Chapter 15

Information Technology and Telecommunication

Pakistan is making significant strides in the digital realm, particularly in technology. The nation is embracing innovations and connectivity through various initiatives to propel itself into a new era of digital prominence. Investments in infrastructure and developing a conducive ecosystem for innovation and growth are laying the groundwork for Pakistan to emerge as a formidable global digital player. The country's digital landscape is experiencing a profound transformation, opening new opportunities for growth, development, and prosperity. Technological advancements and increased internet usage create new avenues for business expansion, employment opportunities, and economic improvement. Key trends and developments include rapid technological advancements such as artificial intelligence (AI), cloud computing, Internet of Things (IoT), and 5G networks. There is also a growing reliance on digital infrastructure for remote work, e-commerce, and online services. The Government of Pakistan (GoP) is actively pursuing the Vision of Digital Pakistan, leading to the implementation of various cross-sectoral digital transformation initiatives. These initiatives include the Computer Emergency Response Teams (CERTs Rules), Artificial Intelligence Policy, National Freelancing Facilitation Policy, Personal Data Protection Bill, and Digital Pakistan Policy.

The Information Technology (IT) Industry Joint Working Group (JWG) under CPEC is dedicated to enhancing and developing China and Pakistan's information and communication technology infrastructure. It aims to establish a China-Pakistan Digital Corridor, bolster investment cooperation in the digital economy, and support developing and implementing new digital technologies and applications. The successful completion of the 820 km optical fiber project, costing US $ 44 million, will contribute to improving Pakistan's telecom and ICT industry, boosting tourism, and creating trading opportunities in the country's northern areas. Additionally, it will provide ICT infrastructure for 3G/4G services in the northern areas and enhance communication security with an alternative fiber route. The agreed areas of cooperation under the IT Industry JWG include ICT infrastructure development, ICT application innovation, cybersecurity, policy and regulation, radio spectrum regulation, and human resource development.

Information Technology Sector

The 2023 Global Services Location Index by Kearney ranks Pakistan as the world's most financially attractive IT outsourcing destination. Additionally, the International Labour Organization (ILO) has identified Pakistan as the second most significant supplier of digital labor in software development and technology services. The third most significant digital labor supplier includes clerical and data entry services, creative and multimedia services, professional services, sales and marketing support services, software development and technology services, and writing and translation services.

In addition, there are 45 e-Rozgaar centers located in 36 districts across Pakistan. This new initiative aims to empower youth through digital skills training and employment opportunities. These centers act as hubs where individuals can

receive training in various digital fields, such as freelancing, digital marketing, content writing, and graphic design. The goal is to establish 10,000 E-Rozgar centers in Pakistan, providing affordable workspaces for freelancers and start-ups, ultimately benefiting one (01) million freelancers. The government of Pakistan will also support the establishment of e-Rozgar centers by providing interest-free loans of up to Rs 10 million.

The IT industry in Pakistan currently generates an annual export of around US$ 2.6 billion. However, to achieve the ambitious target of yearly exports of US$ 15 billion in the next five years, adding at least 200,000 proficient and specialized IT professionals is necessary. Pakistan's ICT industry caters to the world's largest entities among its regular clients. Several international companies, including Global enterprises like Bentley®, Ciklum®, IBM®, Mentor Graphics®, S&P Global®, Symantec®, Teradata®, and VMware® have established global consulting services centers, research & development facilities, and Business Process Outsourcing (BPO) support services centers in Pakistan thus generating high paying job opportunities for the talented youth, contributing to the development of the soft image of Pakistan, and attracting FDI. Major tech hubs in Pakistan's IT & IT enabled services (ITeS) industry are Karachi, Lahore, and Islamabad/Rawalpindi. Pakistan's ICT industry has 600,000+ English-speaking IT & BPO professionals with expertise in current and emerging IT products and technologies.

Pakistan Startup Fund (PSF): PSF is a government-backed initiative to support and promote the growth of startups in Pakistan by encouraging investments in Pakistan through top-notch global and local venture capital (VC) funds. VC firms often face high risks in nascent startup ecosystems. The Government of Pakistan (GoP) has recognized the necessity of intervention to address these challenges and foster a robust startup culture. It has launched a programme aimed at mitigating the risks faced by VCs through the Pakistan Startup Fund.

The fund will offer 10 percent—30 percent of the total investment made by a VC in a particular funding round as equity-free capital or a grant as the last cheque. The GoP's contribution of Rs 2 billion is poised to catalyze Rs 50 billion in the Pakistani startup ecosystem.

