of their case is postponed for the day and a new date has been announced. The benefits of this one e-Government initiative alone could be measured in million of rupees in economic savings in addition to saving time and the rejection faced by the masses.

While ICT4D can do wonders for providing basic citizen services and rights, a hallmark of a truly welfare oriented society as envisioned by the founding father of Pakistan, the impact of ICT on increasing productive capacity of the economy is no less dramatic. With an increasing population and dwindling resources, efforts should not only be concentrated on enlarging resource and services pool but increasing the productive capacity of the existing economy. The wealth of a nation increases in proportion to either the increase in deployable human and material resources or improving the efficiency of existing human and material resources. While the first of these components can be inflationary sometimes, the second generates wealth without expansion of inputs. What that means is that using the same amount of raw material and same number of human resource, a business can produce more products and services. The first wave of productivity increase was witnessed from the beginning to middle of the 20th century fueled by the steam engine and factory automation. The productivity increase then took a dip but revived again significantly starting in late 70's and early 80's of the 20th century. Economists have argued that innovation enabled by information, communication and computing technologies contributed largely to the increase in this spur in productive growth in later part of the 20th Century. While the ICT itself technology itself doesn't make a business efficient, its application to improving business processes, efficiency gains and innovative business models and practices does. Such gains can also accrue to the Pakistani society if every sector of the economy innovates with the help of ICT technologies.

Businesses can better manage inventories and process more orders, better service customer needs and identify the bottlenecks in the supply chain. A store chain can exactly know what was sold across the stores all over the country and what needs to be shipped to each store the next day, something that is done manually today and can sometime take weeks to compute. Such productivity gains can be achieved by the introduction of high speed data networks carrying two way video, audio and voice to hand held devices. Virtual conferences between buyers and sellers can take place without anyone to have leave town and incur high cost of air travel, boarding and lodging. The concept of an experienced

foreman sitting at a support console helping those field technicians that encounter complex repair problems has a multiplier effect on the productivity, efficiency and customer satisfaction. All these are examples of productivity increase by deploying computing and ICT technologies. High speed wireless data networks act as the backbone of such systems.

The Next Generation content delivery systems enabled by 3G and 4G technologies are fundamentally changing the entertainment paradigm. Today most of people in Pakistan get content pushed to them and they can only watch what is available at a given channel at a given time. This is fast changing to a system where content is pulled based on viewer's needs, wants and wishes. People in developed countries have already integrated their media PCs with their high definition TVs to seamlessly view YouTube content along with the broadcast and cable TV. Television delivered through high speed wireless connection to a mobile device is becoming the norm in developed societies. Such content can also be entertainment or educational in nature. Unfortunately, in Pakistan, there hasn't been enough emphasis on developing digital content with local context and in local languages. That needs to change if the telecommunication, media and entertainment companies are to scale and provide high value add media products to a large segment of the population.

The content developed with a local context is also essential to keep the national vision, coherence, context and culture intact. Language and culture are intimately intertwined and ignoring the local and national language will eventually lead to a society with a lost heritage. In fact, there is a tremendous opportunity to unify the nation by emphasizing traditional value system, our shared Islamic heritage and the common vision for the nation. Such emphasis is best delivered in local and national languages. The tools and technologies that get developed for producing content in local language will also have an application for doing the same for educational content.

The enabling technologies and policy infrastructure to implement the vision described above will take effort from the PTA, the PEMRA, the ICTRDF, the USF, the State Bank and other government ministries to work together and provide the requisite policies, programs, tools and instruments. The PTA has been actively pushing the adoption of 3G technologies in the country so that the basic infrastructure for the connected vision of the country can be achieved. This needs to be augmented by taking this infrastructure and pipeline to various parts of the country irrespective of how big the city, town, tehsil or district is. The infrastructure needs to be available to all citizens of Pakistan to reap the true benefits of the Next Generation of ICT technologies. There should simply be no haves and have nots in the new ICT driven paradigm. Research funding organizations like National ICT Research and Development Fund (ICTRDF) will need to play its role by fostering technologies to develop a Nastaliq Urdu layer for computing devices, mobile telephone and wireless

devices. This will enable publishing of e-books in the rich readable print quality e-paper for educational and commercial use. Version of operating systems with a true Urdu and regional languages based user interface need to be developed. Where applicable the smart phone interfaces need to be changed to entirely Urdu or a regional language. This can be achieved by implementing policies that mandate handset and mobile device manufacturers to provide this capability in their product line up ramping from a small percentage of produce lineup in early years to complete adoption within five years.

The PEMRA and the ICTRDF would need to consider Content Generation Support programs to initially kick start Urdu and regional language based content for broadcast media. A keystone product equivalent to Sesame Street will need to be developed in Pakistan using local themes, local context and local production houses supported by the government. A project of its kind will build the national confidence, show value of such an endeavor to the population and widely increase demand and usage of local language content. Telecommunication companies will need to show foresight to act as big brothers supporting younger digital content companies by giving them a greater share of the revenue pie early in the product lifecycle. The revenue sharing model could shift in favor of telecommunication companies over time and as the content becomes popular. This will be consistent with the cost model for creating digital content which is highly skewed towards substantial initial cost discouraging smaller content providers from experimenting and generating a variety of high quality content. The State Bank of Pakistan will have to play its forward looking regulators role to enable cost efficient on-line payment systems for individuals and businesses based on traditional banking as well as emerging models like PayPal.

The Ministries, government agencies like the PERMR, the USF and the ICTRDF must work with the PTA to define a set of national priorities for the coming decade. These priorities must be defined in concrete terms, for example, “reaching at least 30% of rural population with e-Health services by the year 2020”. Such a vision will only be achieved if other relevant stakeholders, for example, Ministry of Health provide the relevant components. In this particular example, telecommunication and value added service providers can only provide part of the solution, the rest will need to come from relevant stakeholders like the Ministry of Health to institute programs to incentivize medical doctors to provide the content and day to day remote patient care to truly enable e-Health service delivery.

Similarly, the PTA with help from relevant quarters can produce educational content for K-12 student population, however, the content will only be useful if the guideline for developing the content and integrating it into the curriculum is supported by the Ministry of Education. The PTA will play its role by acting as the laboratory which demonstrates the

usefulness of these new applications and encourages the relevant stakeholders to come together to use ICT infrastructure to enrich lives of individuals as well as increase productive capacity of the economy.

The government has played a vital role in revitalizing higher education in Pakistan by allocating precious national resources to this sector despite severe economic challenges faced by the country due to war on terror. Significant progress has been made by the HEC and public and private universities to start building a pool of talented scientists, researchers and engineers with capability to make deep impact on the national economy and life. The ICT technologies aided by right government policies and interventions and aided by organizations like the PTA offer a path for this human resource capability to be deployed for deployment of innovative ideas, research and products for uplift of Pakistani population. The country has the will and the talent to implement a grand vision where computing and the ICT technologies can change the landscape of this country in the coming decade and make Pakistan a prosperous nation internally and a proud member of the world nation.

Chapter 3

Telecommunication Services

Pakistan's telecommunications market is huge and continuously growing. Total annual revenue recorded for 2009-2010 was PKR 352 billion with a compound annual growth rate of 10-15% over the last four years. It is expected that growing GDP (per capita) and accumulation of income has driven consumer demand and will drive the demand for new services such as 3G & 4rth (3rd generation / 4rth Generation mobile) and Internet protocol television (IPTV) in coming years.

A telecommunications network is driven by network economics which is a reference to the geometric growth as networks combine and more users join them. For this reason, we observed that interconnection between fixed and mobile networks increases the value of each other. Closed User Group (CUG) networks, typically operated by the enterprise sector, are a truncated form of network economies, yet generate most of the value to operators and service providers. Open (public) user networks traditionally mostly offer voice services, but with the futuristic broadband environment they will increasingly offer a range of non-voice services such as fast internet access and 'converged' services such as Internet Protocol Television (IPTV).

Most business models for our telecom sector currently still rely upon subscriber line rentals and usage charges. Increasingly, new revenue streams are appearing in the form of either access (usually to a Web-based service) or carriage charges (usually paid by a content provider) or revenue-sharing with the providers of content and application services. These new revenue streams are expected to come into play especially for fixed line telecommunication market. Moreover, with the emergence of all-IP Next Generation Networks (NGNs), Internet Protocol Virtual Private Networks (IPVPN) will integrate voice and non-voice communications for enterprises. It may be kept in mind that most profitable business for fixed line operators is the enterprise data market yet voice traffic remains a

cash cow, a continuing source of liquidity that makes the efficacy aspect of the larger telecom companies.

While talking about the historical revolution, telecommunications can be conveniently divided into the analogue, digital, internet and broadband ages. Digital started taking over in the 1980s and became prevalent in the 1990s with the introduction of the Asymmetric Transfer Mode (ATM) digital switch, the workhorse of the network, supported by Synchronous Digital Hierarchy (SDH) or Synchronous Optical Network (SONET) high-speed transmission technologies over high grade copper or optical fiber cables. Internet Protocol (IP) was seen as a challenge from outside of the industry and was for a long time resisted by the telecommunications community as an inferior technology for voice and data communications.

The spread of broadband at the turn of the century has facilitated use of internet and the World Wide Web to develop peer-to-peer (P2P) software to upload TV, movie content or music and videos for redistribution globally over broadband networks to any type of device that can attach to the Web.

In the long term this promises to be future revenue possibilities for telecom companies as providers of access and carriage, but in the short term, the IP technologies have severely undermined international voice business of telecom companies, which used to be major cash streams of their business and an important source of foreign exchange earnings for developing countries like ours. The parallel development in telecommunications since the 1980s has been the rise of cellular mobile technologies. Like wired telecoms, wireless mobile telecom has developed from analogue (1G) to digital (2G) to internet (2.5G) and now looking ahead to broadband (3G+). Mobile cellular technology has been primarily focused on the consumer market, acting as a substitute for often unavailable wired telephony. Now visions of 4G and beyond, including established technologies such as WiMAX are heralding the age of convergence. The most prominent example of convergence is TV over telecom networks. In the wired world, this means IPTV and Web-TV. In the wireless world it means mobile TV.

The following text illustrates the future predicted services of different segments of telecommunication sector in the country.

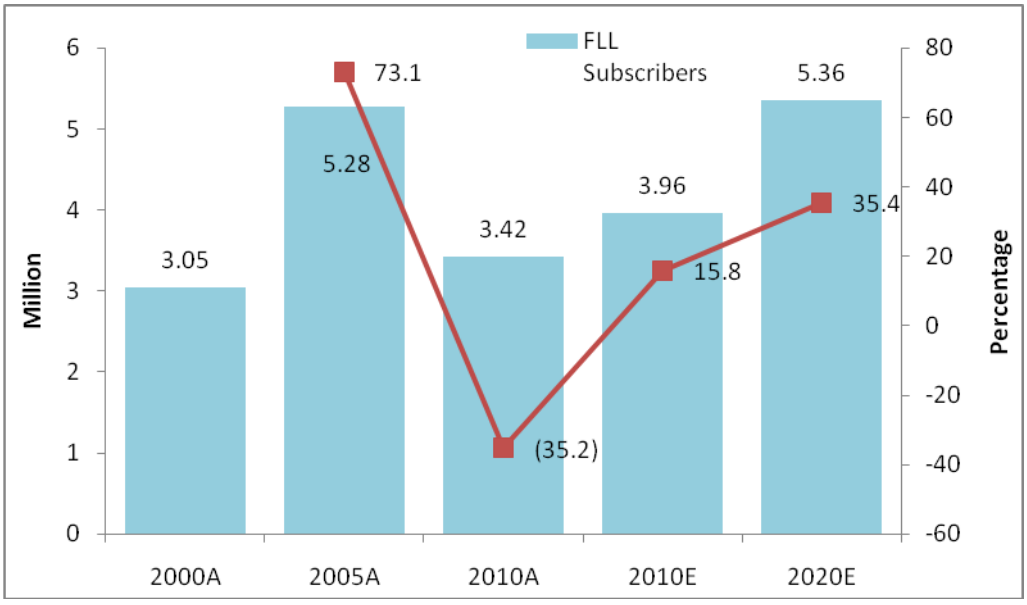
FIXED LINE SERVICES

The key growth drivers for wire-line telecommunications will be the increasing demand for data and Internet services, cost-effective deployment of fixed-wireless technologies, and introduction of fiber-optic cables. The demand for Next Generation Networks (NGN) for communications has mostly focused on the trend in technology and the efficiencies of moving to networks driven by the IP protocols. This is expected to be the main leading trend towards the success of fixed line services where the incumbent operator would be utilizing IP-core bundled with soft switches and media gateways to offer attractive bunch of services over its fixed line network.

As we progress from 2010 to 2020, we will experience tremendous change in fixed line voice communication business. Networks, especially designed for voice communication will vanish and it will all be IP/MPLS communication or a newer version of it. Voice and Data will continue to merge as information bits with data superseding the voice in fixed line segment. This change will also bring a bundle of new value added services to be offered via fixed line networks. Phone carriers have already made their goal to offer numerous "bundled" services through high speed DSL or Fiber-to-the-premises lines.

Pakistan's economic advance has been blown badly of course over the last two years. Prior to the country's descent towards political instability, the domestic economy had been ticking along nicely, with growth averaging 6.8% per annum in the five years between FY2002/03 (July-June) and FY2006/07. However, a late 2008 balance of payments crisis, requiring an IMF bailout, in conjunction with severe political turmoil, caused real economic growth to plummet to just 2.0% in FY2008/09. It is expected that the country's economic recovery will proceed at a modest pace. International agencies forecast Pakistan's real economic growth at 2.4% and 2.8% in FY2009/10 and FY2010/11 respectively. Although these readings do look relatively impressive by a developed-state standard, they are very disappointing compared to regional peers. The opportunities to invest in Pakistan have improved during recent years; the country does have one of the most liberal foreign investment regimes in South Asia with a commitment to low tariffs and 100% foreign equity permitted in sectors like telecommunication.

