Chapter 26

INFORMATION AND COMMUNICATION TECHNOLOGIES

The paradigm shift from the industrial to knowledge-based societies, which began in the early 21st century, is transforming the overall fabric of the socio-economic framework. In this transformation, the Information and Communication Technologies (ICT) is playing the central and multi-dimensional role. It is now considered as an enabler of the societal change, a driver of economic growth and a facilitator in better governance.

This extraordinary capacity of the ICT to drive growth and innovation, enhance productivity, efficiency, transparency and facilitate good governance can be utilised in handling challenges encountered amidst global economic crisis. Hence, while it is basic to pursue strategies for overcoming short-term challenges, then there will be an approach to avail longer-term opportunities for achieving sustainable high-growth of economy. Living examples of countries having adopted Information Technology as the main driver of growth are known to us. Therefore, the ICT policies will be skilfully formulated and implemented with full zeal for actualising the future being aspired.

The ICT sector is now at the take-off stage and as such, it needs to be nurtured and encouraged to expand at a highly-accelerated pace in the next five years to become a real enabler and facilitator of development. The potential IT areas, which can increase growth, are identified as follows:

- IT industry, particular emphasis on software development
- Software and IT workforce export
- In-country employment opportunities
- E-governance for an effective service delivery
- M-governance and smart monitoring
- FDI for IT and Telecom hardware production
- Technology incubators and support for entrepreneurs
- Business promotion through e-commerce
- E-Learning and e-education
- Business Process Outsourcing (BPO)

Situational analysis

Led by the private sector, the IT sector has reasonably grown during the last decade. At a take-off stage, there is a tremendous potential in this sector to accelerate its contribution significantly to the national economy. Based on the Global Information Technology Report

(2014), the following is a synopsis of Pakistan's standing in the IT sector with a special focus on the issues and challenges hindering massive growth of this sector:

Education, creation of human capital and capacity for innovation

The dwindling quality of the education system is one of the major reasons for under-achievement in developing the IT sector. Pakistan's ranking for 'Quality of the Educational System' stands at 84, which is well below India (33) and China (54).One of the serious concerns is dismally low spending on education as compared to other regional countries. An efficient and focused educational system needs to be put in place for encouraging and promoting thinking, innovation and creativity among students by revising the curricula.

IT exports

Pakistan's IT exports are about $600 million, which is very low as compared to other countries such as India ($49.5 billion), China ($15.4 billion) and Malaysia ($2 billion) (*Source: UNCTAD Handbook of Statistics, 2014*). Pakistan can benefit from off-shoring and outsourcing industry as being done by the leading destinations. Furthermore, Pakistan's computer hardware industry requires more attention to make it a vibrant sub-sector of the overall IT industry. The Silicon Valley USA, Multimedia Corridor Malaysia and Internet City Dubai are examples of the leading IT industrial success stories, which will be replicated in Pakistan as well.

E-commerce and IT security

E-commerce is a key driver of the knowledge economy, whereas in Pakistan, e-commerce is still a long way to be seen at a recognisable level. In this regard, many issues will have to be addressed, which include: expansion in connectivity infrastructure, introduction of the Public Key Infrastructure (PKI), implementation of laws related to electronic transactions, data protection and cybercrimes; so that confidence is built for doing business using this medium. At present, Pakistan is ranked at 122 in the index of 'Laws relating to use of IT', whereas India is ranked at 54 and China at 52. To increase the use of e-commerce, applications and services need to be made available to the business community, especially the SME sector.

E-government

Emphasis on e-government continues since 2000 when an independent Ministry of Information Technology was established. The e-government needs to be steered towards the right direction. In this regard, various issues, like weak institutions for implementation, incomplete infrastructure, incomplete software projects, lack of beneficiary participation, non-observance of the codal formalities and lack of retention of IT professionals due to uncertainty, lucrative salaries in the private sector and absence of the career path, etc., have to be addressed in true spirit. A citizen-centric e-government initiative can act as a catalyst for improving perception of the citizens about better governance.

