Recommendations on National Program for Digital Transformation

Innovate, Empower, Transform

OICCI **Digital Pakistan Report**

About Overseas Investors Chamber Of Commerce and Industry (OICCI)

The OICCI is the largest chamber of commerce in Pakistan in terms of economic contribution. It is the collective voice of top 200 foreign investors in Pakistan, who belong to 35 countries and operate in 14 key sectors of the economy. The OICCI members contribute approximately one-third of the revenue collected in the country and are among the largest investors year-after-year in expanding their footprint in Pakistan. The OICCI member companies have assets of over USD 90 billion; 56 OICCI member companies are listed on the Pakistan Stock Exchange and 50 members companies are associates of the Global Fortune 500 companies. Besides their business operations, the OICCI members are major contributors to various CSR activities.

Established over 157 years ago in 1860, the chamber is focused on promoting foreign investment in Pakistan by working with all the key stakeholders in ensuring that the existing foreign investors are allowed to operate smoothly and that policy issues are proactively managed to allow OICCI members to expand their business and speak for Pakistan in attracting additional FDI. The OICCI is actively engaged in promoting Pakistan as an attractive destination for new Foreign Direct Investment (FDI). Most international trade delegations interact with the OICCI to get an independent view of the investment climate in the country. Incentives offered by the government to investors; experience of OICCI members who are foreign investors; and their success stories are always highlighted at all local and international investment forums focusing on Pakistan.

The OICCI is a research based organization which provides thought leadership in matters of business and investment. The chamber regularly issues policy statements on matters of interest to investors on subjects like Taxation, Intellectual Property and other matters related to foreign investors. 'OICCI Business Confidence Survey' conducted every six months across Pakistan; 'Investment and Perception Survey' with foreign investors on doing business in Pakistan; 'Security Survey' on status of security and Law and Order; 'Intellectual Property Rights Survey'; 'CSR Report' on OICCI members' contribution in CSR initiatives; and providing the leadership on Women Empowerment\Gender Equality through the launch of 'OICCI Women: Empowering for a Brighter Tomorrow' initiative; are highly appreciated by the stakeholders. Recently, OICCI submitted "Energy Reforms 2017" recommendations to the Government of Pakistan and is also closely assisting the authorities in improving "Ease of Doing Business" in Pakistan.

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Foreword

On behalf of OICCI, the premier body of foreign investors in Pakistan, it is our pleasure to present the "Recommendations on National Program for Digital Transformation." The timing of our recommendations is motivated by the belief that Pakistan is currently being assessed as one of the most promising and major emerging global economies. With a population of over 200 million and young population of around 130 million below the age 30[1], and a middle class of almost 80 million, Pakistan is on the radar of all leading international organizations including foreign investors for seeking a role in Pakistan's road to recovery and growth. Advanced stage of digital footprint is obviously critical for the expected growth strategy for Pakistan.

We are living in the digital age and the presence of digital technology is growing rapidly and is steadily becoming ingrained into our society. Developments in the digital world are having a vital and necessary effect on all aspects of our lives, especially the economy, society and government.

The advancements in digital technology are inspiring innovation. Being amongst the fastest growing mobile markets in the world, Pakistan has immense potential to become a global leader in digital innovation. Presently, many businesses and individuals are creating applications and solutions that are helping accelerate economic growth. This is being done through innovations in all sectors of economy; however, there is still immense growth potential. If an enabling environment is created through the implementation of the policy recommendations provided in this report, we believe the economic and social impact will be unparalleled.

In order to empower and enable digital entrepreneurship, an ecosystem needs to be established and the youth of Pakistan needs to be equipped with a digital skillset. Focusing on digital literacy, E-education and digital entrepreneurship will not only reduce inequalities, create jobs and boost the economy but will also give Pakistan a fair chance to compete with other regional economies.

Globally, digitalization is a key factor in reshaping the world of medicine and healthcare. In Pakistan, there is a dire need to revolutionize this sector and digital technologies provide numerous opportunities to do so.

Digital transformation also has a major impact on smart and efficient governance. Through adopting and accepting digital technologies such as cloud computing and artificial intelligence, the government can change the way it does things and make life smarter and simpler for its citizens. The government should be dedicated to constantly implementing innovative ways to make processes seamless and efficient not only for its employees but for the country as a whole.

In the end, we would like to recognize the significant contributions of our team of technology professionals from the OICCI member companies who worked hard in developing this set of recommendations for the country. In particular, we would like to extend our appreciation to Shoaib Qureshi from IBM, Zafar-ul-Islam from Microsoft Pakistan, Asad Noman from Shell Pakistan and Kamal Ahmed and Shan Ul Haq from Telenor Pakistan, who collectively led the effort to make this report a reality.

We hope that this set of recommendations will encourage all stakeholders to do their part and prioritize this mission in order to lead a digital revolution in Pakistan.

Irfan Wahab Khan
President OICCI

M. Abdul Aleem
CE/Secretary General OICCI

1. Unleashing the Potential of a Young Pakistan, UNDP 2017

Introduction

The report "Recommendations on National Program for Digital Transformation" is an effort by our members, who are leading foreign investors belonging to 35 countries including 50 Fortune 500 companies, to share their experience and expertise in helping the country move to a respectable level of digital participation by all segments of the society. We realize that Pakistan's digital participation metrics is currently lagging behind regional economies; but the potential to improve is immense as we are amongst the fastest growing mobile market globally, with over 150 million mobile phone subscribers accounting for 73% teledensity and around 156 million people still without internet. Our IT workers rank the highest in terms of number of freelancers globally and broadband users have grown from a mere 2 million to 58 million since 2014. This makes the country one of the top-5 growth markets for the connectivity industry.

An estimated 40% of the world population, about 3.2 billion individuals, currently use the internet compared to only about 400 million in 2000; and there are over 5 billion mobile subscribers throughout the world compared to less than 1 billion at the beginning of the millennium. The internet and mobile now serve as platforms for the development and proliferation of advanced technologies. The Mobile Connectivity Index (MCI) for Pakistan is 34, which is well below the South Asian average of 38, primarily due to relatively low connectivity infrastructure, lack of affordability in some segments of the society and low digital literacy of the population, besides unavailability of relevant local content.

Globally, the digital economy is growing rapidly and is currently estimated at around USD 11.5 trillion. All sectors of the economy including retail trade, transport, health, education, personal commutation etc., are now benefiting from digital innovation.

It is our understanding that countries, that have embraced the digital revolution, have taken action to integrate innovative technologies at all levels of society and the economy, enjoy higher productivity, accelerated growth and enhanced quality of life for their citizens compared to other countries. Besides business use, the use of automation and technology in governance is bringing significant rewards to the society and countries as recorded in rapid growth of few countries versus others in the World Bank's Ease of Doing Business Survey and other similar competitive measures used to judge the attractiveness of a country for investment and business growth potential.

We invite you to review our Digital Plan recommendations which aim to gradually transform the digital landscape of Pakistan by reducing socioeconomic inequalities, help create an ecosystem for use of technology in all segments of the economy including agriculture and more importantly, how to move towards a smart government by benefiting from Cloud as an enabler to Digital Government. The report also makes certain policy recommendations for ensuring a sound infrastructure through Artificial Intelligence and Blockchain.

Finally, we recognize that these recommendations by no means are comprehensive and best in the class but are an attempt to provide thought leadership based on our members' international experience in taking the country to the next level of growth and prosperity through the smart use of technology. We, therefore, look forward to your views and suggestions for improving the recommendations as we move along on this path for Digital Pakistan and raise the profile of the country among the international community.

1   Executive Summary

The world is in the midst of one of the most significant revolutions in human history. Digital revolution is transforming the world as we know it, with an intensity not experienced since the industrial revolution in the 19th century and producing fundamental changes in all areas of modern life – including the economy, society and government.

Countries, that have embraced the digital revolution, have taken action to integrate innovative technologies at all levels of society and the economy. A study of their digital journeys reveals that they have followed similar goals while their national priorities and political structures have resulted in different trajectories and timelines. Each of these countries has sought to compete with other regional economies, while at the same time learning from the experiences of others. The underlying objectives of their digital transformation can largely be aggregated into the following three categories:

a)   Reducing socioeconomic inequalities amongst citizenry
b)   Accelerating economic growth
c)   Smart and efficient governance

Pakistan is considered to be amongst the major emerging global economies. On digital participation metrics, however, we are lagging behind regional economies; but the potential to improve is immense as we are amongst the fastest growing mobile markets globally, with over 150 million mobile phone subscribers accounting for 73% teledensity and around 156 million people still without internet. This makes our country one of the top-5 growth markets for the connectivity industry.

Keeping in perspective the current developments in ICT and the fact that we have yet to take meaningful steps in that direction, we believe that the following recommendations need to be prioritized and acted upon with a sense of urgency. These recommendations have the potential to significantly uplift the socioeconomic wellbeing of the citizens and generate more than 5 million direct and indirect job opportunities in the country, while at the same time increasing our GDP by USD 40-50 billion annually.