The following graph shows a trend of fixed line subscribers in the country till 2020. A growth rate of 35% is forecasted in the next ten years.

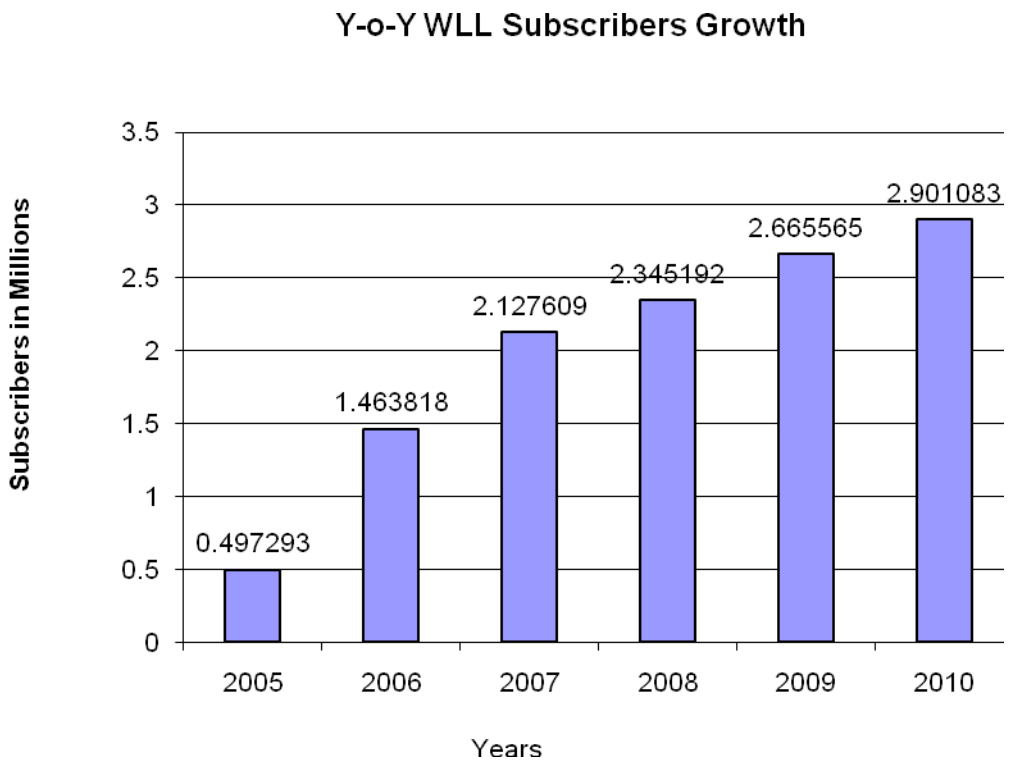


The fixed line market is expected to generally remain stagnant over the next ten years of time. An average growth rate of 3.5% per year is predicted adding an additional 1.4 million subscribers by 2020. Primary reason behind this will be preference of using mobile voice services to the fixed line with a limited chance of any fixed line voice access infrastructure deployment by the operators. Though offerings of bundled services (voice, video, and data) via high speed fiber access network are expected to be on the rise, however the tendency towards utilizing fixed voice services will remain low.

WIRELESS LOCAL LOOP

The WLL was introduced as a fixed wireless service for basic telephony, in which copper based local loop was to be replaced by a last mile wireless connection. The WLL was seen to have great promise, especially in developing countries as an economic solution to reach areas beyond the reach of copper based networks. The WLL services were launched in Pakistan in 2005 with high expectations on account of low fixed teledensity of 3.4 per 100 people. The objective was to address requirements for cost effective affordable and efficient fixed line basic telephony (i.e. voice) services across the country especially in the rural areas.

Keeping in view the envisaged role, the WLL license conditions were designed in a manner to restrict the licensees to their own market segment. This was done through the Limited Mobility clause and mandatory voice services. The performance can be gauged from the following Y-o-Y growth of WLL Subscribers.



Certainly this has not been an impressive growth. A comparison of WLL teledensity with FLL and Mobile sectors reveals the real story.

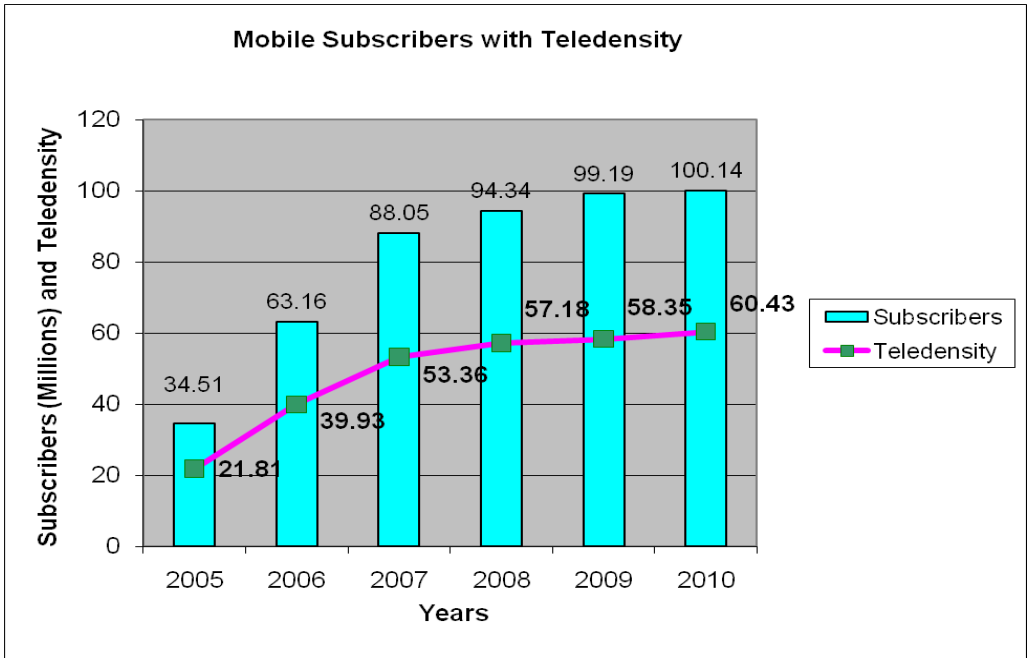
Year	WLL Density	FLL Density	Mobile Density
2004-05	0.17	3.43	8.30
2005-06	0.66	3.37	22.21
2006-07	1.08	3.04	39.94
2007-08	1.4	2.70	54.6
2008-09	1.6	2.20	58.2

Annual teledensity Comparison (WLL, FLL and Mobile)

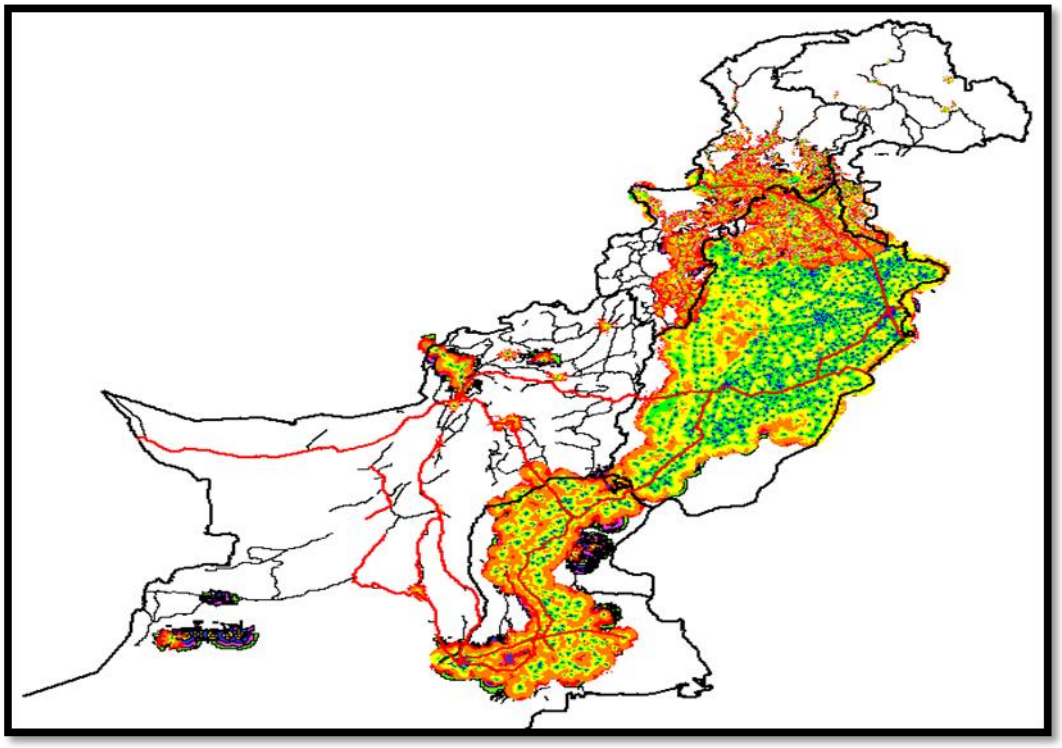
The WLL was considered a highly cost effective and viable replacement of wire line network. The low fixed tele-density offered a viable business opportunity for the WLL. However, both the WLL and the FLL operators faced intense competition from mobile operators on account of high convenience, low barrier to entry, mobility and pocket sized handsets. Nevertheless, the segment is still surviving through change in strategy (emphasis on marketing Broad Band Services instead of Voice). Three frequency bands reserved for the WLL services are 450/479 MHz, 1900 MHz and 3.5 GHz. A survey of the international Telecom market reveals that there were very few countries which licensed fixed wireless services akin to Pakistan's WLL services, and many of them have converted these to either mobile wireless services or provided the operators an option of conversion to unified licensing regimes. Limited Mobility restriction resulted into a major barrier to the growth of WLL, wherever it existed and significant growth was witnessed immediately after the restriction was relaxed.

CELLULAR MOBILE

Pakistan allowed for Cellular Mobile services in 1990. M/s Paktel and Pakcom (Instaphone) installed AMPS networks and offered very expensive mobile phone services. The first GSM license was granted to M/s Mobilink in 1992. Although an advanced technology at the time yet it could not attract masses due to very high tariffs for outgoing as well as incoming calls. In 2000, Pakistan introduced the CPP regime which initiated turnaround in spread of the cellular mobile services. The crowning policy decision which broke all growth records was deregulation of telecom sector in 2003 and resulting auction of two new mobile licenses to M/s Telenor and M/s Warid in 2004. The following subscriber and teledensity growth chart depicts the trend of Pakistan's Cellular Mobile sector in the outgoing decade.



Presently, more than 90% of the country's population and more than half of the country's geographic area are covered by the existing 5 mobile operators.



All the mobile operators in Pakistan are offering 2.5G GSM services while competition and packages are voice and SMS centric.

MOBILE VOICE SERVICES 2020

In 2020, there would be 5 billion mobile users, shaping technology, services, content and pricing globally. Driven by the ubiquitous deployment of mobile systems, widespread use of the mobile internet, rapid advancements in wireless technologies, insatiable demand for high-speed interactive multimedia services, and growing need for secure wireless machine-to-machine communications, mobile commerce is rapidly approaching the business forefront. Mobile technology will have even more of a profound effect than internet and wireless technology because it influences every aspect of our lives.

Mobile operators have been focusing heavily on increasing their revenue through new mobile data services, but they must not lose sight of opportunities within the voice market, which generates a vast bulk of communication revenue today and will continue doing so in the next ten years. The potential to grow voice revenue represents an important opportunity for mobile operators as they battle to reverse the long-term decline in mobile ARPU. The potential growth in voice revenue will come from service innovation but, if significant growth is to be realized, mobile operators will continue targeting traffic that is currently being carried on fixed networks (both Domestic and International).

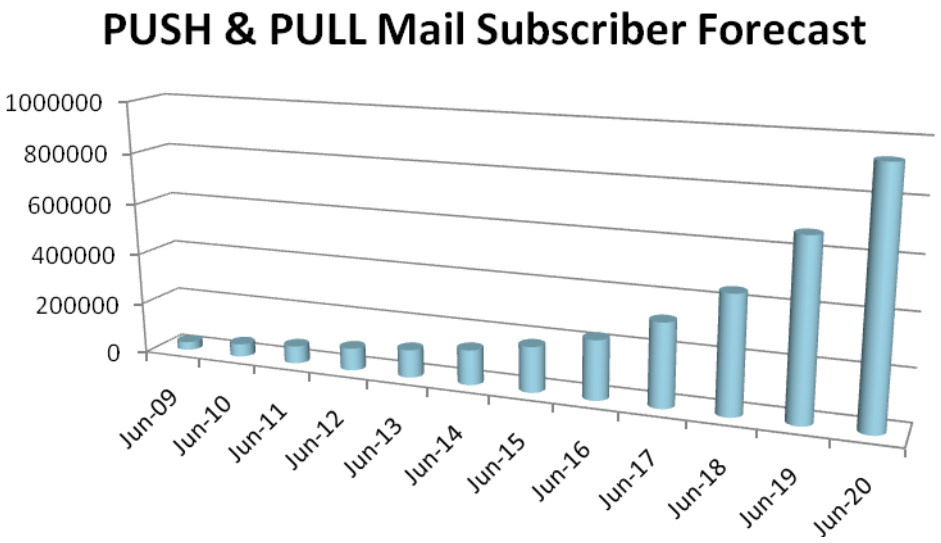
One of the future services expected to come along with 3G mobile networks in Pakistan will be high definition voice. The HD voice is the future standard for mobile communications. The operators would endeavor to rapidly extend offerings of the HD voice-compatible mobile handsets in the future.