Promotion of Urdu language in IT

As long as the masses do not use technology, benefits of the IT revolution will remain elusive. For this, it is perceived that unless computing is not in the language they understand, it would not happen. A simple barometer of the pervasiveness of using IT in daily life can be gauged from the internet usage. Pakistan, ranked at 124, still has a very low level of internet usage as compared to Singapore (29), Korea (15) and Finland (7). Availability of software in Urdu, conversion of the electronic knowledge sources from other languages to Urdu and research and

development activities are some of the areas where huge potential exists, and appropriate investments will be made for this.

IT industry – software exports and BPO, IT-enabled services

In order to increase competitiveness of the IT Industry in the international market, the Pakistan Software Export Board (PSEB) initiated programmes for the Pakistani companies to improve software processes by adopting ISO 9000 standards, Capability Maturity Model (CMM), ISO27001, COPC, etc. As a result, companies which achieved the CMMI certification are two CMMI Level-5, four CMMI Level-3 and eighteen CMMI Level-2. Also, 110 companies got ISO-9000 certified, while 11 got ISO 27001.

Quality of IT education and human resource development

In the human resource development area, programmes were initiated to expand the base of qualitative human resource for the IT industry. Also, programmes for short-term trainings were introduced to create greater awareness and use of computer technology. Under the programme to equip public sector schools with computer labs and computer science teachers, 1098 secondary and high schools and inter-colleges were equipped with 17,500 Personal Computers (PCs) for the benefit of about 44,000 students of matriculation and intermediate. The National ICT Scholarship Programme provided opportunity to about 7,300 students from non-metropolitan areas to get foundation training and scholarships to about 3500 students for 4-year bachelor's degree IT or Computer Science programme in various universities country-wide.

E-governance

The e-governance gained importance in the last five years. Some of the major initiatives undertaken during this period were: Machine Readable Passport, Machine Readable Visa Project, Government of Pakistan Web Portal for facilitating citizens to access public services through the internet, Development and Replication of e-Office (Basic Common Applications) in the federal government to enable government to have computer-based workflow for common functions, which include: electronic file movement (less paper office), finance and budgeting, human resource management, procurement, inventory and project management. All modules of e-office software have been tested, and are being implemented.

An important initiative, which directly benefits citizens, is the Land Revenue Records Management System for the Punjab, and is aimed at having efficient management of land records, and the people to access records at an affordable cost. Also, the Telemedicine Centres were established at each of the three major hospitals, which served four rural healthcare centres (total 12 in Attock, Khushab, Pindi Gheb, DG Khan, Gujrat, Sahiwal, Rajanpur, Jhang, Shikarpur, Gambat, Mirpurkhas, Jacobabad) to provide quality healthcare at the doorstep of people living in the rural areas. Also, the Health Management Information System was implemented at the Children Hospital of the Pakistan Institute of Medical Sciences (PIMS), Jinnah Post-Graduate Medical Centre Karachi and Sheikh Zayed Medical Complex, Lahore.

Issues and challenges

The following are the problematic areas:

Issue 1: Dearth of trained human resource having marketable skills and capacity to innovate

Constraints

- Producing low-value human resource by the university education system (Only about 10-15 per cent universities produce quality graduates)
- Lack of specialised training and quality vocational institutes (centres of excellence) to produce skilled personnel compliant to regional and international standards
- Lack of access to computing and internet facilities at schools
- Weak linkages between domestic Industry, research and academia resulting in absence of the research ecosystem within the country
- Low priority for an effective utilisation of the National ICT R&D Fund and Universal Services Fund (USF)

Issue 2: Low volume of IT exports

Constraints

- Few CMMI level 5, 3, 2, ISO 27001 certified software companies
- Small-sized and dispersed software companies with little overseas presence
- Lack of institutional expert guidance for young entrepreneurs, that is, very few IT incubators and also limited-structured mentoring opportunities for innovators and start-ups
- Lack of access to venture capital, angel funding and crowd-funding

Issue 3: E-government initiative still in the preliminary stage with very little emphasis on e-services