1.   **Implement telemedicine in public sector health units:** Deploying technology in the provision of healthcare, Pakistan has the potential of rapidly increasing the quality and extent of services in far-flung areas while financially providing the incentive of achieving breakeven in terms of savings within months.
2.   **Introduce distance learning (e-education) to public sector educational institutes:** This initiative can harmonize curricula while providing world-class learning opportunities to students in every corner of the country.
3.   **Impart digital skills to the workforce:** We have a unique opportunity to bridge the digitally skilled manpower deficit currently being observed in many countries. With special focus on China, we can potentially add an additional USD 500-700 million annually to our foreign remittances.
4.   **Improve financial inclusion for people at the bottom of the pyramid:** A more financially inclusive economy can result in GDP increase of USD 36 billion per-year and creation of 4 million additional jobs by 2025.
5.   **Digitalize agriculture sector:** Provision of timely information, shared economy platforms and digital payments will significantly uplift the efficiency in the agriculture value chain.
6.   **Enable digital entrepreneurship:** Creating special economic zones for IT can create employment opportunities for an additional 100,000-300,000 knowledge workers in the country.
7.   **Extend the reach of broadband services:** Broadband is the oxygen of digital world and quickly addressing the supply-side of it can result in increasing our GDP by USD 10-15 billion per year.
8.   **Transform public services through "digital government":** This is a proven way of improving delivery of public services while at the same time, increasing transparency of the government.
9.   **Deploy public cloud and introduce open data:** Cloud adoption will dramatically increase the speed of ICT deployment while reducing cost and making data more secure.
10. **Adopt Artificial Intelligence (AI) for sustainable development:** This can result in an additional USD 250 million per year by capturing 3-5% of the services component of the global AI market.
11. **Implement a comprehensive national cybersecurity policy by adopting a risk-based approach:** It is imperative to have a comprehensive yet efficient security policy for the protection of critical data for the digital ecosystem to flourish.
12. **Establish a national center for development of blockchain technologies:** This new technology is already improving transparency, reducing inefficiencies and curbing pilferage in tax collection.

By executing this National Digital Program, the federal and provincial governments can develop and implement a comprehensive set of initiatives that can deliver significant growth in GDP, exports, contribution to the exchequer and broadening of the tax base. In addition, the National Digital Program will yield several societal benefits in critical sectors, such as health and education that will contribute to the overall uplift in the wellbeing of Pakistanis. The OICCI remains committed to serving Pakistan in the best possible way.

2 Pakistan – Current Status

Pakistan is considered among one of the major emerging global economies. On digital participation metrics, however, we are lagging behind regional economies. The Mobile Connectivity Index (MCI) for Pakistan is 34, which is well below the South Asian average of 38. India, Bangladesh and Iran, all rank higher than Pakistan, with scores of 38, 41 and 44 respectively[2]. The reasons attributed to Pakistan's below-average performance are relatively low connectivity infrastructure, lack of affordability due to low-income population, low digital literacy of the population and unavailability of relevant local content. Together, these enablers define the ecosystem that is necessary for creating the right balance of supply and demand for digital products and services.

2. GSMA, Connected Society, 2016

Similarly, World Economic Forum's (WEF) Global Information Technology report ranks Pakistan 110 on the Readiness Index out of 139 economies surveyed in 2016[3]. Of the ten constituent factors of this index, those directly related to the availability and usage of ICT related services are particularly low for our country. In infrastructure and digital content, our rank is 126, while on skills, we are at 127. Similarly, on individual usage of ICT services, Pakistan ranks at 123.

A more comprehensive benchmark is WEF's Competitiveness Index, which assesses the competitive landscape of 137 economies and ranks them in the context of productivity and prosperity. Of the 137 economies surveyed in 2017-18, Pakistan ranks at 115[4], below South Asia's average on all but 2 of the 12 measured components. A high-level implication of this widely respected benchmark is that in comparison with Pakistan, global players will tend to favor other South Asian countries for their investment dollar. The other take-away is a high degree of correlation between ICT readiness and competitiveness of an economy.

Whereas, this presents a humbling picture of our overall performance in all socioeconomic sectors, the potential to improve is immense. We are amongst the fastest growing mobile markets globally, with over 150 million mobile phone subscribers accounting for 73% teledensity. Our IT workers rank the highest in terms of number of freelancers globally and broadband users have grown from a mere 2 million to 58 million since 2014[5].

This represents a great untapped opportunity in our country. According to a recent report, there are still 156 million people without internet in Pakistan[6]. This makes our country one of the top 5 growth markets for the connectivity industry. As the focus of the vendor community shifts to the next growth frontier, prices are expected to come down further, making ICT related products and services more affordable for the low income population.

We have also seen a recent spate of innovation from private companies in Pakistan. Private sector companies are delivering the digital solutions that are providing a much-needed boost to the supply-side of the digital ecosystem. A few examples are as follows:

- Birth Registration – Telenor, since 2014, along with the government has been facilitating birth registrations using mobile text messages sent by authorized community members and health workers. This enables the ability of new citizens to be recognized officially and have access to healthcare and other services, thus making a huge impact.
- Smart schools – Jazz and the Federal Directorate of Education have introduced a digital learning platform through which 75 schools in Islamabad have benefited since February 2018. These schools offer educational digital devices, learning content and training and support to ensure that our youth can compete on the same level as students globally.
- Smart cars – In January 2018, Zong introduced the country's first 4G-enabled smart car solution which offers in-car diagnostics and a plug-and-play wireless hot spot.
- Language learning – Ufone, in 2015, began offering an SMS-based learning platform UEnglish, which provides students with daily English vocabulary lessons, developed by British Council, based on one-year course.

3. http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/
4. http://reports.weforum.org/global-competitiveness-index-2017-2018/countryeconomy-profiles/#economy=PAK
5. http://www.pta.gov.pk
6. GSMA, Mobile Economy Report, 2018

3   Global Trends

We are in the midst of one of the most significant revolutions in human history. Digital revolution is transforming the world as we know it, with an intensity not experienced since the industrial revolution in the 19th century and producing fundamental changes in all areas of modern life – including economy, society and governance.

More than 40% of the world population – about 3.2 billion individuals – currently use the internet compared to only about 400 million in 2000; and there are more than 5 billion mobile subscribers throughout the world compared to less than 1 billion at the beginning of the millennium[7]. The internet and mobile now serve as platforms for the development and proliferation of advanced technologies.

The digital economy is growing rapidly. It is estimated that its size has doubled between 2000 and 2016 and now estimated around USD 11.5 trillion globally[8]. All sectors of the economy, for example retail, transport, health, education, communications etc., are now benefiting from digital innovation. An ever increasing number of transactions and personal exchanges take place through global digital networks on daily basis. A rapid proliferation of connected devices is spurring advancements in machine learning that have application in residential and industrial uses.

The volume of information, created on these communication infrastructures, is unprecedented, making almost all the knowledge known to humans accessible anywhere on the globe. In 2012, it was estimated that 2.5 billion gigabytes of information is created every day and this rate has accelerated significantly since then[9].

Digitalization also fosters business innovation and supports economic growth worldwide. The digital economy constitutes 22.5% of the global GDP and by 2020, is expected to grow by approximately USD 5.5 trillion to increase its share to 25% of the world economy[10].

The digital revolution has transitioned to a new stage in the recent years, with a strong interplay of social and economic applications. Four digital trends are developing concurrently, creating innovative business models and revolutionary digital work methods and changing the way each and every one of us experiences life. These trends are known as SMAC – Social Media, Mobile Devices, Analytics and Cloud applications.

Cloud

Cloud technologies consolidate various computer services and make them accessible to any person according to their needs, providing every person and organization access to powerful computers, unlimited storage and advanced services and software programs.

Social Media

In recent decades, social media has become the most dominant communication platform in the lives of people throughout the world, bridging huge geographic and cultural gaps.

Analytics

The scope of information has grown at an enormous rate and at a tremendous speed, and technologies for its analysis and for generating insights are becoming more sophisticated. This enables streamlining decision-making processes and the development of new services that are both efficient and customized.

Mobile Devices

The extensive use of smartphones and devices, along with the large amount of accessible information and the technologies made possible owing to them, are changing our lives beyond recognition, including the development of innovative business models. Smartphones also play a vital role in the growth of the Internet of Things (IoT).

7.   https://www.gsma.com/newsroom/press-release/number-mobile-subscribers-worldwide-hits-5-billion/
8.   Huawei, Oxford Economics, Digital Spillover - Measuring the Impact of the Digital Economy, 2017
9.   IBM, Bringing Big Data to the Enterprise, 2012
10. Accenture, Digital Disruption: The Growth Multiplier, 2016

One of the trends arising from the above forces is the pervasiveness of computer and communication technologies. Due to the rapid development of sensors, data processing and wireless communications, more and more physical items and abstract definitions are linked to the internet. In not-too-distant future, each object and machine (fridge, lamp, TV, etc.) will be connected to mobile devices through the Internet of Things (IoT). The IoT will increasingly enable capabilities like remote diagnostics, smarter energy consumption (the so-called smart homes) as well as safer traffic and transport management.

Advanced analytics and big data are also important trends. Considering the always-on lifestyle and growing volumes of information, it is important to find new methods and technological solutions to manage complex and voluminous data and benefit from their use. This is all the more important as data is not only growing more voluminous but also comes in greater variety and is often unstructured (e.g. audio and video). Greater volumes of data will bring along the need to change the nature of ICT solutions. While to-date data have been directed to programs for processing, in the future programs will be moving to the data[11].

Advanced analytics and big data enable real-time analysis of data. This will be a huge step forward from the existing model, where data processing has mainly been used to analyze past events. In the future, even predictive analytics will become increasingly important. It will make decision-making both in the public and the private sector smarter and more future-oriented, and allow for more intuitive and preventive service development.