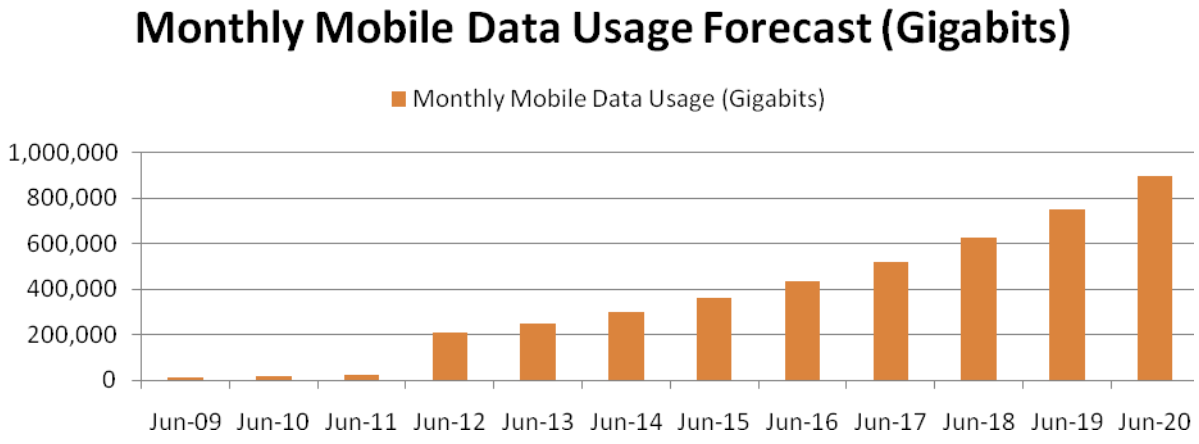
This new generation of wireless applications requires far deeper understanding of the constraints and needs of users – their inhibitions and motivations. A humanized understanding of how technology will be exploited means that it is both relevant and necessary to look at choice of mobile services from a socio-economic perspective.

In light of the fact that the highly-personalized, context-aware, location-sensitive, time-critical, pin-point information presentation forms the basis upon which promising applications can be built, mobile commerce services are presented. We expect the next ten years to be highly competitive for mobile voice services in the country. Probable introduction of 3G and LTE technologies would lead the way.

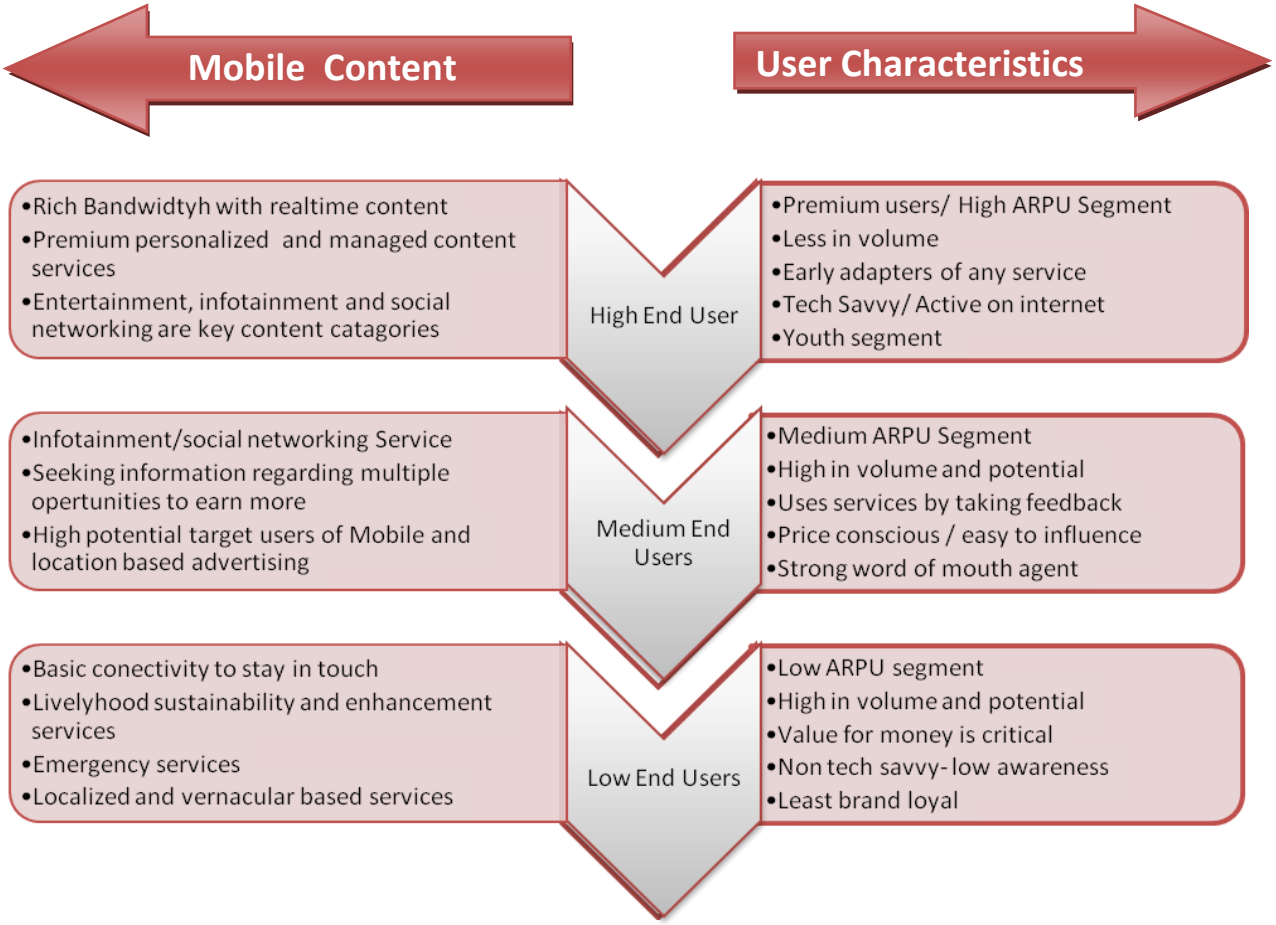
MOBILE DATA SERVICES 2020

It is expected that the youth of today will become the advanced mobile services user of tomorrow - having grown up with the technology. Consequently, the future usage of wireless services will be oriented to a range of ubiquitous applications, perhaps never seen before, that support specific lifestyles with supporting services and entertainment. The next ten years would be bringing a new era beyond the basic communications of voice and SMS.





Moreover, while we explore the market behavior of mobile services by 2020, an important change is expected in the consumer behavior as well. Personalization of content would emerge as an important subscriber based factor. The mobile subscriber segment can be divided into three generic categories--high end users comprising of youth, tech savvy professionals demanding high speed real time content and those interested in more personalized services over their mobile services.



The medium end users would be the most numbered and price conscious. They would prefer general use of services like information seeking, social networking and entertainment. The last segment of low end users would be more interested in using emergency services with no specific demand for high speed availability. They would be more concerned about the value for money with least interest in a specific operator brand.

These mobile data services will enable the entire GSM/GPRS mobile industry to demonstrate enormous potential of this technology to the world. The future m-services for our economy could come up with these five areas:

m-Payments: Enabling users to carry out all kinds of payments through mobile phone networks.

m-Employment: In context of unemployment, it is expected that mobile job boards or an m-Craigslist would be listed as one of the popular mobile data services of the future.

m-Health: A major segment of population having limited or no access to basic health services, offering them healthcare services (advice to diagnosis to treatment) over mobile phones will be amongst future mobile data services.

m-Agriculture: The primary sector of the economy requires introduction of ICT enabled services targeting locally-consumed food production companies and farmers. Mobile platform appears to be the most suitable by offering mobile agriculture services.

m-Education: Literacy rates stand as another social challenge which could be narrowed by using mobile devices assisting people to enhance learning opportunities. The mobile education platform can drive people to education both in formal and informal education areas.

Mobile data services face barriers to deployment in markets like Pakistan. The services require to be low cost and yet high volume to be sustainable over millions of rural and poor users. Scaling mobile data services is the key to empower population with new access to information, services and goods, and therefore will result in overall economic development.

The PTA is keeping a mainstream focus towards promotion and facilitation of mobile data content services in the country. Subsequent to Electronic Transfer Act (2005) and Branchless Banking Regulations (2008) promulgated by the State Bank of Pakistan, a couple of financial institutes introduced mobile banking models based on one-to-one relationship. Furthermore, a mobile company also announced its mobile payment / transfer model where the operator bought a financial institute. The available regulatory regime of mobile banking is kind of vague in terms of models and relationships. In order to introduce a unified regulatory regime catering the requirements of the operators, financial institutes and the consumer by providing a many-to-many relationship. The PTA has

joined hands with the SBP for drafting 'Mobile Banking Regulations' based on third part service provider model.

In order to institute the right direction for inviting B2C and B2B transaction through a secure communication channel over internet and mobile communication, the PTA carried out a partnership work with a leading private group to establish Pakistan's first local electronic commerce gateway. The PTA has also joined hands with telecommunication service providers and academia to unhide prominent potential of young innovative minds of the country. The regulator invited two national level competitions for mobile data content and applications; an amazing set of applications were received affirming a vivid future for localized mobile data services.

THE VISION 2020

Telecommunication services would continue to play their vital contribution not only in providing a cheap and reliable multi flavor communication supply but also climbing its contribution for economical and social growth of the country. The next ten years are expected to bring along a whole bunch of innovative, remarkable and high speed services in voice, video and data segments both in wireless and wired formation.

The convergence of technologies is enabling service providers to introduce new types of services, as the PTA, being a regulator, has to confront a number of challenges and significant issues bundled with encouragement of future telecommunication services. The PTA would emphasize towards its primary role of creating an environment conducive to the investment and create a favorable regulatory environment, transparent regulatory framework and a level playing field. A rigid regulatory framework is essential component behind success of telecommunication services. The PTA has to deal with licensing, interconnection, pricing, right of way, spectrum allocation, infrastructure development, operator's conflict resolution, consumer protection and universal access for continuous success of telecommunication services of the future.

The following set of driving elements is identified as of utmost importance for the telecommunication services success in the next ten years.

During the last decade, technology sectors such as the telecommunication, internet, electronic media and information technologies have started to converge to form one new sector. This convergence trend in the telecom and the other sectors has led to convergence

of services where telecommunication service providers are utilizing these technologies for delivering a wide-range of innovative services. Liberalization of the telecom sector in countries has spawned intense competition within and across borders. The rise of consumerism and the need to anticipate consumer demand have been a catalyst to convergence of services. This has in turn inspired massive advancement in the field of information and communication technologies (ICTs).

In the light of above mentioned scenario, a new regulatory model is emerging globally to cover the whole range of existing and new services. This future regulatory environment will be of crucial importance in order to reap the social and economical benefits from ICT services. With emerging era of convergence in the country, information and communication technologies are becoming a critical foundation to virtually every aspect of our lives. It is envisioned that an organization may be empowered to regulate the whole ICT sector of the country or merge all ICT related organizations to form a converged regulatory regime as proposed above.

UNIFIED SERVICES LICENSING

It is evident that long distance and international communication segment has achieved almost all its objectives i.e. multiple choices to the customer at affordable rates in a fiercely competitive market. However, local loop does not make a viable business model.

Emergence/deployment of IP based networks has further complicated business case for local loop operator where technology cannot be restricted to geographic boundaries while local loop license confines the operator to offer its services strictly within the licensed territory. The technology further complicates the business case for LDI where local loop can indulge in the LDI business without great risk of detection complicating the regulatory environment while (IP based networks are increasingly being deployed for local loop operations, e.g. OFAN (NGN Access) by different operators. Technologies like satellite and IP are non-geographic in nature and imposing geographic limitations is not technically feasible.

Unification of LL and LDI licenses would increase room for technological and commercial services evolution as well as it can truly accomplish service neutrality and pave the way for future technological growth of the sector.

UNBUNDLING OF ACCESS & SERVICES

The trends in the telecommunication industry are fast changing and the emerging services will require regulatory frameworks to support modernization. An accurate assessment of the telecommunication infrastructure and facilities is required to promote latest services and create conducive environment for proliferation of latest trends in telecommunications. The telecommunication service providers in Pakistan are making substantial investments in infrastructure as well as services. The facilities, infrastructures and various services are required to be opened with a broader view to promote telecommunication services. The particular area of concern is provision of broadband services by the licensed service providers in addition to the services that are being offered by licensed Mobile Cellular, LDI as well LDI operators of Pakistan.

The PTA may attempt to implement a framework for unbundling of Access & Services; necessary measures would be required to avoid any collision or conflicts that may hamper industry growth. This is essential that unbundling framework for Access & Services should be able to address concerns of SMPs. In particular benchmarking is necessary to evolve an unbiased and appropriate pricing framework for unbundled network component, element and/or services of SMPs to avoid any associated distortion or conflicts to core services business areas of SMPs.

FIXED LINE NUMBER PORTABILITY

Currently in Pakistan, FLL operators and WLL operators are in operation. The FLL and WLL markets have a wide spread share of operator's subscriber strength. Service providers are likely to have ample time to strategize and prepare themselves to gain the most from LNP, as LNP implementation, due to its complex nature, could take anywhere between 12 and 18 months to complete.

While implementing NP it comes to a more competitive marketplace. By lifting the remaining barrier to what some would consider a completely free market, operators would become even more focused on subscribers. Rather than continuing price wars, in countries where NP has been implemented, operators tend to start consumer loyalty programs, improve customer service, reduce hold times, increase outbound calling programs, focus on renewal incentives, work to improve network coverage, rollout additional differentiated. LNP eliminates a competitive handicap that would occur if market entrants cannot provide services to consumers using their existing telephone number assignments. LNP provides

substantial consumer benefits by making competition feasible without forcing consumers to accept a different telephone number as a precondition to changing carriers.

