

Special Section: Pakistan's Growing IT Exports and Tech Start-ups: Opportunities and Challenges¹

Information Technology (IT) sector presents an opportunity for developing economies to leapfrog due to its transformative nature and lower entry barriers. IT facilitates this transition by improving efficiency and productivity across public and private sectors, potentially benefiting nearly all aspects of socio-economic life. However, IT-led leapfrogging depends on various factors such as the absorptive capabilities of individuals, businesses, and governments; effective coordination among stakeholders; availability and access to IT. The recent growth in Pakistan's IT service exports and tech start-up funding appear as emerging signs of digitalisation amid Pakistan's large young population alongside regulatory developments aimed at increasing digital adoption and online payments. Further benefitting from Covid-19, which led to increased demand for digital services, the growth in Pakistan's IT service exports averaged 24 percent between FY20-FY22, whereas start-up funding between CY21-CY22 reached around US\$ 709 million compared to approximately US\$ 100.8 million in CY19-CY20. However, to continue this trajectory and benefit from the transformative impact of IT, the digitalisation of the economy has to be prioritized across public and private sectors with a focus on bridging the increasingly noticeable human resource gap in the sector, providing a facilitative environment for investment in local start-ups, addressing the issue of availability and affordability of IT services, and the provision of cross-cutting technology and ancillary frameworks.

S1.1 Introduction

The Information Technology (IT) sector has a transformative impact on developed and developing economies. It is steadily becoming a key driver of economic growth and has been changing the structure of economies in many ways (**Figure S1.1**). This includes faster growth in capital and labour productivity; increased efficiency in traditional business operations; new opportunities for employment and entrepreneurship, especially for women and marginalised segments; fostering financial inclusion and financial sector development; and enabling knowledge spillover that stimulates innovation.²

Supported by the proliferation of telecom, internet and computing technologies, the growth in IT industry is being driven by two related but distinct categories that broadly encapsulate a wide and evolving field. The first, which forms the basics of IT led digitalisation, includes software production and its usage by individuals, businesses and governments. The second relates to broader digitalisation of economy via technology based solutions typically offered by start-ups that explore untested innovative ways of business models across various facets of economy and society.^{3,4}

¹ This special section draws on discussions with various public and private sector stakeholders including software exporting firms, relevant government bodies, incubators and start-ups from multiple sectors.

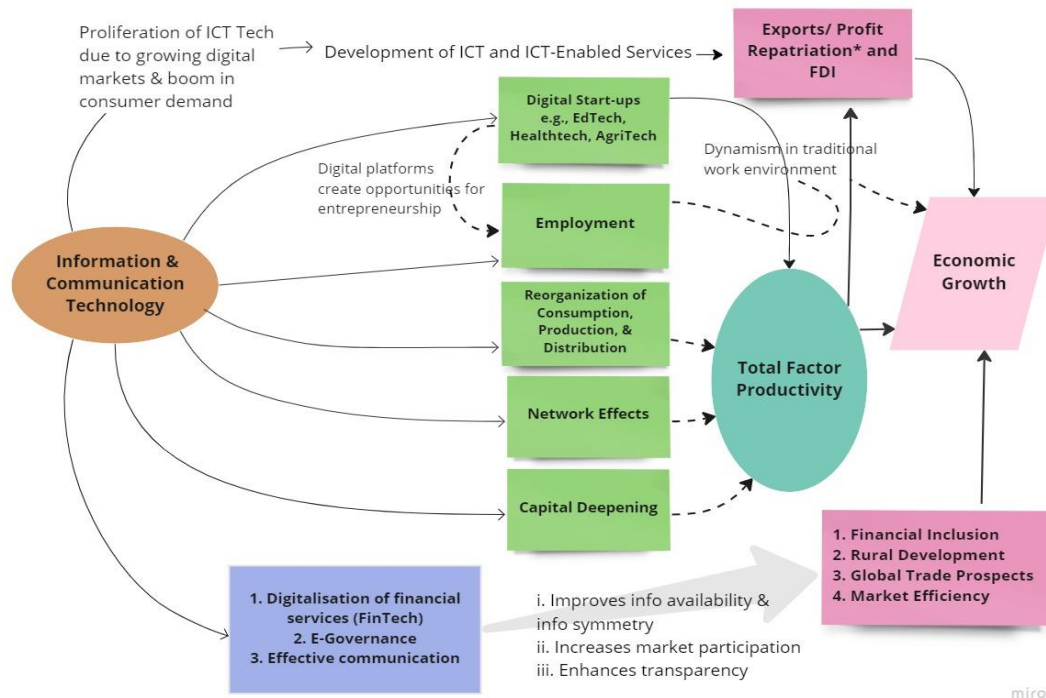
² Asian Development Bank (2010). *Information and Communication Technology for Development ADB Experiences*. Manila, Philippines: Asian Development Bank; T. Niebel (2018). ICT and economic growth: S. Asongu and B. Moulin (2016). The role of ICT in reducing information asymmetry for financial access, *Research in International Business and Finance*, Elsevier, vol. 38(C), pp. 202-213; W. Sutherland and M. H. Jarrahi (2018). The Sharing Economy and Digital Platforms: A Review and Research Agenda, *International Journal of Information Management*, vol. 43, pp. 328-341; C. Corrado, J. Haskel, C. J. Lasinio (2017). *Knowledge Spillovers, ICT and Productivity Growth*, Oxford Bulletin of Economics and Statistics, Vol. 79(4):

³ World Bank report (2022). *South Asia's Digital Opportunity Accelerating Growth, Transforming Lives*, Washington D.C: World Bank

⁴ The definition of start-ups is in want of consensus in academic and non-academic contexts. In this Special Section, the term is being used in the context of firms that explore new untested technology (or tech) based business models that disrupt the old way of economic organisation, production process or service delivery.

ICT's Impact on Economic Growth and Development

Figure S1.1



*Some Startups may scale up and invest abroad.

Source: SBP based on various papers cited in this special section chapter particularly: (a) J. Grace, C. Kenny, C. Zhen and W. Qiang (2004). *Information and Communication Technologies and Broad-Based Development*, World Bank Working Paper No. 12. Washington D.C: World Bank (b) M. Andrianaivo and K. Kpodar (2011). *ICT, Financial Inclusion, and Growth: Evidence from African Countries*, IMF Working Paper, Vol. 73. No.11, Washington D.C: International Monetary Fund (c) S. Asongu and B. Moulin (2016). *The role of ICT in reducing information asymmetry for financial access*, *Research in International Business and Finance*, Elsevier, vol. 38(C), pp. 202-213.

While there are certain commonalities between these two categories –such as need for programmers and coders, cloud storage and computing and digitisation of records – both are also quite distinct. Software and other IT firms can have large established players and SMEs, whereas tech start-ups are generally young firms with less than ten or even five years of operations. They are also distinct in their usage, application and intended impact. The former includes software production and design, software troubleshooting, software consultancy vis-à-

vis archetypical productivity-enhancing IT and software usage within existing business models. For example, generic or bespoke accounting or customer management software for financial or non-financial company.

The latter includes internet or telecom-based services – such as ride sharing solutions, e-commerce ventures, fintech, and education, agriculture and health technology solutions (edTech, agriTech and healthTech) – where the defining feature is a technology-based

product or business model that has been untested or little tested before. For example, an accounting mobile app that enables families and individuals to maintain easy to use household accounting ledgers connected directly with their bank accounts, credit card as well as credit bureaus for credit scoring.

Both these categories are also commonly known for different reasons. Software and other IT services have gained attention because of its growing share in international services trade, even though it is their usage in domestic economy across various sectors and operations thereof that leads to a transformative impact on economy. Start-ups have gained prominence due to the way they are disrupting old ways of economic and social organisation given the cross-cutting technology solutions they work on. While start-up services are also tradable across countries, they are typically tailored to their respective local environment at the time of their launch.

Globally, start-ups have also started using frontier technologies, i.e. new generation technologies which are reshaping industry and communication, paving the way for the fourth industrial revolution (4IR). These include Artificial Intelligence (AI), Virtual Reality, Big Data, the Internet of Things (IoTs) and other technologies that are being

built on the third industrial revolution that focused on IT and electronics.⁵ Unlike the previous revolutions, the pace of advancement of the 4IR is exponential,⁶ which implies that the opportunity cost for inaction or late action can be massive for developing countries.

The multi-faceted impact of IT sector therefore, has particularly persuaded developing economies to focus on IT as a development strategy because it provides an opportunity to leapfrog i.e. growth and development through adoption of latest technology in areas where earlier versions of technological means and methods were not adopted. Since IT alters the way consumers, producers, governments and citizens operate and interact with each other, increased focus on its production and usage - both domestic usage of IT and software services and expanding footprint of start-ups - helps bypass the traditional pathways to development; hence the leapfrog. Moreover, businesses and governments in developing countries are comparatively swift to switch to new technologies because they have no or relatively less sunk investments in legacy (i.e. older or soon to be outdated) technologies whereas IT sector has low entry barriers, making it an equalizing agent between individuals and countries.⁷

⁵ World Intellectual Property Organization website: (Available at: www.wipo.int/export/sites/www/about-ip/en/frontier_technologies/pdf/frontier-tech-6th-factsheet.pdf), Geneva: WIPO

⁶ K. Schwab (2016). *The Fourth Industrial Revolution: What It Means, How to Respond*. Fourth Industrial Revolution. Geneva: World Economic Forum

⁷ C. Perez and L. Soete (1988). *Catching up in Technology: Entry Barriers and Windows of Opportunity in Technical Change and Economic Theory*, Open Access publication from Maastricht University, Maastricht, Netherlands; K. Lee (2019). *Economics of Technological Leapfrogging*, working paper 17, United Nations Industrial Development Organization, Vienna: Austria; J. Manyika, M. Chui, P. Bisson, J. Woetzel, R. Dobbs, J. Bughin, D. Aharon (2015). *The Internet of Things: Mapping the Value Beyond the Hype*, New York: Mckinsey & Company

For governments, the growing prevalence of digital data repositories, telecom and internet, for example, opens new, effective and easily scalable ways to provide data driven policy and fiscal support. It also supports the private sector to leap frog; for instance, the internet has allowed farming communities and other marginalised segments of economy, such as women entrepreneurs, to by-pass the conventional brick-and-mortar way of retailing and directly venturing into web-based or mobile-app-based retailing (e-commerce & m-commerce). This is often across national boundaries as IT services exports and IT-enabled exports can flourish without capital intensive investments. Similarly, digital financial technologies (fintech) are fast tracking financial inclusion and digital financial payments in countries that have had significantly poor performance in brick and mortar banking networks and credit card penetration.

While the hardware aspects of IT remains prominent, a transformational shift from IT manufacturing sector to IT services has been witnessed recently. The move from a hardware to software-centric growth has been particularly pronounced in developing countries, due to declining costs of broadband internet, telecom services, and other new technologies that facilitate growth in both basic form of digitalisation i.e. software and software related services and wider form of digitalisation via start-ups.⁸

However, leapfrogging through IT-led growth and development depends on many enabling factors. These include absorptive capabilities of individuals, businesses and governments to learn, adopt and adapt to new technologies. This, inter alia, necessitates improving IT-focused human capital, wider digital literacy, and affordability of technology. Moreover, given the cross cutting nature of IT, the development of complementary technologies as well as rules and procedures in interlinked industries and sectors need to be upgraded to affect IT spillover and leapfrogging.⁹

In this regard, digitalisation of both public and private sectors of economy plays a critical underlying role as it directly impacts the addressable market for both domestic usage and exports of software, as well as start-ups. A large addressable domestic market provides a strong base for software firms to ultimately grow and cater to regional and foreign markets. Given the fast evolving nature of IT technology and that technological adaption is a continuous and cumulative process, the public sector has an important role to play. This includes improving coordination among stakeholders; increasing awareness and usage of sector-specific technologies; ensuring affordability and access to hardware and IT services, strong domestic demand for digitalisation;

⁸ *Measuring the Information Society Report 2018*, Vol.1, pp. 1-189, Geneva, Switzerland: International Telecommunication Union

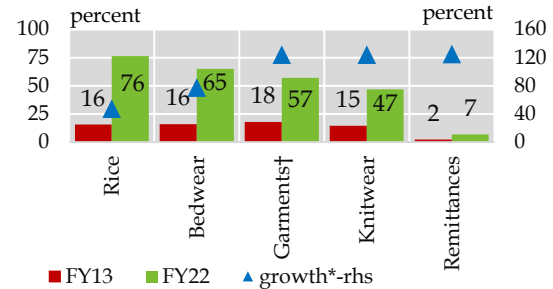
⁹ W.E SteinMueller (2001). *ICTs and the possibilities for leapfrogging by developing countries*, International Labour Review, Vol. 140, Issue No.2 ; M. W. L. Fong (2009). *Technology leapfrogging for developing countries*. Encyclopaedia of Information Science and Technology. Khosrow-Pour, Mehdi, ed. Information Science Reference, Hershey, Pa, USA, pp. 3707-3713.

availability of infrastructure, and provision of an enabling regulatory environment.¹⁰

In Pakistan, the recent growth in IT exports and start-ups appear as emerging signs of digitalisation. Driven by both enabling policies of the government and the central bank, availability of low-cost human capital, and the onset of the pandemic, both IT exports and tech start-ups have witnessed sharp growth in recent years. IT exports – mainly led by software and software-related exports - rose to \$2.1 billion in FY22 from \$0.89 billion in FY19 and \$0.29 billion in FY13. As a result, IT exports is increasingly becoming one of the leading foreign exchange earning segments of economy (Figure S1.2). Likewise, the size of funding and the number of deals in technology start-ups rose from around US\$ 37.5 million and 29 in 2019 to US\$ 347.4 million and 70, respectively, in 2022, led largely by international investors.¹¹

However, as discussed in next section, this growth stems from a negligible base. While software usage in domestic economy is uncommon, implying low level of basic form of digitalisation, the country's IT exports are dominated by small-sized software exporters most of whom export less than \$0.1 million a year. IT exports are not diversified, where the share of US alone is more than half. The

Figure S1.2
Pakistan's IT Exports as Percent of Other Foreign Exchange Earning Avenues



*Refers to growth in proceeds from above-mentioned export products and remittances between FY13-FY22
†Readymade

Source: State Bank of Pakistan

domestic tech start-ups on the other hand are concentrated in fintech and e-commerce that cumulatively accounted for 71 percent of total funding of all publicly reported deals between 2015-22.¹² Start-up activity as indicated by funding and deal count is not widespread across various sectors of economy, such as education, health and other sectors where digital transformation can have large positive externalities.