Pakistan Software Export Board (PSEB): The development of Pakistan's ICT sector can be gauged from the fact that 20,000+ IT&ITeS companies are registered with the Securities and Exchange Commission of Pakistan (SECP) comprising domestic and export-oriented enterprises. ICT export remittances have surged from US$ 339 million (17.44 percent) to US$ 2.283 billion during FY2024(July-March) compared to US$ 1.944 billion during the same period last year. In March 2024, ICT services export remittances surged to US$ 306 million, an increase of 36 percent compared to US$ 225 million in March 2023. Compared to the previous month of February 2024, ICT services export remittances increased by US$ 49 million (19.1 percent growth) in March 2024.

The trade surplus of US$ 1.996 billion, the highest in all Services (87.43 percent of total ICT export remittances), has been realized by the IT &ITeS Industry during FY2024 (July-March), an increase of 15.84 percent as compared to a trade surplus of US$ 1.723 billion during the same period last year. At the same time, the Services sector has recorded a trade deficit of US$ 1.655 billion during FY2024 (July-March). ICT sector exports of US$ 2.283 billion are the highest among all services (39.31 percent of total export of services), with 'Other Business Services' trailing at US$ 1.205 billion fromFY2024 (July to March). Pakistan-based freelancers contributed foreign exchange earnings to Pakistan's economy through remittances of US$ 350.15m million during FY2024 (July-March).

Pakistan's ICT industry exports to 170 countries and territories. The top 15 export destinations for Pakistan's ICT industry are the USA, UK, UAE, Ireland, Singapore, Canada, China, Saudi Arabia, Germany, Norway, Sweden, Australia, Switzerland, Japan, and Malaysia.

Activities undertaken to Enhance ICT Industry Exports during FY2024 (July-April):

i. Marketing

During the period spanning from July to April FY2024, PSEB subsidized the participation of IT companies in 12 international events and one local event, benefiting over 200 companies. Additionally, six domestic events were organized to promote the local IT industry, including the IT/ITeS Awards Ceremony. At this ceremony, the top 550 IT exporters who demonstrated positive growth in exports during Q2 of FY2024, compared to Q1, were awarded cash rewards.

ii. Infrastructure Development

PSEB is managing 43 Software Technology Parks (STPs) in Karachi, Lahore, Islamabad, Rawalpindi, Faisalabad, Sialkot, Gujranwala, Gujrat, Multan, Bahawalpur, Rahim Yar Khan, Abbottabad, Swat, Mansehra, Peshawar, Quetta, Nawabshah, Khuzdar, Jamshoro, and Gilgit. These STPs have around 02 million sqft of office space, and more than 19,000 ICT professionals work in them. All these STPs are running as profit centers.

In addition to STPs, PSEB is establishing an IT Park in Karachi with financial assistance from the Korean Exim Bank. PSEB has started another infrastructure development initiative to support freelancers by developing the e-Rozgaar program across Pakistan. A pilot project has been initiated during FY2024 to establish 250 e-Rozgaar centers across Pakistan. PSEB launched another initiative to develop ICT infrastructure in public sector educational institutions/universities to boost industry-academia linkages and promote the startup ecosystem. Under this initiative, PSEB launched its first-ever women's software technology park at the Women's University of Bagh AJK during FY2024.

iii. Human Resource and Skill Development

To develop a human capital talent pool for the ICT Industry and increase the labor pool available for IT and ITeS companies, PSEB has, under the ICT Internship program, placed 800 interns in the ICT companies from July to April FY2024 and a total of 2,700 interns in the last 02 years.

iv. Capacity Building of IT and ITeS Companies Through International Certifications

During FY2024 (July-March), financial and technical assistance was extended to 15 IT and ITeS software companies for ISO27001 and ISO27701 certification. PSEB has extended financial and technical assistance to 20 call centers to standardize the call center industry and achieve ISO18295 certification. In addition, 304 call centers were facilitated for IP Allow listing through PSEB One Window to serve their cross-border customers.

v. Providing IT Industry access to Equity Capital

PSEB is working on enlisting Pakistani IT companies on the GEM (Growth Enterprise Market) Board of the Pakistan Stock Exchange (PSX). The goal is to increase the number of listed technology companies on the PSX Main Board and GEM Board, which would, in turn, help strengthen the financial ecosystem for IT/ITeS sector growth and contribute to efforts to build a strong brand image of Pakistan's IT/ITeS industry in international markets.

IGNITE–National Technology Fund (NTF)

IGNITE-NTF is focused on funding and promoting technology innovation and entrepreneurship in Pakistan. For this purpose, IGNITE offers the following funding programme:

a. National Incubation Centers (NICs)

NICs is to encourage innovation and entrepreneurship in the technology sector, create a sustainable ecosystem for startups to thrive, and contribute to the overall economic development of Pakistan. Ignite has established eight NICs in Islamabad, Lahore, Quetta, Karachi, Peshawar, and Hyderabad, and two specialized incubators in Faisalabad (for agri-tech) and Rawalpindi (for aerospace). These NICs can support 245 plus startups annually,

with 40 startups in Lahore, Karachi, and Islamabad and 25 startups in Peshawar, Quetta, Hyderabad, Faisalabad, and Rawalpindi. The combined area of all 8 NICs is approximately 135,000 sq.ft. The total project duration for each NIC is five years and three months, including the establishment period. The "One Metric, One Problem" approach is used for focus and review, and startups also have access to investors, design and marketing assistance, financial support, and legal assistance.