IP TELEPHONY

Since a wide range of services, including voice, video, and data, can be transmitted via IP-enabled networks along with cost effectiveness attached with these networks than traditional circuit-switched networks. We have already anticipated that IP would play a core role in future telecommunication access service in Pakistan; one of the services that will trigger the overall transition to IP environment is Voice over Internet Protocol (VoIP). The PTA will have necessary consideration for formulation of the required IP telephony regulations once the market situation oblige by giving the right signals to introducing access services of VoIP. Different models for the regulation of VoIP would come into play including VoIP as data service, specific numbering, limited interconnection and equality of VoIP and traditional PSTN.

IP INTERCONNECTION

The future of telecommunication services will heavily rely on Internet Protocol (IP) as a transport mechanism. In this evolving era of IP-based networks, importance of interconnection cannot be neglected. After all, the "poster child" of all IP-based networks – internet itself – was teethed and weaned on open architectures, common protocols, and massive peering and transit relationships that have eventually spanned the globe. In a basic sense, then, interconnection is the founding ethos of IP-based networks**:** they exist to interconnect Telecommunication operators will be using NGNs to deliver a package of voice, data and video offerings, all using the same core network hardware. Few of the operators would plan to control the entire network value chain (end-to-end) same as in case of PSTN. These two network flavors would coexist, interconnection between both would pose several interoperability and charging issues. The PTA would plan out necessary IP interconnection regulatory regimes which may be applied symmetrically on all operators, or asymmetrically, on particular operators.

SPECTRUM RE-FARMING TRADING & SHARING

Frequency harmonization is extremely important to achieve benefits of rapid development in wireless technologies; therefore, administrations allow changes in frequency assignments in national interest. Acknowledging this, several countries have

formulated Spectrum Re-farming Policy Framework. In order to promote wireless broadband dissemination in rural areas, the PTA would plan ahead to devise national spectrum re-farming strategy.

The most optimum approach to increase efficient use of spectrum is spectrum trading, which has been adopted in almost all the major developed states in the world. In this approach, the authorized primary users are permitted to allow secondary users to use the entire spectrum or its portion for providing any service. There are many potential benefits of this approach such as more efficient use of spectrum, technologically and economically, more flexibility in spectrum management, including removal of rigidities in primary assignment and ability to charge market value of spectrum. In Pakistan, spectrum sharing approach has been adopted in some bands but the policy in this regard is not clear and transparent, and the number of such bands is limited. In order to increase efficient use of the spectrum for respective telecommunication services, spectrum trading and sharing would be in list of next ten years regulatory vision.

Chapter 4

Telecom Economy

Telecommunication and ICT have played a significant role in human life vis-à-vis promoting economic and social development across the globe. Telecommunications is now recognized as a catalyst to the efficiency of economic activities. It improves effectiveness of social services and distributes social, cultural and economic benefits of the process of development more equitably when it offers a cheap and accessible alternative of value to heavier modes of communication like mail, post and transportation. International Telecom Union has developed a measure called Digital Opportunity Index (DOI), which benchmarks the micro and macroeconomic indicators for measuring ICT proliferation, performance and digital divide in the information society of and across countries.

While defining the role of telecommunication in economic development, it is evident from a number of studies conducted across the world that telecommunication is an economic engine of growth in the information age. Improved quality of telecom system and services has become a critical determinant of competitiveness in Information and Communications Technology (ICT). Therefore, policy makers are increasingly aiming at ICT not only as an element of support but as also a driving force of economic growth. The telecommunication networks competency has evolved into a central nervous system of the age of global information sharing. Technical advancements and innovative policy instruments attract economic activities on a regional or national scale by creating incentives for the service providers.

EMERGENCE OF PAKISTAN ECONOMY

The economy of Pakistan has passed through different phases of revolution in the last six decades. Today Pakistan's economy is the 27th largest economy in the world in terms of purchasing power, and the 45th largest in absolute dollar terms. The economy is semi-industrial or precisely agro-based economy mainly relying on textile sector which constitutes about 60% of the total exports. While experiencing various phases in its growth patterns, the national economy encountered peeks and dips during the last few decades.

In the post independence era, Pakistan's economy was fraught with challenges of setting up organs of a new state body and coping with the influx of millions of refugees from India. In the early 1960s, Pakistani economy underwent transformation and GDP growth in this decade jumped to an average annual rate of 6 percent from 3 percent in the 1950s. However, major income inequalities surfaced in this era which resulted into chaos in the country. The growth rate in the 1970s fell to 3.7 percent per annum from the 6 percent recorded in the 1960s owing to a great set back of separation of the country's eastern part. In late 70s, economic conditions improved and the GDP grew at 6.6 percent annually. The fiscal deficits widened during this era and resultantly, Pakistan had to approach the International Monetary Fund (IMF) for assistance in 1988. The era of 1990s, witnessed political instability in the country where political governments changed frequently. During 1999-2008, political system was again disturbed and confronted with worst security situation, which still continues.

The process of political rehabilitation started in 2008 through a democratic government that met with severe electricity shortfalls, volatile security situation, double digit inflation and rupee depreciation which once again resulted in volatile economic situation. The recent super flood has caused unparalleled damage to the economy and the recovery efforts are exerting further pressure on it.

MARKET POTENTIAL FOR TELECOM SERVICES

Pakistan is the world's sixth most populous country, with an estimated population of 167 million as of June 2010. With an annual growth rate of 2.05 % it is expected that Pakistan will become the fourth most populous country by 2050. Pakistan is also called a young country with median age of 20 years where more than 104 million people are below the age of 30 years. With increasing trend of urbanization, it is estimated that approximately

36% of our population currently resides in urban areas. According to Vision 2020 released by the Planning Commission, it is expected that moderately declining fertility and mortality will result in improved life expectancy. Since the telecom growth is basically dependent on increased accessibility and affordability to users of all ages, the potential telecom market will keep growing with increasing trends in population growth. Currently, there are 100 million mobile subscribers which are almost 59% of total population of 2010.

In order to assess the potential market for telecom services, the population below the age of 10 years is excluded which is almost 15% of the total population; similarly the 13% people living in extreme poor conditions is also excluded from the total population. Also, it is assumed that people over 70 years of age do not fall in the potential market computation, which is almost 2% of the total population. So the current potential market is around 118.2 million, of which it is believed that 58% is already covered. Decreasing this 58% to 40% owing to the fact that some of mobile subscribers have more than one SIM, our total potential population becomes over 70 million for the year 2010.

Population Distribution & Total Market Potential
(in million)

	2000	2005	2010	2015F	2020F
Population	137.5	152.5	166.52	180.589	195
Above 65		2.9	3.3	3.7	4.1
Below 15 Years		45.4	24.2	26.3	28.4
Extreme Poor		21.2	20.8	20.8	19.5
Potential Market		84.5	118.2	129.8	143.1

A major potential segment of the market which still remains untapped is that of women. Increased emphasis on women education and the recent legal provisions for providing more jobs to women is likely to result in more connectivity demand by them. The WLL service that is replacing the FLL segment very swiftly can also capture a handsome share of this potential market. In the coming five years, it is estimated that the population of Pakistan will reach 181 million; of which the potential market would be 80 million ceteris paribus. Similarly, in the next 5 years the population will grow further to 195 million whereas the potential market will be around 143 million.

TELECOM SECTOR ROLE IN ECONOMY

A strong correlation between economic growth and telecom does exist, which is furthered by technical skill development. The enhancement of telecom services across the country is possible with improved economic performance of the country and vice versa. In case of Pakistan with the liberalization settling into the telecom sector actually changed the very

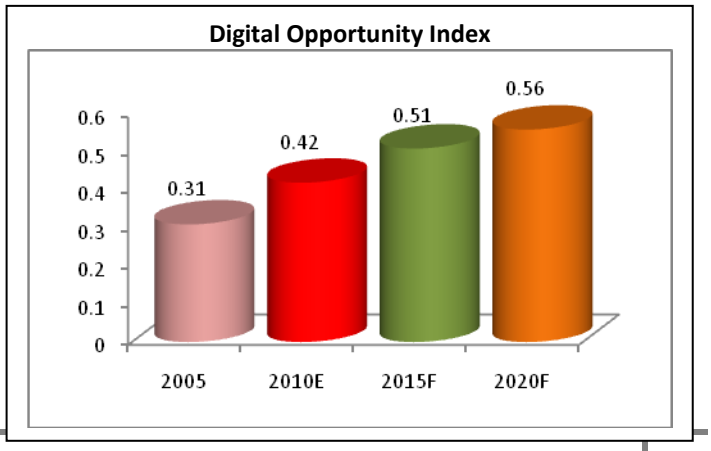
structure of the sector, whereby the trickledown effect was felt in almost every segment of the economy. An impressive stream of investment was pouring into the economy that met with a multiplier effect. The impact was felt on the GDP through increased efficiencies in both industrial and agricultural sectors. A major shift in the effectiveness of services sector was seen. This in turn improved both economic and social well being of the nation in the form of increased per capita income, literacy rate, and communications; in addition, it also improved the country's overall DOI rating.

With a passage of deregulation era, the sector attracted sizeable amount of Foreign Direct Investment (FDI). Several major telecommunication operators like Telenor, Etisalat. SingTel, Q-Tel, OmanTel, China Mobile and Abu Dhabi Group invested directly and in equity shares of local companies. This contributed substantially toward the national exchequer as a large amount of tax had been collected from the telecom sector. According to figures collected, over Rs. 100 billion has been going into national kitty from telecom sector since 2007, therefore increasing financial resources of the country for better economic performance. In addition, over US$ 5 billion entered the country in three years (from 2006 to 2008) in the form of FDI in telecom. A major impact of telecom growth was also felt on economy in the form of increased consumer surplus generated by mobile phone services. Competition driven prices of service reduced call rates encouraged value addition in the process and offered lucrative deals.

Keeping in view the telecom's role in improving economic environment of the country, a discussion on role of telecom development on essential socio economic parameters is made in ensuing paragraphs thereby emphasizing role of telecom in economy. Estimates have been made for all the parameters till 2020.

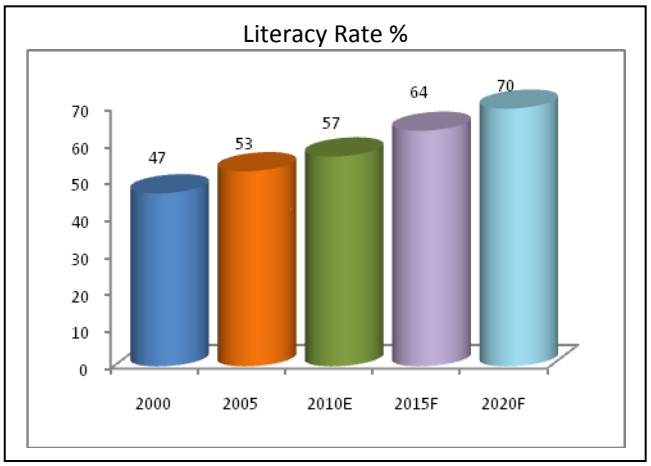
DIGITAL OPPORTUNITY INDEX

Digital Opportunity Index (DOI) is a measure of density of ICT networks across the country, the skills and information uptake and intensity of use. The index was developed by ITU, which is now taken over by a more advanced ICT Development Index (IDI) which measures the e-readiness of a country including ICT access, use and



skills. These indices are not only used for analyzing the country's own ICT position in relation to economic and social factors like per capita income and literacy rates but also tell about the country's ICT status in comparison to other countries. Similarly while calculating IDI, it is observed that how many homes are equipped with ICT fixed line, mobile broadband services and how easy it is access to these services at affordable prices. While looking at Pakistan's position for DOI it is calculated to be 0.29 (2006) and in case of IDI it is 1.46, also Pakistan according to IDI rating is ranked 127th in the world. Figure shows estimates made for DOI count of Pakistan which is improving due to growing trend of telecoms in the country, it is forecasted that the DOI count would reach 0.56 by 2020 (almost doubled).

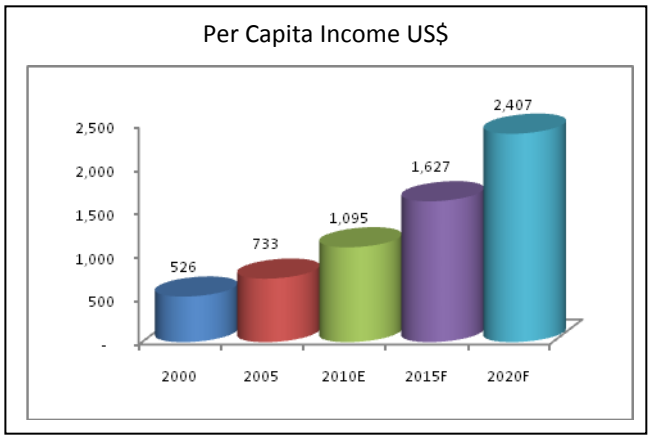
LITERACY RATE



Since the start of new millennium, Pakistan's literacy rate has been growing quite impressively with 47% (2000) and 53% (2005) growth rates. With conventional teaching methodologies, Pakistan's performance was commendable; however, the government's enhanced focus on education in terms of increased budget allocation for education sector kicked start the growing trend. With advancement in telecoms, modern technologies for improving methods of teaching were introduced in Pakistan. E-education, distance learning and cyber classrooms became buzzwords in Pakistan. This in turn not only improved the quality of education and better literacy rate but also resulted in huge cost savings for students and the government. Today the literacy rate stands at 57%, with Gross Enrollment Rate (GER) of age 5-9 crossing 91% (2010). With telecom growth more sophisticated and faster modes of communication are expected to work as catalyst for improving literacy rate. It is estimated that by 2020, it would cross 70%.

