ACCELERATE

TO THE DIGITAL STATE

d-EDUCATION

CONTENTS

EXECUTIVE SUMMARY

Technology is changing the world as we know it, and is continuing to permeate our daily lives. This phenomenon, known as Digitalization, has vast benefits for societies, economies, and governments. Various sectors are transitioning towards adopting electronic and mobile based solutions in an effort to reap the benefits of digitalizing existing systems and processes.

The use of technology in the education sector has escalated over the past decade. Societies are recognizing that investment in education is an investment in their future growth and economic prosperity. Traditional methods of learning and teaching are increasingly being replaced or enhanced by digital technologies. This paradigm shift is not only the result of digitalization of the industry but also partly a response to increasing costs of education and the accompanying inefficiencies.[1] While developed nations are increasingly more dependent on utilizing digital solutions in their education systems, developing nations are just beginning to embark on that journey.

This report makes a case to proliferate Digital Education (d-Education) in Pakistan. It provides a deep-dive into the existing challenges and opportunities in Pakistan's education sector, a high-level analysis of the state of education in different provinces, the benefits that d-Education has brought about around the world, before concluding with a set of recommendations supported by international case studies.

This report has identified a number of important gaps that still have to be addressed to achieve quality education in Pakistan. Some of the challenges highlighted in the education sector include; a high number of out of school children, high dropout rates, gender disparity, urban-rural disparity, the lack of basic facilities in schools, poor quality of education, untrained teachers, and the misallocation of funds.

The paper argues that d-Education has the potential to solve the challenges of the education sector including; the potential to improve reach and accessibility, personalize the learning experience, promote efficiency, improve learning outcomes, increase economic benefits, and ultimately create a digitally literate society. Mobile Network Operators (MNOs) can plug in their expertise and offer ways of addressing these challenges by making use of technology that can support, enhance or enable educational opportunities and practices.

The report concludes with a set of recommendations to expedite the uptake of d-Education in Pakistan which focus on government prioritization of d-Education, the Enablement of access for the masses, a focus on digital literacy, and the enhancement of Public-Private & Private-Private Partnerships.

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[1] Vodafone, Connected Education, 2017

ABOUT **DIGITAL EDUCATION**

1. About Digital Education

Digitalization in the education sector has two primary components – e-Education and m-Education. According to a joint publication by McKinsey & GSMA, **e-Education** comprises of all forms of electronically supported learning and teaching, where the information and communication systems serve as specific media to implement the learning process.[2] **m-Education** on the other hand, is defined as all forms of e-Education that use mobile networks for connectivity and are accessed through portable devices.[3] e-Education and m-Education are quickly blending with traditional methods of learning to not only improve access to education but also to improve the quality of the education that is being delivered.

In order to approach the digitalization of the education sector in a more holistic manner, d-Education is the terminology that will be used in this report to encompass both e- and m-Education. Within **d-Education**, Mobile Network Operators (MNOs) play a more pivotal role in the provision of education through the utilization of digital technologies.

Several actors can benefit from utilizing technology in the education sector. These include the individuals, the communities and provinces, the government, as well as private corporations. d-Education:

- **Improves Reach and Accessibility:** d-Education simplifies the access of the masses to education resources and experts. Through different tools of technology, it overcomes traditional constraints of time and space. Hence, it promotes equal access and increases potential reach. d-Education can thus provide access to education for students who are out of school.

- **Personalizes the Experience:** d-Education personalizes the education experience for learners by offering flexibility and tailoring the learning experience. This in turn helps improve the learning experience for students. It improves their academic performances, leads to better classroom practices, improves digital literacy, and helps eradicate illiteracy. A key example is Telefonica Spain's web-based solution "Aula365". Students have the flexibility to choose their instructional media (e.g. video/graphics) to learn, enhance understanding and deepen engagement.[4] Such flexibility can be used to gage the interest and hence reduce the number of students dropping out due to their unwillingness to go to school.

- **Reduces Information Asymmetries:** Devices with mobile connectivity improve learning and engage students and teachers, leading to a variety of benefits, including the real-time assessment, increased innovation, and the empowerment of women and disadvantaged population groups. Remote learning can also help reduce gender and urban-rural disparities in education. The access to education ultimately reduces information asymmetries and equalizes opportunities for the masses.

- **Promotes Efficiency & Transparency:** As processes are digitalized in the education system, efficiency and cost savings are promoted. For example, Mobile Financial Services can be utilized to automate financial transactions for students and parents. Furthermore, attendance of both teachers and students can be monitored through the use of digital technology. In addition, communication can also take place more effectively between parents and the schools.

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[2] McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012
[3] McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012
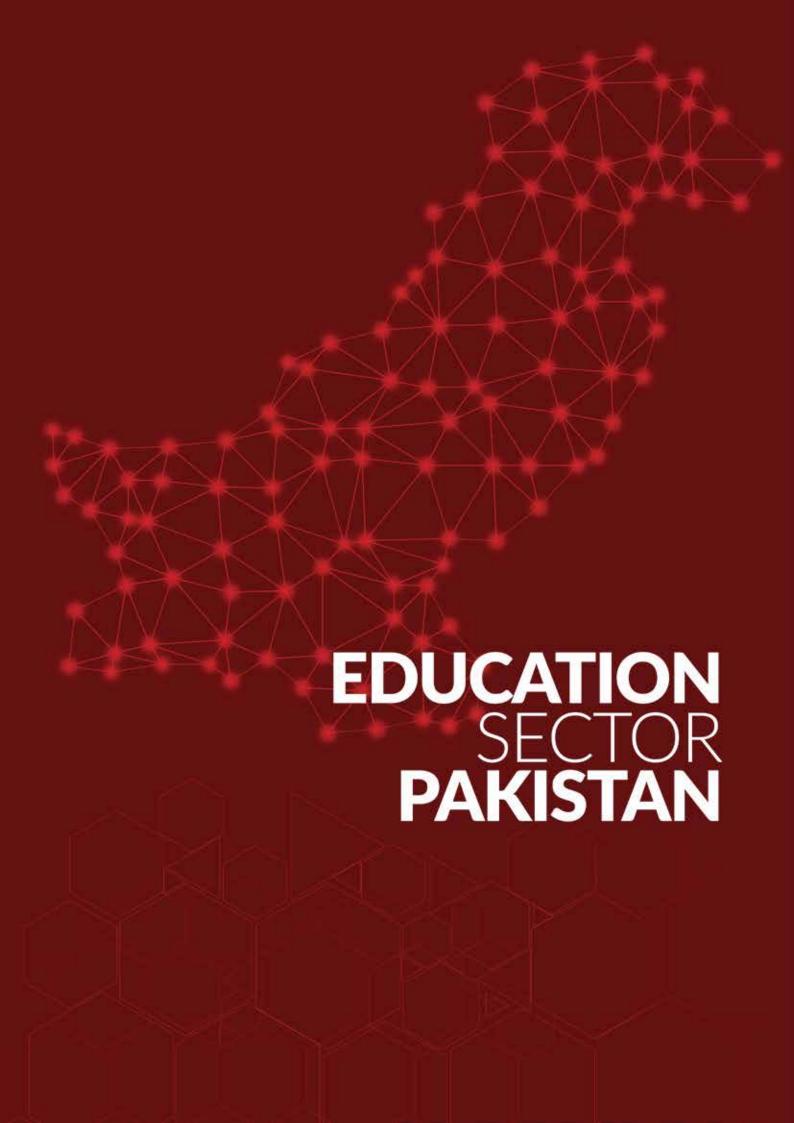[4] Deloitte, Telecom: Enabling Growth And Serving The Masses, 2014