Big data is linked to several other trends, such as open data. This refers to making non-personal public sector data available to everyone in a machine-readable format to enable automatic processing. The purpose of opening up data is for businesses to create new innovative products and services, for individuals to develop community services, analyze social trends or use the data for other individual or joint activities. Open data is, in turn, related to linked open data — a trend that enables different applications to use and analyze open data faster and in greater volumes, thus potentially improving the quality of management decisions. The use of big data, open data and linked open data requires more efficient privacy protection as well as increased analysis and take-up of privacy-enhancing technologies.

Similarly, augmented reality will make services and applications smarter by adding a digital information layer. Users can obtain relevant information about the surrounding world in real time through smart phones and obtain detailed information about various things like sightseeing, getting recommendations for cafes, museums, etc. Through rapid proliferation of smartphones, augmented reality has a great potential to bring additional value in education and culture as well as in law enforcement and other areas.

Revolutionary changes can also be predicted in the field of user interfaces, allowing for increasingly natural user interaction. Touch screens have already become the norm. In the future, an increasing number of interfaces will be based on sign, face and speech recognition technologies. The use of speech technologies, including speech synthesis, will increase. All these interfaces will make technology use more convenient and intuitive. Smart phones are already bringing these interfaces within the reach of global citizenry and with these phones becoming more affordable, will extend the reach to the margins of society across the globe.

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11. https://e-estonia.com/

4   Digitalization in Developed Economies

Countries, that have embraced the digital revolution, have taken action to integrate innovative technologies at all levels of society and the economy. Among them South Korea, Britain, Estonia, Sweden, Denmark, Norway and others have led this revolution and enjoy higher productivity, accelerated growth and enhanced quality of life for their citizens compared to other countries.

A study of their digital journeys reveals that they have followed similar goals while their national priorities and political structures have resulted in different trajectories and timelines. Each of these countries has sought to compete with other regional economies, while at the same time learning from the experiences of others.

The EU digital agenda is one of the seven flagship initiatives of the multi-year EU strategy, Europe 2020. The agenda seeks to exploit ICT potential to foster innovation and economic growth, by focusing on creating a shared digital market and eliminating barriers and geographic limitations to using e-commerce, increasing trust in internet use and its safety, promoting access to fast internet infrastructures to all populations, investing in R&D in ICT fields and fostering digitalization[12].

Part of the German government digital policy deals in digital infrastructures as well as the economy and employment in the digital age. The policy underscores, among other things, digitalization support to SMEs and various industries, fostering technological entrepreneurship, adapting workplaces and the labor force to the digital world, encouraging the development of communication infrastructures in the private sector and developing e-Health[13].

Australia's national program seeks to make the country a leading digital economy by advancing eight strategic objectives: Online government services; Laying a broadband network; Internet usage among businesses and organizations; Health; Online education; Remote work; Environment and Infrastructures; and Advancing outlying areas. The program also deals in seven enabling factors that will support advancement of the strategic objectives: Infrastructures; Digital skills; Identity and reliable/secure online communication; Safety and security using the internet; A supporting environment for the digital industries; Cloud services and Fostering open information and Big Data[14].

The foundation of the British program for "Digital Inclusion" is to impart basic skills for internet use, to increase motivation for its use and to strengthen trust in the internet. The main barriers identified for acquiring basic digital competencies among the population at large are access, knowledge and motivation. Also identified are several necessary steps for promoting digital inclusion, that include advancing programs at the country level, fostering inter-sector collaborations and improving tracking and measurement of digital literacy in the population[15].

One of the key goals of Estonia's national digital program is to improving the digital literacy level in the country, focusing on acquisition of basic skills and imparting advanced competencies in order to improve employment status. The Estonian program also stresses access, knowledge and motivation barriers of excluded population groups, and identifies that most of the factors are controlled by government entities through infrastructures, teachers, imparting abilities and strengthening the use of online government services[16].

Denmark identified the digital field at an early stage, such that the first strategic program was already formulated in the beginning of the millennium, and a new program is developed every few years since then. Accordingly, the challenges Denmark faces require different goals when formulating a national strategic program. Digital Welfare, the current program, focuses on harnessing digital to advance the social welfare field in Denmark. The program aims to accelerate the use of ICT tools with the goal of improving service to the public, particularly in healthcare for the elderly, social services and education[17].

In 2012, the British Government launched Digital by Default initiative. The program stresses making services digital by a transition to services that are available, direct, convenient and online so that all those who can use them will choose to do so as the "default". Thus for example, a government portal was built (Gov.uk) that consolidates all government services under one address[18].

12. European Commission, The EU explained: Digital agenda for Europe, 2014
13. DE.DIGITAL, Digital Strategy 2025, 2016
14. https://www.dta.gov.au/
15. GOV.UK, Government Digital Inclusion Strategy, 2014
16. https://e-estonia.com/
17. https://en.digst.dk/policy-and-strategy/digital-welfare/
18. U.K. Cabinet Office, Government Digital Strategy, 2012

5   Strategic Objectives for Pakistan

Pakistan has been slow to adopt digital technologies and to benefit from the advancements in ICT. Part of the reason, as identified by GSM, is low income levels in the country that leaves little or no disposable income for average consumers to spend on ICT products and services[19]. It is important to highlight that a short-term focus by successive governments has led to an environment that has not attracted long-term investments in the sector. The current government's stated manifesto[20] bodes well for the ICT industry and it is encouraging that developing the ecosystem is a major priority for the government.

As a first step, the underlying goals of our digital transformation may be outlined under the following three pillars:

1.   Reducing socioeconomic inequalities amongst citizenry
2.   Accelerating economic growth
3.   Smart and efficient governance

19. GSMA, Country Overview: Pakistan, A Digital Future, 2017
20. PTI Digital Policy, 2018

Digital Pakistan Vision

Pakistan will leverage digital technologies and advancement in ICT to reduce inequalities in the society while simultaneously achieving greater economic growth and realizing smarter and more efficient governance.
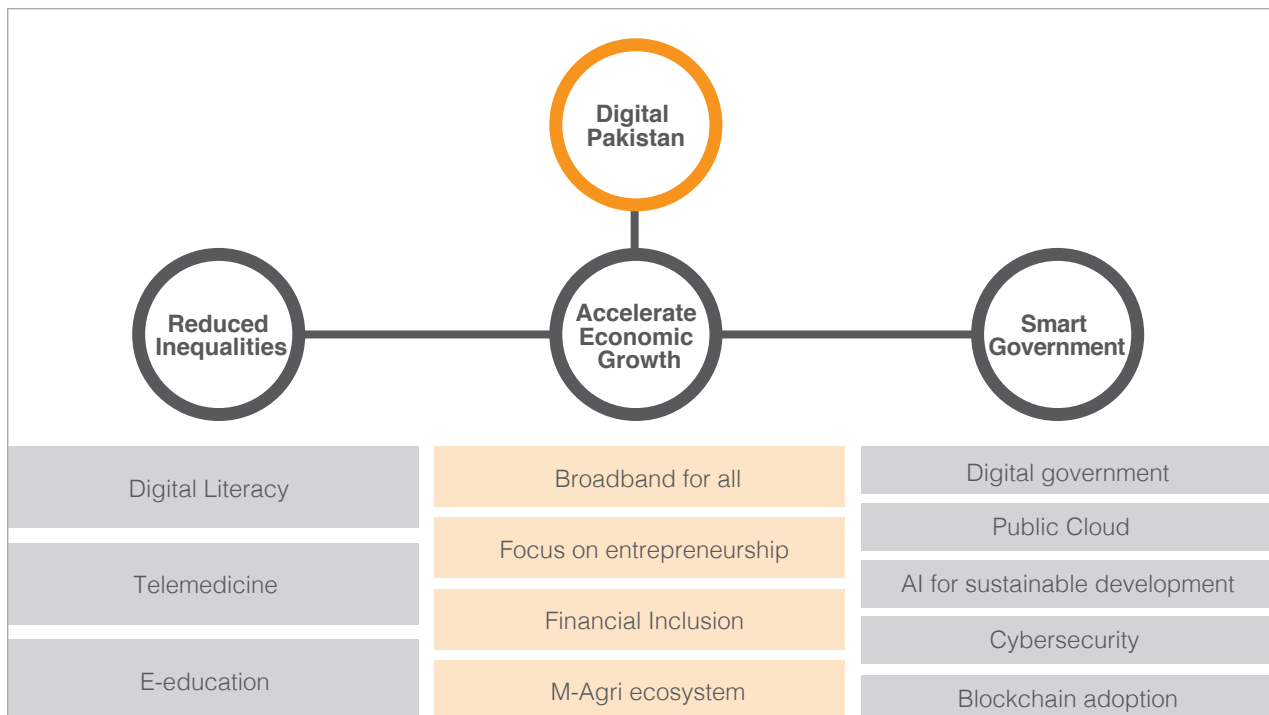
Next step is to define specific objectives under each of these pillars. While there are myriad possibilities available to us, we must take a phased approach of the sort seen in countries like Britain and Denmark. Both of these countries have focused on specific areas and have revised their digital programs at regular intervals.

Digital policies for the government are, thus, ongoing programs that need to be revised at regular intervals for two reasons. Firstly, to take stock of the progress as laid out in a particular phase, and secondly, to revise the priorities to keep up with developments and advancements in ICT.