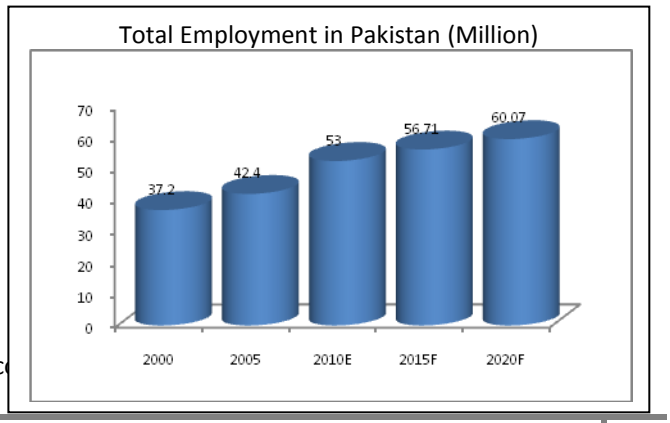
PER CAPITA INCOME

Per capita income is an authentic indicator of economic well being of a country. Since 2005, people of Pakistan experienced economic comfort in terms of enhanced per capita income which jumped from US$ 733 (2005) to US$ 1095 (2010) with an average growth rate of approximately 10% per year. Enhanced forex reserves, increased investment, better Rupee Dollar parity, lower inflation rate, improved industrial activities and bumper agriculture produce gave an outcome of increased per capita income. Telecom sector had both backward and forward linked effects on all the economic indicators and as a result chip in the economic development. Huge investments in telecom sector of Pakistan from around the world increased FDI position and foreign exchange reserves. Increased consumer surplus due to easier and cheaper way of communications for business/social/other purposes resulted in higher savings. Thus the investment and saving multiplier effect improved economic environment. It is estimated that by 2015 per capita income would reach US$ 1627 and is expected to cross US$ 2407(120% increases) by 2020, showing positive effects of telecom development on economic power of people.



EMPLOYMENT

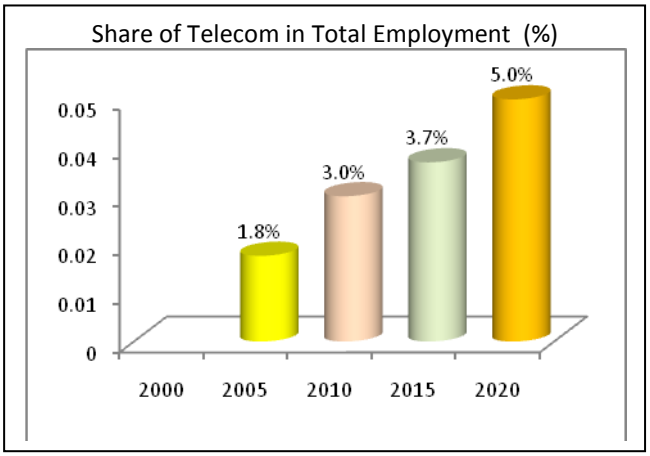
In 2005, the total employment figure for Pakistan was 42 million and telecom's share in it was negligible (1.7% only). With the introduction of liberalization in telecom, a very positive effect has been witnessed with a wave of employment opportunities generated in the sector. New opportunities were created after the introduction of new means of communication. Delloitte[1] estimated that



[1] Deloitte (2007), " SIM Activation Tax and Mobile Telec
May 2007

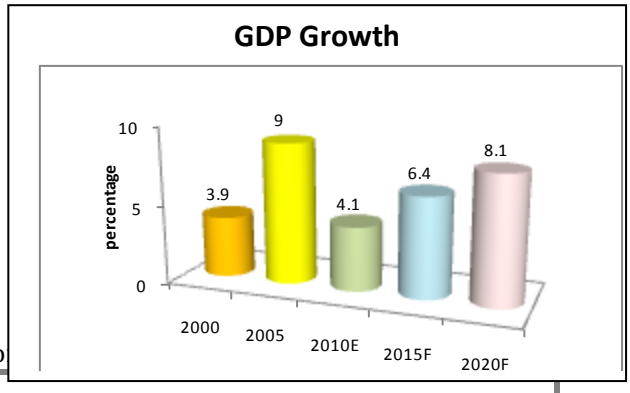
telecom sector in Pakistan created about 0.2 million direct and indirect employment opportunities all across the country. However, TEACH has estimated in its study conducted in 2008 that the telecom sector is providing employment to about 0.8 million people (direct and indirect) throughout the country. Today, the total employment of Pakistan stands at 53 million, whereby the total employment in telecom sector crosses 1.6 million which implies that telecom sector is employing more than 3% of the total employment in Pakistan. It is estimated that share of telecom in total employment of Pakistan will rise to 5% by the end of 2020 when the sector would be able to provide bread butter to more than 3 million people in Pakistan[2].

Advancements in technology and services like 3G, LTE and broadband, it is estimated that the elecom's contribution to employment would further enhance. Similarly, introduction of converged technologies and services and more business opportunities in content development for new services would result in increased share of telecom employment (direct/indirect/induced) in the total employment of the country.



GROSS DOMESTIC PRODUCT (GDP)

A study undertaken by GSMA "The economic impact of mobile services in Latin America" states that in middle income countries, such as those of Latin America, increasing mobile penetration by 10% boosts GDP growth by 0.3% per year. This is a very significant increase in the countries where overall national GDP is growing at only 1.5% per year. Keeping the study as the base line in case of Pakistan, the share of the telecom in the overall GDP and services sector contribution increased during the liberalization era and with expansion of the telecommunication sector the shared GDP rose from 1.6 percent in the year 2001-02 to 2 percent in the recent years. While looking at the overall GDP growth rate before



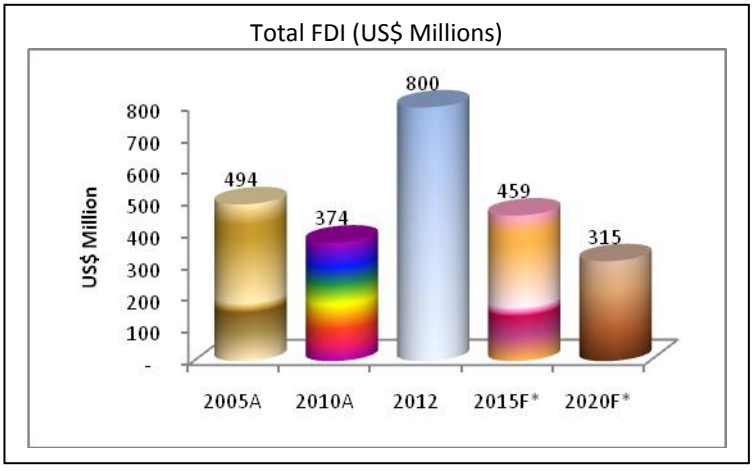
[2] Socio Economic Impact of Telecom Growth and Indicato

deregulation, the GDP growth rate was 4%(2000) which was almost doubled with 9% (2005) increased share of services sector was the main factor towards this improvement in addition better performance of industrial and agricultural sector due to better means of communication. Currently, the growth rate of GDP is over 4.1% (2010). With more realistic and consistent economic government policies, economic reforms and improved international position of Pakistan, we expect that the GDP will grow on an improved rate. While looking at the telecom scenario introduction of new technologies, 3G licensing, NGN, intensified focus on Value Added Services on enhanced speed, expansion in broadband services and introduction of converged services and technologies is expected to bring a huge influx of foreign and local investments. Increased foreign and local investment will have a multiplier effect on the economy bringing an expansion in the related services sector. The backward and forward linked industries would increase share of each in total GDP of the country. We therefore forecast that the GDP will go beyond 8% by 2020 with a significant share of ICT services.

The policy and regulatory measures adopted by the PTA have been proving helpful in rapid growth of telecommunication sector with emphasis on pro-poor, pro-gender and pro-marginalized policy. Main players in this aspect have been the mobile network operators.

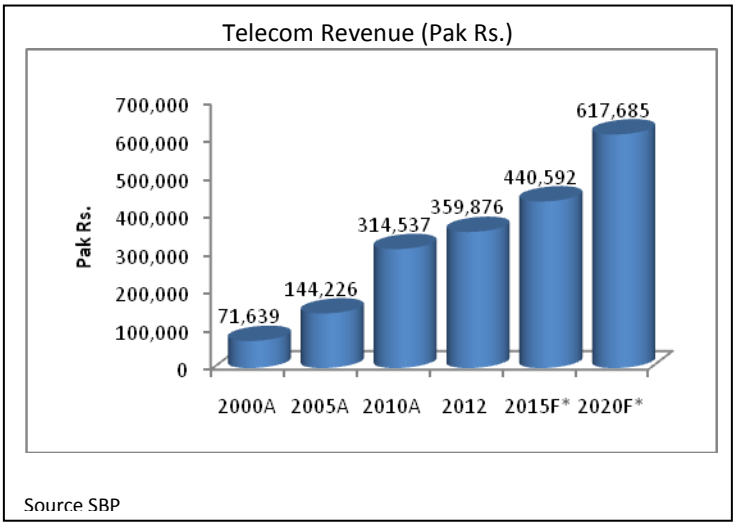
FOREIGN DIRECT INVESTMENT & TELECOM REVENUES

The economic reforms, investors' friendly policies and increasing return convinced the foreign investors to invest in Pakistan telecom sector during the last decade. The telecom sector attracted over US$ 6.3 billion FDI during last 5 years (2005-2010) which is an encouraging response by the investors to Pakistan telecom sector policies. The Pakistan telecom sector attracted an average over 25% of total FDI of the country during the same period (2005-2010) that shows the interest of foreign investors in the telecom market. However, recently the growth of FDI in telecom sector declined slightly due to saturation in the voice telecom market. However, we expect another wave of FDI in the sector after launch of 3G services by the



regulator shortly that would boost data and other value added services in Pakistan. It is estimated that the telecom sector will attract US$ 459 million FDI in 2015 which will be 315 million by 2020.

The Pakistan telecom sector has grown over the last decade both in terms of network and financial stability. Telecom sector revenue increased by nearly 84% in the last 5 years where the sector revenue increased from Rs. 144.5 billion in FY 2004-05 to Rs. 357.7 billion in FY 2009-10. The PTCL has always been one of the major contributors to the total telecom revenues. The sector's growth is getting stable and consistent, it is expected that the revenue would keep growing. The operators are now concentrating more on value added data related services so that revenue should keep growing, which is expected to be affected by decreasing voice tariffs. It is estimated that in 2015 the revenue of Pakistan telecom sector would reach Rs. 440 billion, and would cross Rs. 620 billion by 2020.



TELECOM TAXES

The Pakistan telecom sector contributes steady inflow of heavy tax collections under major heads like Activation Tax, GST/FED, the PTA fee & charges and others. The PTA has been advocating to the government to reduce the tax burden on the sector, which it considers as an impediment for its growth. Though, upon the constant plea of the regulator, the government reduced the Activation Tax from

Table –
Regional Countries Comparison of Value Added Taxes-
GST on Telecom Services (2009-2010)

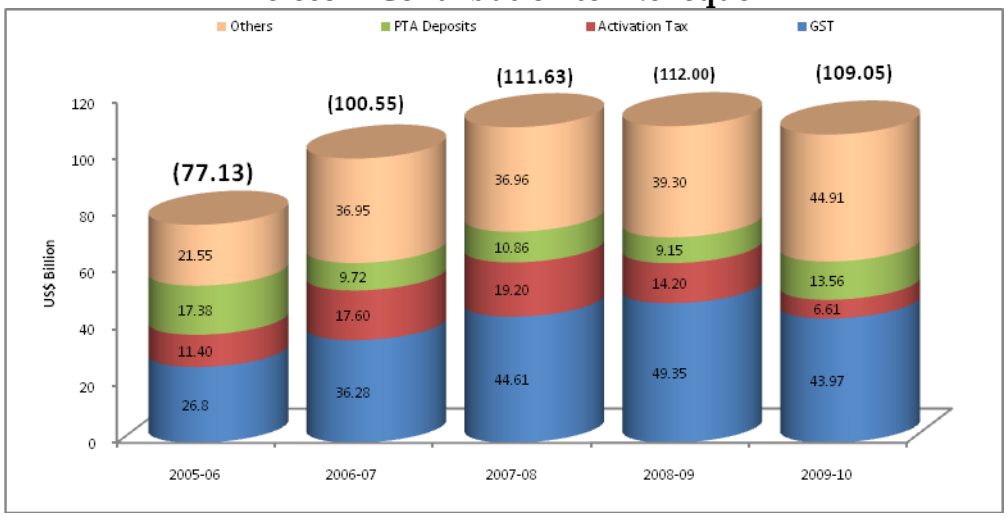
Country	GST/CED/Sales/Service Tax
Pakistan	19.5 %
India	10.3%
Sri Lanka	20%
Nepal	13% (VAT), 10% Service Tax
Philippines	12%
Bangladesh	15%

*Above data has been collected from web sources, same is under verification through authentic sources of each country

Rs. 2000 per connection to Rs. 250 per connection and also reduced Federal Excise Duty from 21% to 19.5% but still the tax rate appears to be on higher side when compared with the regional economies. A comparison of Value Added Tax on telecom sector is presented in Table---. It is evident that Pakistan has the highest Value Added Tax rate i.e. 19.5%, on the telecom sector which may impede the unprecedented growth of the sector. Despite having lowest call rates in the region, the actual price of calls that the Pakistani telecom customers are paying is higher than what it should be. The VAT rate in Pakistan for telecom sector is about 52% higher than that of India, and in case of Sri Lanka the tax rate is almost equal.

Telecom has been extensively contributing to the national exchequer since de-regulation of the sector in 2004. The telecom sector contributed over Rs. 510 billion in the national kitty in the last 5 years. At the end of 2009-2010, the sector contributed over 109 billion in the national **kitty of which GST was** over Rs. 44 billion. It is expected that telecom sector contribution in national sources would multiply after the launch of 3G services in Pakistan.