Moreover, both IT exports and domestic tech start-ups have substantially large room to grow. Even after such fast paced growth in recent years, Pakistan's share in global export of computer services is only 0.3 percent. Similarly, the start-up space still lags far behind regional and global players vis-à-vis

¹⁰ C. Xavier, D. Comin and M. Cruz (2022). *Bridging the Technological Divide: Technology Adoption by Firms in Developing Countries*. Washington, DC: World Bank; D. Suarez and E. Abdallah (2019) *Public Sector Readiness in the Age of Disruption in partnership with Seven Imperatives to Navigate your Journey to Readiness*, World Government Summit in partnership with PwC; J. Tanburn and A. D. Singh (2001). *ICTs and Enterprises in Developing Countries: Hype or Opportunity?* ILO Working Paper. Geneva: ILO

¹¹ Funding refers to an investment by any type of foreign or local investor in a start-up firm, usually against an equity stake in the firm, whereas deal refers to the number of funding transactions regardless of the size of funding. Investments by same investors in different funding rounds are reported as distinct deals.

¹² Source: Data Darbar

the presence of unicorns (start-up with \$1 billion valuation or more), venture capital (VC) funding and overall start-up ecosystem.

Lastly, the enabling factors needed for digitalisation are wanting. At the one end, human capital constraints have begun to emerge in the form of demand-supply gaps, skill-mismatch and inadequate quality of technical and soft skills. At the other end, low levels of basic literacy and weaker levels of digital literacy among population impairs absorptive capacity of technology.

Similarly, despite recent gains digital connectivity remains a challenge both in terms of access and usage as the cost of mobile phone devices and internet is higher in Pakistan compared to both advanced and peer economies and thus a constraint to potential digital transformation. From the perspective of underlying enabling technologies and frameworks such as cloud computing, strong cybersecurity and interoperability, policy framework has started moving in the right direction. However, in this regard, Pakistan is lagging behind peer economies.

Finance is another area that warrants attention, from the perspective of limited access to finance and fintech's current level of penetration in the face of low mobile money account ownership and the challenge of low levels of financial literacy. And while the country needs to improve significantly on e-government indicators to fast track digitalisation of economy that can increase the size of domestic market for software firms and start-ups, digital transformation

also ought to be made as top priority agenda alongside streamlining of sectoral policies and regulations.

With a focus on software exports and domestic tech start-ups within the broader IT sector, this Special Section is organized as follows. The next section discusses trends in Pakistan's IT exports and start-ups space, followed by Pakistan's comparison with regional and global players. Section S1.3 discusses the above mentioned enabling factors that have supported IT exports and start-ups thus far but are far from being adequate for digital transformation. The last section summarizes key insights and emphasizes the importance of enabling environment necessary for leapfrogging, which necessitates whole-of-the-government approach given IT's cross cutting nature.

S1.2 Trends in Pakistan's IT Exports and Technology Start-ups

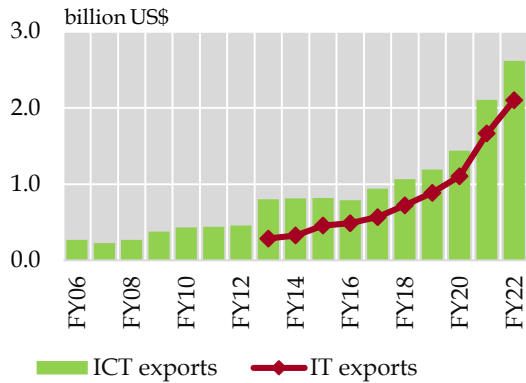
Pakistan's IT exports and technology start-ups have gained prominence in recent years. The former, led by software and software-related services, grew at a CAGR of 24.4 percent between FY17 and FY22, whereas the latter rose significantly during the same period, both in terms of deal count and in terms of funding.

IT Exports – Software and Software Related Services Leading the Way

In terms of export classification, IT is part of the larger ICT sector in Pakistan, which stood at only \$269 million in FY06 when reporting of ICT exports began as per BPM6 standard.¹³ It took more than 10 years before the country's ICT exports was able to cross

¹³ In line with Balance of Payments and International Investment Position Manual (BPM6), the classification 'ICT exports' is divided into three broad sub-categories: Telecommunication Services; Computer Services, and Information services. Each of these comprise different sub-categories that correspond to different nature of transactions as per the Purpose Codes currently adopted by the SBP.

Growth Trajectory of ICT & IT Services Exports Figure S1.3



Source: State Bank of Pakistan

the \$1 billion mark in FY18. However, the pace of growth accelerated sharply since then, with ICT exports crossing \$2 billion by FY21 and \$2.5 billion by FY22. (Figure S1.3). The share of ICT exports in total service exports increased from 7.2 percent in FY06 to 37.7 percent in FY22 which makes it the largest contributor of service exports.

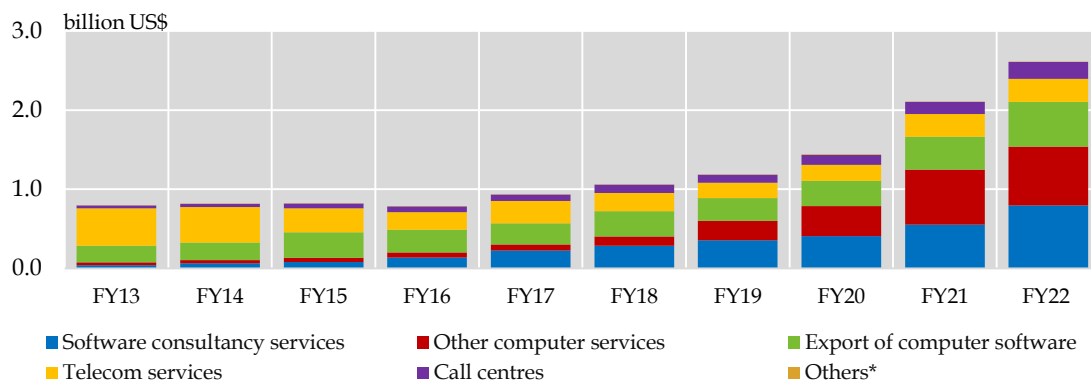
The growth in exports of Pakistan's ICT sector is mainly led by Computer Services (IT exports), which contributed 80.5 percent (or \$2.1 billion) of Pakistan's ICT services

exports in FY22 with the rest of inflows stemming from Telecommunication Services category (including Call Centres) and a negligible share of Information Services (Figure S 1.4).

IT exports as classified under the category Computer Services comprise five sub-sectors: (a) Export of Computer Software; (b) Software Consultancy Services; (c) Other Computer Services; (d) Hardware Consultancy Services; and (e) Maintenance and Repairs of Computers. Of these, software and software related exports - i.e. Exports of Computer Software and Software Consultancy Services - have the largest share in Pakistan's IT exports rising to 52 percent in FY22 from 32 percent in FY13, as a result of an increase from \$255 million to \$1.4 billion during this period.

However, these official statistics do not fully capture the share of software and software-related exports. By definition, the category of Other Computer Services also includes a host of unspecified hardware, software and software related services, of which, industry

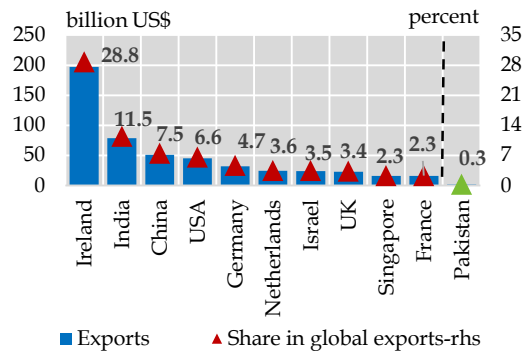
Breakdown of ICT Exports Figure S1.4



*Others include Hardware Consultancy Services, Maintenance & Repair of Computers, Information Services

Source: State Bank of Pakistan

Top 10 Exporters of Computer Services - 2021 **Figure S1.5**



Source: State Bank of Pakistan & International Trade Centre

estimates suggest, Pakistan mostly exports software and software-related exports since the country’s hardware industry is not as developed as software industry.¹⁴ Moreover, the official statistics of Other Computer Services also currently includes export proceeds (\$265 million in FY22) from Freelance of Computer and Information Services, which is also estimated to include software and software related consultancy exports by freelancers.¹⁵

Lastly, an additional \$1.5 billion of IT (including software and software consultancy) and IT-enabled exports was estimated to be in the grey market in 2019, which as per current industry estimates may have grown to \$2.5 billion by FY22.¹⁶ The

combination of these factors imply that total share of software and software-related exports in Pakistan’s IT exports may actually be higher than what is reported as per official classification.

Small Firms; Undiversified Markets

From the perspective of global trade, while Pakistan’s share in global exports of Computer Services remain small; it has increased from 0.17 percent in 2017 to 0.3 percent in 2021. (Figure S1.5) However, analyses of Pakistan’s export markets and firm-wise exports point towards substantial room for improvement.

In terms of export diversification, total IT exports are concentrated to a few markets where the share of USA has averaged more than 55 percent between FY13-FY22 (Figure S1.6). Moreover, while Pakistan’s exports to its top five destinations has increased slightly

Pakistan's Share in Computer Services Imports of its Top Export Destinations **Table S1.1**

Ranking	Top Exporters	2014	2021
1	USA	0.7%	3.9%
2	Singapore	0.1%	0.4%
3	UK	0.4%	1.4%
4	Ireland	0.0%	0.4%
5	UAE	9.6%	7.1%

Source: State Bank of Pakistan and International Trade Centre

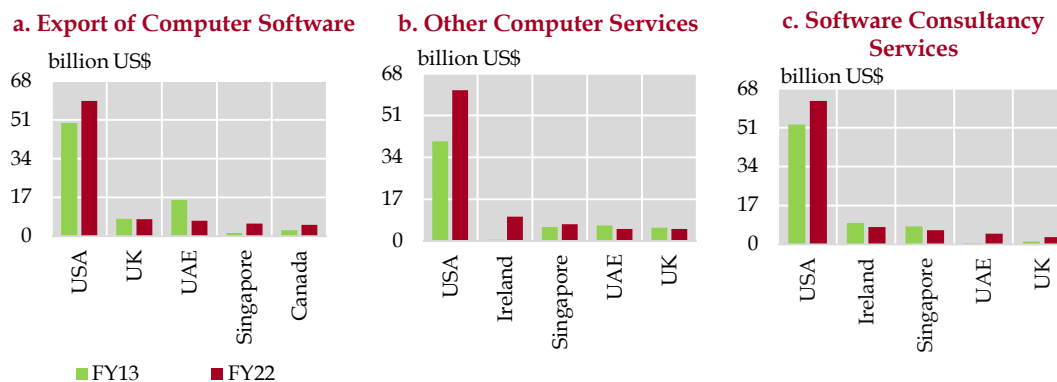
¹⁴ SBP’s purpose codes for services export classification are currently based on sub-sectors that have large inflows, and several hardware and software related services (identified in IMF’s BPM 6th Edition) that do not have large export inflows are currently clubbed as Other Computer Services. The full list of services included in other computer services may be reviewed at: (www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf page. 176-177 accessed on February 02, 2023)

¹⁵ Freelance of IT-enabled exports such as online tuitions, report writing and other services other than those related to computer and information systems are reported in a separate category-(Chapter 10)

¹⁶ State Bank of Pakistan (2019). Special Section: Performance of ICT Exports of Pakistan, The State of Pakistan’s Economy, First Quarterly Report 2018 – 2019, Karachi: SBP

Pakistan's Top 5 Export Destinations

Figure S1.6



Source: State Bank of Pakistan

in recent years (Table S1.1), its export share in the top importers of Computer Services remains negligible except for an increase in the share of US imports (Table S1.2). This underscores the need to explore new and other big markets.

Among the various reasons behind export market concentration is the existence of small IT firms that do not have adequate means to explore international markets, especially non-traditional markets (i.e. markets other than USA, UK, UAE) with which Pakistan does not have strong commercial or historical ties.¹⁷ Analysis of firm-wise data shows that more than 80 percent of firms in Pakistan export less than \$0.1 million and more than 90 percent export less than \$0.5 million per year.¹⁸ In terms of percentage of total receipts, relatively small firms contribute the most to total annual receipts in

Pakistan Export's Share in the Top Importers of Computer Services Table S1.2

Ranking	Top Importers	2014	2021
1	Germany	0.0%	0.1%
2	USA	0.7%	3.9%
3	China	0.1%	0.1%*
4	Singapore	0.1%	0.4%
5	Japan	0.0%	0.0%
6	France	0.0%	0.0%
7	Netherlands	0.0%	0.1%
8	India	0.0%	0.0%
9	Belgium	0.0%	0.0%
10	Sweden	0.0%	0.1%

* based on 2019 data

Source: State Bank of Pakistan and International Trade Centre

each of the major sub-categories of Computer Services (Table S1.3).

¹⁷ Pakistan's export market concentration is a structural issue affecting all sectors of the economy. The reasons for this concentration includes low level of export competitiveness and product diversification, and negligible investment in Research and Development (R&D) etc. (SBP website: www.sbp.org.pk/publications/staff-notes/SN-2-17-Export-Prefor-Pak.pdf and SBP website: www.sbp.org.pk/reports/annual/arFY16/Chapter-06.pdf)

¹⁸ NTN Reporting Firms.

Distribution of Firms by Size of Export Receipts - FY22

Table S1.3

Exports	Exports of Computer Software		Software Consultancy Services		Other Computer Services**	
	No. of	Cumulative	No. of	Cumulative	No. of	Cumulative
<0.1	769 (65)	19 (4)	3351 (80)	69 (12)	2185 (86)	38 (16)
0.1-0.5	237 (20)	56 (11)	643 (15)	143 (25)	281 (11)	60 (26)
0.5-1.0	84 (7)	59 (12)	124 (3)	85 (15)	32 (1)	22 (10)
1.0-5.0	69 (6)	146 (29)	84 (2)	156 (27)	32 (1)	56 (24)
5.0-10.0	8 (1)	50 (10)	5 (0)	32 (5)	2 (0)	15 (7)
10.0-50.0	7 (1)	120 (24)	5 (0)	97 (17)	1 (0)	40 (17)
>50	1 (0)	59 (12)	0 (0)	0 (0)	0 (0)	0 (0)
Total*	1,175	506	4,212	582	2,533	231

Figures in parentheses show percent of total. *The total may not match the official total figure as this figure

Soft information suggests that the existence of small firms in Pakistan may be attributed to a variety of factors including the nascent stage of domestic IT industry, the challenge of access to finance, increasingly evident human capital constraints, and insufficient domestic demand. While these are discussed in Section 3, it's important to note that although IT has garnered attention from the perspective of exports in Pakistan and in other developing economies, domestic software demand has an important role in fostering IT industry.