- **Improves Learning Outcomes:** d-Education represents a profound shift in the way education is delivered and received. The advantage of online learning is that it is flexible, adaptive, and interactive. Hence, the content delivery can be matched to each individual's learning pace and style. For example, in the United States, 3 years after educators began using mobile based computing devices to assess the progress of individual students and tailor lessons to their needs, the oral fluency of kindergartners tripled.[5] Hence, d-Education can help improve the quality of education provided.

- **Increases Economic Opportunities:** Not only does education have the potential to reduce child poverty and improve job opportunities, it also has the potential to have large scale economic benefits. For example, Vodafone's Knowledge is Power program in India and Africa has the combined potential to make a $3.1 bn potential contribution to the GDP by 2025.[6]

- **Creates a Digitally Literate Society:** Those with a higher level of education are not only more digitally literate, they are likely to more easily recognize the value of access to new sources of information and be better equipped to take advantage of it. Education can therefore be the driver of mobile broadband take-up and depth of use. It can also increase the level of sophistication with which they are used. Education has the potential to increase the use of smartphones for other purposes such as business and entrepreneurial activities, social connections, and access to information and current affairs.[7] Educational opportunities will also impact marginalized groups and communities who otherwise may be left behind in a digital world.

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[5] McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012
[6] Vodafone, Connected Education, 2017
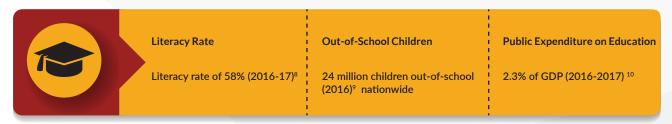[7] Ibid

EDUCATION
SECTOR
PAKISTAN

2. Education Sector Pakistan

2.1. Overview

	Literacy Rate	Out-of-School Children	Public Expenditure on Education
	Literacy rate of 58% (2016-17)[8]	24 million children out-of-school (2016)[9] nationwide	2.3% of GDP (2016-2017) [10]

Education has the power to alleviate poverty and reduce socio-economic disparities. The UN has placed education as one of its Sustainable Development Goals (SDGs). Goal 4 of the SDGs is "to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."[11] The goal specifically focuses on including persons with disabilities, indigenous people, refugee children and poor children in rural areas. Primary and secondary-age education is a vital part of raising living standards. Increasing rates of literacy and numeracy support growth and development and ultimately enhance employment prospects.

In Pakistan, public expenditure on the education sector accounts for about 2.3% of GDP and is projected to increase to 4% of GDP by 2018. In 2015-16, Punjab spent about 37.9%, Sindh about 20.3%, Khyber Pakhtunkhwa about 16.9%, and Baluchistan about 6.85% whereas the federal spent 17.9% of total public expenditure.[12] In the same corresponding year, amongst the provinces, Punjab took the lead with a 61% literacy rate, followed by Sindh with 56%, Khyber Pakhtunkhwa with 53%, and Baluchistan with 43%.[13]

Out of the provinces, Punjab has the highest literacy rate at 63%.[14] There are an estimated 26 million children in Punjab between the ages of 5 and 16, of which 11.4 million are out of school amounting to 44% of children being out of school.[15] Sindh comes second place with a literacy rate of 60%.[16] With more than 12 million children, 6.7 million are out of school totaling to 56% of out of school children.[17] Khyber Pakhtunkhwa has a literacy rate of 53%.[18] There are 6.8 million children of which 2.5 million are out of school which equals to 36% of out of school children.[19] Balochistan has the lowest literacy rate with 44% of the population actually being literate.[20] There are 2.7 million children in Balochistan between the ages of 5 and 16, of which 1.8 million are out of school amounting to 70% of children being out of school.[21] It has the highest percentage of out of school children amongst the provinces.

In Pakistan, Digital Education is just at its early stage of development. Some initiatives are being carried out by the private sector, donor agencies, and funding bodies, that are slowly taking ground with the masses. At the

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[8] "Economic Survey of Pakistan (2016-17) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_17/10-Education.pdf

[9] Alif Ailaan, Pakistan District Education Rankings, 2016

[10] "Economic Survey of Pakistan (2014-15) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_15/10_Education.pdf

[11] United Nations, Sustainable Development Goals, 2017

[12] "Economic Survey of Pakistan (2016-17) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_17/10-Education.pdf

[13] Ibid.

[14] Ibid.

[15] Alif Ailaan, The State of Education in Punjab, 2016

[16] "Economic Survey of Pakistan (2016-17) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_17/10-Education.pdf

[17] Alif Ailaan, The State of Education in Sindh, 2016

[18] "Economic Survey of Pakistan (2016-17) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_17/10-Education.pdf

[19] Alif Ailaan, The State of Education in Khyber Pakhtunkhwa, 2016

[20] "Economic Survey of Pakistan (2016-17) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_17/10-Education.pdf

[21] Alif Ailaan, The State of Education in Balochistan, 2016

government's end, both the Federal government and the Provincial governments are taking lead in starting digital education programs within local universities and educational institutes.