Telecom Contribution to Exchequer



Source: ***Central Board of Revenue and Pakistan Telecommunication Authority.***
Note: PTA's contributions comprise of all its receipts including Initial and Annual License Fee, Annual Spectrum Administrative Fee, USF and R&D Fund Contributions, Numbering Charges, License Application Fee, etc. Others include custom duties, WH Tax and other taxes.

VISION 2020

Economy of Pakistan, according to estimates, would grow at 6% growth rate with stitches of a strong international economic recovery. Any new initiatives in FDI are likely to affect the telecom sector and business environment of the country in a positive way. With rising

population, and consequently the demand, the potential telecom market would keep growing. With the latest technologies further investment prospects are looking up. With 3G licensing, the network coverage would increase especially in the areas left out and broadband services will reach all corners of the country. Similarly increased value added services, improved subscriber base and enhancement in voice services would result in a widened tax base. With the auction of 3G licenses in Pakistan the government estimates an influx of Rs. 60 billion funds from the telecom sector.

There are uncertain and complex relationships between investment in network infrastructure and revenue growth projections of the industry. Voluntary network expansion and infrastructure spending is dependent on a stable political environment, improved security situation, growing economy and attractive government policies. These investment risk factors may drive consolidation of business interests through mergers or business partnerships, increasing size and scale in the emerging communications sector. Based on the forecasted telecom indicators, economic conditions, security situation of the country and impact of telecom revolution on the economy, the future of the telecom markets is evolving to consolidate its roots on grounds of fair play and semi-liberalized market competition for all operators.

The role of the PTA in 2020 is expected to be not only as a limiting intermediary, reformer or a regulator of cartels but also as a facilitator of mergers and acquisitions in order to ease the fierce and intense competition and level the uneven turf of predatory pricing. Similarly, with increased demand of Broadband, WiMAX and other wireless technologies requirement for additional spectrum will arise in the future. The authority would issue additional spectrum besides reframing the existing one for allocation and pricing to accommodate growing demand of a pool of telecom investors and new entrants in 3G and 4G technology zones. The problems with this technology are the high infrastructure and acquisition costs. Capital intensive spectrum (1800 MHZ) has significant attraction in urban areas where a high traffic capacity and maximum reuse of spectrum is required. The PTA has enough spectrums to cater to current demand density due to technology-neutrality stance in assigning the same for its licensed services.

The challenge of this decade is to invoke investor confidence in acquiring technology without fear of business loss as this is only the requirement of 40% urban population. Literacy rate needs to be improved if we are targeting on building a technologically savvy populace that would welcome any advancement in the telecom industry for the reduction of digital divide within and across countries relative to Pakistan. With strong ICT infrastructure, a significant impact can be made on education sector with enhanced, more

sophisticated, modern techniques of teaching. A wide range of resources from all around that would be available to students in Pakistan both in terms of material and human resource. Significant investment can also be attracted by providing local content in local languages. This would serve a two pronged strategy: on one hand it will bring ICT access to those who are not well conversant with English and on the other, it will create new business opportunities. Introduction of mandatory indigenous production of some percentage of mobile user content could also open up new investment and employment opportunities. As a result of all the above mentioned activities it is presumed that there would be a significant impact on social and economic uplift of the country.

It can be predicted that the telecom industry over the next decade in Pakistan will undergo structural changes. New business models and technologies will emerge on the scene; the PTA has therefore already started planning for this future. Internal deliberations on MVNO, IPV6, 3G and 4G technologies are all part of our effort to continue facilitating the telecom industry in the next decade so that it can play its part in the economic development of the country and remains a major contributor to FDI, employment, and public exchequer. The PTA would also continue lobbying the government to ensure an attractive return on investment and sustainable growth opportunities for the telecom investors. We therefore are moving into an era of E-economy with highly advanced industrial sector, modern agriculture sector and resilient financial sector.

Chapter 5

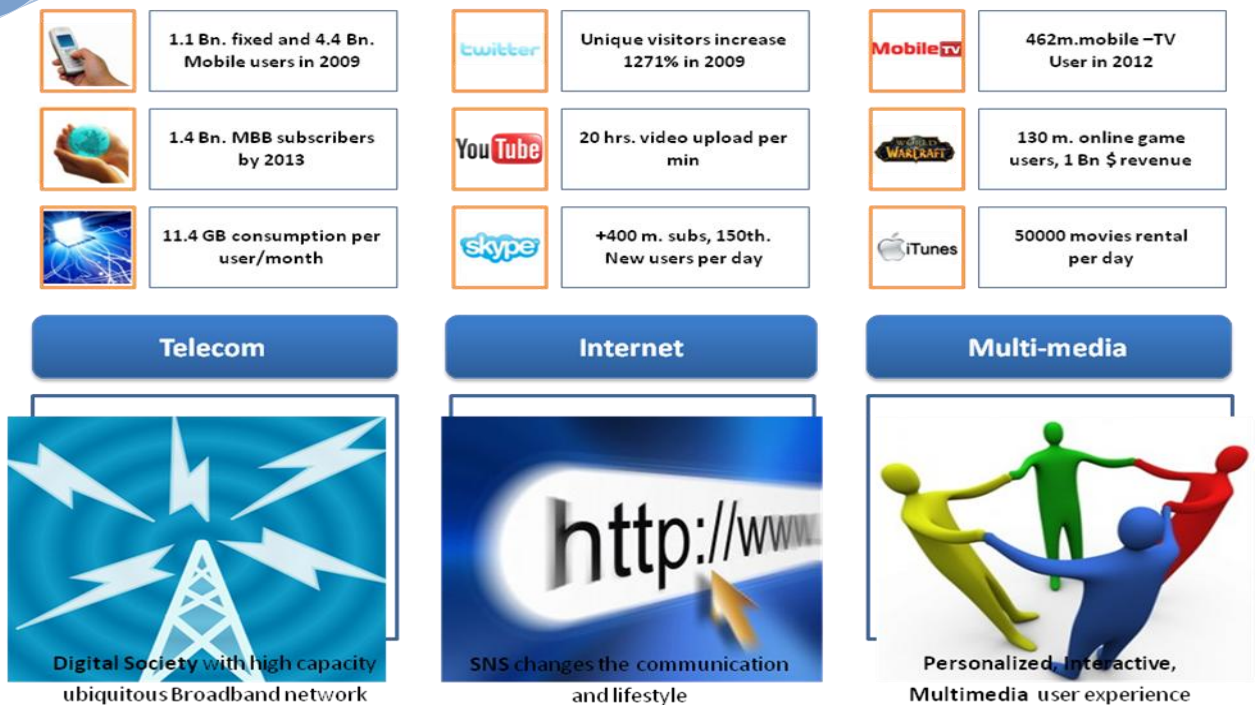
Convergence

Regulatory regimes which discriminate among service providers on account of services are a big bottleneck in way of convergence.

This chapter explores the trends in convergence and the associated regulatory reforms required for the Next Generation of Regulatory reforms required in Pakistan to give a Telecom Sector boom. *The PTA developed the CVAS regime and on recommendations from Government of Pakistan, it was finally introduced as Class Value Added Data & Voice Licensing. This was a major step towards convergence of value added licenses shrinking several separate categories into just two - operator friendly & simplified.*

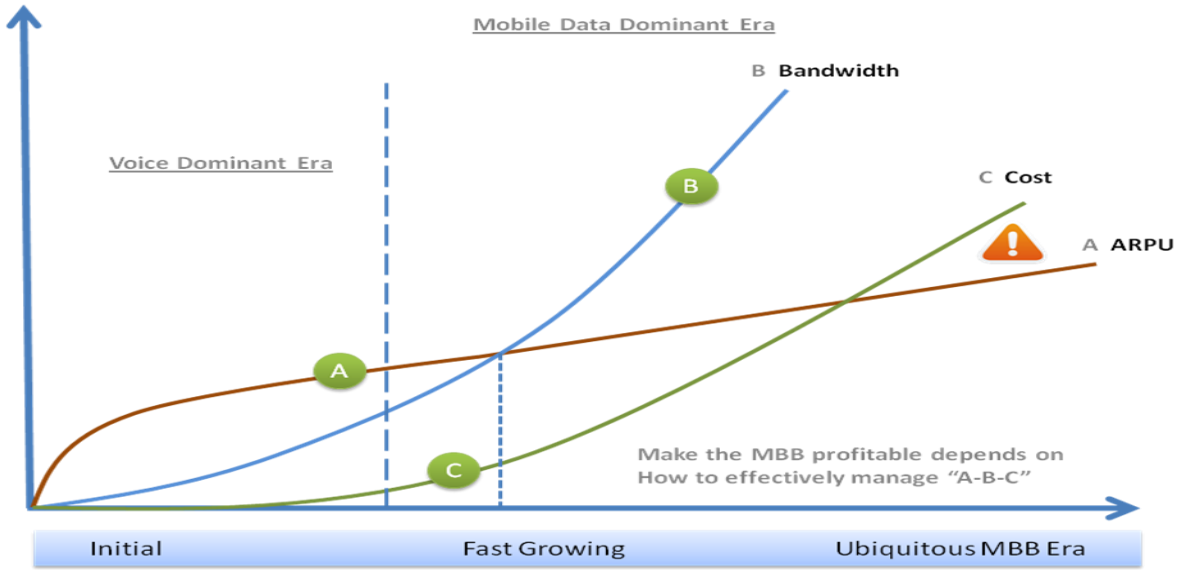
Background

Today the world is experiencing Convergence of Regulations, Technology and Services. Convergence in Technology has already started without any formal introduction due to advantages that are brought to the table because of the economies of scale, bundled services, better infrastructure planning, and a one stop-shop scenario whereby it becomes easy for the investor, the regulator and the public at large to benefit. Vertical platforms offering segregated services, see below are now being offered on single integrated platforms.



With news services available on the WEB, people joining in thousands per day (2009), internet expanding to social networking, personalized interactive multimedia movies rentals, IPTV and as the list goes on, the scenario has contributed to increase broadband demand and core bandwidth is a witness of all this. Telcos are experiencing their networks already incapable of handling the traffic and moving from flat changing mechanisms to capacity based charging over a certain flat rate offering.

As shown below, voice capacity is almost a plateau, data requirements escalating, cost competitiveness bringing the ARPUs down.



One such compelling force behind convergence of Telecom, IT and Broadcasting is the "Internet Multimedia" (IM) platform and "New Generation Network" architectures leading the way through the disruptive Internet Protocol (IP), which has been relentlessly driving convergence. The government of Pakistan will have to move fast to steer the environment in its favor and THINK CONVERGENCE.

Converged Applications

Some of the killer applications and services forcing the administrations and regulators around the globe to form one regulator for regulating IT, Telecom and Broadcast are:

Satellite communication is being used interchangeably for IT, Telecom (voice / data) and broadcast. DTH, Reverse Channel Satellite Communication and S2M (Satellite to Mobile phones for broadcast) are just one example of how satellite bands can be used across several services & applications.

IPTV is now no more a broadcast service through the propagation of radio waves. It travels on fixed and mobile infrastructure and dumps favorite TV programs on a PC monitor without any involvement of a broadcast radio frequency spectrum.

MMS band which was originally considered an innovative means of broadcasting a TV channel from a TV broadcast antenna and received clear TV channel could not take-off worldwide, however the same spectrum is considered to be a future growth engine for Broadband.

3G and 4G services, through their assigned spectrum provide wavering downstream videos.
With the advent of 4G/LTE technologies, New Generation Networks, Internet Multimedia Service (IMS) platforms and Internet Protocol applications, the boundaries between transmission of Data, Voice and Image have vanished by virtue of IP Data, VoIP and IPTV.

Only one platform is needed to offer all services through a single pipe to subscribers through one Window.

Global Trend & Convergent Regulators
In recent days the acceptance of Convergence, for Technologies Services and Regulations, has taken momentum more than ever, for reason described throughout this chapter. However, we know that in several countries things had been regulated under one umbrella long before this debate started.

ITU, International Telecommunication Union which is the world body responsible for standardization on telecommunication the world over, comprising of administrations and regulators, is involved in tackling issues related to IT, Telecommunication and Broadcasting.

ITU-T Recommendation Q. 1761, 3.1 defines convergence as the coordinated evolution of formerly discrete networks towards uniformity in support of services and applications.

FCC (Federal Communication Commission, USA) has always been the focal regulator for Telecommunications, Broadcasting and Internet Telecommunication activities.

With the turn of the 21st century the world has seen a major transformation in ICT & Broadcast Regulators.

The European Union directive states that the European Parliament and Council[1] recognize the need to separate the regulation of transmission from the regulation of content.

The United Kingdom transformed its segregated controlling bodies into one single entity OFCOM (after amalgamation of its four separate entities).