Over the past few years, the NICs have incubated more than 1,480 startups, with more than 710 graduating successfully so far. These startups have generated over 128,000 jobs, received a total investment of Rs 23 billion, and have a combined revenue of more than Rs 16 billion. To date, over 2,800+ women entrepreneurs have been empowered through the programme.

b. Digiskills.pk 2.0 Training Programme for Freelancing

Due to the overwhelming success of the DigiSkills.pk training programme, DigiSkills.pk 2.0 was launched in January 2022 to provide the youth, freelancers, students, professionals, etc., with the knowledge, skills, tools, and techniques necessary to take advantage of international and local online job markets. To date, the overall number of training that DigiSkills.pk has conducted is more than 3.97 million. The total trainees comprise 72 percent males and 28 percent females. The number of overseas Pakistanis trained in the programme is more than 42,266.

d. Digital Pakistan Cybersecurity Hackathon 2024

Ignite conducted Pakistan's third nationwide Digital Pakistan Cybersecurity Hackathon 2023, which aimed to improve the country's cybersecurity readiness, protection, and incident response capabilities by conducting cyber drills at the national level. A total of 3,530 participants, including experts from banks, ICT companies, students, and researchers from leading universities, registered for the training workshops. After an online test, 1,576 attended the hands-on training workshops.

e. National Grassroots ICT Research Initiative (NGIRI)

The programme promotes research and development (R&D) and Innovation at the grassroots level by providing financial support to selected final-year projects (FYPs) of undergraduate students enrolled in ICT-related disciplines of public and private sector institutions. The programme is being rolled out from FY2012 to FY2023, total of 8,429 FYPs have been approved for funding. Disbursements of Rs 390.68 million have been made against 7,115 approved FYPs.

Universal Service Fund (USF) Initiatives: The USF has been mandated to provide access to telecom services in the unserved, underserved, rural, and remote areas. To meet its objectives, USF has designed and launched several projects under different programmes, each targeting deployment of specific infrastructure and provision of related services. These services are made available at prevalent affordable rates in the country, which empower both men and women.

USF programmes can be categorized into two broad categories:

a. **Voice and Highspeed Broadband Data Services:** This programme focuses on establishing infrastructure and providing voice and highspeed broadband data services to unserved and underserved areas across the country. Under different variations of this programme, coverage is also being extended to unserved Road segments along National Highways and motorways and to tourist locations.

b. Backhaul Services: This focus is on laying Optic Fiber Cable to unserved Tehsil Headquarters/ Union Councils and major towns and establishing points of connectivity (Nodes) that telecom operators can utilize to expand their services.

The province-wise breakup of initiatives undertaken under different categories follows:

a. Voice Broadband Data Services Projects (3G/4G)

Balochistan: Since inception till Q2 of FY2024, 26 projects of Rs 39.09 billion have been launched, targeting 4,048 un/underserved mauzas in 30 districts. Twenty of these projects have been completed, 3,721 mauzas having a population of 3.95 million have been provided coverage, and an approximate subsidy of Rs 34.86 billion has been disbursed. In FY2024, till the end of Q2, USF has successfully provided coverage to a population of 138,765 residing in 221 mauzas across the province. An approximate Rs 906 million subsidy has been disbursed to achieve different project milestones.

Khyber Pakhtunkhwa: Since inception till Q2 of FY2024, 15 projects of Rs 16.2 billion have been launched, which are targeting 4,281 un/underserved mauzas in 35 districts and 27 tourist destinations in 4 districts. 7 of these projects have been completed, 3,067 mauzas having a population of 5.9 million have been provided coverage and an approximate subsidy of Rs 14.13 billion has been disbursed. FY2024, till the end of Q2, USF has successfully provided coverage to a population of 430,328 residing in 287 mauzas across the province. Approximately Rs 820 million subsidy has been disbursed to achieve different project milestones.

Punjab: Since inception till Q2 of FY2024, 23 projects of Rs 10 billion have been launched, which are targeting 5,670 un/underserved mauzas in 30 districts. Fifteen of these projects have been completed, 4,925 mauzas having a population of 9.8 million have been provided coverage, and an approximate subsidy of Rs 8.12 billion has been disbursed. In FY2024, till the end of Q2, USF has successfully provided coverage to a population of 513,329 residing in 357 mauzas across the province. An approximate Rs 865.2 million subsidy has been disbursed to achieve different project milestones.

ICT: From inception until Q2 of FY2024, two projects worth Rs 41.3 million were launched, targeting 17 un/underserved mauzas in ICT. Both projects have been completed, serving 17 un/underserved mauzas and providing coverage to a population of 16,783.