While countries like India and Ireland – top two global IT exporters – mainly benefitted from global demand, several other leading software exporting countries, such as both the earliest adopters of IT (Western European countries, and the US), and late followers (China, Brazil, Korea, and Russia) primarily thrived on strong domestic demand. This growth in domestic demand is partly supported by increased usage of IT by the government and government policy

interventions to drive IT consumption by domestic businesses and individuals.

This is because large domestic demand enables the typically small software firms to test their products, and gain competitiveness, scale and managerial capabilities, which readies them for international competition. Even in India and Ireland, demand for software by quality conscious domestic consumers, such as local multinational subsidiaries in financial and non-financial sectors, served as conduit for many firms to the export market. Moreover, India and Ireland have recently started focusing on domestic market digitalisation which includes plans for both increased usage of productivity-enhancing software by domestic businesses and increased frontier technologies' usage across the economy.¹⁹

Technology Start-ups

Pakistan's start-up ecosystem is still nascent but evolving, having grown manifolds in the

¹⁹ UNCTAD (2012). *Information Economy Report: The Software Industry and Developing Countries*, Geneva: UNCTAD; R. Heeks and B. Nicholson (2011). *Software export success factors and strategies in "follower" nations*, Competition & Change Journal, Vol. 8 No. 3, pp. 267-303; McKinsey Report (2019). *Digital India: Technology to transform a connected nation*, New York: McKinsey & Company; Government of Ireland website: (www.gov.ie/pdf/?file=https://assets.gov.ie/214584/fa3161da-aa9d-4b11-b160-9cac3a6f6148.pdf#page=null); European Investment Bank Report (2019). *The digitalisation of small and medium enterprises in Ireland Models for financing digital projects*, Luxembourg: EIB

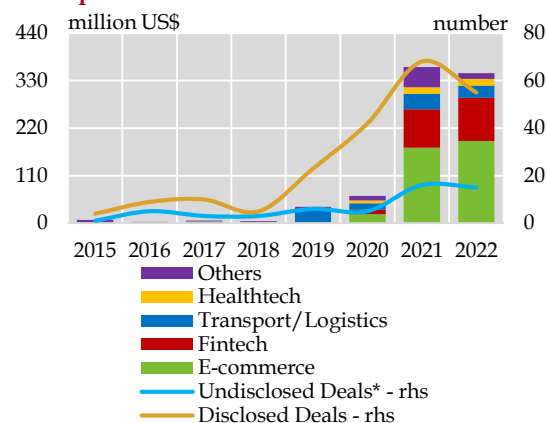
last seven years as measured by three key metrics: total funding raised by start-ups, total number of deals or deal count, and growing interest by international venture capitalists and other investors.

Local start-ups have raised roughly a total of US\$ 837 to US \$ 872 million between 2015 and 2022 with noticeable inflows witnessed in the last couple of years. Of the start-ups that closed deals between 2015-2022, about 11.4 percent are now inactive, with the rest either acquired or active. In

2021, local start-ups raised about US\$ 330 to US\$ 362 million, compared to US\$ 60 to US\$ 63 million in 2020. Similarly, the total number of deals increased to 82-84 in 2021 from 47 in 2020.

Sectoral division of these inflows shows that e-commerce and fintech accounted for 71 percent of total funding between 2015-2022. Similarly, in terms of deal count, the e-commerce and fintech sectors had a share of about 43 percent in total deals during 2015-22. On the contrary, during this period, edtech, healthtech, agritech and foodtech cumulatively attracted only 9.4 and 22.2 percent of the funding and deal count, respectively.^{20, 21} These indicators suggest that start-up activity is not widespread across different sectors, particularly those where digital transformation can have a large positive spillover (Figure S1.7).²²

Deals & Fundings - Pakistan's Startups **Figure S1.7**



* for the undisclosed deals the amount is not disclosed. Note: The total number of deals and funding may not match from different sources because of differences in classifications and categorisation of the startups and deals. Hence, the data is indicative and not exhaustive.

Source: Data Darbar

Nevertheless, international players have started investing in Pakistan's start-up ecosystem in recent years. For instance, Kleiner Perkins, an American venture capital firm and one of the investors in notable companies like Google, Amazon, and Twitter, made its first investment in Pakistan in 2021.²³ Similarly, Sequoia Capital, which partnered with companies like Instagram, Airbnb, Apple, and Zoom, also entered

²⁰ Deal count includes disclosed and undisclosed deals.

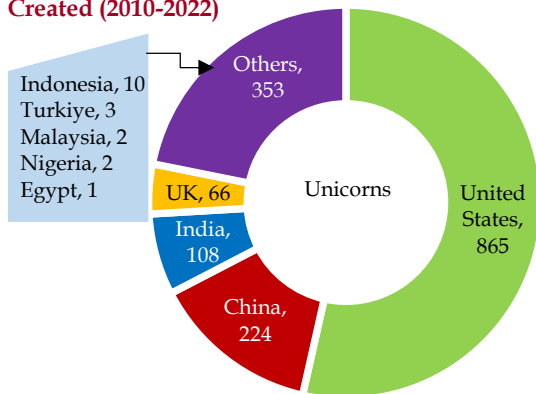
²¹ Estimates are based on the deal flow tracker by Invest2Innovate and Data Darbar. The data is reported on calendar year basis; data prior to CY15 is incomplete and inconsistent. Start-up-related statistics, in general, and the funding and deal count numbers, in particular, used in this section are indicative, and figures from different sources may vary. This variation originates from the differences in the classification and categorisation of the deals.

²² Ignite (2023), Study for Assessment of Pakistan's Startup Ecosystem

²³ Kleiner Perkins (www.kleinerperkins.com/partnerships/alumni [accessed on December 1, 2022] and www.kleinerperkins.com/perspectives/Tajir-new-funding/, [accessed on November 27, 2022]

Total Number of Unicorns Created (2010-2022)

Figure S1.8



Source: Traxcn

Pakistan’s start-up ecosystem.²⁴ Y Combinator, an American accelerator that helps start-ups grow and includes alums like Dropbox and Stripe, has also been involved in different Pakistani start-ups.

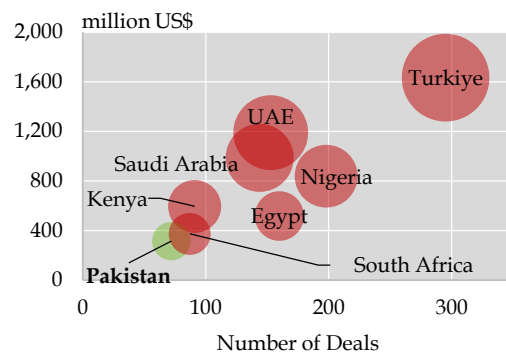
Further, other local and international firms, such as Pakistan’s Habib Bank Limited (HBL) and Brazil’s Nubank, one of the largest digital banks in the world, have also funded local start-ups.²⁵ Foreign start-ups are also attracted to Pakistan’s market; for instance, in 2021, Trella, a trucking and logistics start-up from Egypt, started its operations in Pakistan.²⁶

Pakistan’s Start-ups in Global Landscape

Pakistan’s start-up funding growth in 2021 was in line with global funding boom. In 2021, total venture funding worldwide rose by 114.5 percent to reach US\$ 638.4 billion, as compared to 14.8 percent growth in 2020.²⁷ Despite significant progress, Pakistan’s start-up ecosystem is still small compared to global leaders, and also lags behind regional players in multiple indicators.

For instance, India, with approximately more than 100 unicorns, is currently third in the list of countries with the most unicorns (**Figure S1.8**).²⁸ Likewise, other countries

Funding and Deal Count (2022) **Figure S1.9**



Note: Size of bubbles represents share in total funding raised in Middle East, Africa, Turkiye and Pakistan
Source: Emerging Venture Markets Report, Magnitt

²⁴ Sequoia Capital (www.sequoiacap.com/our-companies/#spotlight-panel accessed on December 1, 2022) and Bloomberg (www.bloomberg.com/news/articles/2022-07-28/sequoia-enters-pakistan-s-start-up-economy-by-backing-fintech?leadSource=uverify%20wall [accessed on December 1, 2022])

²⁵ HBL (www.hbl.com/news-and-media/hbl-inks-landmark-investment-in-finja-pakistans-leading-digital-sme-lending-fintech, accessed on January 10, 2023 and TechCrunch (www.techcrunch.com/2022/07/27/sequoia-kleiner-perkins-nubank-invest-in-pakistan-fintech-dbank/, accessed on January 10, 2023)

²⁶ Trella (www.blog.trella.app/expansion/trella-in-pakistan-the-land-of-trucking-opportunity/ accessed on 26 Nov 2022) and Innvest2Innovate (i2i) (2021). *Pakistan Start-up Ecosystem Report (PSER) 2021*. Islamabad: i2i

²⁷ CB Insights (2022). *State of Venture*. New York: CB Insights.

²⁸ Source: Traxcn (www.traxcn.com/d/unicorn-corner/unicornlist, accessed on January 25, 2022).

with population trends similar to Pakistan have also produced their first unicorns. For instance, Indonesia had its first unicorn in 2016 and had produced approximately ten such companies by 2022. Nigeria, which also features in the top ten populous countries list, had its first unicorn in 2019. In comparison, Pakistan and Bangladesh are the only countries from the list of top ten

populous countries not to have produced a local unicorn by 2022.²⁹

Further, funding in Pakistan's ecosystem is still very small when compared with global leaders in the start-up space. For instance, of the disclosed deals during 2015-2022, local start-ups raised roughly US\$ 831 to US\$ 872 million.³⁰ In contrast, total funding of US\$ 136 billion, US\$ 837 billion, and US\$ 2.7 trillion were raised by the start-ups in India, China, and the USA respectively in the 2014-2022 period.³¹ Pakistan's funding level is also not yet at par with other emerging regional players. Of the US\$ 7.2 billion raised in 2022 in the Middle East, Africa, Pakistan, and Turkiye, the country's share was only 4.4 percent of total funding (**Figure S1.9**).³² In case of African countries, Nigeria, Egypt, Kenya and South Africa take up majority of tech investment in Africa owing mainly due to favorable ecosystems in their major cities amid growing presence of fintech.³³ In comparison to Pakistan, these African economies had better ranking in Global Start-up Ecosystem Index 2022 (**Table S1.4**). The index ranks 1000 cities in 100 countries on a host of criteria including the number of incubators, exits; and a mix of business and economic indicators. None of the cities in Pakistan featured in the top 100 ecosystems in the world. In contrast, India's Bangalore is

Global Startup Ecosystem Index 2022 **Table S1.4**

Country	Country Ranking	Highest Ranked City	Total No. of Featured Cities
United States	1	San Francisco Bay (1 st)	257
India	19	Bangalore (8 th)	38
Indonesia	38	Jakarta (32 nd)	5
Turkey	46	Istanbul (66 th)	4
Nigeria	61	Lagos (81 st)	3
Kenya	62	Nairobi (163 rd)	2
Egypt	65	Cairo (160 th)	1
Pakistan	76	Karachi (291 st)	3
Bangladesh	93	Dhaka (326 th)	1
Total Countries = 100; Total Cities = 1000			

Source: Startup Blink

Note: The total number of unicorns may vary from different sources.

²⁹ ibid

³⁰ Estimates based on deal flow compiled by Invest2Innovate and Data Darbar.

³¹ Inc42 (2022). *Indian Tech Start-up Funding Report 2022*. New Delhi: Inc42; The variation in the comparable period (i.e., 2015-22 for Pakistan and 2014-22 for other countries) is because the data used is from different sources. As highlighted above, in general, the datasets used to analyse the start-up space are indicative.

³² Magnitt (2023). *Venture Investment Report. Emerging Venture Markets Report*. Dubai: Magnitt

³³ A. Dushime (2022). "These four countries are leading Africa's start-up scene – here's why" Geneva: World Economic Forum. (www.weforum.org/agenda/2022/08/africa-start-up-nigeria-egypt-kenya-south-africa/, [accessed on March 03,2023])

ranked 8th, with four other ecosystems from the country are also ranked in the top 100 list. Similarly, Jakarta, Istanbul and Lagos also feature in top 100 ecosystems. The highest-ranked ecosystem from Pakistan is Karachi, with a rank of 291, followed by Lahore (305) and Islamabad (438).³⁴

Similarly, Pakistan ranked 97th out of 113 countries in the Asian Development Bank's Index of Digital Entrepreneurship Systems (AIDES) 2021 that tracks various aspects of digitalisation of economy and society, such as market conditions, physical infrastructure and policy and institutional support. While Pakistan's rank is better than Nigeria (101st) on AIDES; it lags behind India (75th), Egypt (73rd) and Indonesia (71st).³⁵

S1.3 Assessment of Drivers and Enabling Factors

The onset of Covid-19 provided a unique opportunity for businesses offering digital services as consumer habits changed from offline to online.³⁶ Measures such as social distancing, lockdowns, and working from home, led to wider adoption of e-commerce, digital payments, and online modes of communication, while fast-tracking the overall digitalisation of economies across the world. As a result, while total global services exports contracted by 17 percent year-on-year in 2020, IT service exports continued to grow.³⁷ In Pakistan too, while the country's IT exports had been growing prior to Covid-

19, the pandemic increased the pace of growth to a CAGR of 24 percent between FY20-FY22 compared to 14 percent in the preceding five years.

Tech start-ups also saw pronounced increase in the pace of growth after Covid. As highlighted in earlier section, start-up funding in Pakistan witnessed unprecedented growth in the post-Covid period. The global shift towards virtual meetings facilitated this, which allowed Pakistani founders to pitch remotely to global investors. Also, as Pakistan was one of the largest untapped markets, global funding activity in the country increased.³⁸

While Covid-19 provided an unexpected impetus to growth, a host of other factors such as Pakistan's large population, increased adoption of digital modes, and favorable regulatory developments also explain the recent trends in software exports and start-ups. However, as the ensuing discussion shows the country's overall economic and sectoral policy environment needs to improve to enable leapfrogging via digital transformation.

Market Size

Pakistan is the fifth most populous country in the world, with 72 percent of the population less than or equal to 34 years of age.³⁹ This serves as an advantage for the tech-centric start-ups in the country as young people are generally early adopters of

³⁴ Source: Startup Blink (www.startupblink.com/)

³⁵ E. Autio, E. Komlosi, L. Szerb, and M. Tiszberger (2021). Asian Index of Digital Entrepreneurship Systems 2021. *Background Paper*. Manila: ADB

³⁶ Invest2innovate (2021). *Pakistan Start-up Ecosystem Report (PSER) 2021*. Islamabad: i2i

³⁷ Source: World Bank and International Trade Centre

³⁸ Invest2innovate (2021). *Pakistan Start-up Ecosystem Report 2021*. Islamabad: i2i

³⁹ Source: UN Population Division, World Population Prospects 2022.