Constraints

- Weak e-governance implementation institutions require restructuring and strengthening
- Lack of incentives framework for retention of the IT professionals in the public sector
- Financial constraints for completion of the basic IT infrastructure projects
- Low priority being given to implementation of the public sector e-services due to insufficient back-office automation
- Lack of legal framework for the e-governance to sustain its implementation in the long-run
- Absence of standards for procurement of hardware and software in the public sector

Issue 4: Very small usage of IT in the domestic trading and commerce

Constraints

- Non-existence of E-Payment Gateways for free and open e-trading

- No PKI available for mass level e-trading activity
- Cyber-laws not complying to the internationally accepted standards for electronic financial transactions; thus hindering mass adoption of the e-commerce
- Lack of applications and web-based content in local and regional languages for facilitating understanding and boosting productivity

Issue 5: Negligible computer hardware manufacturing industry

Constraint

- Infeasible business proposition for manufacturing computer hardware components and telecom equipment

Strategy

The ICT is a very attractive sector for young entrepreneurs. However, they are required to be groomed for producing high-value innovative products and services. This sector is an enabler and facilitator in improving productivity and efficiency in all development sectors of the economy. The ICT education and training can work as a catalyst by providing highly-paid jobs employment to the youth, which will help in alleviating poverty and improving socio-economic conditions of individuals as well as communities. The ICT is a field, which rewards creativity and innovation with very little investment. This strength will be used for realising high growth of the economy by getting even a small share out of large international market of $4 trillion. In accordance with the Vision to increase the ICT industry size to $20 billion by 2025, it is planned to have an $8 billion ICT industry by 2018. For leveraging the ICT to transform the socio-economic environment and create enabling environment for knowledge economy, the following steps will be taken:

- Provide access to universal education, learning and knowledge sources with special focus on quality ICT education
- Move forward from being a ‘follower’ to ‘leader’
- Policy shift from the government-centred to the private sector-centred policy
- Focus on quantitative expansion and qualitative improvement
- Creating demand for the local ICT products and services
- Formation of an IT cadre for sustainable public sector services
- Implementation of the cyber laws for improving trust and security of the e-transactions

Action plan

The following steps will be ensured.

- Creation of entrepreneurial eco-system to promote tech-entrepreneurship and exploiting the existing academic and TVET system for the purpose
- Establishing an IPR framework to encourage investment and innovation
- Focusing on the software exports and outsourcing

- Encouraging domestic use of indigenous software products and IT-enabled Services (ITeS), and expansion of broadband and web-hosting infrastructure within the country
- Strengthen software industry by encouraging internationally recognisable brands of the Pakistani software products and arranging discounted advance arrangements with media for small and skilled software companies
- Provide incentives for achieving CMM Level 5,3,2, ISO certifications 9001, 27001, and Certification Program for Individuals (PMP, PRINCE2, etc.) and other soft skills
- Establish internet city and knowledge village to achieve critical mass of high technology companies under the PPP
- Encourage establishment of software development companies in smaller cities (other than Karachi, Lahore and Islamabad)
- Encourage local companies to produce international standard software for local and domestic market
- Promote use of Urdu and other local languages by encouraging availability of the IT content and applications in Urdu to help increase adoption of technology among the masses; collaborating with the software market leaders for making their software products available in Urdu and regional languages; conducting R&D for availability of content in local languages, and development of the e-services and software applications in Urdu and other local languages in collaboration with the private sector
- Ensure implementation of laws related to electronic communication and transactions, acceptance of the electronic documents and signatures, and privacy of information
- Attract foreign investment and transfer of technology for the manufacturing of the IT equipment and components; pioneer MNCs in the IT, network, mobile and security devices equipment manufacturing sector to be offered investment insurance and guarantees to cover security risks and carry out study on investment insurance for the MNC investments (linked to company performance) in Islamabad, Lahore and Karachi
- Encourage mergers, acquisitions, joint ventures with foreign software houses to build world-class companies and provide interest free financing for such deals
- To encourage e-business and proliferation of e-services, a legal framework to be developed for creating a trusted and secure communication environment
- Encourage growth of the Certification Authorities (CAs), establishment of e-commerce payment gateways, and deployment of the Pakistan Internet Exchange
- All procurement by the government and its attached bodies to be done through e-procurement
- Provide incentives for international best practices in information security such as the Computer Emergency Response Team
- Setting up regulatory and accreditation bodies to ensure quality IT education at all levels of educational and vocational institutes
- Enhancing quality of IT-related human resources by introducing domestic as well as international certifications such as PMP, OCP, MCP, etc.