Keeping in perspective the current developments in ICT and the fact that we have yet to take meaningful steps in that direction, we believe that the following objectives need to be prioritized and acted upon with a national sense of urgency.

1. Imparting digital skills to all future workforce in the country
2. Introducing telemedicine to public sector health units
3. Introducing distance learning (E-education) to public sector educational institutes
4. Extending the reach of broadband services
5. Encouraging entrepreneurship
6. Improve financial inclusion for the bottom of the pyramid
7. Digitalizing agriculture sector
8. Transforming public services through "digital government"
9. Deploying public cloud and introduce open data
10. Adopting Artificial Intelligence (AI) for sustainable development
11. Improving cybersecurity in the country
12. Establishing a national center for development of blockchain technologies

We can club these initiatives under the three strategic pillars as following:

Reduced Inequalities	Accelerate Economic Growth	Smart Government
Digital Literacy	Broadband for all	Digital government
Telemedicine	Focus on entrepreneurship	Public Cloud
E-education	Financial Inclusion	AI for sustainable development
	M-Agri ecosystem	Cybersecurity
		Blockchain adoption

Digital Pakistan

6   Reducing Socioeconomic Inequalities

6.1   Telemedicine

HealthHub, initiative of the Singapore Ministry of Health, is a one-stop online portal for Singaporean citizens and permanent residents who can login to check their latest health records, make appointments at public healthcare facilities and access personalized information "to lead a healthier lifestyle." It is available through web and mobile app, and can be accessed by logging on to the national digital authentication system, SingPass[21]. Additionally, the Integrated Health Information Systems (IHiS) is a subsidiary of the Ministry of Health that is tasked with developing and implementing innovative technologies in the healthcare sector.

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21. GSMA, Digital identities: Advancing digital societies in Asia Pacific, 2018

Some of their initiatives are:

- **Queue 1 Payment (1Q1P):** An integrated queue and payment system that optimizes patients' appointments and payments.
- **Outpatient Pharmacy Automation System:** A system that enables pharmacies to handle high prescription loads safely and efficiently.
- **Smart Health Video Consultation System:** A system that leverages video conferencing technology for remote consultations.

In Pakistan, the present government's manifesto recognizes the need to accelerate use of technology to improve provision of public services, especially telemedicine[22]. The benefits associated with telemedicine include a dramatic improvement in healthcare in rural communities. The variety of healthcare offering goes up with a simultaneous improvement in perception of quality. Recruitment and retention of physicians, which is generally an issue in rural areas, also undergoes significant improvement. In the absence of telemedicine, the rural health units would have to incur significant costs to build a similar capability, which would make it prohibitive for provincial governments to upgrade healthcare offerings uniformly in their jurisdiction. It is estimated that with an investment of around USD 45,000, government can save up to USD 500,000 annually per rural unit and still achieve a dramatic improvement in healthcare[23].

6.1.1 Policy Recommendations

a) To begin with, all public health facilities down to the basic health unit (BHU) level, should be connected to high-speed broadband within the next five years. This can be done in a phase-wise manner starting from the most marginalized areas of the country. Government can secure funding from the USF to subsidize telecom operators to achieve this goal within the recommended period.

b) All public health facilities should be equipped with telemedicine hardware and software. This can be deployed through hub-and-spoke model, with District Headquarter (DHQ) hospitals serving as regional hubs and Tehsil Headquarter (THQ) hospitals as sub-regional hubs. All basic health units should be part of this hierarchy to ensure that specialist care is available remotely to every citizen of Pakistan.

c) To facilitate patients belonging to the marginalized segments of the society, all patients' records must be digitalized and placed on a public cloud. Local software companies may be engaged to develop patient management systems and related applications to ensure that patient records are available at regional as well sub-regional hubs whenever required.

d) All public sector pharmacies should be managed through deployment of centralized ERP systems at provincial HQ levels. Local companies may be employed to develop such applications.

e) Bait-ul-Maal funding for poor patients can be governed through integration of patients' record with NADRA database. Disbursements can be done through online transactions facilitated by payment gateways and mobile wallets.

f) Funding for telemedicine development projects can be sought from the government-established Accelerate Fund as well as multilateral organizations.

6.2 E-education

Improving and bringing uniformity to the standard of education is a key priority for the current government. The Prime Minister has stated earlier about imposing an "education emergency" in order to rapidly increase literacy and human resource skillset if the country was to compete effectively in future with other regional economies. There is little arguing against the validity of such a statement.

The availability of online services in remote and underserved communities can be instrumental in expanding the quality and accessibility of education, training and broader civic engagement. This is especially true in the developing countries. A recent study found that across 12 African countries, 9 percent of people with mobile phones or an internet connection use them to access formal education services every day, and 33 percent use the internet at least occasionally to find free education content[24].

6.2.1 Policy Recommendations

a) As a first step, all public schools should be provided high-speed broadband connections. The government-established USF can be utilized to accomplish this in the earliest possible timeframe.

b) All public sector schools down to the Tehsil level need to be equipped with computer labs and those in the rural areas with affordable tablets and handsets.

c) At the provincial level, digital curricula along with e-learning applications with standard instruction for all levels till secondary education can be placed on public cloud. In effect, the virtual university model, with Khan Academy[25]-like engagement software, should be developed and deployed on the public cloud for primary and secondary levels, along with the availability of digital books, notes and guides.

22. PTI Digital Policy, 2018
23. Brian E. Whitaker, Estimating the Economic Impact of Telemedicine in a Rural Community, 2011
24. World Bank, Digital Dividends Overview, 2016
25. https://www.khanacademy.org/

d) Online content should be prepared in every national language and instruction medium be made interactive through software applications. Engagement with the local software and IT companies to accomplish the above activities will help create employment opportunities as well as development of skillset within the country.

e) Digital payments platforms should be utilized for payment of school fees and text books. As an example, in 2011 the Ministry of National and Technical Education (MENET) of Côte D'Ivoire's began collaborating with mobile money and digital payment providers to digitalize annual school registration fee payments for secondary school students, with no extra cost to the students[26].

6.3 Digital Literacy

The modern economy is evolving at a rapid pace. The skills that are required to power the new economy are also rapidly changing. As the digital space continues to be redefined at every step of the existing and evolving value chains, the workforce has to be upskilled continuously through comprehensive program of education and training courses.

New skills are in demand in this new economy coupled with the challenge that workforce will require regular reskilling to acquire both technical skills as well as professional or soft skills. It will become increasingly important for people to collaborate and adapt to the changing environment in order to stay relevant in the workplace. Technology will play a very important role in meeting this challenge effectively and to ensure that workforce remains competitive globally.

The challenge of reskilling is a global one. In the United States alone, there is an expected shortage of 2 million workers during the next decade. In Europe, a similar shortage is causing major problems for employers to fill vacancies[27]. In China, skilled labor shortage can reach a whopping figure of 24 million by the year 2020. A survey found that although 87% companies face shortage of skilled digital workers, only 46% of them are investing in trainings and human resource development of existing workforce to preempt the problem[28].

Resource gap of this nature creates two kinds of problems. In the short-run, there is lost opportunity caused by unavailability of qualified resources and in the long-run, these problems often cascade to create income gaps and socioeconomic inequalities.

Yet, simultaneously, it creates opportunities for labor-rich markets like South Asia, where expatriate workers have for decades been contributing towards much needed foreign exchange remittances. In fact, it gives Pakistan a unique opportunity to upskill manpower for the knowledge economies.

The government can aim to fill the supply-side shortage of digitally skilled workforce in our immediate neighborhood. Capturing a modest 5% of the demand from China alone can create employment opportunities for 120,000 knowledge workers while generating FOREX remittances of up to USD 600 million annually. Additionally, it provides us with the opportunity to diversify the skillset of our expatriate population and reduce the heavy reliance on Middle Eastern countries.

Fortunately, technology can be used to rapidly increase digital literacy at national level. Companies like Microsoft have helped many governments develop curricula and deploy solutions through cloud technologies in a cost-effective manner. Integrations of devices, software and online services have helped create powerful platforms that have helped governments educate students in other subjects as well.

6.3.1 Policy Recommendations

a) We recommend that the government starts by identifying skills that need to be inculcated in the young Pakistani workforce. This can be done in collaboration with the industry, academia and governmental and non-governmental organizations.

b) A second step would be to develop partnership with technology companies to quickly deploy integrated solutions and help distribute them efficiently across the country. Finally, oversight and monitoring at the highest level – e.g. the Prime Minister's Office – will help ensure success of the program.

c) Government should also encourage entrepreneurship through developing programs that teach technology worker basic skills required in setting up and running businesses. Technology can be used to help develop skills that enable our vast freelance workforce to advance further as successful entrepreneurs.

26. GSMA, Paying school fees with mobile money in Cote d'Ivoire, 2015
27. McKinsey & Company, Education to Employment: Getting Europe's Youth into Work, 2013
28. Capgemini Consulting, The Digital Talent Gap, Developing Skills for Today's Digital Organizations, 2013

7   Accelerate Economic Growth

7.1   Financial Inclusion

The widespread service availability of 3G and 4G cellular mobile services in Pakistan can now encourage mobile financial services to reach rural and unbanked population. Pakistan mobile money market is showing very rapid growth and as reported by State Bank of Pakistan (SBP) a sum of PKR 2,047 Billion (USD 20 Billion) was transacted in year 2016.