2.2. Federal Focus

The **Ministry of Federal Education and Professional Training (MoENT)** is responsible for creating nationwide policies to ensure availability of education. MoENT's sub-departments includes; the National **Education Assessment System** which identifies the improvement opportunities and problems with the nation's education system; the **National Curriculum Council**, with membership from all provinces to ensure minimum standards in education and the **Higher Education Commission**, an independent, autonomous, and constitutionally-established institution, responsible for primary funding, and regulating and accrediting higher education efforts in Pakistan.

Working with these stakeholders, the Federal Government has recently launched the **National Education Policy 2017**, an effort following the **National Education Policy 2009** which aims to bridge implementation gaps by outlining reforms and policy actions to be taken at provincial levels. The Federal Ministry of Education and provincial education departments then developed the **National Plan of Action 2013 - 2016.**

Key Programs

Higher Education Commission's Smart Education[22]

The Higher Education Commision's objective is to tranform universities in Pakistan into Smart Universities which will lead towards Smart Education. The first step is to launch the initiative of Smart Bags, whereby students are provided with laptops. This is followed by the introduction of Smart Classrooms to make Information & Communication Technology (ICT) integral to learning. This in turn is supported by Smart Campuses under which blanket WiFi coverage is provided across the universities.

Impact to date
Over 500,000 laptops are being awarded amongst the students.

Jazz Smart Schools Project (SSP)[23]

Jazz and Knowledge Platform have launched Jazz Smart Schools in collaboration with Federal Directorate of Education and Capital Administration and Development Division. The Smart School Project (SSP) is based on the concept of 'blended learning' in which digital and online media is used to educate students. A technology-equipped environment in schools with modern computers, internet connectivity and online learning will boost the comprehensive skills of students. Online instruction materials like bilingual (English-Urdu) training courses will improve the technical skills of the teachers. The initiative is under the umbrella of the 'Prime Minister's Education Reform Program' and is aligned with three SDG goals and Pakistan's Vision 2025.

Impact to date
The program rolled out in 75 female public high schools in Islamabad, out of which 49 are situated in rural areas. It will serve over 20,000 girls over the period of two years.

[22] "Smart Education", Higher Education Commission, Retrieved on 7th March, 2018 from: http://www.hec.gov.pk/english/services/Pages/SmartEducation.aspx
[23] "Smart School Project to launch to promote IT-based learning," TechJuice, Retrieved on February 14, 2018 from:
https://www.techjuice.pk/smart-school-project-to-launch-to-promote-it-based-learning/

TeleTaleem[24]

TeleTaleem (T2) uses ICT to connect users with quality learning opportunities across all boundaries. TeleTaleem's products range from primary to tertiary and from teacher education to technical education and training – focusing highly on the use of video conferencing. It is supported by Comcept, a technology development company. While funding was originally provided by Department for International Development (DFID), Asian Development Bank (ADB) decided to invest in TeleTaleem (T2), to fund the second stage of business growth. Some products offered, include:

- ILMunate – An online interactive platform to teach students in remote areas

- Learning boost – Providing Teacher professional development on early literacy and numeracy

- Online Teachers Academy – Teacher training portal where teachers can gain certification

- Rapid Assessment Service – Working with third party actors to carry out assessments

> **Impact to date**
> TeleTaleem works with over 4000 plus schools, across 60 districts. It has provided training to 6000 teachers, and has impacted more than 250,000 children.

Information Technology University & edX [25]

An online initiative to note is the recently announced partnership between the Information Technology University (ITU) and edX – the nonprofit online learning platform created by Harvard and Massachusetts Institute of Technology (MIT). The partnership aims to develop Pakistan's first digital university by offering advanced online courses under faculty supervision.

2.3. Provincial Focus

Since education is a provincial concern, as per the 18th constitution amendment, the education departments in all provinces of Pakistan serve as the implementation body for their respective education plans, ensuring coordination with the federal government. Provincial IT Boards such as the Khyber Pakhtunkhwa Information Technology Board (KPITB) and the Punjab Information Technology Board (PITB) have both launched various initiatives geared towards digitalizing the education sector in their respective provinces.

2.3.1. Sindh

The Education and Literacy Department looks after the educational affairs within Sindh and co-ordinates with the Federal Government and donor agencies regarding promotion of education in the province. The department plays a supervisory role of Primary education and manages Secondary education, Technical Education, incentive programs and development schemes. In 2017, statistics indicated that there were 38,132 primary schools, 1,640 middle, 601 elementary, 1,719 secondary and 291 higher secondary schools.[26]

Autonomous bodies overlooking other areas include: the Reform Support Unit which builds the institutional capability of the Department of Education; the Sindh Textbook Board which overlooks the production and

[24] Meeting with TeleTaleem's Head of Marketing
[25] "ITU & EDX Signs MOU for Pakistan's First Digital University", Information Technology University, Retrieved on June 11, 2017 from:
[26] School Education & Literacy Department, Sindh Education Profile 2016-17

publication of textbooks and supplementary reading material relating to textbooks; the Bureau of Curriculum & Extension Wing which is responsible for curriculum development; the Sindh Education Foundation which encourages and promotes education in the private sector; the Provincial institute of Teacher Education which was created with help of Asian Development Bank, as a teacher education institute; the Sindh Teachers Education Development Authority which oversees and regulates the teacher training activities; and the Sindh Basic Education Program which is a program of the department and the United Stated Agency for International Development (USAID) under which 120 schools will be constructed by USAID in Sindh's under developed areas.

The **Sindh Education Sector Plan 2014-2018**[27] was formulated with key policy, strategy and program priorities outlined under four areas of access, quality, governance, and public finance management.

Sindh's Education Sector Plan (SESP) is a response to the 18th amendment that mandates the province to provide Free and Compulsory Education to all children aged five to sixteen years in Sindh. It continues to be guided by the National Education Policy of 2009, but represents a significantly new vision of education goals and possibilities specific to the rapidly evolving context of the province itself.

Key Programs

Teachers' Biometric Verification[28]

There are close to 150,000 teachers currently employed with the Education & Literacy Department in Sindh. The poor performance of these teachers impacts student learning and overall quality of education. A major hurdle in initiating reforms to address this issue has been the lack of data on teachers. The Teachers' Biometric Verification program maps all government school teachers and compile their information on a central database via biometric verification. The overarching goal of this exercise is to make data-driven decisions in order to regulate teacher recruitment, teacher allocation, salary allotment, and teacher attendance.