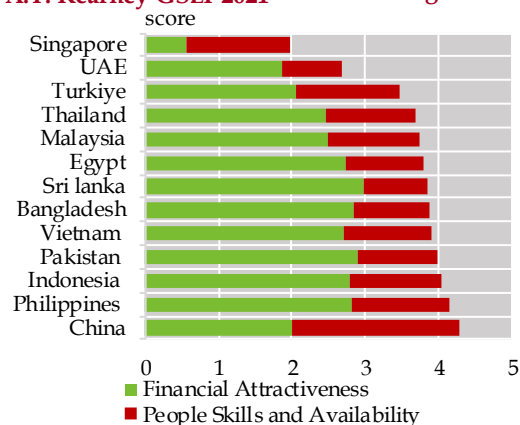
technology. For instance, the percentage of adults who own a smartphone is generally higher in the 18-34 age group compared to those above 50 years of age in emerging and advanced economies.⁴⁰

In addition to population, growing middle class and income levels have a positive impact on the start-up landscape in the country.⁴¹ Although Pakistan's GDP per capita income is lower than peer countries, it has risen from US\$ 531 in 2000 to US\$ 1,282 in 2015, reaching US\$ 1,505 in 2021.⁴² The country was the 15th largest consumer market in 2020 and is expected to become the seventh-largest by 2030.⁴³ This collectively serves as an opportunity for start-ups to foster as domestic consumption grows in the country; and hence attracts the attention of venture capitalists.

However, several factors present a challenge to the prospects of digitalisation in general and growth of start-ups in particular, given their detrimental impact on purchasing power and the addressable market size. For instance, the potential of Pakistan's increasing working age population may be limited by a substantially low level of literacy and a high prevalence of stunting that affects

A.T. Kearney GSLI 2021

Figure S1.10



Source: A.T. Kearney Global

cognitive abilities whose impact is not fully reversible.⁴⁴ Other constraining factors include Pakistan's recurring balance of payment crisis, boom-bust cycles of economic growth and overall macroeconomic instability; as well as low female labour force participation that can impair the country's absorptive capacity.

Human Capital

As per some estimates, Pakistan has supply of 20,000 – 25,000 fresh engineering and IT

⁴⁰ PEW Research Center (www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/)

⁴¹ A. Syed and A. Bokhari (2019). *Starting up: Unlocking Entrepreneurship in Pakistan*. New York: McKinsey & Company

⁴² Data are in current U.S. dollars. Source: World Bank [accessed on February 28, 2023]

⁴³ H. Kharas and W. Fengler (2021). *Which will be the top 30 consumer markets of this decade? 5 Asian markets below the radar*. Brookings Institution Blog. Available at www.brookings.edu/blog/future-development/2021/08/31/which-will-be-the-top-30-consumer-markets-of-this-decade-5-asian-markets-below-the-radar/, accessed on December 22, 2022.

⁴⁴ An estimated 54 percent of working-age population in 2031 will be illiterate or have only primary level education, whereas 27 percent of the working age population in 2033 is estimated to be those who suffered from stunting in childhood years. Details in Chapter 7, *The Promise of Pakistan's Demographic Dividend?*, State Bank of Pakistan Annual Report 2021-2022.

How Easy or Difficult is Hiring Skilled Employees?

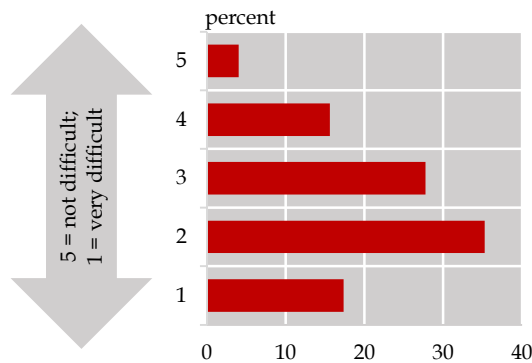
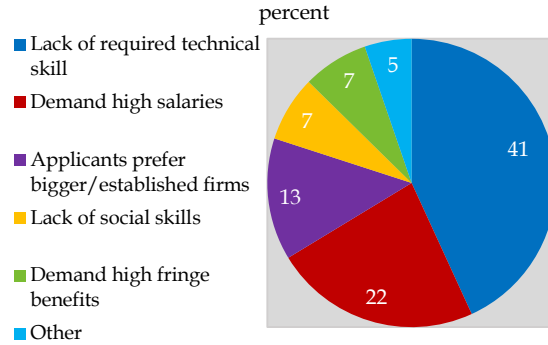


Figure S1.11a

Why is Hiring Skilled Employees Difficult?



Source: SBP Startups Survey 2022-2023 (unpublished)

graduates every year.⁴⁵ So far this has provided a stable base and supported the growth in software exports and start-up industry.⁴⁶ Moreover, IT sector wages in the country are at par with peer economies, as indicated by the financial attractiveness component of Kearney’s Global Service Location Index. This is representative of the relatively favorable wage rates in Pakistan compared to those in more established destinations such as Singapore and China. (Figure S1.10). However, evidence suggests that the country has started to face human capital constraints in IT sector which, if left unaddressed, will hamper future growth in the industry.

inadequately educated workforce as the second biggest challenge after political instability; 22 percent of these firms report workforce as a major problem, the most by any other sector.⁴⁷ This resonates with the SBP’s forthcoming survey on start-ups whose preliminary results show that majority of IT firms face high level of difficulty in hiring skilled employees (Figure S1.11a). In part, this is because IT firms, being typically small and nascent, also find it difficult to pay high salaries, perks or otherwise compete in terms of employees’ choice with bigger and established companies that are mostly found in the traditional non-IT sector (Figure S1.11b).

Skilled human resource is a challenge for all sectors of the economy in Pakistan. However, of all the major problems faced by businesses in the country, IT related firms report

Considering the estimates of over 40,000 new job openings in just 140 companies in 2021, the shortage of skilled resources in Pakistan is considered to be biggest bottleneck in

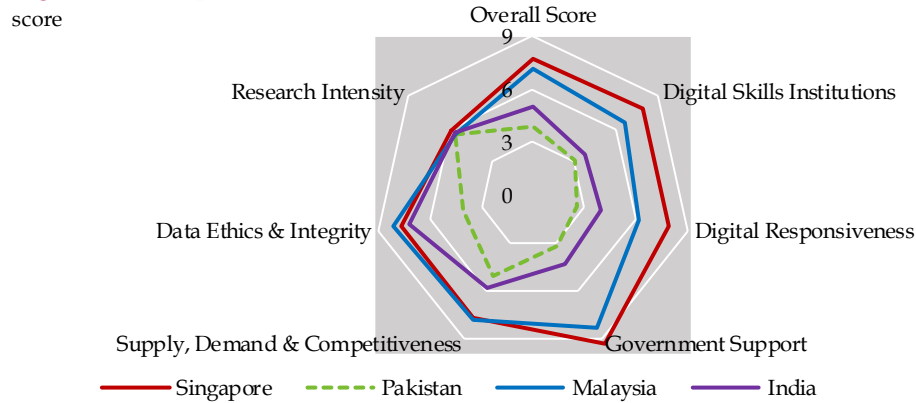
⁴⁵ These numbers are not annually reported but are rather rough estimates quoted widely by public and private sector organisations (including Ministry of Information Technology and Telecommunication and Pakistan Software House Association.) This underscores the need for periodic estimates of the supply of labour in the fast-evolving industry of increasing importance.

⁴⁶ World Bank Report (2020). *Pakistan Economic Policy for Export Competitiveness; Digital Pakistan: A Business and Trade Assessment*; Pakistan Software Export Board. Washington DC: World Bank

⁴⁷ World Bank Report (2019). *Pakistan: Skills Assessment for Economic Growth*, Washington DC: World Bank

Digital Skills Gap Index - Selected Countries

Figure S1.12



Source: Wiley Digital Skills Gap Index, 2021

achieving the desired growth in software exports and tech start-ups. Moreover, the adequacy and quality of skills in the trained workforce is also a stumbling block. Only 10 percent of the IT graduates are employable, given different levels of weaknesses in both technical as well as soft skills; soft skills include marketing, social skills, problem solving or critical thinking, entrepreneurship mindset, and English language proficiency needed to engage international buyers or investors as the case may be.⁴⁸

These challenges exist mainly because of a large industry-academia divide and other institutional gaps as also reflected in Pakistan's performance on various metrics of digital skills (Figure S1.12) including performance of digital skills educational institutions, and supply, demand and competitiveness aspects. In addition to improvements in skills for existing technologies, investments are also needed to

improve skills required for a growing wave of frontier technologies such as AI, robotics, and IoTs. With a rank of 146 out of 158 countries, the country scores 0.09 out of 1 in the skills component of UNCTAD's Frontier Technology Readiness index 2019 compared to Indonesia's score of 0.28, India's 0.31, Nigeria's 0.33, Egypt's 0.45 and Malaysia's 0.46.⁴⁹

These gaps need to be addressed if Pakistan is to grow its IT exports and fast track digitalisation. Indeed, labour input has been the most important factor behind growth in IT exports of leading exporters like India and Ireland.⁵⁰ One obvious solution is to significantly increase the number, and employability, of university graduates to be able to drive export growth and digitalisation of domestic economy alongside consistent wide ranging improvements in the quality of their skills. However, since university education takes a long time, there

⁴⁸ PASHA (2022). *The Great Divide: The Industry - Academia Skill Gap Report*, Karachi: P@sha

⁴⁹ UNCTAD (2019). *Frontier Technology Readiness Index*, Geneva: Switzerland

⁵⁰ R. Heeks and B. Nicholson (2011). *Software export success factors and strategies in "follower" nations*, *Competition & Change Journal*, Vol. 8 No. 3, pp. 267-303

is a need to scale up ongoing interim solutions being offered by the public and private sector.⁵¹ These include on-site and off-site IT skill bootcamps and other skills development programmes, such as train-the-trainer modules and training via social-media platforms, to quickly address the skill gap in specific IT related skills including data analytics, cloud computing, coding, software development and app design.⁵²

To this end, top-tier global bootcamp companies may be invited to set up camps across the country under various forms of public-private-partnership models. Considering that male staff comprise more than 90 percent of IT sector’s human resources, there is a need to focus these efforts on females as well to reduce the gender gap.⁵³ Lastly, to incentivize employee training and to increase attractiveness of IT sector in terms of employee choice, fiscal incentives may be offered on employee stock options in line with international best practices.⁵⁴

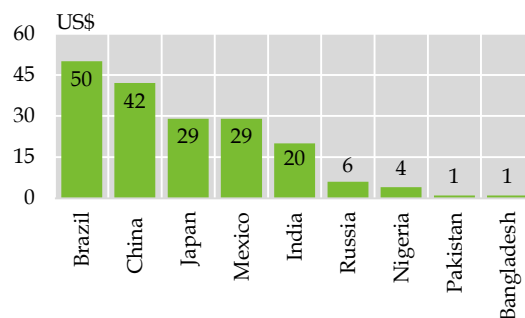
Access to Finance and Investor Funding

Access to credit in Pakistan, one of the lowest among emerging markets, is rather limited due to a host of demand and supply side challenges including lack of collateral. For technology companies (software oriented or otherwise) it is even more difficult since

these firms are typically young, and without large parcels of land or plants that could be used as collateral.⁵⁵ Accordingly, the absence of collateral affects software export growth prospects since IT firms do not necessarily have the working capital needed to meet export orders, nor a collateral to avail financing under Export Financing Schemes. One exception was the currently suspended SME Asaan Finance which is sector-agnostic concessionary financing provided to SMEs in which loans maybe secured against personal guarantees.⁵⁶

In the case of start-ups, non-bank means of financing, such as venture capital, plays a much more important role. This is because the prospects of start-ups are untested, given

Venture Funding Per Capita in Selected Countries* Figure S1.13



*Investment totals are for the 12 months ending October, 2021

Source: Crunchbase

⁵¹ These include Ignite’s DigiSkills Program, and various skills development training program by Pakistan Software Export Promotion Board and provincial IT boards

⁵² Bootcamps refer to short, often 3-6 month, high-intensity, immersive training

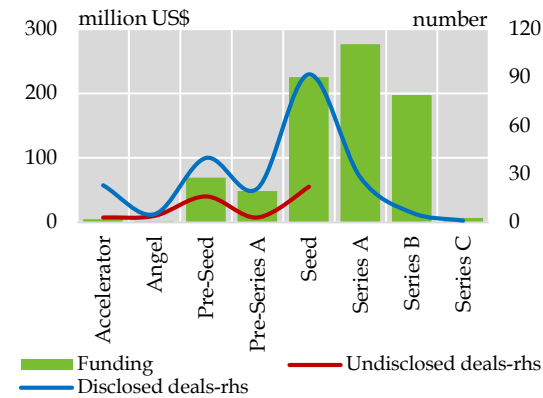
⁵³ PASHA (2021). *Pakistan IT Skills Survey Report*. Islamabad: PASHA

⁵⁴ Ignite-National Technology Fund (2021). *Study for Assessment of Pakistan’s Start-up Ecosystem & Freelancing Ecosystems*

⁵⁵ For weak private sector credit penetration in Pakistan, see, Chapter 7, *Understanding Low Private Credit Penetration in Pakistan Contextualizing Recent Policy Reforms* in the SBP’s FY20 Annual Report on the State of Pakistan’s Economy Report.

⁵⁶ Source. State Bank of Pakistan (www.sbp.org.pk/sme/d/circulars/2021/C9.htm)

Funding by Type of Rounds **Figure S1.14**



Note: Deals classified as convertible notes, corporate investments, and with the "undisclosed" round type are not included in the figure. However, the mentioned rounds may contain the deals whose amount was not disclosed.

Accelerator: funding from accelerator programs (generally, accelerators focus on early-stage and growth-driven startups and provide mentorship as well)

Angel: typically, an early-stage funding round conducted by angels (high-net-worth individuals)

Pre-seed: funding at the early or ideation stage

Seed: generally referred to as the first formal round; at this stage, companies have a minimal viable product with a better understanding of the market and low to no revenue.

Pre-series A: a mid-round between seed and series A

Series A: first formal round of venture funding; startups at this stage generally grow revenue, expanding teams and customers.

Series B: Typically succeeds Series A, with startups focusing on scaling and exploring new markets.

Series C and Beyond: Late-stage rounds with companies showing success.

Note: The definition of terminologies about startups is evolving. For instance, pre-seed was earlier considered a pre-institutional round, but now with VCs investing at this stage, it is also becoming a formal round.