We have witnessed rapid developments and innovation in the financial technology (fintech) sector in the last decade. To some extent, our liberalized policies have enabled Pakistan to become part of this wave of innovation to bring the previously unbanked population within the fold of financial inclusion. People are now using mobile phones and network of agents around the country to send and receive remittances, allowing rapid increase in commerce and business opportunities to flourish in the country.

Pakistan is fifth most populous country in the world. Less than 20 percent of the population is formally banked, primarily due to poor infrastructure and illiteracy. The National Financial Inclusion initiative was introduced in 2015 to increase the penetration of branchless banking (BB). The initiative envisions a target of 50% of Pakistan's adult population and 25% of the total adult women population to have access to transactional accounts by 2020.

Since the start of this initiative, BB transactions have experienced steady growth. In the second half of 2017, 10 million accounts BB transactions took place in the country. Total value of the transaction was PKR 21 billion, while the share of m-wallet in the technology-based system expanded to 71%, according to a recent report of the State Bank of Pakistan (SBP). M-wallet (mobile wallet) share has crossed 70% mark for the first time in history, ending at 71% by the end of Oct-Dec 2017 quarter.

With 80% market still available, there is plenty of growth in the sector. According to a McKinsey study, financial inclusion can result in potentially adding USD 36 billion to our GDP by 2025 and result in creating 4 million additional jobs[29]. Ant Financial investment in Telenor Bank is a testament to the potential that exists in our market. We can expect that with the right kind of enabling environment, the value can actually exceed the forecasted projections.

We suggest that the State Bank of Pakistan (SBP) and Pakistan Telecommunication Authority (PTA) work together and in the following section, highlight some recommendations to accelerate the adoption of BB in Pakistan.

7.1.1 Policy Recommendations

a)   Introduce secure payment gateways in the country. This will further secure transactions taking place through online and BB channels and will increase trust of the consumers.
b)   Encourage inter-operability through establishment of third party service providers (TPSP). This initiative is already happening and by enabling TPSP; banks, telecom operators and Fintech companies will integrate their services seamlessly.
c)   Work with the banks and telecom operators to increase the adoption of Aasan Mobile Accounts. While regulatory requirements around opening and managing bank accounts are necessary, we believe that banks can leverage the reach of telecom operators to accelerate the process.
d)   Introduce an increasingly forward looking regulatory framework that puts Pakistan at the forefront of BB adoption. We have set some great examples recently and can further our march towards financial inclusion by utilizing regulatory sandbox mechanism to test out new capabilities.

7.2   E-Agriculture

An estimated 65% of Pakistan's population lives in rural areas with agriculture as their main source of income. This crucial sector of our economy also happens to be one that is affected the most by climate change. In recent years, rainfall has been unpredictable with alternating patterns of drought and floods. Water supply has been sparse at best and in recent days, has assumed a crisis-like situation. Rise in average temperatures and erosion of top soils is impacting yields. Seeds are mostly obsolete and new varieties of insects have increased the pesticide expenditure of the farmers. In addition to these problems, farmers either don't have information of or direct access to the market to get a fair share for their labor.

It is not a surprise, therefore, that many farmers are abandoning the profession of their forefathers and taking up labor jobs in cities and construction industry. This bodes ill for our economy in general and exports in particular. If left unchecked, the current trend may lead us down a path where we may have to depend on other countries for food supply. From being self-sufficient in food to being importers will be a drastic step backwards for the nation.

29. McKinsey&Company, Digital Finance for All: Powering Inclusive Growth in Emerging Economies, 2016

The advantages of transforming the agriculture sector in Pakistan, which accounts for 21% of our GDP, are immense. There are direct implications in terms of cost savings and additional yields when information and agricultural tools are available to the farmer in a timely manner. Moreover, digitizing payments in the value chain can serve as the entry point to financial inclusion because this sector employs around 62% of our population directly or indirectly[30]. Moving money through mobile wallet reduces costs, increases efficiency and transparency, and improves the safety of payments for agribusinesses and farmers. Globally, the direct revenue opportunity arising from digitizing business-to-person (B2P) payments and government-to-person (G2P) transfers in agriculture could potentially reach USD 2 billion and USD 200 million respectively in 2020. In addition, G2P has the potential to add nearly 360 million new mobile money accounts over the same period[31]. The fact that these revenues will be well-documented can help government bringing a portion of this important sector into the tax net.

A significant and sustained effort from provincial governments will be required to achieve this end. Technology can be a potent enabler for farmers and can play an important role in many areas. The following section highlights some recommendations to modernize this critical economic sector.

7.2.1 Policy Recommendations

a) Information portals can be created to provide relevant information to the farmers quickly. Timely information on weather conditions, pest attacks, recommended seeds, fertilizers and commodity pricing can be provided via mobile phones to the farmers in local languages. Some of these initiatives have already been taken by telecom operators that can be scaled up through government funding and subsidy.

b) Remote sensing technologies and IoT can be deployed to monitor water channels and weather conditions. The data, thus, generated can be analyzed through machine learning to predict environmental threats as well as opportunities. Integrating these technologies with information portals can further strengthen the relevance and timeliness of information being provided to the farmers.

c) Trading platforms that link farmers with seed providers, fertilizer companies, pesticide manufacturers and logistics companies will increase competition in the supply chain. On the demand side, the platforms can have buyers and exporters of the products with their orders that can be fulfilled either directly by the grower on intermediaries. The platform can be sponsored by supply chain players through ads and enabled by fintech companies for cashless transactions.

d) Finally, providing farmers with connectivity will get the information to the last mile. As literacy and income levels are much lower in rural areas, local content as well as subsidized mobile handsets may be provided to the farmers. This can be done through mobilizing USF and subsidized handsets can be acquired affordably through leveraging significant economies of scale. Funding from government-established R&D Fund can also be secured to create shared-economy mobile applications for farmers that enable them to rent machinery and equipment from each other.

7.3 Entrepreneurship

Municipal authorities in China helped create Special Economic Zones (SEZs), which increased Foreign Direct Investment (FDI) through firm relocation into their territories. With heavy investment in the targeted municipalities, the SEZs achieved economic growth and wage increase. Municipalities with multiple SEZs have experienced larger effects than those with only one SEZ[32]. Singapore is a mature market for e-commerce with well-developed infrastructure and a high-income, digitally savvy population. The government's integrated and holistic approach along with their alignment with industry, makes Singapore a model for others to emulate in creating a business-friendly environment and a culture of innovation and progress, especially for small businesses.

Previously, through various policy documents, need has been highlighted for establishing special Technology Parks with incubators at various cities to promote efficient and cost-effective collaboration, digitalization, R&D, entrepreneurship and innovation. Some work has been undertaken to that effect but an integrated approach is needed to scale these indicatives up.

30. Economic Survey of Pakistan, 2017
31. GSMA, Market Size and Opportunity in digitizing payments in Agriculture Value Chains, 2016
32. The Journal of Development Economic , The economic impact of Special Economic Zones: Evidence from Chinese municipalities, 2010

7.3.1 Policy Recommendations

a) Encourage municipalities to compete with each other for the establishment of SEZ for ICT in their respective territories. To-date, this effort has been led primarily at provincial level with the pitfall that resource mobilization has been slow and is concentrated in a few cities. Given the urgency of creating employment opportunities for youth across the country, the government should empower the basic administrative unit.

b) This can be done through allocation of resources in a phase-wise manner – e.g. starting from provincial capitals and then to district headquarters, followed by Tehsil headquarters. There is a dire need to do this urgently given the imminent problem of youth bulge and associated social ills.

c) Establish public-private partnerships to enable technology companies to contribute while creating business opportunities for them. Government-established USF and Accelerate Funds can be mobilized in order to do this most efficiently.

d) Develop seed funding for entrepreneurs and incubation setups. There is a critical deficit in the funding ecosystem at the moment in Pakistan, while our neighboring economies have made far greater progress in this area. Financial and Banking regulators must be engaged with the goal of increasing the volume of seed funding sector by at least 10x in the following five years.

e) Establish next-generation technology incubators to address local challenges faced by start-up companies in our country. There has been some good work recently in this area and various accelerators have been set up with the support of private companies. This initiatives should be scaled up rapidly and once again, the ambition should be to increase incubators by at least 10x in the following five years.

7.4 Broadband for All

Broadband is termed as the oxygen of digital world without which the digital ecosystem cannot flourish. We see that even developed countries with very high broadband penetration are not resting on their laurels and continue to improve the speed, quality and coverage of their national broadband networks. In U.K., the government is "supporting investment to provide superfast broadband coverage to as many premises as possible beyond the 95% level achieved in December 2017[33]".

Various studies have found a credible link between increase in broadband penetration and GDP growth. One survey suggests that 10% increase in broadband penetration rate in developed countries lead to an increase of 0.25 – 1.21% in national GDP growth[34]. Other studies have found a higher impact in growing economies. For instance, a recent World Bank publication[35] suggests that the corresponding GDP growth rate is 1.4% for low-income economies[36].

Broadband penetration in Pakistan is only 29%[37] compared with overall teledensity of 73%. Several factors are responsible for this slow uptake. Unlike more developed countries, the wired infrastructure in Pakistan is lacking and resultantly, the instrument of growth is wireless broadband.

For wireless broadband to grow, radio spectrum needs to be made available at affordable prices to telecom operators. A recent study suggests that the cost of spectrum as a proportion of revenue was around 2.5 times higher in developing countries than in developed[38]. This is particularly true for Pakistan where spectrum prices have been going up consistently, owing to the artificial scarcity being created by the authorities.