> **Impact to date**
> As per December 2015, a total of over 147,000 teachers (over 95%) have completed their biometric verification.

Sindh School Monitoring System (SSMS)[29]

The Monitoring System collects, analyzes, and disseminates data on key indicators such as student enrolment and teacher presence. Data is collected on the monthly basis to allow monitoring of trends and 'real-time' response to identify weaknesses in education system. Moreover, more elaborate and systematic mobile application has recently been developed to monitor all the schools. The system aims to control teacher absenteeism levels, monitor school education, and provide first-hand information about school infrastructure.

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[27] "Sindh Education Sector Plan", Sindh Education and Literacy Department, Retrieved on June 10, 2017 from: www.sindheducation.gov.pk/Contents/Menu/Final%20SESP.pdf

[28] "Teachers' Biometric Verification-Mapping the Education Department's workforce", Sindh Education and Literacy Department, Retrieved on May 29th, 2018 from:
http://www.sindheducation.gov.pk/pages.jsp?page=biometricverification

[29] "Sindh School Monitoring System", Sindh Education and Literacy Department, Retrieved on May 29th, 2018 from:
http://www.sindheducation.gov.pk/pages.jsp?page=sindhschoolmonitoringsystem

World Bank's Sindh Education Sector Reform Program (SERP II) [30]

SERP II focuses on the upgradation of selected governance, accountability, and system improvement activities in order to help the Sindh Government improve access and quality of education. According to the website, activities include a need and merit based teacher recruitment, induction training for the newly recruited teachers, improvements in data collection and verification, school management committee grants and school specific budgets to manage minor needs at the school level, student achievement tests for Grade 5 and 8 students, improvements in the education management cadre and consolidation of schools in the same vicinity to improve school management.

Impact to date

- 16,800 teachers were recruited through a test, merit and need based recruitment process.

- Out of a total of 40,356 schools, 22,471 School Management Committees (SMCs) have been verified and PKR 678 Million (USD 6.78 million) disbursed to the committees for school based repairs and learning needs.

- The government also supported approximately 100,000 students by giving subsidies to 664 low-cost private schools in rural parts of the province.

In May 2018, it was announced that SERP II project would be ceased due to poor progress.[31]

USAID's Sindh Basic Education Program [32]

The Sindh Basic Education Program is a $155 million USD USAID-funded project which is being implemented by Government of Sindh's School Education Department. The Government of Sindh will contribute $10 million USD. While the program was initially planned for 2012-2016, it was later extended till September 2018. The program aims to increase and sustain enrolment of young students in primary, middle and secondary schools in targeted districts in Sindh.

Impact to date
106 new schools will be constructed and the remaining 280 will be merged to improve the efficiency and performance of the schools.

JazzCash partnership with Sindh Education Reform Program (SERP)

In 2017, JazzCash partnered up with the Sindh Education Reform Program (SERP) to disburse stipends to female students (from class VI-X) in Sindh. This would ultimately reduce the gender disparity in the province whilst simultaneously increasing the provincial and national literacy rate.

Impact to date
The total number of beneficiaries for this project are 600,000. A total of PKR 1.8 Bn ($ 17.2 Mn) were to be disbursed within the year of 2017.

[30]"The Second Sindh Education Sector Project", The World Bank, Retrieved on May 24th, 2018, from:
http://www.worldbank.org/en/results/2015/04/15/second-sindh-education-sector-project
[31] "Poor progress: World Bank declines funding public schools, says Sindh education secretary", The Express Tribune, Retrieved on May 29th, 2018 from:
https://tribune.com.pk/story/1721136/1-poor-progress-world-bank-declines-funding-public-schools-says-sindh-education-secretary/
[32] "Sindh Basic Education Program – In Partnership with Government of Sindh", USAID, Retrieved on May 24th 2018 from: http://sbep.gos.pk/aboutus.php

2.3.2. Punjab

The **School Education Department** overlooks education in the province of Punjab. The functions of department are to exercise legislation, policy formulation and planning of primary, elementary, secondary and higher education, and to maintain standards of education in these fields. The department is supported by the **Punjab Education Assessment System (PEAS)** which assesses student's learning outcomes. Statistics acquired in 2018 indicate that there are currently 52,394 public schools, 12,268,981 students, and 403,172 teachers in Punjab.[33]

Other autonomous bodies include: the **Punjab Textbook Board** which overlooks the production and publication of textbooks and supplementary reading material; the **Punjab Examination Commission** which assesses and examines the learning achievements of students in grade 5 through 8; and the Punjab Education Foundation which encourages and promotes education in the private sector. The **Punjab School Education Sector Plan 2013-2018**[34] focused on various service delivery models and emphasized the need for a strategy towards education quality, access, equity, and governance.

Key Programs

Punjab Education Sector Reform Program (PESRP)[35]

The creation of the Punjab Education Sector Reforms Program (PESRP) deals with all donor funded programs. The primary purpose of these reforms is to increase access to education by allocating more financial resources at the provincial & district level, to support devolution and public sector management reforms and to improve governance, access and the quality of education system in the Punjab.

PITB's e-Learn Punjab[36]

The Punjab School Education Department has been working with PITB to develop, test and implement e-Learning solutions for public schools. Some of their most notable achievements include:

- Digitizing textbooks for grades 6 through 10, and enhancing them with interactive ICT components
- Developing topic-based video lectures in local language
- Creating terrain-viable classroom technology solutions
- Including multimedia components, formative assessment modules, and class room activity lists in lesson plans

> **Impact to date**
> The program has been implemented in 250 classrooms which have impacted over 10,000 students and teachers.