Source: Data is from Data Darbar and definitions are from various sources including Pitchbook and Crunchbase.

the innovative nature of the business- that founders have to develop, launch, and then scale. As discussed in Section 2, start-up funding has increased in recent years. However, despite *recent* high growth in start-up funding, venture funding per capita in the country is small at approximately US\$ 1 (Figure S1.13).

In addition, funding breakdown shows that angel rounds are scarce in Pakistan, which is a constraint to new start-up formation.⁵⁷ In a growing start-up ecosystem, young firms in need of angel or pre-seed investments are generally greater in number than the relatively large firms that are looking to raise Series A funding and beyond, since several firms die in the process between ideation and relative maturity. In light of this, the fact that only 65 of total 270 deals were classified as angel round and pre-seed round in Pakistan between 2015 and 2022 indicates that even when start-ups saw heightened interest, investor focus on start-ups at ideation or initial stages was low compared to those that graduated out of angel phase to seed phase and beyond (Figure S1.14).

On the other hand, while seed stage funding is the highest in Pakistan, late-stage funding has not witnessed large number of deals thus far. Only two rounds, of US\$ 6.5 million in 2015 and US\$ 20 million in 2016, were classified as Series C.⁵⁸ Likewise, only seven

⁵⁷ Angels are high-net-worth individuals who usually invest in a start-up's early phase and may also play the role of mentor for founders and facilitator for subsequent rounds. Financing by angels is crucial as it positively impacts the growth trajectory and survival rate of the start-ups they invest in regardless of the external environment for entrepreneurs in a country. Source: J. Lerner, A. Schoar, S. Sokolinski and K. Wilson (2015). *The Globalization of Angel Investments: Evidence across Countries*. NBER Working Paper Series, W. P. No. 21808. Cambridge, Massachusetts: National Bureau of Economic Research.

⁵⁸ Source: Crunchbase, available at www.crunchbase.com/funding_round/zameen-com-series-c-c0e336e5 and www.crunchbase.com/organization/rozee-pk/company_financials accessed on January 22, 2023.

rounds are classified as Series B, with one in 2008 and two in every year since 2020.⁵⁹ A similar trend can be witnessed in the exit rate of start-ups in the country.⁶⁰ In the last five years, there have been eight exits in the ecosystem, with 6 of them in 2022.⁶¹ For comparison, Turkiye's ecosystem recorded 31 exits in 2022, and India, a larger ecosystem, recorded 240 mergers and acquisitions in 2022.⁶² However, as start-ups in the country mature, Pakistan's ecosystem may witness an increase in exits and late stage funding as well; this may increase confidence of local and international VCs to invest further.

Moreover, the start-up funding in Pakistan is led by foreign investors.⁶³ For instance, in 2021, local VC investments amounted to approximately 10 percent of the international VC investments during the year.⁶⁴ Soft information suggests that this is mainly because local investors, including high net worth individuals, family houses and VCs, do not have large fund size, neither do they have the risk appetite and the long term patient investment mindset that is characteristic feature of investments in start-ups.⁶⁵ The number of family investment

offices by local business groups is very low in Pakistan; for instance, in India, there are 2600 family offices while in Pakistan, less than 1 percent of that. In addition, the number of impact investors in the country are also very few, which presents a big challenge for social enterprise and impact startups to raise capital since.⁶⁶

To improve financing conditions in the country, a host of measures may be considered. These include the introduction of bank lending based on Intellectual Property Rights, cash-flows, or other alternative means of collateral such as reputational collateral based on credit scores for technology firms, particularly software-oriented firms.⁶⁷ To this end, enabling legislation and regulations may also be introduced for technology firms. For instance, Italy introduced Start-up Act in 2012, which offered tax incentives for equity investors, fundraising through equity crowdfunding campaign, and public guarantee on loans to start-ups provided by financial institutions. Similarly, under Senegal's Start-up Act in 2019, the

⁵⁹ Source: Data Darbar

⁶⁰ A start-up exit refers to the sale of partial or full stake by founder and early investors; exit transactions usually happen after several rounds of funding and may take the shape of mergers, acquisitions, or listing at the stock market. An exit in start-up ecosystem is seen as a sign of success of a firm whose previously untested business idea has finally been validated by the market.

⁶¹ Magnitt (2023). *Venture Investment Report. Emerging Venture Markets Report*. Dubai: Magnitt

⁶² Inc42 (2022). *Indian Tech Start-up Funding Report 2022*. New Delhi: Inc42.

⁶³ SECP (2022). *A Diagnostic Review of Pakistan's Private Funds Industry*. Islamabad: SECP

⁶⁴ Invest2innovate (2021). *Pakistan Start-up Ecosystem Report 2021*. Islamabad: i2i

⁶⁵ McKinsey & Company (2019). *Starting up: Unlocking Entrepreneurship in Pakistan*. New York: McKinsey & Company

⁶⁶ Ignite (2023), Study for Assessment of Pakistan's Startup Ecosystem

⁶⁷ Source: Ignite - National Technology Fund, Policy Recommendations for Promotion of Start-ups in Pakistan; Special Section - *Private Credit Bureaus in Pakistan - Enhancing Credit Penetration by Addressing Information Asymmetries* in Third Quarterly Report of the Board of Directors of the State Bank of Pakistan on the State of the Economy for the Year 2020-21.

government guarantee on loans are provided to start-ups by financial institutions.⁶⁸

The stock market may also have to be developed to facilitate exits and late-stage funding. While raising capital through the stock market is not a natural route for tech start-ups in the country, neither for funding nor exit, as it may not offer the same valuation level as venture funding, the Growth Enterprise Market (GEM) Board of Pakistan Stock Exchange (PSX) offers a potential opportunity for relatively mature software exporting companies and other start-ups.⁶⁹

To this end, the MOU between PSX and Pakistan Software Export Board (PSEB) to mutually facilitate the listing of up to 40 IT

and IT-enabled firms at the GEM Board by providing financial and technical assistance for listing is a promising development.⁷⁰ In addition to the GEM, a venture exchange may be created as a venture capital market place for over the counter trading of unlisted shares of emerging and innovative companies.

Fintech as an Enabler of Digitalisation

Technology-led advances and innovation in financial services (fintech) is transforming the financial ecosystem in different ways. It is contributing to increase in financial inclusion and economic growth as well as narrowing the digital access gaps. This is done by unbundling of financial services, increased customization of services, lowering the cost of services, and reduction in

Payment Systems

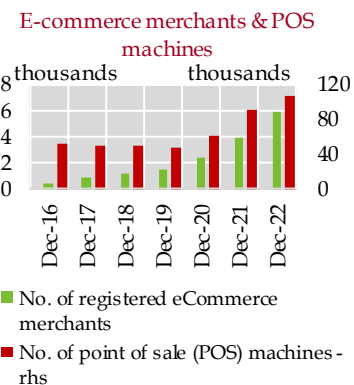
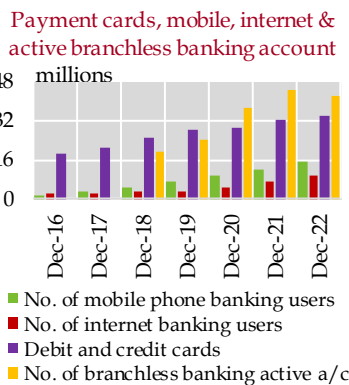
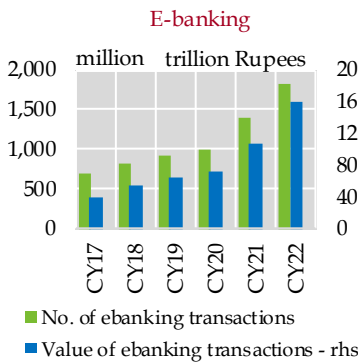


Figure S1.15

Source: Easy Data, State Bank of Pakistan

⁶⁸ A. A. Ghanghro (2020). Legal Framework for Start-ups in Pakistan. Islamabad: Karandaaz

⁶⁹ For instance, the average funding raised in 37 IPOs between FY15-22 was approximately US\$ 14.7 million, compared to an average of US\$ 32.9 million raised in the six Series B rounds in 2015-2022. Source: SECP 2021. *Annual Report 2021*. Islamabad: SECP; SECP 2022. *Annual Report 2022*. Islamabad: SECP; and Data Darbar.

⁷⁰ Pakistan Stock Exchange (www.psx.com.pk/psx/files/?file=162113-1.pdf, accessed on February 17, 2022.)

information asymmetries.⁷¹ In addition, fintechs' role in enabling payments for other start-ups- such as e-commerce and e-health companies- implies that fintechs have an essential role in fostering the digitalisation of the economy.

In Pakistan, digital payments have gained traction in recent years with improvements in payment infrastructure. The number of e-banking transactions nearly doubled between CY17 and CY21. The number of branchless banking active accounts have also outpaced total debit and credit cards, which shows the potential of technology in fast tracking financial inclusion (**Figure S1.15**).⁷²

While Covid-induced restrictions amid growing internet penetration led to increased use of internet and digital payments for various activities, a host of policy efforts already had been driving these trends prior to Covid. These include National Payment Systems Strategy for digital payments, Branchless Banking Regulations, Rules for Payment System Operators and Payment Service Providers, Regulations for Mobile

Banking Interoperability, and more recently, Regulations for Electronic Money Institutions (EMI) through which the SBP provided a framework for non-banking entities to offer digital payment instruments like wallets and contactless payment.⁷³ The SBP also introduced RAAST, an instant payment gateway, and Licensing and Regulatory Framework for Digital Banks in Pakistan⁷⁴, under which NOCs to five applicants have been issued.⁷⁵

Despite this growth, there is substantial room for fintech development both in terms of breadth and depth. For instance, Pakistan is far behind peer economies when it comes to using mobile phone or the internet to check account balances, which is a basic service. The overall account ownership as well as mobile money account ownership is also low compared to regional averages and income groups (**Figure S1.16**). Pakistan's low rank, 116 out of 152 nations, in UNCTAD's Business-to-Consumer E-commerce Index, 2020, also points in the same direction.⁷⁶ This is in part due to relatively high cost of internet connectivity

⁷¹ Y. W. Tok and D. Heng (2022). *Fintech: Financial Inclusion or Exclusion?* IMF Working Paper no. WP/2022/080. Washington D.C.: IMF; T. Beck (2020). *Fintech and Financial Inclusion: Opportunities and Pitfalls*. ADBI Working Paper 1165. Tokyo: Asian Development Bank Institute.; E. Feyen, J. Frost, L. Gambacorta, H. Natarajan and M. Saal (2021). *Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy* BIS Papers No 117; X. Zhang, Y. Tan, Z. Hu, C. Wang, G. Wan (2020). "The Trickle-down Effect of Fintech Development: From the Perspective of Urbanization" *China & World Economy* Vol. 28, Issue 1, pages 23-40.

⁷² Data for Mar-22 is provisional. Source: SBP Easy Data

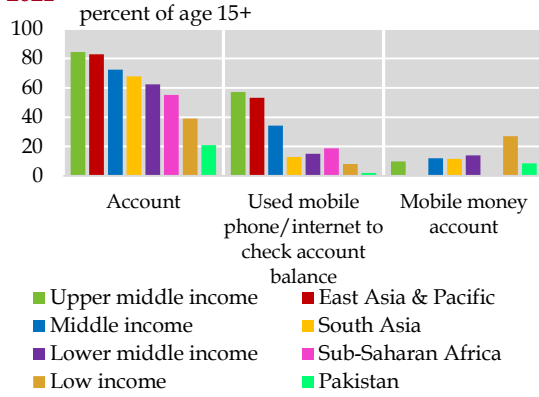
⁷³ SBP (www.sbp.org.pk/ps/PDF/NPSS.pdf; www.sbp.org.pk/bprd/2019/C10-Branchless-Banking-Regulations.pdf; www.sbp.org.pk/psd/2014/C3-Annex.pdf; www.sbp.org.pk/bprd/2016/C3-Annex-A.pdf; www.sbp.org.pk/psd/2019/C1-Annex-A.pdf, [accessed on March 24, 2023])

⁷⁴ SBP (www.sbp.org.pk/bprd/2008/annex_c2.pdf); (www.sbp.org.pk/psd/2014/C3-Annex.pdf); (www.sbp.org.pk/bprd/2016/C3-Annex-A.pdf); (www.sbp.org.pk/PS/PDF/List-of-EMIs.pdf); (www.sbp.org.pk/dfs/Digital-Bank-Regulatory.html) accessed on February 20, 2023

⁷⁵ Source State Bank of Pakistan (www.sbp.org.pk/press/2023/Pr1-13-Jan-2023.pdf)

⁷⁶ For details, see www.unctad.org/system/files/official-document/tn_unctad_ict4d17_en.pdf, accessed on March 21, 2023.

Selected Indicators From Findex - Figure S1.16 2021



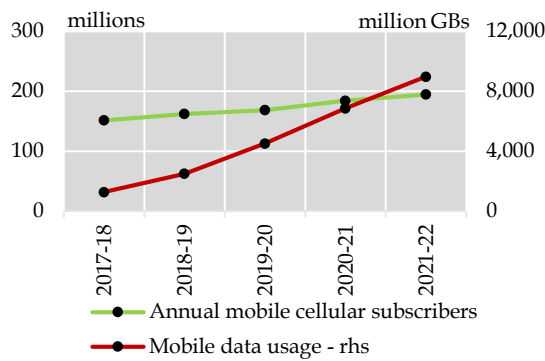
Source: The Global Findex Database, World Bank

and affordability of mobile devices.⁷⁷ Moreover, on the demand side, financial literacy is a significant challenge, with only 14.3 percent of the country's adult population considered financially literate.⁷⁸

On the supply side, there is a limited supply of skilled human resources who understand technology and finance to the degree that they can create innovative solutions, particularly targeting the financially excluded segments.⁷⁹ An underdeveloped credit reporting system, marked by incomplete and insufficient pool of credit information available with the credit bureaus, is also a stumbling block in this regard.⁸⁰

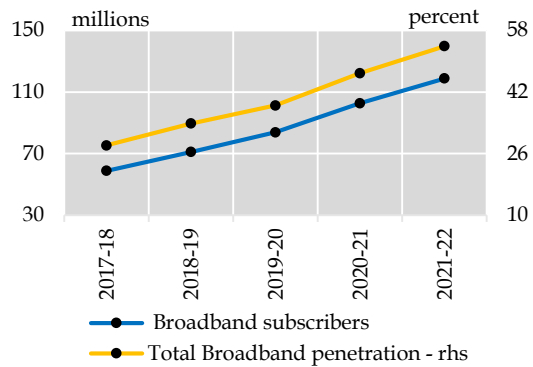
From the perspective of depth, the funding trend suggests that the country's fintech industry is mainly concentrated in payments, and credit and financing. Relatively few startups are operating in the field of insurance, investment and savings, and other facets of financial sector development where

Mobile Cellular Subscribers and Mobile Data Usage Figure S1.17a



Source: Pakistan Telecommunication Authority

Total Broadband Subscribers and Penetration Rate Figure S1.17b



⁷⁷ I. Khan and K. H. Jaffar (2021). *Searching for the Binding Constraint to Digital Financial Inclusion in Pakistan: A Decision Tree Approach*. CGD Policy Paper 218. Washington, DC: Center for Global Development.