This reality becomes stark when we study the amount of spectrum being made available in Europe and even developing Asian economies like Malaysia. The amount of spectrum that has been made available for mobile broadband in Pakistan is half of that in Malaysia[39]. Holding back on spectrum in densely populated country like Pakistan does two things – it compromises the user experience and it drives operators to pay exorbitant prices for spectrum, hence aggregating the benefits of such awards disproportionality in favor of the governments. Conversely, recent auction results in developed countries and even developing Asian countries like Malaysia show that governments are accelerating availability of spectrum at affordable prices so that the benefit goes to the consumer.

A second factor that has contributed to slow uptake of mobile broadband is the issue of right-of-way (RoW). The authority to determine RoW in Pakistan is delegated to local governments, e.g. Tehsil Administration, Cantonments and Housing Authorities etc. There is absence of central policies at provincial and federal level, which makes rules, regulations and fees a very fragmented affair to deal with. Consequently, telecom operators face many difficulties administratively as well as escalating trend in fees due to lack of harmonization. The government made an attempt to address the RoW issue in the National Telecom Policy[40] but there is no progress even after three years of issuance of the policy.

33. GOV.UK: Broadband Delivery UK (https://www.gov.uk/guidance/broadband-delivery-uk)
34. ITU, Impact of Broadband on Economy, 2012
35. The World Bank Group, Exploring the Relationship between Broadband and Economic Growth, 2016
36. Qing et. al., 2009
37. http://pta.gov.pk (October, 2018)
38. GSMA, Spectrum pricing in developing countries, July 2018
39. MCMC, Spectrum Plan, 2017
40. Government of Pakistan, Telecommunication Policy, 2015

Thirdly, the issue of affordability has put smartphones out of the reach of many Pakistanis. The majority of our population lives in rural areas with much lower income than urban population. A nominal smartphone costs around PKR 4,000, which is well above mean income of rural population.

Finally, the issue of exorbitant taxation has been a major impediment to mobile internet usage in Pakistan. Historically, the mobile industry has contributed over 30% of total revenues towards taxes and regulatory fees, thus making it as one of the highest taxed country in the world. These taxes are not limited to only services, but rather are extended to custom duties on mobile handsets, SIM Sale and provincial taxes. These taxes not only put pressure on prices for consumers, but constricted operators' ability to extend and upgrade network infrastructure. Historically, taxes have accounted for more than one-third of the total cost of mobile ownership, the highest level observed in Asia Pacific[41].

There have been some positive developments recently with taxation that are already increasing the momentum of broadband growth in Pakistan. It is foreseeable that the gap between teledensity and broadband penetration can be eliminated within a period of three years, thus, resulting in over 5% growth impact on our GDP. For this, the government will have to carry out reforms that have had a proven impact in other economies. In the following sub-section, we will discuss policy-level reforms to help us close the gap on broadband uptake in our country.

7.4.1   Policy Recommendations

a)   More spectrum for broadband internet should be made available immediately to operators. The European Commission's (EC) spectrum strategy should serve as a benchmark for us. Even achieving half of EC's target will go a long way for Pakistani economy and digital enablement.

b)   Spectrum pricing should follow best international practice rather than revenue maximizing tool for the government. The prevalent model in developed countries is to auction adequate spectrum at low reserve prices.

c)   Spectrum auction proceeds go to the government as revenue – hence, taxing it further is counterproductive and discourages investment.

d)   Spectrum sharing and trading should be allowed and made implicit to future auction terms.

e)   The government should proceed with a sense of urgency to conclude the public consultation process on RoW. The consultation process must be followed by a unified right-of-way policy nationally.

f)   All Tehsils, Cantonments and Housing Authorities must have same fee structures and should attempt to digitalize the approval process.

g)   Subsidized handsets should be made available in under/unserved areas of the country. Funds from USF can be mobilized to achieve this end.

41. GSMA Intelligence, Taxing mobile connectivity in Asia Pacific, 2018

8   Smart and Efficient Governance

8.1   Transformation to a Digital Government

Digital transformation is having a major impact on governments as organizations increasingly harness the power of the cloud and digital technologies to optimize their operations, transform their services, empower employees and engage citizens. As more government organizations around the world are realizing the benefits of digital transformation, they are inspiring others to begin their journey.

With a single username-password, French users can access around thirty (30) government services. Similar service is offered by the Australian government, where one username-password can offer federated authentication processes which links existing accounts and connections to new services. In Singapore, by using a single online portal and identifier-password, known as SingPass, users can access 270 different services from 58 government agencies. The utilization of SingPass is around 90%, with 80% satisfaction rate[42].

The world is seeing an increased focus on citizen engagement, as governments work to deliver intuitive services and reach out to citizens across an expanding range of touch points. This is an exciting area that will continue to generate new and innovative solutions, such as the Canadian City of Regina's portal to handle single sign-on for accessing city services and viewing public utility bills; or the Croatian Regulatory Authority for Network Industries' (HAKOM's) free-to-use and mobile-ready application to help users find the telecommunications tariffs and options that suit their needs[43]. HAKOM's story also brings the security of the cloud to the fore, as it chose not to host its app on its on-premise infrastructure due to security concerns, turning instead to a cloud based implementation model, which is certified in accordance with EU data regulations.

Government organizations are also harnessing ever-increasing volumes of data to produce actionable analysis, deep insights and better decision-making that is transforming the services they deliver. A great example is the Government of Estonia, which has embraced the cloud to support its national identity card, enabling it to provide service to Estonians wherever they are and to conduct more than 95% of its transactions electronically.

In Montgomery County, Maryland US, the government is working with farmers to voluntarily deploy sensors on their farms that help them operate more efficiently by measuring everything from ground temperatures to water and pesticide usage.

Bringing it all together, some governments are approaching each of these elements of digital transformation at once. Kent County Council in the UK is working with Microsoft to develop a new business model that reimagines public services. By harnessing the power of the cloud, the council is delivering collaborative solutions that enable its agencies to engage with citizens and provide high quality services to an aging population. At the same time, it is applying innovative mobile technologies in local communities to contextualize citizens' needs and preferences, provide relevant on-the-spot offers and access markets that were previously unavailable to it. As a result, Kent is reshaping governance in towns and cities, improving economic growth and reducing the demand on public services by helping citizens to take responsibility for some of their own needs.

These examples illustrate the impact that digital transformation is having on government now, and the tremendous potential it holds for the future as more government organizations begin their transformation journey. However, there are inevitable challenges to overcome. More than ever, technology is not simply adding capability; it's changing business models. It is vital that organizations seeking to transform have a clear vision of where they want to go and how they're going to get there. That means looking at their engagement strategy, putting the appropriate policy and practices in place, and enabling business intelligence based on accurate data and powerful analytics.

In many ways the path to digital transformation is less about capitalizing on new technology than it is about people and processes. Digital transformation requires leaders to embrace a different way of bringing together people and processes with those technology tools. It requires openness to re-envisioning traditional business models and acquiring the mindset of a digital company in terms of how they engage the citizens, empower the employees and optimize the operations to reinvent products and services.

We are already seeing an increase in new titles such as Chief Innovation Officer, Chief Digital Officer and Chief Analytics Officer as governments, such as the US Federal Government, commit to leading transformation at senior level, institutionalizing innovation in their organizations and driving technology to enable constant improvement to services and new ideas. The following section highlights some recommendations that have had a track record of success in various countries.

8.1.1 Policy Recommendations

a) Develop a central portal that delivers all government services to the citizens through simple online and mobile application interfaces.
b) Carry out a consultation process to provide access to resource data for application development.
c) In the consultation process, suggest key areas of budgets and policy execution data to be made available via open data initiative to improve governance.
d) Establish a digital program under the direct supervision of the Prime Minister of Pakistan.

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42. GOVTECH Singapore, Improving Lives, Supporting Businesses, 2016/17
43. https://www.hakom.hr/

8.2 Cloud as an Enabler to Digital Government

Most government departments are challenged with availability of up-to-date infrastructure. They have limited resources and lack advanced in-house skills to embark on the journey of digital governance and to be able to achieve it quickly. Hence, a growing number of government organizations are embracing cloud technology to enable a vast range of connected services that are optimizing government operations. Open Data and Big Data Analytics are having a noticeable impact and enabling more efficient operations and improved services to the citizens.

Cloud technology can help governments achieve various benefits. Some of these are highlighted in the following section.

8.2.1 Benefits of Using Cloud Computing in the Government

a) **Inter-Agency Collaboration for Greater Efficiency and Better Citizen Online Services:** Cloud computing enables more effective collaboration as agencies are able to easily share resources across institutions, allowing for greater efficiency, entrepreneurship and creativity in delivering public online services.

b) **Operational Continuity and Business Recovery:** With centralized data storage, management and backups, data retrieval and business recovery during times of crisis (e.g. natural disasters or other disruptive events) become faster, easier and more cost effective.

c) **Faster Deployment of Services:** Reducing the amounts of infrastructures required to be built and owned by government agencies reduces overall deployment times and shifts the focus from management of infrastructure to delivery of online services. Public ICT facilities and services can be tested and deployed quicker and maintained more cost effectively than if the government agencies will own and run unique computing facilities themselves.

d) **Greater Budget Control:** A utility-based "pay for what you use" model means that government agencies can purchase as much or as little resources as they need. Cloud scalability results in systems usage being dialed up or down throughout the year as required. Transparency of the utility-based pricing structure means that spending caps and alerts can be implemented to further assist in budget control.

e) **Decreased Spending on Legacy Infrastructure:** Deploying government online services in cloud infrastructure results in immediate reductions of large capital outlays for infrastructure and maintenance costs. More commodity solutions, including best of class services, are also made available to government agencies through cloud provisioning. The cloud first model enhances government ICT resilience and security as version upgrades to both hardware and software are managed by the cloud service provider.