PITB's Smart Monitoring of Schools[37]

A school monitoring initiative supported by PITB, whereby the Government of Punjab deploys monitoring officers to digitally collect data related to teacher presence, student enrolment and attendance, and availability of facilities

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[33] "Programme Monitoring & Implementation Unit, PITB, http://open.punjab.gov.pk/schools/

[34] "Punjab School Education Sector Plan (2013-2017)", School Education Department, Government of Punjab, Retrieved on May 1, 2017 from:

http://aserpakistan.org/document/learning_resources/2014/Sector_Plans/Punjab%20Sector%20Plan%202013-2017.pdf

[35] "Punjab Education Sector Reform Program", Department of School Education, Retrieved on May 22nd, 2018 from: http://www.pesrp.edu.pk/pages/mission

[36] "Digital Punjab, Enhancing Public Services Through Technology, 2012-2017", Punjab Information Technology Board

[37] "Smart Monitoring of Schools", Punjab Information Technology Board, Retrieved on June 8, 2017 from: https://www.pitb.gov.pk/sms

during on-spot visits. 1,100 officers make monthly visits to over 52,000 public schools across the province. Data collection through an app reduces data entry time, ensures data accuracy, and allows for real time data availability and visualization.

> **Impact to date**
> Since August 2014, over 1 million spot visits to public schools have been processed and analyzed through this application.

PITB's School Information System for Public Schools[38]

The School Education Department in Punjab collaborated with PITB to develop a tablet-based system that would allow schools to report data in real time. This would ultimately help track the enrollment, attendance and retention of students.

> **Impact to date**
> In 2017, over 10.6 million children had been registered by their schools.

JazzCash partnership with Punjab Vocational Training Council (PVTC)

Punjab Vocational Training Council (PVTC) is an autonomous corporate body focused on imparting important skills onto the population. JazzCash has partnered up with PVTC to disburse stipends into the Mobile Wallets of the trainees.

> **Impact to date**
> A total of PKR 1,100 Mn ($ 10.5 Mn) are to be disbursed, out which PKR 570 Mn ($ 5.4 Mn) have already been disbursed to PVTC through JazzCash.

2.3.3. Khyber Pakhtunkhwa

The **Elementary and Secondary Education Department** overlooks all matters pertaining to education and is one of the biggest government departments in Khyber Pakhtunkhwa (KPK). Its primary responsibilities include the formulation of policies, strategies, and regulations with regards to education, institution, and increasing literacy in the province. It also overlooks the preparation of Annual Developmental Programs (ADP) for Elementary and Secondary Education Sector and processes various developmental projects. In KPK, over 4.17 million students attend more than 28,000 public schools. The province has also employed over 123,000 teachers.[39]

Other attached departments include the **Directorate of Curriculum and Teachers Association** and the **Provincial Institute for Teacher Education (PITE)**. PITE creates and provides continuous professional development opportunities and services to teachers and educational managers in the Province.

The Government of Khyber Pakhtunkhwa developed the **KP Education Sector Plan 2010-2015**[40] which was a medium-term plan focused on providing guidelines for an education plan and serving as a monitoring and evaluation tool to assess progress against the Sustainable Development Goals (SDGs) targets.

[38] "Digital Punjab, Enhancing Public Services Through Technology, 2012-2017", Punjab Information Technology Board
[39] "Elementary and Secondary Education Department", Government of Khyber Pakhtunkhwa, Retrieved on May 25th, 2018 from: http://ese.kp.gov.pk/page/introduction
[40] "Education Sector Plan 2010-2015", Government of Khyber Pakhtunkhwa, Retrieved on April 27, 2017 from: www.kpese.gov.pk/Downloads/Education%20Sector%20Plan.pdf

Key Programs

Independent Monitoring Unit (IMU)[41]

The Independent Monitoring Unit (IMU) is responsible for ensuring that data for all key performance indicators are collected regularly on monthly basis and uploaded using Smartphone. Once collected, the data is analyzed to evaluate the performance of different districts. This provides the Elementary & Secondary Education Department and its development partners with a viable means of ensuring that education sector reforms are efficiently developed and effectively implemented.

KPITB's Youth Employment Program (YEP)[42]

KPITB's Youth Employment Program (YEP) is a digital skills platform that connects the youth in Khyber Pakhtunkhwa with the digital skills they need. Courses are offered in modules that help to customize learning. YEP offers several core courses designed to meet the most pressing demands in the digital economy today, as well as a growing set of programs designed to provide intensive full time training for specific career paths in high demand areas. In addition, YEP is an open platform to connect training providers with learners on a demand basis to help facilitate learning opportunities for all.

Impact to date
A total of 4600 students have been trained across 7 districts. Furthermore, 789 projects have been initiated through the program.

KPITB's Early Age Programming & IT Essentials Project [43]

The Early Age Programming & IT Essentials is a capacity building project that brings programming into classrooms. By providing courses built on micro-projects, the initiative allows school children to learn how to program at their own pace in an interactive manner.

Impact to date
Students across the districts of Swat, Nowshera, Mardan, and Peshawar have been enrolled in the program.

JazzCash partnership with KPK Higher Education Department

Jazz partnered up with the Higher Education Department (HED) of Khyber Pakhtunkhawa Province to digitize the admission fee of public colleges across the province. Before this, students were required to visit dedicated bank branches along with a challan form to deposit this fee. Students can now register themselves on HED's official website and pay at any of their nearest JazzCash retailers, this has improved access and convenience for higher education.

Impact to date
Digitizing payments has reduced the process from days to less than an hour. In the first year of launch, over 160,000 students paid their fee using JazzCash seamlessly.

[41]"Independent Monitoring Unit (IMU)", Khyber Pakhtunkhwa, Retrieved on May 26th, 2018 from: http://175.107.63.45/NewIMUSite/index.aspx#

[42] "Youth Employment Program: Digital Skills for All", Khyber Pakhtunkhwa Information Technology Board, Retrieved on February 15, 2018 from:
http://kpitb.gov.pk/projects/kp-yep

[43] "Early Age Programming", Khyber Pakhtunkhwa Information Technology Board, Retrieved on February 15, 2018 from: http://kpitb.gov.pk/projects/early-age-programmingpdf

2.3.4. Balochistan

In Balochistan, the **Secondary Education Department** overlooks educational matters in the province. Other supporting bodies include: the Bureau of Curriculum (BOC); the Provincial Institute of Teacher's Education (PITE); the Balochistan Textbook Board (BTBB); the Balochistan Board of Intermediate and Secondary Education (BISE); the Policy, Planning Implementation Unit (PPIU); the Directorate of Schools; the Directorate of Colleges; the Balochistan Assessment Commission (BEAC); and the Balochistan Education Endowment Fund (BEEF).[44]

The **Balochistan Education Sector Plan 2013-2018**[45] was prepared as a vehicle to manage the planning, execution, and monitoring & review of education policies and strategies in the province, with a focus on monitoring the implementation plan.