⁷⁸ M. Termezy and H. Razi (2021). *Fintech Ecosystem of Pakistan, Landscape Study*. Islamabad: Karandaaz Pakistan

⁷⁹ Ibid

⁸⁰ Special Section: Private Credit Bureaus in Pakistan - Enhancing Credit Penetration by Addressing Information Asymmetries in the State of Pakistan's Economy - *Third Quarterly Report 2020-21*

large and swift improvements are needed in Pakistan.

To advance the fintech industry, it is important to encourage tech-based financial literacy initiatives tailored for different segments of society. For instance, under National Financial Literacy Program for Youth, an e-learning game, PomPak, was launched focused on children and youth.⁸¹ Further, digitisation of civil registries; development of credit reporting systems, fintech-focused courses and university programs; and availability of enabling technology factors, such as cloud storage and computing, cyber security mechanisms and interoperability, are also needed to bring about digital transformation in the country.

Digital Connectivity and Affordability

Pakistan has made considerable progress in connectivity indicators in the past five years. Mobile cellular subscription has increased from approximately 152 million to 195 million between FY18 and FY22, whereas total broadband subscribers increased at CAGR of 15.1 percent, with total broadband penetration reaching 54 percent in FY22. This translated into increased user data consumption, with a CAGR of 48 percent during the period (**Figures S1.17a & S1.17b**).

This growth has had positive implications for digitalisation of economy as the use of internet directly impacts the addressable market for tech start-ups. For instance, a tech

start-up in the education or health sector would generally reach the final user and receive payments for their service digitally, all of which are enabled by the ICT infrastructure. Likewise, better access to affordable ICT infrastructure also enables IT services exports.

However, despite these developments, Pakistan's digital connectivity indicators still remains rather low - both in terms of access and usage - which is a constraint to the prospects of sustained growth in IT, and IT-enabled exports as well as digitalisation of domestic economy (**Figure S1.18**). This in part is because the cost of mobile devices, as well as fixed and mobile broadband prices are noticeably high in Pakistan (**Figures S1.19 & S1.20**).

Moreover, the speed of internet also plays a pivotal role in digital connectivity as internet speed sets the parameters of the effectiveness and efficiency of internet use. According to 2022 Netflix ISP Index, Pakistan's internet speed is 2.8 Mbps compared to global average of 3.5 Mbps and lower middle income countries average of 3.3 Mbps.⁸²

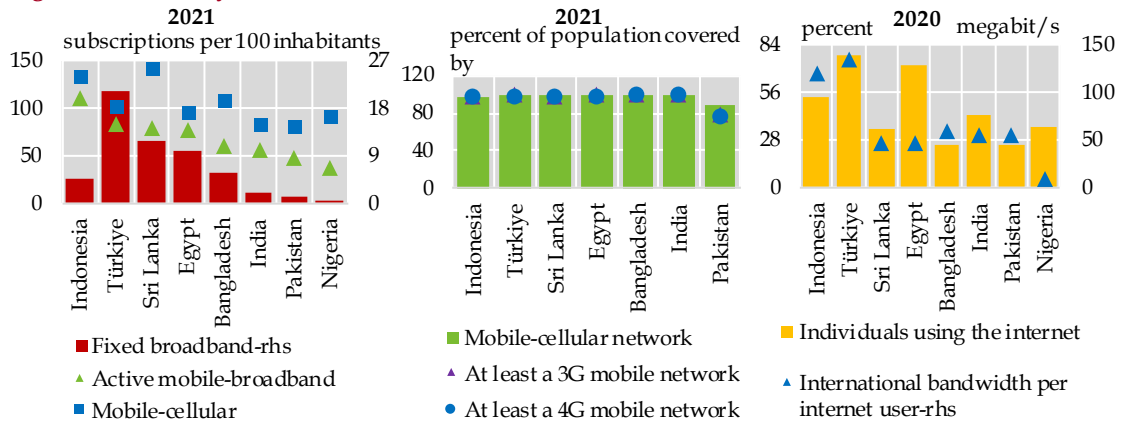
The upcoming telecom infrastructure sharing framework proposed by the Ministry of Information Technology & Telecommunication (MoITT) offers an opportunity to lower rollout costs and boost network coverage and performance. However, since affordable mobile devices and services holds the key to increasing

⁸¹ National Financial Literacy Program for Youth is implemented by the State Bank of Pakistan and National Institute of Banking and Finance Source: www.nflpy.pk/pompak/ accessed on February 21, 2023.

⁸² World Bank's classification has 54 countries in the lower middle income countries (LMIC) category. Due to data unavailability of internet speed for all countries in Netflix ISP index, the average of 8 LMICs has been taken.

Digital Connectivity Indicators for Selected Countries

Figure S1.18



Source: International Telecommunication Union

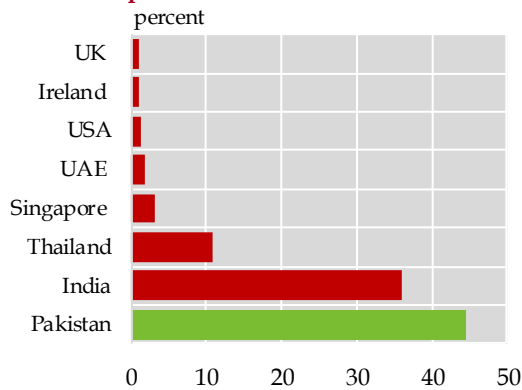
digital connectivity, fiscal incentives need to be considered.⁸³ For instance, in Kenya, following the exemption of taxes on mobile phones and mobile services, mobile phone purchases increased by 200 percent and teledensity more-than-trebled to 70 percent in 2011 in a span of two years.⁸⁴ Similarly,

reduction in import tariff has been one of the key drivers of increased penetration of ICT in technology clusters of India.⁸⁵

The opportunity to leapfrog that ICT offers is not only by way of producing ICT hardware but rather the software as well as the

Smartphone Price as a Percent of GNI Per Capita 2022

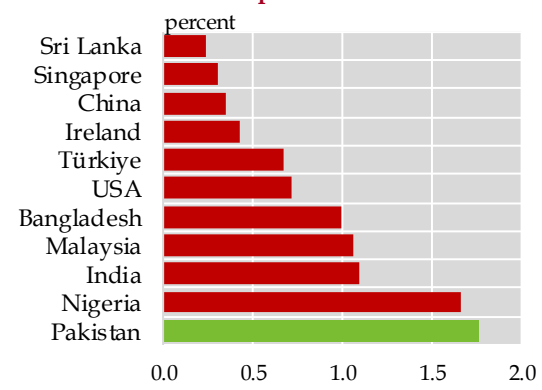
Figure S1.19



Source: Alliance for Affordable Internet

Mobile Cellular Basket as Percent of GNI Per Capita - 2021

Figure S1.20



Source: International Telecommunication Union

⁸³ MoITT (2023). Telecom Infrastructure Sharing Framework. Draft. Islamabad: MoITT

⁸⁴ The Groupe Speciale Mobile Association Report 2020. The Mobile Economy Asia Pacific 2020. London: GSMA

⁸⁵ R. Heeks and B. Nicholson (2011). Software export success factors and strategies in "follower" nations, Competition & Change Journal, Vol. 8 No. 3, pp. 267-303

ubiquitous usage of ICT hardware and software in all facets of economy.⁸⁶ To this affect, Pakistan's accession to the international IT Agreement that entails across the board drop in tariff, taxes and other duties may be considered in the interest of large positive spillover of technology on the economy.

Digital Literacy

Digital literacy refers to general and basic digital skills that all citizens need to have to adapt to digital transformation of economic and social life, and form addressable markets for digital products, services and content. This is regardless of an individual's general literacy level and employment in technology or non-technology sector. Rapid digital innovations are pushing the boundary of digital literacy beyond basic skills. Indeed, over the course of years, the evolution and increasing penetration of frontier technologies, such as AI, will reshape personal and professional life and require constant improvements in digital literacy.⁸⁷

These exigencies have influenced developed and developing countries to not only

develop frameworks to improve digital competence of their citizens but also periodically measure it to identify gaps in digital skills of citizens and accordingly tailor digital literacy programs. One such example is European Countries' Digital Competence Framework for Citizens to support their plan of reaching a minimum 80 percent population with basic digital skills by 2030. In recognition of the importance of digital literacy of wider population, the EU's Digital Economy and Society Index tracks citizens' progress on a high bar across five diverse areas: (a) information and data literacy (b) communication and collaboration (c) digital content creation (d) cyber safety and (e) problem solving.⁸⁸

The level of digital literacy of a population depends on economic development, policy priorities and the nature of a particular business ecosystem. Pakistan, where general literacy level is already very low, also fares considerably low in digital literacy in relation to other economies even in the much less diverse and easy standards tracked by International Telecommunication Union (ITU) (**Figure S1.21**).⁸⁹ Only 37 percent of the

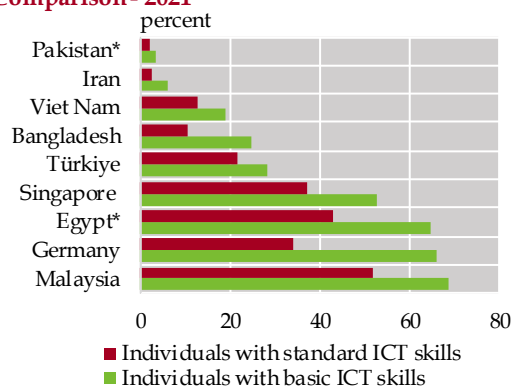
⁸⁶ S.J. Ezell and J. Wu (2017). *Assessing the Benefits of Full ITA Participation for Indonesia, Laos, Sri Lanka, and Vietnam*, The Information Technology and Innovation Foundation, Washington D.C.: ITIF

⁸⁷ World Bank (2022). "South Asia's Digital Opportunity: Accelerating Growth Transforming Lives", Washington D.C: World Bank; C. Dahlman, S. Mealy and M. Wermelinger (2016). *Harnessing the digital economy for developing countries*, Working Paper No. 334, Paris: OECD; A. M. Oyelakin (2022). *Increased Digital Literacy Skills as a Catalyst for Driving Nigerian Digital Economy- An Overview*, Malaysian Journal of Applied Sciences, vol.7(3)

⁸⁸ European Commission, DigComp 2.2 2022. "The Digital Competence Framework for Citizen", (website: www.schooleducationgateway.eu/en/pub/resources/publications/digcomp-22.htm); Digital Economy and Society Index 2022. www.digital-strategy.ec.europa.eu/en/policies/desi; G20, Priority Issue 2, 2022. "Toolkit-for-Measuring-Digital-Skills-and-Digital-Literacy"

⁸⁹ The ITU measures digital literacy on basic and standard ICT skills on the basis of different computer based activities. Basic Skills include copying or moving a file, folder or information within a document, sending e-mails with attached files, and transferring files between devices. Standard Skills include using basic arithmetic formula in a spreadsheet; connecting and installing new devices; using presentation software; and finding, downloading, installing software.

Digital Literacy: Cross Country Comparison - 2021 **Figure S1.21**



* 2020 data

Source: International Telecommunication Union

population reports being aware of the internet, and 87 percent of those who know about e-commerce platforms do not use them to buy goods or services.⁹⁰ Moreover, while Pakistan Bureau of Statistics has begun tracking ICT skill indicators, mostly based on ITU's basic and standard skills, the country does not have an official framework for periodically assessing skills in wide ranging cross-cutting themes that evolving pace of technologies entail.⁹¹

To ensure a digitally literate workforce that can absorb the technologies for digital transformation, Pakistan needs to develop a framework to target growth in digital literacy in both educated and uneducated segments of population. Since basic education is the foundation for technical and digital literacy, both segments may need differently tailored strategies. At the same time, efforts need to

be made to ensure that those currently in schools meet desired level of digital literacy by the time they graduate.

In this context, lessons may also be learnt from international best practices by increasing the standard of digital literacy beyond basic skills, and ensure frequent monitoring to correspond to the fast changing technological environment. For instance, Singapore's National Digital Literacy Program is built around four competencies: (a) gathering and evaluating information safely and effectively); (b) interpreting and analyzing data, and solving problems; (c) using digital means, knowledge and skills, and (d) producing digital products, and collaborating online. Similarly, Europe's Digital Decade program sets targets for digital skills at various stages and segments of the economy and society with an annual cooperation cycle based on (i) shared and transparent monitoring system, (ii) annual report on the state of Digital Decade and (iii) adjusting Digital Decade roadmap every two years.⁹²

E-government

E-government, which refers to ICT usage by the government, is essential to digital transformation. The development outcomes of e-government are not the same for every country, and benefits to vulnerable communities are uneven. However, in general, ICT usage helps governments

⁹⁰ UNESCO (2018). "A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2", Information paper No. 51, Paris: UNESCO; World Bank report (2019). Pakistan: Skills Assessment for Economic Growth, Washington D.C.:World Bank.

⁹¹ Pakistan Bureau of Statistics, Social and Living Standards Measurement Survey (PSLM) 2019-20.

⁹² Source: www.moe.gov.sg/microsites/cos2020/refreshing-our-curriculum/strengthen-digital-literacy.html; www.commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en#the-path-to-the-digital-decade

become more efficient, tailor better policies, and enhance public service delivery. Moreover, since public sector is largest buyer of ICT goods and services, e-government helps create a demand for services offered by local software firms and tech start-ups.⁹³

Pakistan has taken multiple initiatives towards e-government. These include development of e-office to help government ministries become efficient and paperless, and the launch of citizen portal that allows the public to register complaints and provide feedback on government performance. Similarly, to foster education via distance learning in the time of Covid-19, the Ministry of Federal Education introduced e-Taleem, a distance learning platform in collaboration with various organisations.⁹⁴

However, despite these initiatives, the government's adoption of technology is much lower compared to peer economies.⁹⁵ Pakistan is ranked 150th out of 193 countries in the UN's E-Government Development

Index (EGDI) 2022, compared to India and Bangladesh that are ranked 105th and 111th respectively.⁹⁶ Although the country fares relatively better in UN's e-Participation index helped in part by the citizen's portal, it has substantial room for improvement in terms of overall maturity of government's ICT usage across four key areas: core government services, public service delivery, digital citizen engagement, and government as tech enabler (**Figure S1.22**).