Sindh: Since inception, till Q2 of FY2024, 15 projects of Rs 6.89 billion have been launched, which are targeting 4,022 un/underserved mauzas in 27 districts. 11 of these projects have been completed, 3,827 mauzas having a population of 10.18 million has been provided coverage and an approximate subsidy of Rs 6.31 billion has been disbursed. In FY2024, till the end of Q2, USF has successfully provided coverage to a population of 9,185 residing in 8 mauzas across the province. Approximately Rs 49 million subsidy has been disbursed to achieve different project milestones.

b. Voice Highspeed Data Services on National Highways and Motorways Projects (4G)

Balochistan: Since inception till Q2 of FY2024, four projects of Rs 6.24 billion have been launched, which are targeting 2,205 km of underserved road segments along National Highways: N10, N25, N50, N65, N70, and Motorway M8 passing through 23 districts (including two districts of Sindh). Three of these projects have been completed, 1,726.77 km of unserved road segments have been covered, and an approximate subsidy of Rs2.25 billion has been disbursed. In FY2024, till the end of Q2, work remained in progress on one project, targeting unserved road segments of Motorway M8.

Punjab: Since inception till Q2 of FY2024, four projects worth Rs 715 million have been launched, which targeted 300 km of underserved road segments along Motorways M3, M4, M5, and Hakla – DI Khan Motorway, passing through 17 districts (including three districts of Sindh and 2 of Khyber Pakhtunkhwa). All projects have been completed, and an approximate subsidy of Rs 665.2 million has been disbursed. In FY2024, till the end of Q2, 17.34 km of unserved road segments have been provided coverage, and an approximate subsidy of Rs 75 million has been disbursed.

Khyber Pakhtunkhwa: Since inception until Q2 of FY 2024, one (01) project of Rs 1.23 billion has been launched, targeting 144.3 km of

underserved road segments along Karakoram Highway (N35), passing through 7 districts (including 2 districts of Punjab). An approximate subsidy of Rs 245.8 million has been disbursed.

c. Backhauls Projects

Balochistan: Since inception till Q2 of FY2024, seven projects of Rs 8.07 billion have been launched, which are targeting the laying of 6,267.04 km of Optical fiber cables (OFC) and the establishment of 124 nodes in 30 districts, including five districts in Punjab and 1 in Khyber Pakhtunkhwa. Out of these projects, five projects have been completed. 103OFC nodes have been established by laying 5,870 km of OFC, and an approximate subsidy of Rs 5.18 billion has been disbursed. In FY2024, till the end of Q2, work remained in progress on two ongoing projects. An approximate subsidy of Rs 8.2 million has been disbursed for the achievement of different project milestones.

Khyber Pakhtunkhwa: Since inception, till Q2 of FY2024, six projects of Rs 8.34 billion have been launched, which are targeting the laying of 3,475 km of OFC and the establishment of 250 nodes in 26 districts. 2 of these projects have been completed, whereas the rest are in progress. 2,045 km of OFC has been laid, 108 nodes have been established, and an approximate subsidy of Rs 4.02 billion has been disbursed. In FY2024, till the end of Q2, work remained in progress on four ongoing projects.

Sindh: Since inception till Q2 of FY2024, seven projects of Rs 10.65 billion have been launched, targeting laying 5,413.64 km of OFC and establishing 514 nodes in 17 districts. Four of these projects have been completed; the rest are in progress. 3,783.68 km of OFC has been laid, 374 nodes have been established, and an approximate subsidy of Rs 6.34 billion. In FY 2024, till the end of Q2, 561.4 km of OFC has been laid, and 67 nodes have been established.

Punjab: Since inception till Q2 of FY2024, six projects of Rs 8.7 billion have been launched, targeting 3,416 km of OFC laying and establishing 384 nodes in 6 districts. Three of these projects have been completed; the rest are in progress. 2,828.35 km of OFC has been laid, 348 nodes have been established, and an approximate subsidy of Rs 6.55 billion has been disbursed. In FY2024, till the end of Q2, 482.7 km of OFC has been laid, 50 nodes have been established, whereas an approximate subsidy of Rs 764.2 million has been disbursed on achievement of different project milestones.

National Telecommunication Corporation (NTC)

NTC is performing its core function, i.e., provisioning of ICT services and maintaining the ICT infrastructure and services compromising of state-of-the-art country-based core and access switching optical fiber-based DWDM/SDH transmission OSP (OFC/UGC) networks and allied power equipment with all the due diligence. NTC has also established a data center infrastructure and disaster recovery center (DRC) demonstrating remarkable resourcefulness, primarily designed to host government websites, email services, and selected applications such as an e-office suite. NTC has also successfully established Pakistan's first centralized emergency helpline, PEHEL-911. As a state-owned entity and fully aware of its role, NTC has also been at the forefront of many national emergencies like earthquakes or floods. NTC's annual development plan consists of 14 Development projects for FY 2024 being planned besides completion of 31 Small Development Works amounting to Rs 28.397 million. During FY 2023 & FY 2024 (Jul-Dec), NTC made a profit of Rs 824 million and Rs 523 million, respectively, before taxation.