Key Programs

Balochistan Education Project[46]

The Balochistan Education Project is implemented by the Secondary Education Department Government of Balochistan with the financial support by the Global Partnership for Education. The project aims to increase school enrollment and retention in project supported schools with a special focus on girls' participation; and to develop mechanisms for information collection and use for the improved management of education. The World Bank is the supervising entity and United Nations Children's Fund (UNICEF) is the coordinating agency. The project covers four main thematic areas of the Balochistan Education Sector Plan (2013-18) i.e. Access, Equity, Quality and Governance in public sector education system across 31 districts of the province. This intervention is expected to contribute in improving access to education for all children in general and equity for girls and marginalized groups in particular.

Impact to date

- 246 new schools established in transition spaces provided by the community
- All target schools of the project are notified by Education Department
- 56 schools notified by Secondary Education Department for up-gradation
- 342 teachers taken onboard after successful selection through National Testing Service (NTS)
- 200 abandoned buildings shortlisted out of 708 buildings for transforming into new schools
- Real Time Monitoring System (RTSM) is up and running

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[44] "Balochistan EMIS – Quality Education Without Discrimination", Retrieved on May 23rd, 2018, from: http://emis.gob.pk/

[45] "Baluchistan Education Sector Plan 2013-2018", Government of Baluchistan, Retrieved on June 7, 2017 from: emis.gob.pk/Uploads/Balochistan%20Education%20Sector%20Plan.pdf

[46] "Balochistan Education Project", Government of Balochistan, Retrieved on May 29th 2018, from: http://gpeb.gob.pk/Home/About

STOP

2.4. Challenges

Pakistan faces a myriad of challenges in its education sector. Despite the fact that every child is guaranteed a right to an education under the Constitution, over 47% children are out of school.[47] Schools are under resourced with many children lacking basic access to quality education. The challenges in the education sector in Pakistan can be divided into three major baskets – low government prioritization of education, lack of access, and poor quality of education.

Technology, however, has the power to democratize education, providing access to the best educators to those in the most remote or underprivileged communities. The widespread penetration of mobile networks offers a powerful platform to improve access to the relevant and high quality content, which otherwise is a key challenge in Pakistan.

Prioritization

- Low Prioritization of Education
- Mismanagement of Funds

Access

- Out of School Children
- Urban-Rural Disparity
- School Drop Outs
- Gender Disparity

Quality

- Poor Quality of Education
- Teacher Absenteeism
- Lack of Basic Facilities in Schools

The following statistics have been collected from Alif Ailaan [48]

- **Low Prioritization of Education:** With only 2.3% of the GDP set to be spent on education in the country, Pakistan falls far behind the global average of 4.7%.[49]

- **Mismanagement of Funds:** Research conducted by the Pakistan Coalition for Education highlights that a majority of the education budget is spent on salary payments in the sector whereas a miniscule amount is spent on non-salary programs and development.[50]

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[47] Alif Ailaan, Pakistan District Education Rankings, 2016
[48] Ibid
[49] "Government expenditure on education, total (% of GDP) - United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics," The World Bank, 2013
[50] Pakistan Coalition for Education – PCE, Do Schools Get Money? 2016

- **Out of School Children:** Pakistan has the second highest number of out of school children at the primary level. Over 47% of children between the ages of 5 and 16 are out of school. This amounts to 24 million children.

- **School Dropouts:** 52% of boys and 30% of girls drop out of school as they are unwilling to go to schools. Out of this, 41% of student drop out after primary school.

- **Gender Disparity:** The literacy rate for females across Pakistan is a meager 48% in comparison to the 70% literacy rate reported for males.[51] Only 51% of women in Pakistan have ever attended school and in rural areas this number is even lower at 40%. Cost is also highlighted as an issue with 13% of women reporting it to be too expensive to attend school. While 10% of women have never attended school because they are situated too far.

- **Urban-Rural Disparity:** The disparities amongst rural and urban areas are evident as the literacy rate remains much higher in urban areas (74%) than rural areas (49%).[52] Children in urban cities have better access to education as there are more schools in closer geographic proximities. Furthermore, schools councils also focus more resources on schools in metropolitan areas. Students living in rural areas on the other hand must cross larger geographical barriers to reach their educational institutions. Furthermore, the quality of education is also lower in rural areas due to more untrained teachers.

- **Poor Quality of Education:** The quality of education is extremely poor nationwide. In addition, there are infrequent evaluations and feedback by teachers in many schools. Statistics collected by Alif Ailaan indicate that:
  - 44% of children in class 5 cannot read a story in Urdu, Sindhi or Pashto
  - 48% of children in class 5 cannot read a sentence fluently in English
  - 49% of children in class 5 cannot perform simple two-digit division

- **Lack of Basic Facilities in Schools:** Statistics indicate that the condition of schools in the country are below par:
  - 49% of schools function without electricity
  - 4 out of every 10 schools have no drinking water
  - 1 out of every 3 schools is missing a toilet
  - 1 out of every 3 schools is without a boundary wall

  Scarce resources for schools are also being wasted. Today, there are approximately 8252 non-functional and ghost schools in Pakistan.

- **Undertrained Teachers & High Teacher Absenteeism:** Another challenge is undertrained teachers who are not able to contribute meaningfully to learning process. Furthermore, teacher absenteeism is a huge issue. Research shows that 8%-15% of government school teachers are absent on any given day.

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[51] "Economic Survey of Pakistan (2016-17) – Education", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from:
http://www.finance.gov.pk/survey/chapters_17/10-Education.pdf

[52] Ibid

GLOBAL
LEARNINGS
IN DIGITAL
EDUCATION

3. Global Learnings in Digital Education

Across the globe, countries are fast picking up the opportunity to digitalize their education systems. Most of the countries have taken a national level strategy route and have done efforts to build an ecosystem. Some key learnings are shared below –

Korea – A Case Study [53]

- Education Master Plans

Since 1996 the development of ICTs within the education system of the Republic of Korea has been implemented under three national master plans. The first Master Plan (1996—2000) was focused on the establishment of a world-class ICT infrastructure in elementary and secondary schools. The objective of the second Master Plan (2001— 2005) was to enhance the quality of education by allowing open access to educational content and providing teacher training for the integration of ICT into classroom teaching practices. In addition, the National Education Information System (NEIS) was developed as a computer network maintained by the Ministry of Education to facilitate the electronic management of all education-related administrative tasks. The third and most recent Master Plan (2006— 2010) has been focused on the creation of sustainable learning environments with u-Learning and future education through more flexible and secure educational services such as the development of digital textbooks.