Soft information complements these findings. For instance, while e-office and digitisation of government records have been rolled out, their implementation and usage is not widespread. Given that public sector's usage of ICT has a positive spillover on digital absorption by citizens, federal and provincial governments need to scale up their ICT usage in all facets of governance, where efforts need to be made to reduce digital divide to ensure that e-government does not create disparities.⁹⁷ In addition, the country's public procurement rules, which

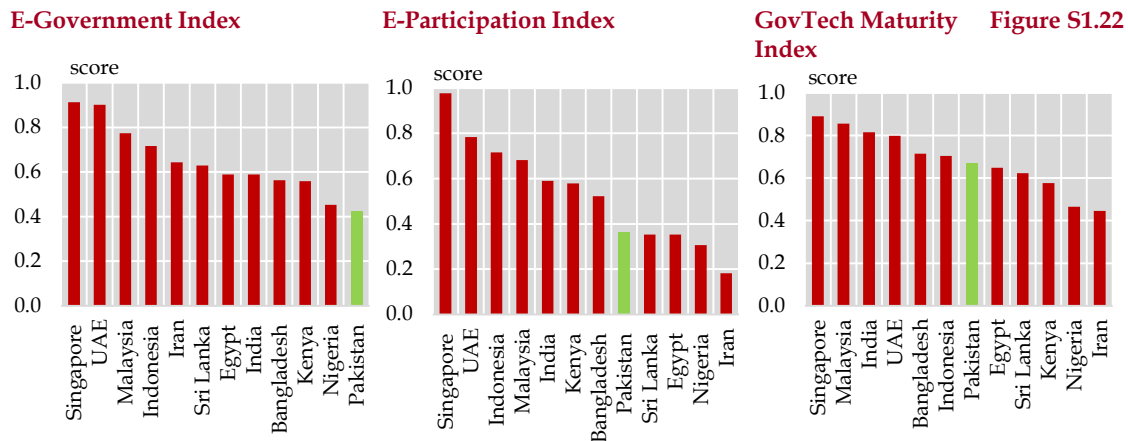
⁹³ World Bank (available at www.worldbank.org/en/topic/digitaldevelopment/brief/e-government, accessed on February 7, 2023; United Nations (2022). *E-Government Survey 2022, the Future of Digital Government*. New York: United Nations Department of Economic and Social Affairs; J. Lee (2016). *Digital Government Impacts in the Republic of Korea: Lessons and Recommendations for Developing Countries*. In T. G. Karippacheril, S. Kim, R. P. Beschel Jr., C. Choi (eds.). *Bringing Government into the 21st Century: The Korean Digital Governance Experience*. Directions in Development. Washington D.C.: World Bank; H. M. Zangana, N. E. Tawfiq, Dr. M. Omar (2020). "Advantages and Challenges of E-Government in Turkey." *International Journal of Creative Research Thoughts* Volume 9 Issue 11 A. Imran and S. Gregor (2005). *Strategies for ICT Use in the Public Sector in the Least Developed Countries: A Cross-Country Analysis*. *ACIS 2005 Proceedings - 16th Australasian Conference on Information Systems*.

⁹⁴ Source: National Information Technology Board (www.nitb.gov.pk/ProjectDetail/MzUyZTIQwNDktZDYwMi00OTJkLTlmMGQtMTQzZmYxN2U2MWNk accessed on February 13, 2022.); E-Taleem (www.etaleem.gov.pk/ accessed on February 13, 2022.); NITB (www.nitb.gov.pk/AllProjects accessed on February 13, 2022.)

⁹⁵ World Bank (2020). "Pakistan: Digital Economy Enhancement Project." *Project Information Document* Report No: PIDC29750. Washington D.C.: World Bank

⁹⁶ EGDI is composite of three sub-indices namely: online service delivery, telecommunication and human capital. Source: United Nations Department of Economic and Social Affairs

⁹⁷ World Bank (2020). "Pakistan: Digital Economy Enhancement Project." *Project Information Document* Report No: PIDC29750. Washington D.C.: World Bank



Source: United Nations Department of Economic and Social Affairs; and World Bank

currently favour established and large IT firms, need to be revised to promote domestic IT industry typically comprising small and young firms.⁹⁸

While relaxing public procurement regulations for small and less established IT firms are a difficult proposition because of risks of nepotism, poor quality of public services, and ineffective utilization of public funds, there is an increasing realization that public procurement can be a useful mechanism to incentivize local firms. This helps domestic IT firms to grow and eventually become capable to compete in international markets.

For instance, Singapore's government encourages local ICT firms to develop solutions for different government bodies, and promotes successful firms through

government-to-government partnerships. Some of the largest Singaporean IT exporting firms have grown through such initiatives.⁹⁹ Sri Lanka's ICT Agency also helps the development of local ICT firms by promoting joint ventures between foreign and local firms and giving such JVs higher points in public procurement criteria.¹⁰⁰ Similar initiatives may be considered in Pakistan where one solution could be to mandate or incentivize IT contractors to sub-contract a certain percentage of work to small domestic IT service firms that do not currently meet public procurement criteria on their own.

Key Cross-cutting Technology Enablers

Digital transformation of both public and private sectors needs a set of cross-cutting technologies and ancillary frameworks that serves as a foundation for growth in both software and start-ups led digitalisation.

⁹⁸ World Bank Report. Pakistan Economic Policy for Export Competitiveness Digital Pakistan: A Business and Trade Assessment, Washington D.C.: World Bank

⁹⁹ V. Grant (2018). Critical Infrastructure Public-Private Partnerships: When is the Responsibility for Leadership Exchanged?, Security Challenges Journal, Vol. 14, Issue 1 , pp. 40-52

¹⁰⁰ UNCTAD (2013). *Promoting Local IT Sector Development Through Public Procurement*. Geneva: United Nations Conference on Trade and Development

Some of the most important ones include cloud storage and computing; cybersecurity; databases and interoperability.

A digital economy produces and thrives on large datasets whose storage and usage requires various types of cloud services, such as cloud storage and computing.¹⁰¹ The inevitability of the use of cloud technology in future can be gauged from the fact that, by 2025, more than 51 per cent of ICT spending within the area of application software and infrastructure market along with business processing services will shift to the public cloud.¹⁰² However, globally, particularly in developing countries like Pakistan, several barriers have decelerated the pace of cloud migration and adoption. These include weak or unreliable internet connectivity; weak or absence of regulations and standardization, stringent data localization rules, and lack of professionals with expertise on cloud-based security solutions etc.¹⁰³

In Pakistan, the first government national data center – that offers various services including cloud – was established in 2016.¹⁰⁴ This was considerably late compared to India and Bangladesh which had launched their first national data centers in the year 2008 and 2009 respectively.¹⁰⁵ However, in recognition of cloud's importance, the MoITT's 2018 Digital Pakistan Policy – that envisions accelerated digitilisation in the country – gave a policy direction to promote cloud infrastructure and its associated services. Accordingly, in 2022 it launched Pakistan Cloud First Policy (PCFP) that aims to guide and empower organisations, including public sector enterprises, to transition to cloud-based solutions. Prior to the launch of PCFP, SBP had also allowed banking industry to use cloud based solutions for non-core banking operations, which have recently been expanded now to use cloud based solutions for core operational data as well.¹⁰⁶ Securities Exchange Commission of Pakistan (SECP) also issued draft Cloud Adoption Guidelines

¹⁰¹ Cloud storage refers to digital data storage on servers at off-site locations while cloud computing refers to the delivery of different services through the internet. The servers are maintained by a third-party service providers.

¹⁰² Source: GARTNER. (website: www.gartner.com/en/newsroom/press-releases/2022-02-09-gartner-says-more-than-half-of-enterprise-it-spending accessed on January 18, 2023)

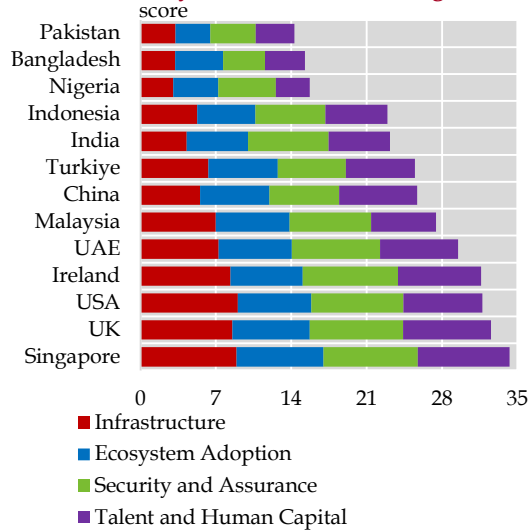
¹⁰³ S.T. Koudah, B.E. Popovsky and A. Tsete (2014). *Barriers to Government Cloud Adoption*, International Journal of Managing Information Technology, Vol.6, No.; T. Vemu and P. Sravya (2019). *A Study on Cloud Migration Models and Security Issues in Cloud Migration*, Department of Computer Science and Engineering, SSRN Electronic Journal, Vol. 6, Issue 4; Cloud Insights survey, Longitude Research, (2017). Oracle Cloud Platform. *Move Workloads to the Cloud*; Accenture Report. *Sky high hopes: Navigating the barriers to maximizing cloud value*. Dublin: Ireland

¹⁰⁴ Source: National Telecom Center website (www.ntc.net.pk/orderbooking/home.asp accessed on January 25, 2023)

¹⁰⁵ India National Informatics centre website. (www.nic.in/servicecontents/data-centre/#:~:text=The%20National%20Data%20Centres%20form,and%20NDC%20Bhubaneshwar%20in%202018. accessed on January 26, 2023); GovTech Maturity Index Update 2022. Trends in Public Sector Digital Transformation, The International Bank for Reconstruction and Development: Washington D.C

¹⁰⁶ SBP Circular No. 4 of 2020. (www.sbp.org.pk/bprd/2020/C4.htm); SBP Circular No. 1 of 2023 (www.sbp.org.pk/bprd/2023/C1.htm)

The Cloud Ecosystem Index - 2022 Figure S1.23



Source: Massachusetts Institute of Technology Technology Review

in 2021 for its regulated sectors;¹⁰⁷ however those guidelines have not been finalized as of yet.

The potential of cloud adoption in public sector is immense as federal government alone has more than 40 divisions and 600 affiliated departments.¹⁰⁸ However, successful implementation of PCFP in public hinges on coordinated efforts from different government departments; for instance, ensuring cloud usage in public sector development programme (PSDP) and in public procurement.¹⁰⁹ This is an area that presently requires a detailed action plan for migration and continuous implementation.

¹⁰⁷ SECP website: (www.secp.gov.pk/document/draft-cloud-adoption-guidelines-for-incorporated-companies/?wpdmdl=42956&refresh=63d22f61ced1674719073 accessed on January 26, 2023)

¹⁰⁸ Government of Pakistan website. (www.pakistan.gov.pk/ministries_divisions.html accessed on January 25, 2023)

¹⁰⁹ H. Fatima and N. Qazi (2022). *Untethering from Legacy Infrastructure: Pakistan's Cloud First Policy*, Centre for Digital Transformation, Islamabad: Tabadlab

¹¹⁰ World Bank (2020). *Pakistan: Digital Economy Enhancement Project (P174402)*, Project Information Document (PID), Concept Stage, Report No: PIDC29750 Washington D.C.: World Bank

Moreover, the role and responsibilities of each department also need to be clearly defined with regard to data residency, security protocols and certification accreditation to avoid ambiguity.¹¹⁰

Other areas that warrant attention for wider cloud adoption across public and private sector include improvements in cloud infrastructure, relevant human capital, as well as security, as evidenced by Pakistan's 73rd rank in global cloud ecosystem out of 76 countries evaluated by MIT Technology Review on four key metrics (Figure S1.23). To this end, one solution that may be considered, is attracting large foreign cloud operators to set up cloud operations in Pakistan. This may be done by allowing data centers to be set up as special technology zones where the government can provide or lease subsidized land and ensure electricity, high speed internet under the planned 5G rollout.

Cybersecurity poses a key risk to the prospects of digitalisation as, breaches of cybersecurity, privacy and data sovereignty are a challenge for storage and processing infrastructure. It also risks loss of digital identity, financial losses, private personal records and several other facets of digital existence. This is why regulators see cybersecurity as among the top risks to digitalisation, where fintech and other

financial organisations rate cybersecurity risks at par with liquidity risks.

To this end, a Prevention of Electronic Crimes Act (PECA) was passed in 2016 followed by the passing of Data Protection Bill (DPB) in 2021 to help ensure the protection and confidentiality of online data, upholding privacy of the citizens. A National Cybersecurity Policy (NCP) was also announced in 2021 aimed at ensuring security, confidentiality, integrity, and availability of digital assets across the public and private sector.

Moreover, in line with global best practices, the MoITT has prepared draft rules for Computer Emergency Readiness Team (CERT), an important part of the overall capacity to tackle cyber incidents. The rules are in the process of finalization; once they are finalized and approved, all government authorities will form CERT for their regulated sectors and assist the private sector.¹¹¹ For instance, the PTA has launched its CERT to protect telecom sector.¹¹² A National Cybersecurity Act is also currently being reviewed by the MoITT’s legal wing; it is expected to take up to a year for eventual approval from the Parliament, where PECA 2016 is also being reviewed for possible amendments to keep pace with the fast evolving digital world.¹¹³

While these are promising developments, Pakistan still lags behind its peers in Global Cyber Security Index 2020 that assesses

Global Cyber Security Index- 2020 **Table S1.5**

	Score	Rank
USA	100.0	1
UK	99.5	2
Singapore	98.5	4
India	97.5	10
Turkiye	97.5	11
Indonesia	94.9	24
Vietnam	94.6	25
Thailand	86.5	44
Bangladesh	81.3	53
Iran	81.1	54
Philippines	77.0	61
Pakistan	64.9	79
Sri Lanka	58.7	83

*GCSI calculated on basis of legal, technical, organisational, capacity building and cooperative measures

Source: International Telecommunication Union

cybersecurity on five aspects: legal; technical; organisational; capacity building and cooperation measures. The recent passing of DPB and NCP can be expected to improve Pakistan’s global rankings in legal component of cybersecurity index henceforth. However, considering that cybersecurity breaches also cause loss of public trust leading to setbacks on the path to digitalisation, the country’s substantially low scores suggest that cybersecurity efforts need to be mainstreamed across various aspects (**Table S1.5**). These include the need for cybersecurity audit and compliance; national curriculum for basic cybersecurity literacy and skills; human resource development programs for technical staffing in public and private sector; and special courts related to cybersecurity.¹¹⁴

¹¹¹ As per correspondence with officials of MoITT

¹¹² Pakistan Telecommunication Authority website (www.pta.gov.pk/en/media-center/single-media/pta-launches-cert-portal-for-telecom-industry--050421 accessed on March 16, 2023)

¹¹³ As per correspondence with officials of MoITT

¹¹⁴ Source: International Telecommunication Union, Global Cybersecurity Index Report 2020

Data registries and interoperability, which refers to the ability of digital systems to exchange and use information, is another important technology enabler. One example of it is digital identity, such as Nadra's national ID systems. Other examples of it include cloud-based health, police, court, taxation and land records and utilities payment history. These are not only needed for a thriving fintech industry, such as for their KYCs and credit scores, but also for other industries such as- hospitals and better public policymaking especially during emergencies. Though the country has a relatively strong national ID system and payment system respectively, the lack of interoperability frameworks and mechanisms acts as a barrier to public and private sector's capacity to exchange data securely and seamlessly and thus, hampers the transition towards e-documentation, e-signatures and e-invoicing.