Major Initiatives of NTC

i. NTC Security Incident & Event Management (SIEM) in multitenancy Environment:

NTC has strategically positioned itself as a leader in cyber security by implementing a robust 24/7 Security Information and Event Management (SIEM) system. This system can not only fulfill NTC's internal security and monitoring demands but is also ready to secure other Government organizations as a Managed Security Service Provider (MSSP).

ii. Improved Security Posture of Data Center

NTC has significantly fortified its security stance through strategic human resources and technology investments. Our strengthened cyber security posture results from a multifaceted approach, incorporating a layered security strategy.

iii. Disaster Recovery (DR) as a Service (DRaaS)

DRaaS is a cloud computing solution that allows NTC to replicate and back up its data and IT infrastructure in a remote facility. NTC is offering this service to other departments to acquire backups for the continuous operation of its services in case of disaster or system failure.

Public Key Infrastructure (PKI) Web Trust Seals

NTC has established PKI to provide certification identity management at international standards for the Electronic Certification Accreditation Council (ECAC). With its robust and secure framework, the PKI system is designed to facilitate the secure electronic transfer of information for various network activities such as e-commerce, internet banking, and confidential email. It is a system that employs asymmetric cryptography and a system of digital certificates, Certificate Authorities, and other registration authorities that verify and authenticate the validity of each party involved in an electronic transaction. We have been awarded the Web Trust Seals because we are committed to adhering to global standards and best practices. These seals are a testament to the successful completion of the Web Trust Audit, an internationally recognized assurance service provided by the American Institute of Certified Public Accountants (AICPA) and the Chartered Professional Accountants of Canada (CPA Canada).

Electronic Certification Accreditation Council (ECAC)

ECAC provides a legal framework to recognize and facilitate documents, records, information, communications, and transactions in electronic form, enabling digital signatures to be accepted on par with and written (wet) signatures. ECAC is mandated to grant accreditation to any Certificate Service Provider who intends to work as an Accredited Certificate Service Provider. All companies, individuals, or firms engaged in electronic services must use accredited digital certificates for security, integrity, and authenticity. The Certificate of Accreditation aims to make electronic transactions more secure, reliable, and acceptable worldwide-a conducive environment for electronic transactions through trust and a legal and stringent policy framework in the country.

Special Communication Organization (SCO)

SCO provides ICT services to 4.5 million people of AJ&K and 1.48 million of GB. SCO mobile and Fixed Local Line (FLL) services have 28.4 percent and 1.3 percent penetration, respectively. The teledensity in GB is lower than that in AJ&K due to the area's low population density. However, SCO has reached far-flung, underserved, and unserved areas. SCO is the only organization providing all types of telecom facilities to its users. SCO has achieved 5 percent growth in various domains of ICT Network in AJ&K and GB in the past year. Currently, SCO is serving over 2.6 million users. The Telecom industry contributes an average of Rs 150 billion to the national exchequer, and SCO contributes over Rs 6 billion annually to the national economy directly. Revenue realized by SCO is deposited in the Government exchequer through the Federal Consolidated Fund (FCF). In FY 2024, SCO deposited Rs 6.130 billion in government exchequer. The targeted revenue of FY 2025 is Rs 6.5 billion.

Telecommunication Sector

The present era is witnessing a technological revolution centered on ICTs. Mobile broadband usage—one of the most significant ICT innovations of the past decade—has rapidly increased globally in the 21st century, impacting economic development, particularly in terms of GDP. According to a 2020 ITU study, a 10 percent increase in mobile broadband penetration can lead to an impressive 2.4 percent uptick in GDP for middle and low-income countries in the Asia Pacific region, including Pakistan, surpassing the global average impact

of 1.5 percent on GDP.

The telecom industry in Pakistan has undergone significant transformations in recent years, thanks to the development of 3G and 4G services and the regulator's commitment to enable advanced technologies in the country. PTA has consistently facilitated investment in the telecom sector, which is fully deregulated and features multiple international telecom entities providing services. Recognized by ITU as a 4G Regulator, PTA pursues active collaboration with industry players and stakeholders to develop the sector. The country's telecom services (Mobile and Fixed) are experiencing healthy growth rates, with 194.6 million subscribers (80.7 percent teledensity) and 135.4 million broadband subscribers (56.1 percent penetration). The industry holds substantial investment potential, with local investments of US $ 6.3 billion and FDI (Inflow) of US$ 1.4 billion from 2019 to March 2024.