- Upgrade teaching and IT skills of teachers and trainers of the primary and secondary education, and develop and introduce specialised courses in colleges in line with the ITeS and BPO industry needs
- Establish centres of excellence – also to act as regulatory bodies – for enhancing training and skills of the IT professionals to design curriculum as per requirement of the software industry and international standards
- Introduce compulsory courses for all public sector employees, including the armed forces, and making it mandatory for induction into service
- Provide scholarships and grants for education and vocational training in niche areas and skills, new and emerging software technologies, research, participation in conferences and workshops, technical certifications
- Provide scholarships to brilliant students of the under-served areas
- Launch of an e-services programme in collaboration with the private sector to improve public service delivery
- Online access points (tele centres) to be established at public places for an easy access to the internet and services at affordable cost, and incentives be given for extension of infrastructure for provision of the internet to the rural areas
- Establish a single focal point for all IT initiatives and enforcing standards for having seamless interoperability among all departments of the government
- An IT cadre to be created for attracting competent IT professionals in the public sector

Strategic areas

The following strategic areas will be under focus during the Plan period.

Important initiatives	
Education	**Health**
Integrated Educational Boards Network Smart School Management System Access to e-Content and e-Learning Initiative Integrated College and University Admission System (Smart Apps for students)	Hospital Management Information System at government hospitals Medicine Inventory System for all health facilities (up to the BHU level) Establishment of tele-medicine clusters Smart system for disease surveillance and tracking
Judiciary	**Security**
Witness biometrics at courts Court Cases System Automation of courts at the district level	Smart Traffic Control System Smart Applications for Public Transport Monitoring and Checking Prison Management System E-Policing System Provincial Dashboard for Crime Investigation and Reporting
Agriculture	**Governance**
Digitalisation of Masavi and computerisation of the land records Agricultural Information Services Network Smart Applications for Agriculture (Pest Control, Crop Reporting, Weather Forecasting, Soil	Public Sector Centralised HRMIS Provincial Grievance Redressal System Local Government level Service Request System National Digital Repository of GIS and GPS Emergency and Disaster Reporting System

Conditions, Commodity Prices, Livestock, etc.) National Digital Dashboard for Improved Water Courses	Infrastructure for G-Cloud and Big Data
Internet Data Centres Establish 3 enterprise-level, 6 mid-level and 12 small-level Internet Data Centres through the public and private arrangement in cities where these do not exist Academic Institutions Connectivity Programme to provide high speed fibre or satellite connectivity among universities and other educational institutions by establishing 15 large, 50 mid-sized and 12 small data centres for universities, colleges and schools	**Internet Traffic Exchange Points (IXPs)** At least three international level IXP's in Pakistan where all the carriers interconnect to allow for seamless and smooth flow and delivery of the Internet Traffic (IP Traffic) National Broadband Satellite Communication System

Financial outlay

In order to launch and actualise various initiatives and programmes, Rs63 billion are required for the entire Plan period. However, major portion will be invested by the private sector. This has been summarised below.

Summary of the financial outlay

S.No.	Sub-sectors/areas	Estimated cost (Rs Million)
1	Software exports, STP,BPO/ITeS, e-business, IT security, hardware	13,496
2	High-value IT human capital and skills development	14,294
3	E-governance	9,894
4	Provincial programmes for the LRMIS	7,207
5	Localisation programme	721
6	Broadband and domestic infrastructure	4,952
7	Internet data centres	3,803
8	International bandwidth and alternate connectivity	7,013
9	Secure communication and other telecom programmes	1,623
	Grand total	**63,002**