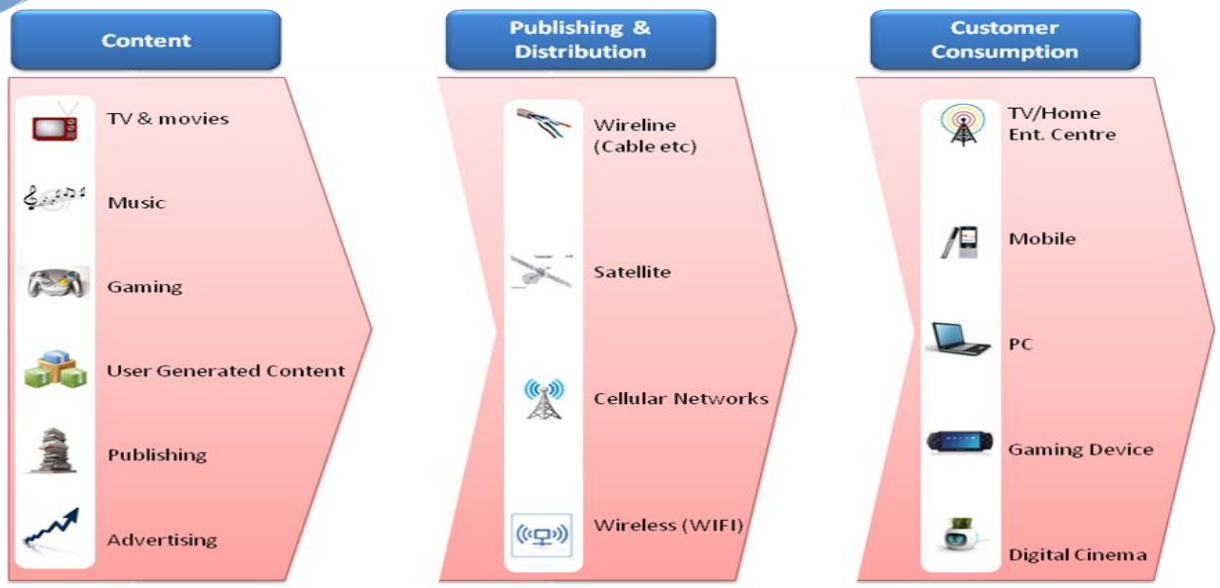
Australian Communication Commission (ACC), Malaysian Communication and Multimedia Commission (MCMC), Sri Lankan Commission and dozens of converged commissions around the world are more examples of converged regulatory commissions.

India also has a pending legislation on Convergence since 2006[2] but IT and Cable industry are regulated by the Telecom Regulator. There are an increasing numbers of convergent regulators e.g. CRTC (Canada), Austria, Portugal, Bosnia, Herzegovina and South Africa, etc. Some Converged regimes of varying World Economies is shown below:

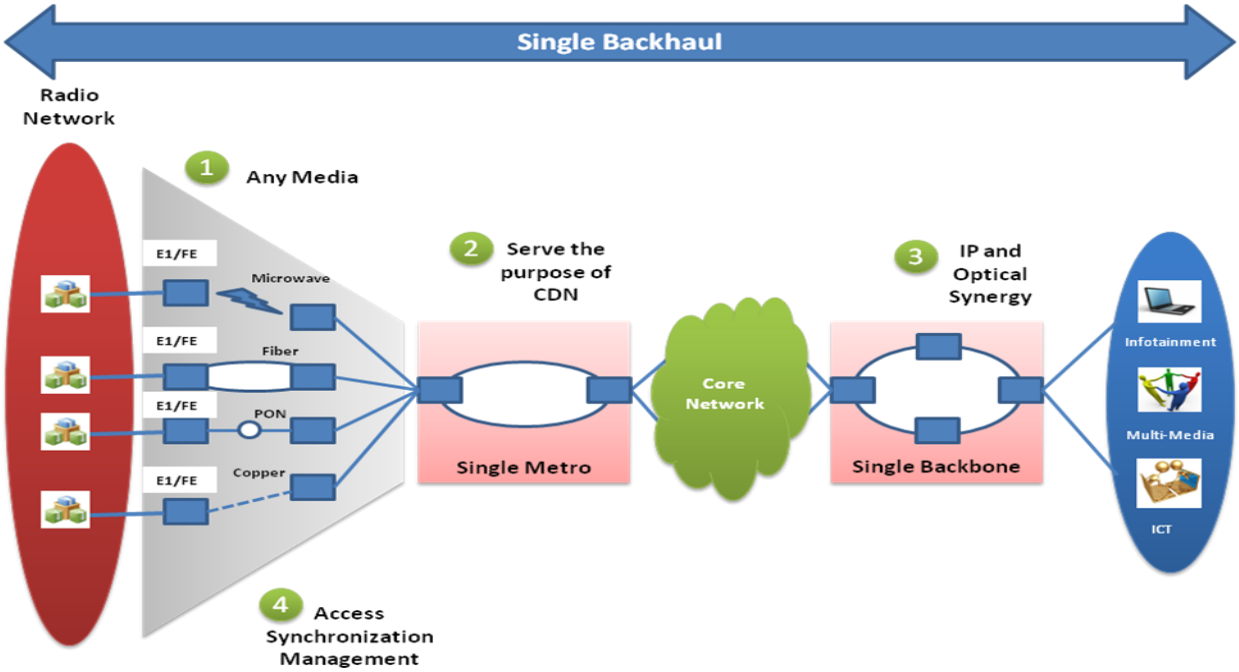
World Converged Regimes

- FCC USA: Federal Communication Commission
- CRTC Canada: Radio Television ,Telecom Commission
- OFCOM UK: Telecom, Radio, TV, IT &Spectrum
- MCMC Malaysia: Malaysian Communication and Multimedia Commission
- ACMA Australia: Australian Communication and Media Authority
- ICASA South Africa: Postal Broadcasting, Telecomm
- NTC Philippines: Broadcast, Spectrum, ICT Commission
- NTC Thailand: Broadcast, Telecom Services & Business
- TRCSL Sri Lanka: ICT Commission
- TRAI India: Cable TV, IT & Telecommunication
- RTR Austria: Telecom & Broadcasting
- CRA Bosnia Herzegovina : Spectrum, Broadcasting, Telecom
- Portugal, etc

The regulators around the world are working on regulatory reforms to take care of convergence in telecommunications and broadcasting markets. They want to support provision of converged services with the objective of promoting the innovation, the reduction of prices and an increase of efficiency in the provision of services, as a result of the continuing rapid development of wireless and mobile radio communications, and their convergence with both fixed telephony and broadcasting services.



The emergence of key technologies are setting up new paradigms and desiring new ways to establish regulatory regimes thereby promoting the building of the information society for efficient cities of tomorrow. A modern network is incomplete without its efficient utilization of terrestrial or satellite radio waves, fiber in the ground or ocean, modern smart phones or consumer centric terminal equipment, all content that one can possibly think of consisting of voice - data or video. All this is not possible unless we offer them under one roof using all possible Access technologies as below:



The converged ICT readiness of a country today will determine its future ability to provide state-of-the-art ICT services at affordable process as well as to counter and deter national catastrophes, natural or man-made calamities through the effective use of ICTs by means of smart & integrated early warning management systems with closely monitored and controlled planning, mitigation, and relief strategies. Although it may not appear on the surface as important but non-readiness of the government under such calamities have shown that the nation is subjected to colossal damages.

Smart Grid

Flood Prevention

Transport

PAKISTAN SCENARIO

Pakistan telecom sector has been deregulated under the legislative framework of Telecom Act 1996 and the policies by GoP, i.e Deregulation Policy 2004 and Cellular Mobile Policy 2005. Both the policies have described the service specific license to be issued by the PTA. The Ministry of IT and Telecom has been declared as the facilitator for grooming IT in Pakistan.

Although, spectrum and more specifically broadcast has taken a new twist worldwide moving towards the digital dividend strategy, efficient utilization of Spectrum, rationalized charging methodology and explosion of application through free use of 'Short Range Devices' but Pakistan needs to play it role.

While 2.3 / 2.5 Ghz is being considered globally a vital transport mechanism for broadband proliferation to steer countries into an effective governance through E_Government, offer Tele-Medicine and E_Education across all spheres of life, boost the country's economy through E_Commerce, facilitate integrated delivery of services - we in Pakistan are yet to decide on the usefulness of the unutilized MMDS spectrum and handle the issued spectrum intelligently.

Under the Telecom Act 1996 licensing all wired and wireless telecom services is the PTA's domain. It is the PTA that was made responsible for processing all spectrum applications, suggesting the spectrum fee, license fee and annual license fees etc. However, practices in vogue are vague and need streamlining which would happen automatically provided we enforce complete convergence through legislative reforms. The prevailing situation is an impediment to a smooth flow of investment in telecom and broadcasting sectors, which otherwise have great potential.

A snap-shot of some ICT & Broadcast operations, licensing, and facilitation is shown at Table-A for ready reference which depicts the sheer spread of regulatory institutions, a flight away from 'One Window Operation'.

Table-A

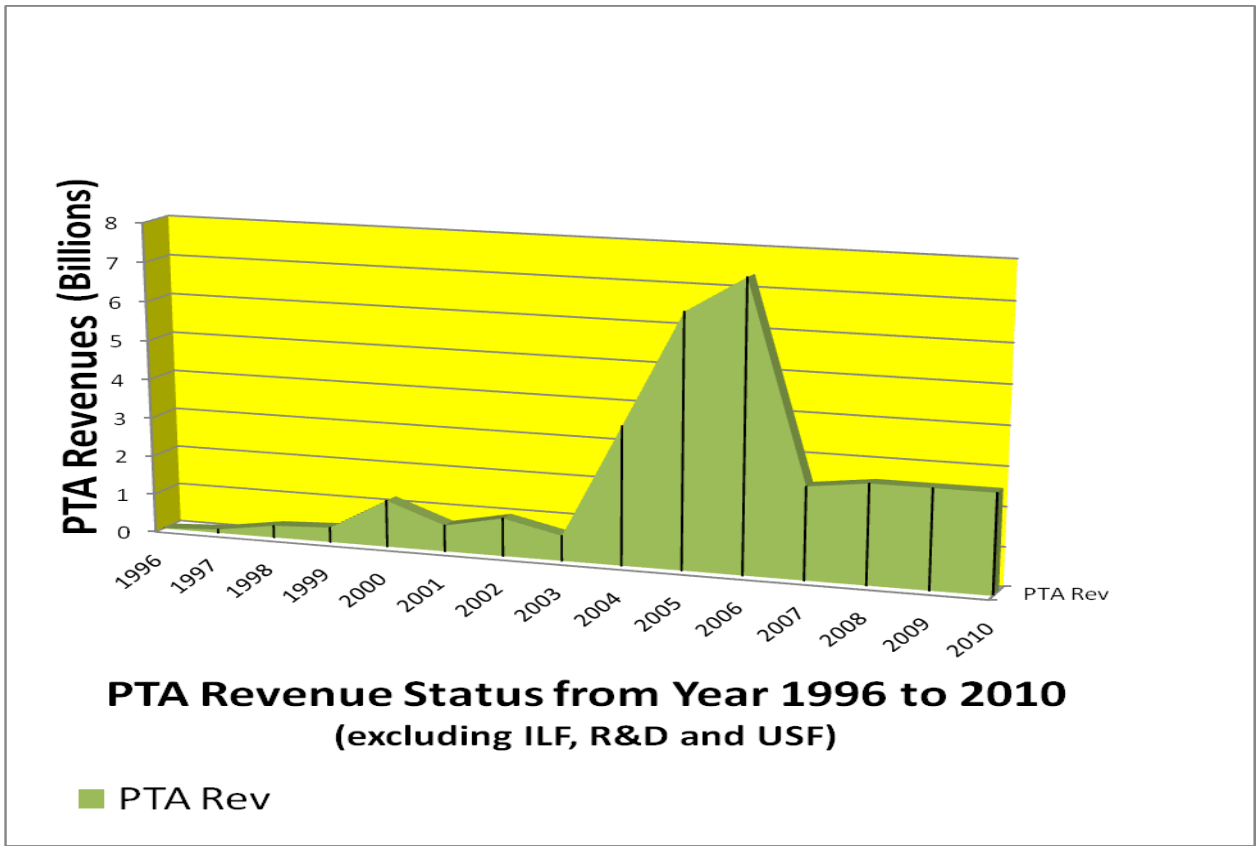
The Existing Regulatory Regime of Pakistan.

Serial #	Name of Licensee	Services	Licensor	Facilitator
1	**PTCL**	**Voice**	**PTA**	
		ISP	**PTA**	MoIT
2	**Nayatel/Micronet**	**IPTV**	**PEMRA**	
		Local Loop	**PTA**	
		ISP/ DSL	**PTA**	MoIT
		IPTV	**PEMRA**	
3	**WorldCall**	**LDI**	**PTA**	
		Local loop	**PTA**	
		ISP	**PTA**	MoIT
		Cable TV	**PEMRA**	
4	**Telenor**	**Cellular**	**PTA**	
		IPTV	**PEMRA**	
5	**Mobilink**	**Cellular**	**PTA**	
		IPTV	**PEMRA**	
6	**Cellular TV**	**TV Data**	**PTA/PEMRA**	
7	**Cable Operator &**	**TV**	**PEMRA**	
8	**FM Radio**	**FM private**	**PEMRA**	
9	**PTV**	**National**	**MoI&B**	
10	PBC	National Radio	MoI&B	

FINANCIAL IMPACT OF CONVERGENCE

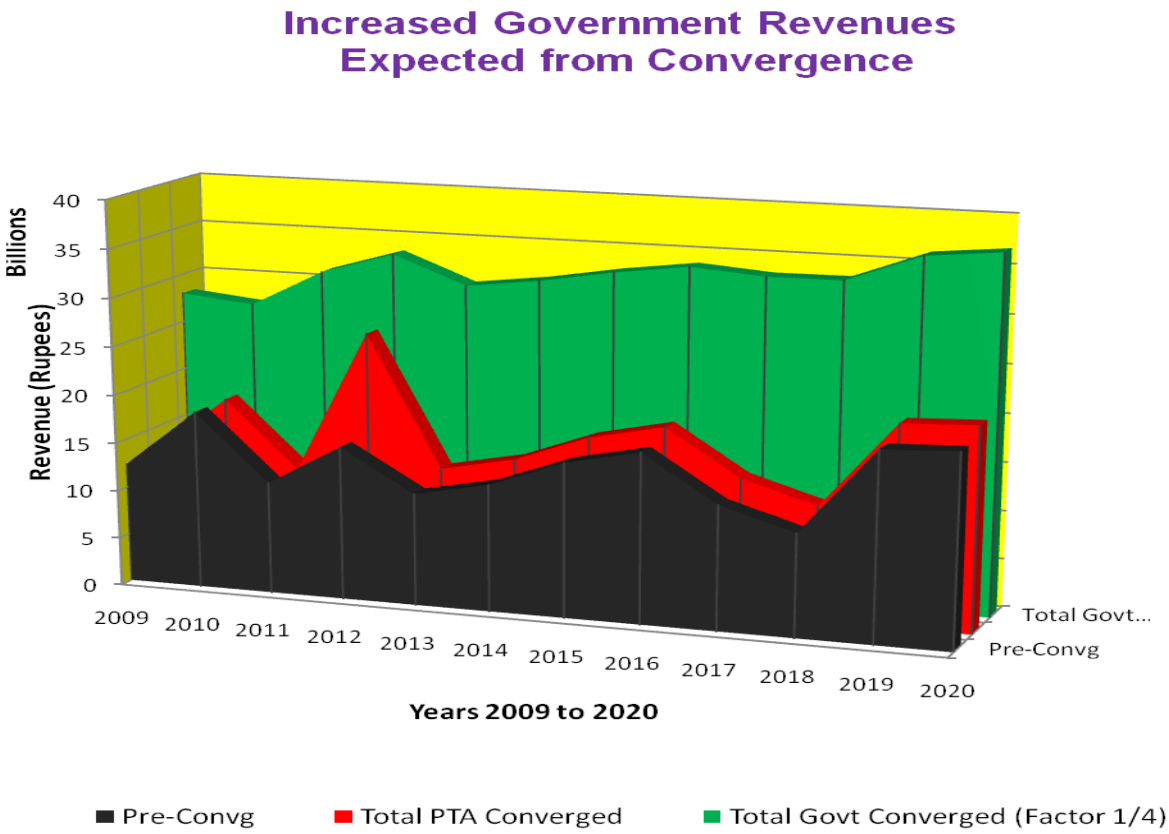
The PTA conducted an extensive study in Y2008 on the possible impact of 3G/ 4G spectrum auction, convergence through an ACT of legislature leading to more organized spectrum utilization through Digital Dividend, Optimum utilization and rationalized charging mechanism.