Despite economic challenges such as higher business costs and inflationary pressures in FY 2024 (July-March), the telecom sector showed resilience, expanding its services and generating telecom revenues of Rs 735 billion(estimated). With ongoing service expansion and economic recovery in the medium to long term, broadband penetration is expected to increase further in the coming years.

During FY 2023, the telecom sector remained a significant source of revenue generation, with Rs 340 billion in GST, withholding tax, regulatory fees, initial and annual license fees, and other taxes. During FY 2024 (July-March), the telecom sector also contributed Rs 213 billion.

PTA is regulated in a hybrid environment with merged physical and digital boundaries. In doing so, it utilizes both conventional and contemporary regulatory tools, initiatives, and procedures essential for Pakistan's transition from an emerging to a developed digital market. Key telecom sector developments and regulatory interventions are detailed below:

Table 15.1: Telecom Industry Financials

	2018-19	2019-20	2020-21	2021-22	2022-23 (P)	2023-24 Jul-Mar (E)
Telecom Revenues (Rs Billion)	604	595	647	725	850	735
Telecom Contribution (Rs Billion)	111	286	219	323	340	213
Telecom Investment (US$ Million)	882	1,140	1,214	1,666	762	617

E: Estimated, P: Provisional; Estimated

Source: Pakistan Telecommunication Authority

i. Telecom Sector Development; Digital Landscape of Pakistan:

a. International Connectivity

Pakistan has a robust international connectivity infrastructure with undersea fiber optic cables and terrestrial links. It has seven submarine cable connections, a Pak-China optical fiber cable (OFC), and 19 cross-border terrestrial telecom links to neighboring countries, consisting of nine microwave and 10 OFC links. This diverse network ensures redundancy, reliable Internet connection, and resilience against cable damage or other unforeseen glitches. Key players in Pakistan's international bandwidth provision include Pakistan Telecommunication Company Limited (PTCL), Transworld Associates (TWA), Cyber Internet Service Providers (Cybernet), and Special Communication Organization (SCO). Together, they offer an installed capacity of 14.8 Tbps while 8.5 bps (57.4 percent) is activated capacity. PTA has approved the launch of operations for the PEACE submarine Cable Landing Station (CLS), designating Cybernet as Pakistan's third upstream gateway. With a 96T backbone, this cable system connects important global destinations spanning Asia, Africa, and Europe. Cybernet has also established its CLS in Karachi, which is currently serving as the landing point for the PEACE submarine cable system, and it plans to host multiple subsea cables.

b. Optical Fiber Cable Network

OFC networks are vital for Pakistan's telecom and Internet infrastructure, providing high-speed, reliable, and efficient connectivity nationwide. To promote OFC deployment, the PTA and the government launched initiatives addressing challenges such as Right-of-way (RoW) disputes, infrastructure security

concerns, and funding constraints. New LDI licensees must lay 1500 km of OFC in their initial six years, facilitating further fiberization and connectivity for the upcoming 5G infrastructure. The country is gearing up for network advancements as technology evolves, including adopting emerging technologies like 5G.

c. Cellular Cell Sites Network

The growing demand for broadband expansion and technology upgradation, particularly with the launch of 3G and 4G networks, has been pivotal in shaping Pakistan's telecom landscape. Over the last five years, CMOs have added 12,296 cell sites, marking a significant 29.2 percent growth, including deploying 1,850 cell sites in FY2023. Besides cell site additions, they have made multi-billion-dollar investments in upgrading existing 2G sites to 3G and 4G. 96 percent of cell sites are 4G-enabled, with more undergoing upgrades.

Table 15.2: Cellular Mobile Cell Sites

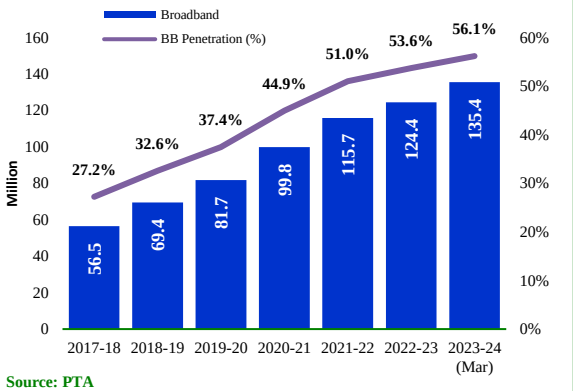
Year	Cell Sites	4G%
2017-18	42,119	48
2018-19	45,171	68
2019-20	47,251	78
2020-21	48,958	82
2021-22	52,565	92
2022-23	54,415	93
2023-24 (Dec-23)	54,629	95