- Governance Structure

The use of ICT in education in South Korea has been driven by a strong cooperation among three key players: Ministry of Education, Science, and Technology (MEST), Korea Education and Information Service (KERIS), and 16 Metropolitan Provincial Offices of Education (MPOEs). MEST has been coordinating the processes from policy planning to implementation. As a government agency, KERIS has been playing exclusive role in supporting and planning implementation of the national ICT policy. Sixteen MPOEs have been autonomously implementing the national ICT policy at the regional level.

- Infrastructure

The establishment of ICT infrastructure in schools was aimed to promote education equity by bridging the digital divide. The School Advancement Project, which included the establishment of school LANs, Internet-connected multimedia labs, provision of PC and information devices for classrooms, and personnel support, had been implemented according to the three national master plans. Since the mid-1990s national initiatives for supporting ICT integration into the school curriculum have been gathering momentum. The projects ranged from educational content such as supplementary materials and educational software for the development of digital textbooks. Educational content, which almost in full has been provided and shared in EDUNET, plays an important role in the curriculum integration of ICT.

- Teacher Training

Since the late 1980s the South Korea government has provided teacher training for both ICT literacy and integration purposes. The focus of teacher training, however, has changed over the course of the three master plans from computer literacy to curriculum integration. In addition, the government has built the teactraining

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[53] UNESCO, E-Learning in the Republic of Korea, 2010

framework for ICT in education to meet the specific needs faced by teachers throughout their career. The new teacher roles and adequate ICT competencies should be taken into consideration for the future design of teacher training.

- Digitizing Educational Materials[54]

In 2011, South Korea started its US$2.4 billion effort to digitize all educational materials by 2015, making them accessible through computers, tablets and smartphones. This attempted to enable education through technology at lower costs. Each school was also slated to have its own cloud computing system to store the digital curriculum for students seeking study material.

Australia – Digital Education Revolution[55]

The Digital Education Revolution (DER) was an Australian Government funded educational reform program. Through the program, the government would allocate A$2.4 billion over seven years to:

- Provide laptops to all public high school students through the National Secondary School Computer Fund
- Deploy high speed broadband to all Australian schools and quality digital tools, resources and infrastructure to help support the Australian Curriculum
- Increase information and communication technology (ICT) proficiency for teachers and students throughout Australia to nourish the use of ICT in teaching and learning
- Develop projects and research that will assist and support the use of ICT in learning
- Enable parents to participate in their child's education through online learning and access
- Support mechanisms that will provide assistance to schools in ICT deployment

Schools have been able to install more than 911,000 computers, exceeding the original target of 786,000 computers by the beginning of the 2012 school year. The Fund provides funding of $1000 per computer and up to $1,500 for the installation and maintenance of that device.

Ireland – Digital Strategy for Schools (2015-2020)[56]

Ireland's Digital Strategy for Schools (2015-2020) provides a rationale and a Government action plan to integrate ICT into teaching, learning and assessment practices in schools. This Strategy builds on previous strategies in the area of ICT integration and it takes cognizance of current education reforms that are already underway within Ireland's education system at a primary and post primary level.

The Strategy has been developed around four key themes:

- Theme 1: Teaching, Learning and Assessment Using ICT
- Theme 2: Teacher Professional Learning
- Theme 3: Leadership, Research and Policy
- Theme 4: ICT Infrastructure

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[54] South Korea (Pawel Piejko, South Korea plans to withdraw printed textbooks from schools by 2015, 2011
[55] Department of Education, Employment and Workplace Relations. "Digital Education Revolution — Overview"
[56] Department of Education & Skills Ireland, Digital Strategy for Schools 2015-2020, Enhancing Teaching, Learning And Assessment, 2015

India – The National Mission in Education through ICT[57]

The National Mission on Education through Information and Communication Technology (NMEICT) has been envisaged as a Centrally Sponsored Scheme to leverage the potential of ICT, in teaching and learning process for the benefit of all the learners in Higher Education Institutions in an "any time anywhere" mode.

The three cardinal principles of Education Policy; access, equity and quality could be served well by focusing on three major components:

- Providing connectivity to all colleges and universities
- Providing low cost and affordable computing devices to students and teachers
- Providing e-content free of cost to all learners in the country

Philippines – Investing in People: Digital Literacy for All[58]

The Philippine Digital Strategy (PDS) 2011-2016 aimed to address the needs of the formal sectors as well as the marginalized communities in the Philippines. Innovative approaches were taken to ensure the digital inclusion of all sectors of the population, including support for disabled people. Special focus was placed on content development and delivery of ICT trainings. Broadband Internet access and integration of ICT in curriculum across all levels of the education system were prioritized to ensure a skilled workforce.

Philippines – Tech4ED[59]

In 2015, the Philippines' Department for Information and Communication Technology initiated the Technology for Education, Employment, Entrepreneurs, and Economic Development (Tech4ED) Project. These multi-purpose community public access points, provide affordable or free-of-charge access to the internet. Each center is provided with access to the Tech4Ed Platform and Learning Management System (LMS). The Platform has various content and learning materials classified in 5 segments:

- e-EduSkills: aims to deliver e-Learning on demand to address the education divide.
- e-Assist: Focuses on providing learning and continuous skills development opportunities for digital inclusion for special sectors such as women, People With Disabilities (PWDs), senior citizens, etc.
- e-GovServe: Provides direct government services to rural communities through the Tech4Ed Centers. This segment is an aggregation of various content and services from other government agencies, making the Tech4Ed Platform a one-stop shop for selected government services.
- e-Agri: contents and services on agriculture technologies for farmers and fisher folks.
- e-Marketplace: Provides greater market reach beyond the entrepreneurs' community for exponential economic growth and opportunities.

The project has been very well received in the Philippines. From 2015-2017, 700 target centers grew to 2,121 centers. Registered platform users grew from 35,824 in 2016, to 91,017 in 2017.