The table below shows the total actual revenues collected by the PTA from 1996 up to 2010. The hump from 2004 up to 2008 is because of the Cellular and WLL spectrum auction money received. It decays in after 2007.



During the study, the PTA also analyzed what additional revenues convergence would may bring about, depending how legislative frame work is set. The table below is an estimated conservative graph of what the comparison look would like from the time Convergence with accompanied legislative framework takes shape. It shows Revenues of the PTA without convergence, the PTA Revenues with convergence and also how government treasury will benefit. It is assumed that Y2012 could be the time when such changes will take place. Big hump will be seen in 2012 because of the spectrum auctioning. Thereafter,

the graph will come back to a better than previous value and grow steadily. It ends in 2020 with the last 2 years of the existing 2G cellular licenses filled through estimation.



THE VISION 2020

In summary, it is imperative that all electronic communication infrastructure and services licensing be channeled through one window with the mandate "make life easier through ICTs". The potential benefits of Convergence to the ordinary citizen, consumer, and businesses and eventually to the government are significant. As a single platform is capable of offering a multitude of services, which are being regulated by different entities or none, it creates confusion, service quality cannot be maintained for the consumer, segregation of services based on the different regulatory environments become difficult and ends up costly to the consumer**.** Without saying the government very often is unable to get its dividend of the share as multi-regulatory situation becomes a safe haven to tax evaders. Businesses for legitimate and high ethic institutions become difficult.

For instance a telecom operator (PTA Licensee) lends its bandwidth to a Cable TV Operator (PEMRA) that in turns resells it to an ISP (sometimes without a license) or to a Call Center (without a license, simply being facilitated by the PSEB who may not know Call Center whereabouts in 18 months) or to Grey Trafficker or to an illegal ISM Band operator. The multiple possibilities make it impossible to control Quality of Services offered or to conduct a technical or financial audit. Many more examples can be given. Again for instance, a cellular or WLL operator decides to provide IPTV. IPTV in principle is not the same type of broadcast service which one could assume relayed through broadcasting TV antennas. It is more of a live video down-streaming (like YouTube or one of its type). However, if the PEMRA one fine day decides to stand licensing IPTV or Mobile TV (with GoP approvals) then there can be none to ensure quality of service. If Mobile Operator decides to bundle the tariff into a flat rate then who collects the money? If nobody then the government is a looser. Although the PEMRA decided to license IPTV and warn the operators to obtain an IPTV license but hardly very many could benefit. On the other hand, every house is down-streaming TV through their DSL but the PEMRA could neither lay down any regulation nor they seem to be interested. Cable TV to-date has been unable to offer HDTV in Pakistan as the regulation doesn't exist. The PTA has a history of producing Regulations and QoS KPIs be it: Cellular 2G Voice, Texting, GPRS/Edge; or WLL Voice & Data; or Broadband QoS KPIs; or ISP KPIs.

Similarly, we see Pakistan lagging in content development. Those who were responsible have not done enough. The theory of multiple regulators working efficiently has miserably failed.

In the foregoing, we discussed the advantages of converged services through converged regulations for benefit to the consumer. This leads to the argument that convergence of regulators too is important. A convergent regulators model is presented below in which setting of a converged, independent and legislatively powerful Commission is suggested with adequate representation from the civil society. Following is a pictorial presentation of a converged regulatory commission made up of the private and public sector.

Converged Regulatory Regime

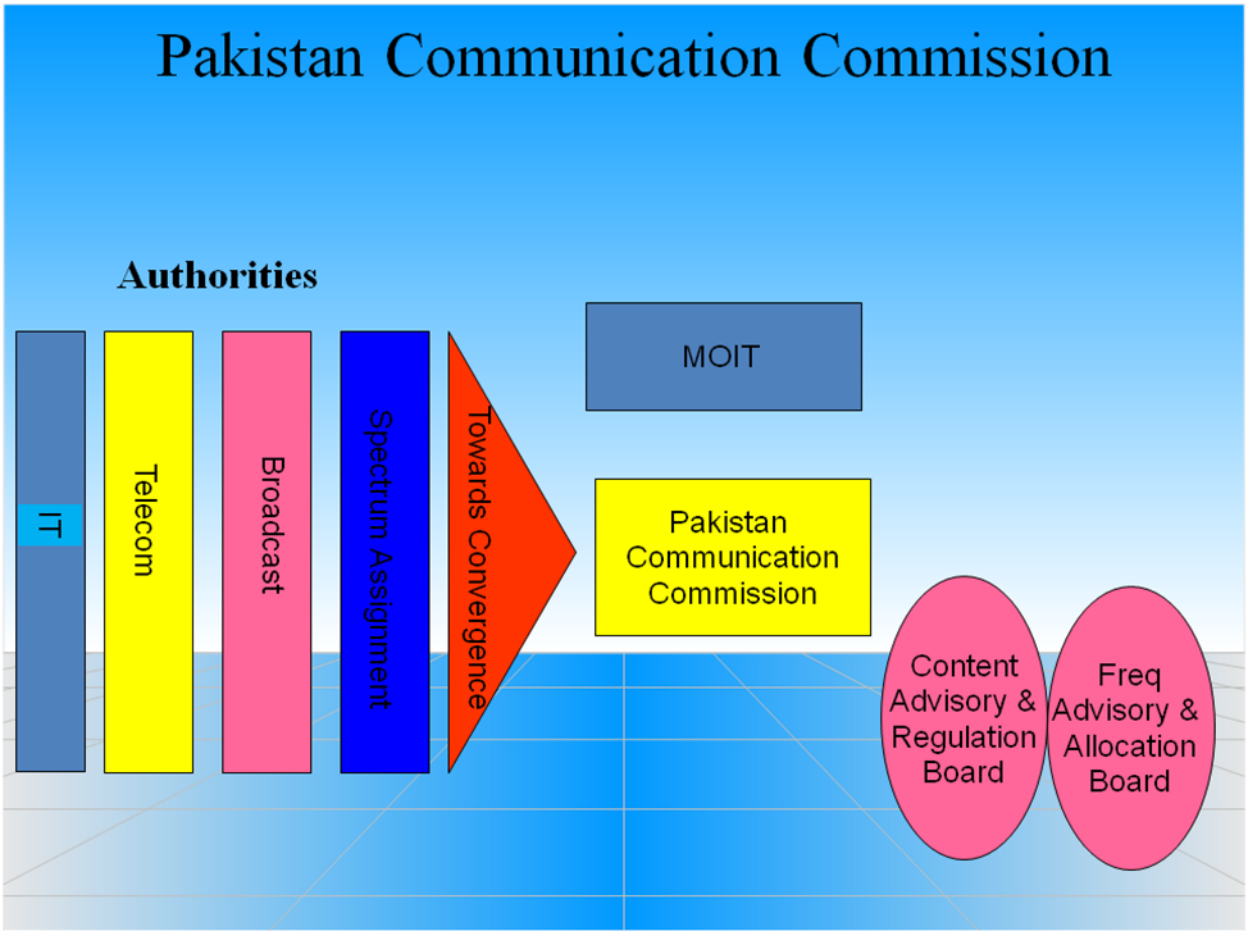


Figure 1, Convergence Vision

Conclusion & Recommendations

CONCLUSION

Based on the criteria and postulates enumerated in Chapter 1 of this Vision 2020 and the forecasted estimates we can easily conclude that if this government and subsequent governments continue following those visionary steps then 2020 will make Pakistan a forefront country in ICT usage and will have a strong mechanism in place on which other sectors of the economy could count-on thereby boosting the country's position manifold from where it started i.e. process of deregulation and reforms in telecom in 2004.

Telecoms in 2020 will be competitive with fewer giant service providers, a multitude of content providers, a strong CONVERGED regulator, with greater span of its regulatory jurisdiction spreading over to INTERNET, SPECTRUM Assignment & Allocation, BROADCASTING, INTERNATIONAL communication, and COMPUTERS. PAKISTAN would have started mass scale manufacturing of telecom equipment with significant exports.

It is anticipated that well ahead of 2020, may be 2015, fixed-mobile Convergence would be in place, local-loop unbundling well taken care-off and address portability (number + e-num) applied across all technologies be it telecom or IT. During the same decade international roaming will see increased competition with some networks offering 'one network, one world, one rate'. Pakistan, in 2020, would be a HUB of ICTs with several SUBMARINE and TERRESTRIAL communication links passing through it like the trade passed through its territory in distant past. It is in the interest of the internal as well as external forces to ensure that Pakistan does attain the status as mentioned above as a strong ICT and its affiliate environment will help peace and prosperity for all.

In order to achieve high goals set in the preceding chapters, Pakistan will have to ensure a GDP growth rate of 10, a ninety percent literacy rate for age above 15 and below 65 , GDP

per Capita income of USD ,2,500 and possibly unemployment to be less than 20% for its inhabitants over the age of 18 and below 65. Pakistan will most likely have a retirement age increased to a minimum of 65 through continuation of emphasis on pro-poor, pro-gender and pro-marginalized policy. The ICT revenues have a possibility to hit one trillion rupees by 2020. It is estimated that 10-20 percent of this would be contributed to the government sector. Pakistan has a potential to have fixed line subscriber base close to 10 million, provided proper policies are in place.

The year 2020 will experience Pakistan as a country with 100% NGN infrastructure, a Pakistani INTERNET backbone and unwavering local and international content utilization. The divisions between voice & data, circuit switch or packet or cellular and fixed line, telecom or broadcasting would be a story of the past, and operators will be providing a host of services on a converged infrastructure platform. There will be several options for international connectivity with stringer regulations. International bandwidth requirements could cross a terabit/s of information flow. Country will see many mergers and acquisitions leading to new owners most of them globally operational. The country will experience benefits of ICT in sectors like Health, Agriculture, Commerce, Education, Public Safety, Government Services & Efficiencies and Economics.

It is clear that if the government continues on its visionary track of implementing positive policies, it is imperative that all electronic communication infrastructure and services licensing will be channeled through one window with the mandate “make life easier through ICTs”. This will deliver potential benefits of Convergence to the ordinary citizen, consumer, and businesses and eventually to the government in a significant way. It is expected that sometime in 2011 or 2012 timeframe; the government will merge the distinctive regulatory authorities and form a convergent commission merging IT, Telecom, Broadcast, Spectrum Assignment and related ancillary companies under “Pakistan Communication Commission”.

RECOMMENDATIONS

- Introduction of a Converged Framework through Legislative changes for Broadcasting, IT Regulations, Efficient Spectrum management.
- Introduction of Number and e-Num Portability across all services, along with unbundling of fixed network.
- Introducing a new set of meaningful licensee obligations to eliminate digital divide and increased penetration.
- Allow mergers and acquisition in a systematic manner without losing an optimum competitive environment.
- A clear policy is desired to remove anomalies with overlapping service provisioning.
- A clear roadmap and definition for infrastructure providers.
- Unbundling all Access Providers wired or wireless.
- Regulated trading of Infrastructure & Spectrum, for efficient use.
- Presence of Cyber security infrastructure.
- A well planned framework is needed for content development. GoP policy for unethical content.
- Establishment of Telecom Appellate Tribunal.
- Abolishing APC regime.
- Addressing Digital Dividend through a 2x30 MHz arrangement for making 700 MHz band fully available for the 4G operations in Pakistan.
- An earnest effort is required to free up all important spectrum which is not required for National security.
- Establishment of a telecom centers at reputable institutes to be funded by National ICT R&D Fund Company Ltd to offer short training courses on various aspects of Telecommunication equipment installation and commencement. Telecommunication technicians required to be certified from the Institute according to PTA regulations for ensuring and promoting skilled human resource development as well as quality installations at customer premises, in Telecommunication sector.
- Adoption of a general policy for those who have acquired spectrum and holding-on without efficient to vacate for use by other efficient users on a competitive basis.