In the following section, we have some policy recommendations that provide a framework for deployment of cloud based technologies in Pakistan.

8.2.2 Policy Recommendations

a) The government should adopt cloud as a preferred deployment tool (Cloud First Policy) for administration as well delivery of public services. The only two exceptions should be: (i) when special circumstance, e.g. sensitivity of data, requires otherwise, or (ii) when the alternative is more cost efficient.

b) Government should develop clear and enforceable data privacy regulations that are aligned with best global practices.

c) The framework should ensure that people have meaningful control over the control and use of their personal data.

d) The consent of the user should be a requirement in circumstance when data is being collected and used.

e) Data processing should be allowed in order to bring the benefits of big data to our economy.

f) For data processing, consent should not be a requirement unless such a processing has a significant impact on the individual's rights and interests.

g) All organizations in the country should have data privacy requirements to protect the rights and interests of their customers/beneficiaries.

h) The privacy requirements should not be so restrictive that they impede the development of data analytics used for public good in our country.

i) Cross-border data flow should be facilitated in order to reap industrial benefits of cloud computing.

j) Instead of having sweeping data protection laws, only classified sensitive data should be restricted to local hosting and development.

8.3   Artificial Intelligence for Good

Artificial Intelligence (AI) was long considered to be the most promising application of technology. The concept fueled many fantastical works of fiction. We are now arguably reaching a tipping point where the advancements in computing and connectivity technologies are making this promise a reality.

Companies like Amazon, Apple and Google are building devices that use voice recognition to bring AI into household applications. Self-driving cars are being piloted in various countries and companies like Airbus will soon be prototyping autonomous air taxies built on intelligent platforms[44].

Healthcare applications are already in use to help detect errors and deviations from best clinical practices in the hospitals of developed countries. Environmental applications are being used through integrated use of connected devices and data analytics to manage disasters and manage natural resources more efficiently.

The Cloud, combined with significant progress in techniques to analyze massive amounts of data and draw insights, can be used to enhance every decision and process. Together, these advances have enabled great leaps forward in AI technologies that are giving our digital devices and systems everything from mobile phones to automobiles, airplanes and computers — the ability to perceive, learn, reason and make recommendations.

Simply put, AI is computational intelligence, a tool that is valuable in helping humans complete tasks and make decisions in a quicker and more effective manner. Just to highlight the speed at which AI can complete tasks, Microsoft's AI system can translate the English-language version of Wikipedia into another major language in less than one-tenth of a second, or the time it takes to blink an eye. It has also learned the ability to process human speech to the same level as a human and provide for real-time translation of conversations.

AI technology available today can already save thousands of lives and improve the performance of many systems. Key opportunities include healthcare, transportation, education, agriculture, manufacturing and accessibility for those with special needs. In healthcare, AI can reduce hospital readmission, enhance the quality of care for managing chronic disorders, and keep hospitals safe and efficient. An Institute of Medicine study from May 2016 estimated that preventable errors in hospitals are the third leading cause of death in the US, trailing only heart disease and cancer. AI systems can be developed to catch errors by recognizing anomalies in best clinical practices, saving thousands of patients per year.

AI can also enable new approaches to existing challenges such as cancer research. Microsoft researchers are collaborating with biologists, radiologists and other medical experts to use advanced computational methods to understand the behavior of cells and their interaction, which will help to "debug" an individual's cancer and provide personalized treatment.

8.3.1   Policy Recommendations

Government should consider solving critical problems being faced by the country by building a comprehensive strategy to leverage AI as an enabler. A detailed AI country plan should be formulated on priority with the following goals in mind:

a)   Position Pakistan as an AI excellence-hub for the world and export AI skill. By just capturing 3-5% of the services component of the global AI market, we can potentially increase our exports by additional USD 250 million per-year.

b)   Leverage AI as enabler to solve critical problems around healthcare, agriculture, water, law & order, education etc.

8.4   Ensuring a Secure and Reliable Infrastructure

Data security and privacy form the fundamental ingredient to build users' trust in digital services. As data is stored and processed without borders, a combination of internationally standardized approaches, national legislation and industry action may be considered for necessary safeguards. Service and technology-neutrality may be ensured by the regulators while drafting these regulations, so that the rules are applied consistently to all entities which collect, store and process data.

As cloud computing gives rise to powerful new capabilities, it offers the potential to increase productivity and innovation, reduce costs, and drive new levels of security and resiliency. The last two are particularly important, as the ever-increasing connectivity has created new ways for malicious actors to attack or commit crime against people. To be effective, our online defenses need to embrace the security advancements offered by cloud computing, from scalability and geographic replication to the use of machine learning and other innovations.

44. The Guardian, Air taxies: we have a lift off…, 4 Mar 2018

Cloud computing represents a seismic shift from traditional computing, not just in what it enables, but in how it is built, managed and used. To address the risks and threats of the cloud computing era, governments will need to upgrade existing security programs and policies and enhance current approaches to ensure the security and resilience of their systems.

The government must play a central role in developing and implementing national security policies. A continuously evolving approach will ensure that we remain abreast of the innovation in this critical area. In the following section, we will make some policy recommendations that will help minimize security threats to the data of our citizens.

8.4.1 Policy Recommendations

a) A risk based approach should be adopted based on a thorough understanding of the risks and vulnerabilities faced by the country.

b) In adopting the risk based approach, the government should focus on the most important security assets in the country, with a clear realization that a certain degree of risk will always remain in less important areas.

c) A data classification system must be implemented for the cloud based on sensitivity levels and risk profiles. In doing this, the government will identify the most important and least sensitive data and the implementation of commensurate control level will ensure cost effectiveness of the effort.

d) Baseline security measures should be established on public and private entities through regulatory requirements. Best international practices can be adopted for the most efficient implementation as well as international harmonization.

e) The regulatory framework should be outcome focused rather than approach focused. Government policies should articulate what needs to be achieved rather than how it should be implemented. This will ensure variability of architecture and give organizations the flexibility to adopt practices that best suit their needs and classification levels.

f) A common compliance model for critical information infrastructure should be developed as opposed to developing minimum security standards for individual sectors. The government should seek to harmonize approaches by developing overarching security compliance model for critical information infrastructure. To address specific risks relevant to a particular industry only, smaller subsets of additional requirements should be implemented to address their unique environment.

g) The government should collaborate with academia and private companies to establish effective coordination mechanisms for information sharing and security protocols. Public-private partnership is the most potent working model to adopt best international practices for mitigating short-term as well as long-term threats.

h) Threats to cyberspace are not limited to national borders; hence, it is increasingly important that our efforts are coordinated with other national cybersecurity agencies. Global standards for national cybersecurity should be leveraged keeping in mind the goals for harmonization and efficient implementation.

8.5 Blockchain

Businesses and governments never operate in isolation. They are equal participants in the overall economy. Information on ownership of assets, tangible as well as non-tangible, passes across various interconnected networks. Network participants keep their own ledgers, recording all assets they own and updating them at the time of asset transfer. This process is antiquated not very efficient, often carrying a higher cost of maintenance than a digitally automated system.

Blockchain offers a unique and innovative architecture that gives participants the ability to update a shared ledger whenever a transaction takes place. The visibility of the ledger can be limited based on user classification through cryptography techniques, ensuring that the transactions are secure and verifiable. The architecture gives the flexibility to embed the actual nature of the contract in the transaction as well as control the extent to which the data is shared, bringing great degree of transparency in the environment. The whole environment can be subjected to government oversight and audit requirements, making the architecture highly implementable in public domain.

Governments have recently started applying blockchain technology in the public domain, especially to check tax fraud. Thai Revenue Department is testing the use of blockchain to help verify VAT invoices and eliminate claims that are not genuine. The department is planning to test applications of other emerging technologies like machine learning, AI and Big Data to prevent tax evasion[45].

China had applied this concept earlier when Shenzhen National Taxation Bureau partnered with internet giant Tencent to use blockchain in order to prevent tax evasion. The project is aimed at using this technology to create invoices digitally on the blockchain platform as proof of purchase for goods and services for the purpose of combating fake invoices[46].

45. Bangkok Post, Blockchain undergoes tests for tracking VAT payments, 3 Dec 2018
46. Coindesk, Chinese City to Use Blockchain In Fight Against Tax Evasion, 25 May 2018

8.5.1 Policy Recommendations

The government should consider forming a "National Centre for Blockchain" that would speed up the adoption of blockchain to address issues of non-transparency and mal-intent in the public domain. The charter of National Centre for Blockchain may include:

a) Tackling tax evasion and digitalizing invoices for goods and services liable to GST
b) Creating wealth records that can be shared in public domain for the purpose of verifying authenticity and collecting taxes
c) Enabling citizen identity services – e.g. single view of citizens for:
    i. Financial Services (KYC, ECIB, Tax Filing, etc.)
    ii. Medical (health records, vaccination, etc.)
    iii. Education (certificates, degrees, etc.)
    iv. Housing (asset, address, etc.)
    v. Utilities (consumption patterns, services, payments, etc.)
d) Enabling data sharing amongst government departments
e) Implementing transparent regulatory control for businesses

While there could be several other initiatives around blockchain, above are the ones which are closely related to improving governance and providing more transparent public services.