Policy and Institutional Support

To fast track digitalisation, governments, especially of developing economies eyeing the opportunity of technology-led leapfrogging, need to provide policy and

institutional support to encourage innovation policies, infrastructure, and ensure appropriate technological standards and safety.¹¹⁵ In Pakistan, the government has taken a host of policy and institutional initiatives to support the many facets of IT ecosystem from the perspective of promoting IT exports and digitalisation of economy. These include the setting up of National Incubation Centre (NIC) in 2016; launch of Digital Pakistan Policy 2018; and the e-Commerce Policy 2019.

Similarly, SBP has also promoted digital payments and fintech in the country, with policy measures such as Regulations for Digital On-Boarding of Merchants.¹¹⁶ Recently, the SBP had further facilitated IT exporters by advised banks to mandatorily credit 35 percent of the exports proceeds into these exporters' special foreign currency account.¹¹⁷ SECP has provided Regulatory Sandbox to offer tailored regulatory conditions for testing new and innovative products and services at a limited scale to assess their viability.¹¹⁸ In addition, several policies and regulations are currently in draft stages; once approved, these are expected to further facilitate the sector (**Figure S1.24**).

¹¹⁵ UNCTAD (2018). *Leapfrogging: Look Before You Leap*. Policy Brief. Policy Brief No.71. Geneva: UNCTAD; K. Lee (2021). *Economics of Technological Leapfrogging*, in J. Lee, K. Lee, D. Meissner, S. Radosevic, and N. S. Vonortas (eds.) *The Challenges of Technology and Economic Catch-up in Emerging Economies*. Oxford: Oxford University Press

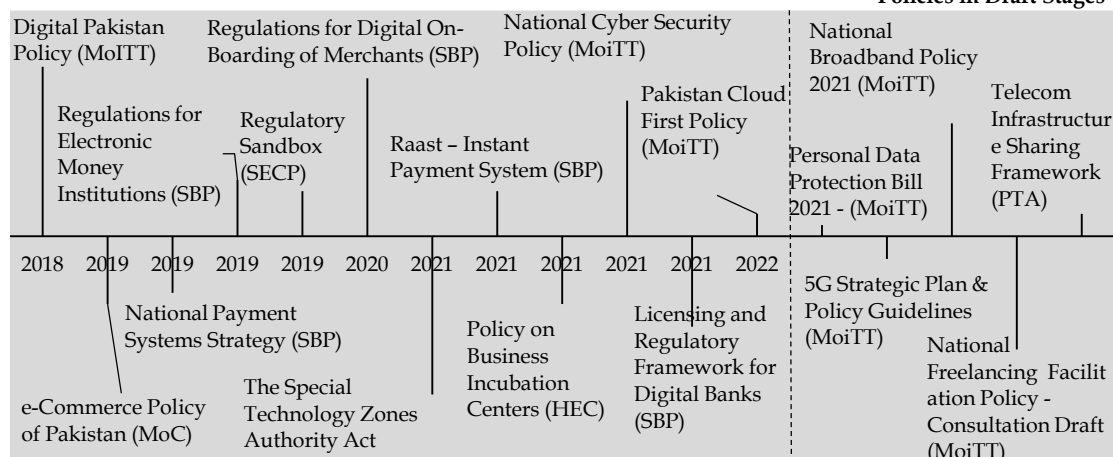
¹¹⁶ Source: SBP www.sbp.org.pk/bprd/2020/CL1-Annex-A.pdf [accessed on March 24, 2023]

¹¹⁷ Under Para 36, Chapter 12 of the Foreign Exchange Manual, exporters of services are allowed to retain 35 percent of their export proceeds in their special foreign currency accounts in Pakistan upon request to banks. In January 2023, SBP had made this facility mandatory for IT exporters and freelancers (wide EPD Circular Letter No. 2 of 2023), to further encourage them to bring their foreign exchange earnings into the country. However, these instructions are valid until March 31, 2023. These instructions will be reviewed in the light of incremental export performance by IT sector and realization of export proceeds thereof during this period. (www.sbp.org.pk/epd/2023/FECL2.htm)

¹¹⁸ Source: SECP (www.secp.gov.pk/regulatory-sandbox/what-is-regulatory-sandbox/ accessed on 27 November 2022)

Recent Regulatory and Policy Developments

Figure S1.24
Policies in Draft Stages



Note: This is not an exhaustive list of policies
Source: SBP, SECP, MoC, MoITT and National Assembly

However, there are at least four key areas that warrant attention from the perspective of government policy and institutional support. First, given the cross cutting nature of digitalisation across sectors, the degree of coordination and concerted efforts needed for digital transformation, requires highest government offices to be leading the digitalisation agenda across federal and provincial governments.

For instance, in Singapore, the Smart Nation and Digital Government Office, which prioritizes and promotes digital transformation in public and private sector, works directly under the Prime Minister's Office.¹¹⁹ In Kenya, a Digital Economy Implementation Secretariat is planned with membership from all key public and private sector stakeholders alongside an inter-ministerial framework to monitor

Indicative PSDP on Digitalisation* Table S1.6

	Allocated Amount (as percent of total PSDP spending)	No. of Projects (as percent of total PSDP projects)
FY19	0.7	4.5
FY20	2.2	5.6
FY21	1.7	5.4
FY22	2.7	7.3
FY23	2.3	7.1

* These are indicative allocations as formal estimates of actual PSDP spending on digitalisation are not available. These are based on the sum of all projects that explicitly relate to the following keywords: *cyber, digital (digitalisation, digitisation), data (for e.g. storage), AI, cloud, knowledge economy, computers and computing, mobiles and broadband, e-learning, smart projects*. These estimates do not include any allocated spending on digital components of projects that are not explicitly named as digital projects.

Source: SBP Staff Estimates based on MoPDSI

implementation throughout its various state departments and agencies.¹²⁰

Nigeria has also re-designated its Federal Ministry of Communications as the Federal

¹¹⁹ PM Office Singapore (www.pmo.gov.sg/About-Us, accessed on February 14, 2023.)

¹²⁰ Kenya Digital Economy Blueprint (www.ca.go.ke/wp-content/uploads/2019/05/Kenyas-Digital-Economy-Blueprint.pdf)

Ministry of Communications and Digital Economy with the mandate of development and implementation of Digital Economy Policy and Strategy across the country.¹²¹ Similarly, Malaysia has formed a National Digital Economy and 4th Industrial Revolution Council chaired by the country's prime minister to accelerate digitisation, accompanied by a strategic change management office which acts as a secretariat to the council to drive changes on the ground across the country.¹²²

Unlike these developing and emerging economies, digitalisation agenda in Pakistan is not being led by Prime Minister office; nor does it have a dedicated ministry or secretariat. While the MoITT has drafted the Digital Pakistan Policy, it does not have the mandate to institute and monitor implementation across the country.¹²³ The absence of a strong driving secretariat to steer and coordinate is evident from the fact that overlapping jurisdictions and lack of clarity at the local government level have constrained the deployment of fiber optic cables even in large cities. Moreover, whereas various digitalisation efforts by different government bodies are in isolation and lack the element of interoperability without policy frameworks for standardized data management.¹²⁴ Moreover, the agenda

of digital transformation also does not appear to be pronounced in public sector development spending (**Table S1.6**).

The second area that warrants attention relates to the alignment of sectoral policies with digitalisation agenda. In some cases, such as fintech and e-commerce, policies focusing on e-commerce, fintech and financial inclusion contributed to growth in these start-ups. However, in several other sectors, policies need to be formed or updated to facilitate digitalization. For instance, ride-sharing tech start-ups faced legal challenges in Punjab and Sindh because public transportation laws were not applicable on them.¹²⁵ Likewise, except for Sindh Telemedicine and Telehealth Act 2021 and the draft policy for telemedicine Pakistan, there is no e-health policy at the provincial or federal level to facilitate health tech start-ups. Similar policy and regulatory gaps need to be addressed in other sectors, including education where the involvement of ed-tech start-ups may go a long way in addressing the gaps in public schooling system.

Third, while the Special Technology Zones Authority aims to create technology parks, and private and public incubators also organize networking activities, there is a

¹²¹ Nigeria National Digital Economy Policy and Strategy (2020-2030) (www.ncc.gov.ng/docman-main/industry-statistics/policies-reports/883-national-digital-economy-policy-and-strategy/file)

¹²² Malaysia Digital Economy Blueprint (www.epu.gov.my/sites/default/files/2021-02/malaysia-digital-economy-blueprint.pdf)

¹²³ MoITT's role in digitalisation is only that of facilitator with a mandate to develop an action plan in consultation with relevant ministries and departments who have the lead role in implementation in their respective domains. Source: MoITT (2018). *Digital Pakistan Policy*. Islamabad: MoITT

¹²⁴ Project Information Document (PID) (2020). Pakistan: Digital Economy Enhancement Project (P174402). *Concept Stage, Report No. PIDC29750*. Washington, D.C. : World Bank Group

¹²⁵ Gulf News www.gulfnews.com/business/careem-uber-hope-for-legal-support-in-pakistan-1.1975263, accessed on February 15, 2023.

need to significantly improve the formation of technology clusters and platforms for interaction between stakeholders operating in the tech industry, especially in smaller cities. To this end, formation of sector specific incubators, development of exchange programmes among clusters and between start-ups and traditional industries will help in community building that is one of the key factors of success in growth of technology startups.¹²⁶

Fourth, while federal and provincial governments have started investing in hardware and software towards digitalisation of limited number of services, these efforts are being made in a siloed manner, leading to duplication of investments. The development of these parallel systems is costlier for governments and time consuming for individuals and businesses. Although some provincial civil registries are being automated, such as land records in Sindh and Punjab, digitalisation needs to be expanded to all registries and linked with National Database and Registration Authority (NADRA) whilst ensuring interoperability, security, single sign-on and other features of an efficient system integration.¹²⁷

S1.4 Final Remarks

Technological advancement offers developing economies an opportunity to leapfrog and catch up with the developed world faster than ever before. However,

timely adoption of digitalisation is needed to be at the forefront of technology. The pace of digital transformation and the ongoing fourth industrial revolution is much faster than earlier technologies, which took decades to develop and spread across countries. This means the cost for inaction or late action can be huge.

The recent growth in Pakistan's IT exports and start-ups deals may be seen as emerging signs of digitalisation. However, domestic market size of IT and software is insufficient to help the industry scale up; the firms in the sector are very small; and their exports lack market diversification. The start-up ecosystem is still very young and concentrated only in two sectors: fintech and e-commerce. For continued growth in these areas and to be amongst early adopters of digital transformation, if not leaders of innovative technologies, it is essential that individuals, federal, provincial and local governments, and businesses across sectors embrace latest technologies.

With software and start-up led digitalisation becoming a subject of policy attention around the world, the competition for IT exports and global VC funding for start-up is expected to increase in the years ahead. This further underscores the need to grow domestic demand for digitalisation in Pakistan.

The government, as one of the largest IT consumers, can generate demand by digitalizing its services and operations of the

¹²⁶ Ignite (2023). Study for Assessment of Pakistan's Startup Ecosystem

¹²⁷ World Bank (2022). *South Asia's Digital Opportunity: Accelerating Growth, Transforming Lives* Washington, D.C.: World Bank; World Bank (2023). *Pakistan: Digital Economy Enhancement Project. Project Information Document (P174402)*. Appraisal Stage, Report No: PIDA31211. Washington D.C.: World Bank; World Bank (2022). *South Asia's Digital Opportunity: Accelerating Growth, Transforming Lives* Washington, D.C.: World Bank.

public sector. This will have a two-pronged impact. First, it will bring efficiency in government's own operations, create facilitative business environment, and improve public services provided to citizens. Second, it will provide the opportunity for the typically small domestic IT firms to develop tech-based solutions for the government allowing them to scale up and professionalize before they can compete in international markets.

The appetite for technology by businesses, including SMEs, in the private sector and individuals at large has to increase to expand the addressable market for start-ups and further digital transformation. One of the major hurdles limiting the mass proliferation of IT relates to its affordability and availability, especially for the rural population. To remedy that, the duties and taxes on internet and the devices used to access it need to be reduced. Further, the development of absorptive capacity of the population is crucial. This can be achieved by enhancing digital literacy via focused initiatives, including through social media platforms, and making digital education a fundamental part of the curriculum.

Educational institutes and training centers must also be proactive and forward-looking in bridging the supply-demand gap of human capital in IT industry, and keep pace with the fast evolving advanced skills. This is where private sector has a particularly important role to play by allocating resources to improvements in human capital and digital literacy. The private sector, especially local high net worth investors, family funds and foundations need to develop a patient

capital mindset characteristic of investments in start-ups. This change is especially needed to increase local investments in areas of edtech, healthtech, and other areas of economy where technology can potentially address Pakistan's long standing challenges, including those related to savings, insurance, taxation, and documentation of informal economy.

The role of fintech in digital transformation will be critical, given its potential to address the digital divide and the fact that finance complements economic transactions. However, the growth of start-ups, in general, and fintech, in particular, depends on how fast the government progresses on ensuring the availability of enabling technologies and related frameworks such as cloud storage and computing, cybersecurity, digitisation of civil registries, credit reporting system reforms, and ensuring interoperability between various government systems and databases.

The development of software, technology start-ups and other IT related sectors is not about choosing IT industry as a winner among others; it's about digital transformation of the economy at large and enabling leapfrogging. In recognition of this, a host of policies and regulations by various ministries and government organisations have laid the right foundations. However, the fast evolving IT industry and the enormous nature of this task requires consistent and concerted efforts to be led by the prime minister office or a dedicated ministry to direct, coordinate, and align private and public sector actors, sectoral policies and institutions across the country.