Source: Pakistan Telecommunication Authority

ii. Broadband Proliferation

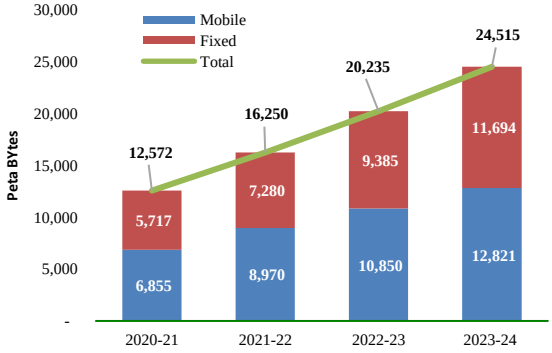
Government recognize the importance of broadband connectivity in fostering economic development and digital inclusion. Broadband expansion is at the heart of the 'Digital Pakistan' vision, which aims to modernize various sectors of the economy and provide digital services to the entire population. Given Pakistan's relatively low GDP growth in recent years, the productivity gains stemming from digital connectivity have become indispensable for sustained economic growth.

Fig-15.1: Broadband Subscribers & Penetration



Source: PTA

Fig-15.2: Data Usage



Note: 2023-24 Figures are estimated
Source: PTA

Ever since the launch of 3G and 4G services in 2014, the broadband landscape in Pakistan has undergone significant transformation. PTA has played a vital role in initiating strategic initiatives such as spectrum auctions, renewals (spanning from 2016 to 2021), spectrum reframing, and additional rollout obligations. These actions have stimulated the expansion and adoption of 4G services. Over the past years, the telecom sector has experienced remarkable growth in broadband subscriptions, encompassing mobile and fixed services. Broadband subscriptions surged to 130.5 percent, increasing from 58.7 million in FY2018 to 135.4 million as of Mar 2024. These statistics emphasize the growing significance of broadband services in Pakistan's digitally connected society.

Data usage in the telecom sector has seen a significant increase; the combined data consumption from both mobile and fixed broadband services in FY2024 amounted to a substantial 24,515 petabytes (estimated), emphasizing the pivotal role of broadband in

Pakistan's digitally connected society and the need for infrastructure expansion.

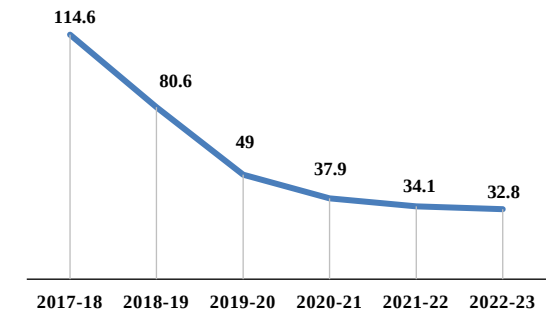
iii. Affordable Broadband Services

One of PTA's strategic objectives is to provide affordable, high-quality services while ensuring investors and operators receive a reasonable investment return. Through proactive regulatory practices and a competitive broadband market, Pakistan offers its citizens some of the world's lowest and most budget-friendly telecom prices. The 1 GB of data cost in Pakistan is a mere US $ 0.12, making it the lowest in the region and 6th lowest globally. An analysis of the effective price of one (01) GB of data over the years reveals a consistently declining trend, with data costs per GB registering a 71 percent decline since FY2018, decreasing from Rs 114.6/GB to Rs 32.8 /GB during FY2023.

iv. Mobile Average Revenue Per User (ARPU)

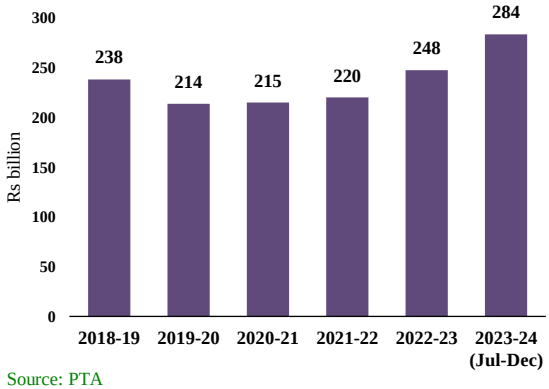
Pakistan's Competitive telecom environment and reputation of offering some of the most affordable rates in the region have traditionally kept the country's ARPU per month relatively low compared to its neighbours. However, recent developments, such as expanding broadband services, flexible pricing regulations for telecom operators amidst rising inflation, and the declining multi-SIM phenomenon, have led to a noteworthy increase in ARPU. In FY2024 (Jul-Dec), ARPU reached Rs 284/month compared to Rs 248/month in FY2023.