9   Implementation of the Program

It is apparent from the discussion in the previous sections that the national program for digital transformation will cut across various governmental organizations. For instance, a successful telemedicine implementation across the country will require working with provincial health ministries, technology companies and multilateral organizations for policy formulation and on-ground execution. Digitalizing agriculture sector will involve effective coordination between provincial agriculture ministries, meteorological departments, supply chain vendors and technology companies. Implementation of a public cloud initiative will require active input and involvement of cybersecurity arms of the state institutions, legislature, academia, financial institutions, telecommunication companies, the State Bank, PTA etc.

Governments internationally have adopted various models but the complexity involved has required creating federal agencies for the implementation of digital programs. This aspect is recognized by the current government. PTI's manifesto on Digital Policy recommends setting up a Knowledge Economy Authority under the supervision of Prime Minister. While, we believe this will be a good step, bringing greater clarity to the scope and working of such an institution will be an important success factor for the program.

We recommend establishing a federal agency, Digital Transformation Agency of Pakistan (DTAP), tasked with implementing a national digital transformation program. The main goals of the agency shall be:

a)   Work with federal and provincial governments to invest in digital services
b)   Help transform the user experiences of services provided by public sector departments and agencies
c)   Work with the government, academia and private sector organizations to implement the transformation program and track return on ICT investments

The agency has to be structurally empowered to wield influence over federal and provincial departments. This can be done by having the agency work directly under the supervision of the Prime Minister. The roadmap of the National Digital Program can gain rapid influence if it's made part of regular cabinet meetings and steered with the help of ministerial-level committees. Cabinet can call upon the Chief Executive Officer of the Agency to provide regular updates on the progress of the program and highlight obstacles to a successful implementation.

The management team of the agency should consist of industry experts with proven leadership experience. The current government has highlighted the need for attracting the best Pakistani talent to staff public sector institution and setting up this agency can provide an opportunity to do the same. Focusing the scope-of-work on specific priorities will help achieve the defined goals. We recommend that over the next five years, the agency prioritizes the following objectives:

1.   **Develop a comprehensive roadmap**
      A good roadmap will provide clear milestones for digitally transforming government services and key socioeconomic sectors. The roadmap needs to be actively reviewed by the cabinet to recognize the progress made and to map out the subsequent steps needed to deliver the digital transformation agenda. The roadmap can also consist of domain-level project plans that will be steered by the relevant ministerial committees.

2.   **Deliver digital platforms and services**
      The agency will deliver platforms and tools that enable governmental organizations to provide public services digitally. This will include developing tools that improve the way people interact with the government and other organizations – for example, creating government portal, public cloud, digital marketplace for agriculture etc. The agency will also act as a custodian for these platforms.

3.   **Track progress and improve returns on ICT investments**
      The agency will provide oversight of all significant government ICT and digital investments. This may include tracking projects, assessing the cost effectiveness of the projects, coordinating procurement within governmental departments, and providing insights on whether the expected benefits of ICT projects are being realized.

4.   **Build Pakistan's digital capability and ICT competitiveness**
      The agency can help government raise the level of digital skills within their ranks. Technology is advancing at a rapid pace and the capabilities needed for transformation will need regular upgradation. To keep up with these changes, governmental departments need to develop staff with specialist digital skills. The agency can help improve the digital literacy of senior staff while also ensuring that existing staff have access to the tools and resources they need to deliver better digital services.

10 Summary of Recommendations

1) Telemedicine

   a)   All public health facilities down to the basic health unit (BHU) level should be connected to high-speed broadband within the next five years.

   b)   All public health facilities should be equipped with telemedicine hardware and software.

   c)   To facilitate patients belonging to the marginalized segments of the society, all patients' records must be digitalized and placed on a public cloud.

   d)   All public sector pharmacies should be managed through deployment of centralized ERP systems at provincial HQ levels.

   e)   Bait-ul-Maal funding for poor patients can be governed through integration of patients' records with NADRA database.

   f)   Funding for telemedicine development projects can be sought from the government-established Accelerate Fund as well as multilateral organizations.

2) E-education

   a)   All public schools should be provided high-speed broadband connection.

   b)   All public sector schools down to the Tehsil level need to be equipped with computer labs and those in the rural areas with affordable tablets and handsets.

   c)   At the provincial level, digital curricula along with e-learning applications with standard instruction for all levels till secondary education be placed on public cloud.

   d)   Online content should be prepared in every national language and instruction medium be made interactive through software applications.

   e)   Digital payment platforms should be utilized for payment of school fees and text books.

3) Digital Literacy

   a)   Identify skills that need to be inculcated in the young Pakistani workforce.

   b)   Develop partnerships with technology companies to quickly deploy integrated solutions and help distribute them efficiently across the country.

   c)   Encourage entrepreneurship through developing programs that teach technology workers basic skills required in setting up and running businesses.

4) Financial Inclusion

   a)   Introduce secure payment gateways in the country.

   b)   Encourage inter-operability through establishment of third party service providers (TPSP).

   c)   Work with the banks and telecom operators to increase the adoption of Aasan Mobile Accounts.

   d)   Introduce an increasingly forward looking regulatory framework that puts Pakistan at the forefront of BB adoption.

5) E-agriculture

   a)   Create information portals to provide relevant information to the farmers in a timely manner.

   b)   Deploy remote sensing technologies and IoT to monitor water channels and weather conditions.

   c)   Develop trading platforms that link farmers with seed providers, fertilizer companies, pesticide manufacturers and logistics companies.

   d)   Provide farmers with affordable connectivity through subsidized mobile handsets.

6) Entrepreneurship

a) Encourage municipalities to compete with each other in establishing special economic zones for ICT in their respective territories.
b) Establish public-private partnerships to encourage companies to invest in special economic zones.
c) Develop seed funding for entrepreneurs and incubation setups.
d) Establish next-generation technology incubators to address local challenges faced by start-up companies in our country.

7) Broadband for all

a) Release more spectrum for broadband internet at affordable prices.
b) Follow best international practice in spectrum pricing and availability roadmap.
c) Allow spectrum sharing and trading for more efficient use of this scarce resource.
d) Harmonize right-of-way fees and approval processes.
e) Provide subsidized smartphones in under/unserved areas of the country.

8) Digital Government

a) Develop a central portal that delivers all government services to the citizens through simple online and mobile application interfaces.
b) Carry out a consultation process to provide access to resource data for application development.
c) Suggest key areas of budgets and policy execution data to be made publicly available via open data initiative to improve governance.
d) Establish a digital program under the direct supervision of the Prime Minister of Pakistan.

9) Cloud Computing

a) Adopt cloud as a preferred deployment tool (Cloud First Policy) for administration as well delivery of public services.
b) Develop clear and enforceable data privacy regulations that are aligned with the best global practices.
c) The framework should ensure that people have meaningful control over the control and use of their personal data.
d) The consent of the user should be a requirement in circumstance when data is being collected and used.
e) Allow data processing in order to bring the benefits of big data to our economy.
f) For data processing, consent should not be a requirement unless such a processing has a significant impact on the individual's rights and interests.
g) All organizations in the country should have data privacy requirements to protect the rights and interests of their customers/beneficiaries.
h) The privacy requirements should not be so restrictive that they impede the development of data analytics used for public good in our country.
i) Facilitate cross-border data in order to reap industrial benefits of cloud computing.
j) Instead of a having sweeping data protection laws, restrict only classified sensitive data to local hosting and development.

10) Artificial Intelligence

a) Position Pakistan as an AI excellence-hub for the world and export AI skills.
b) Leverage AI as enabler to solve critical problem around healthcare, agriculture, water, law & order, education etc.

11) Cybersecurity

a) Adopt a risk based approach based on a thorough understanding of the risks and vulnerabilities faced by the country.
b) In adopting the risk based approach, the government should focus on the most important security assets in the country, with a clear realization that a certain degree of risk will always remain in less important areas.
c) Implement a data classification system for the cloud based on sensitivity levels and risk profiles.
d) Establish baseline security measures on public and private entities through regulatory requirements.
e) The regulatory framework should be outcome focused rather than approach focused.
f) Develop a common compliance model for critical information infrastructure as opposed to developing minimum security standards for individual sectors.
g) Collaborate with academia and private companies to establish effective coordination mechanisms for information sharing and security protocols.
h) Threats to cyberspace are not limited to national borders; hence, it is increasingly important that our efforts are coordinated with other national cybersecurity agencies.

12) Blockchain

a) Establish a national center for blockchain to accelerate the adoption of this technological advancement.
b) Develop solutions to help tackle tax evasion.
c) Create wealth records that can be shared in public domain.
d) Develop citizen identity services that provide a single view to the consumers for the following:
    i. Financial Services (KYC, ECIB, Tax Filing, etc.)
    ii. Medical (health records, vaccination, etc.)
    iii. Education (certificates, degrees, etc.)
    iv. Housing (asset, address, etc.)
    v. Utilities (consumption patterns, services, payments, etc.)
e) Enable data sharing amongst government departments

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