Fig-15.3: Effective Price (Revenue) Per GB Per Month (Rs)



Source: PTA

Fig-15.4: Mobile ARPU per month

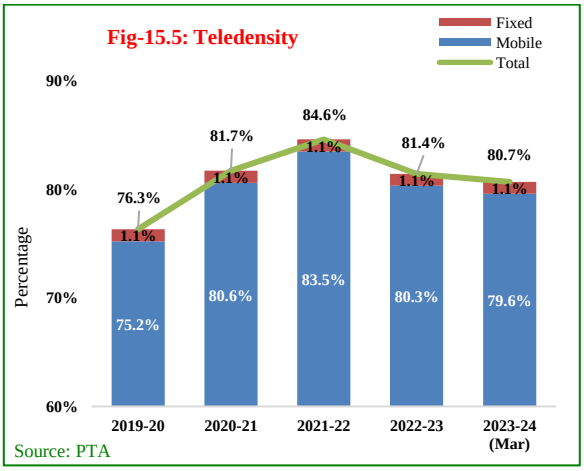


Source: PTA

v. Telecom Subscribers and Teledensity

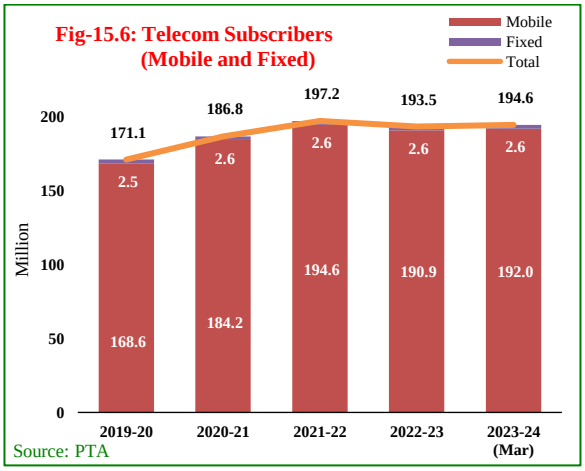
At the end of March 2024, the total number of telecom subscriptions (Mobile and Fixed) reached 194.6 million, and the total teledensity in the country reached 80.7 percent. The cellular mobile segment mainly contributed to the overall growth in subscribers and teledensity.

Fig-15.5: Teledensity



Source: PTA

Fig-15.6: Telecom Subscribers (Mobile and Fixed)



Source: PTA

vi. Telecom Device Manufacturing

PTA has provided a level playing field for foreign investments in Pakistan's mobile device manufacturing industry. PTA introduced the Mobile Device Manufacturing (MDM) Regulations in 2021, leading to the establishment of local manufacturing plants by 33 local and foreign companies. These companies-both standalone and joint ventures-secured a 10-year MDM authorization. From January 2019 to March 2024, Pakistan manufactured 101.1 million mobile handsets (including 34.1 million smartphones), creating numerous job opportunities. Accordingly, an uptake of smartphones to 61 percent of devices on the network is given in Table 15.3.

Table 15.3: Uptake of 3G/4G Devices (Percentage of IMEIs on Mobile Networks) (%)

Year	2G	3G/4G
2019	56	44
2020	52	48
2021	48	52
2022	54	55
2023	43	57
2024 (Feb)	39	61

Source: PTA

PTA is committed to enhancing the industry's financial sustainability, introducing cutting-edge technologies, promoting digital inclusion, and bridging the digital divide, including gender and rural-urban disparities, to ensure widespread access to telecom services. Initiatives such as facilitating local mobile handsets, expanding optical fiber cable (OFC) infrastructure, managing online content, establishing local telecom equipment standards, improving Quality of Service (QoS) and coverage, and addressing spectrum-related issues will be prioritized. Implementing robust cybersecurity measures will safeguard the integrity and privacy of digital communications. Furthermore, the PTA aims to promote balanced content management by developing policies within existing legal frameworks, encouraging infrastructure and spectrum sharing for collaboration and efficient resource utilization, and developing telecom standards for interoperability and seamless integration.

The primary regulatory activities of PTA include 5G Readiness, Handset Registration Facility for Overseas Pakistanis, the Launch of Device identification registration and blocking system (DIRBS) in AJ&K and GB, PTA-Cross Sector Collaboration, Safeguarding Consumers in the Digital Space, Fostering a Safer Digital Environment for Youth and Children, Low Power wide area network (LPWAN) internet of things (IoT) Licensing, Licensing for Satellite Communication Services, PTA-Cross Sector Collaboration, Quality of Service Surveys Strategy on Non-Licensed and Illegal Service Providers, Digital Gender Inclusion Strategy, Development of Regulatory Frameworks, International Collaborations, Cyber Security Strategy 2023-2028, Establishment of Data Center.

Concluding Remarks

The potential impact of investing in Pakistan's IT and telecom sectors is immense and wide-ranging. By leveraging technology, Pakistan can boost economic growth, generate employment, increase foreign exchange earnings, improve productivity across various industries, promote innovation and entrepreneurship, and enhance its global competitiveness. Strategic investments in infrastructure, human capital development, and a supportive environment for technology-based businesses are essential steps toward unlocking Pakistan's IT and telecom sectors' full potential, fostering sustainable economic growth and prosperity for the nation.