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[57] Deloitte, Telecom: Enabling growth and serving the masses, 2014
[58] DICT Department of Information & Communications Technology, "The Philippine Digital Strategy Transformation 2.0: Digitally Empowered Nation," 2011
[59] DICT Department of Information & Communications Technology, "Tech4Ed," Retrieved from: http://dict.gov.ph/tech4ed/about-us/
[60] Turkey (McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012)

In Turkey, the 2010 FATIH Project, aspired to bring 15 million Wi-Fi tablets to students in 600,000 classes across 40,000 schools. The government hopes teachers will have instant access to any document around the world and project it on the interactive smart-board while teaching. This demand for mobile devices suggests that students will one day take these devices home and to out-of-classroom learning environments, extending their learning experience.

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[60] Turkey (McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012)

OPPORTUNITIES
IN DIGITAL
EDUCATION

3. Opportunities in Digital Education

Today's society, and eventually the society of tomorrow, is and will be focused on technological development. With the continuously increasing availability and access to technologies, society is transforming into a Knowledge or Information Society. The sharing of knowledge and information, particularly through Information and Communication Technologies, has the power to transform economies and societies and have significant impacts on people's lives particularly in developing countries such as Pakistan.

Growing Market for Education. According to estimates, by 2020 global spending will more than double to USD 8 trillion.[61] mEducation products and devices alone will add up to USD 70 billion of the market share with products representing a USD 38 billion of that market opportunity by 2020.[62] A conducive and supportive environment means that rapid growth in m-Education is expected in the near future. With the anticipated growth in m-Education, manufacturers are likely to see rapid growth in demand for dedicated devices for use in education. While most of the growth, around USD 30 billion, will be for B2B (educational institutions) solutions, it is estimated that the B2C (individual learners) category will grow to around USD 2 billion over the same period.[63]

Growing Access to Connectivity and Technology. Mobile communication services will continue to be particularly important to create opportunities for disadvantaged population groups with low income or status, especially in emerging markets. Smartphone ownership is expected to continue to grow, thanks to the introduction of low-cost models. By 2020, almost three-quarters of the world's population – or 5.7 billion people – will subscribe to mobile services.[64] Pakistan will be one of the 10 countries accounting for 72% of growth in new mobile subscribers worldwide.[65] Mobile data usage is also expected to grow significantly in Pakistan, driven by demand of more data-hungry services and affordable access.

The Role of Mobile Network Operators

Digitalizing the education sector offers significant opportunities for Mobile Network Operators (MNOs), while enhancing educational access and outcomes for learners and educators around the world. Mobile Network

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[61] McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012
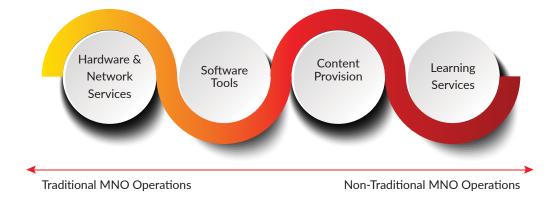[62] Ibid
[63] Ibid
[64] GSMA, The Mobile Economy, 2017
[65] Ibid

Operators (MNOs) have the opportunity to penetrate the education market and implement smart and innovative digital products, solutions, and strategies. Investing in such technology does not only enable access to education but can entirely transform the education sector. According to a joint publication by McKinsey and GSMA[66] , the growth of d-Education is slated to increase due to the following observed trends –

With their progressive approach and abilities, Mobile Network Operators (MNOs) are better positioned to take a lead on d-Education. While the provision of hardware and connectivity is one aspect of the technology supplied by Mobile Network Operators (MNOs), other domains that could come in the ambit of what Mobile Network Operators (MNOs) provide are; software tools, content provision, and learning services. Depending on their aspirations and capabilities, Mobile Network Operators (MNOs) can tap the potential of d-Education in these ways:

- **Hardware & Network Services:** This is the immediate opportunity for Mobile Network Operators (MNOs) and where they have the most natural right to play. Connectivity itself, will be worth approximately USD 4 billion in annual revenue by 2020.[67]

- **Software Tools:** d-Education providers will require a broad range of technical support and enablers such as IT, network, content, and hosting and data management services. Mobile Network Operators (MNOs) can develop their capabilities to offer this support, tapping into a revenue pool of approximately USD 20 billion.[68]

- **Providing Content and Learning Services:** Mobile Network Operators (MNOs) can lead as an end-to-end d-Education provider by investing upfront and enter the market on their own, providing the entire range of services that include in-house content and/or devices. This throws open the entire m-Education opportunity, worth approximately USD 70 billion.[69]

Research conducted by McKinsey states that in the future, almost 90% of the product opportunity will be in content, platform and software with the remaining 10% in connectivity. While hardware & network services along with the provision of software tools are on par with traditional Mobile Network Operators (MNOs) competence, as the spectrum moves into content services and learning services, we see a deviation to non-traditional Mobile Network Operators (MNOs) operations and hence a direction towards more partnerships or a refocus of traditional Mobile Network Operators (MNOs) competence.

| Hardware & Network Services | Software Tools | Content Provision | Learning Services |

Traditional MNO Operations ← → Non-Traditional MNO Operations

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[66] McKinsey & Company, GSMA, Transforming Learning Through mEducation, 2012
[67] Ibid
[68] Ibid
[69] Ibid

RECOMMENDATIONS FOR **DIGITALIZING** EDUCATION **IN PAKISTAN**

ACCELERATE

5. Recommendations for Digitalizing Education in Pakistan

5.1. Recommendations' Summary

Countries around the world are adopting different routes to incorporate d-Education into their society. This paper suggests that there are four key components required in order to expedite the adoption of d-Education in Pakistan.

Government Prioritization of d-Education

- Establishment of the Committee on Digital Education
- Allocate and create a d-Education Fund

Enable Access

- Invest in ICT Infrastructure
- Provide Connectivity

Focus on Digital Literacy

- Introduce digital strategies and curriculums
- Create programs for Digital Skills
- Provide Teacher Training

Enhance Public Private & Private-Private Partnerships

- INGOs, Public Sector, Private Sector
- Hardware & Software Provision e.g. Mobile Financial Services, Security

In order to fully utilize the opportunities that this transformation brings, several actors need to rethink the way education is delivered. As learned by other countries, a series of enabling actions from; policy-makers and educational institutions; education providers and the private sector, particularly mobile network operators, is necessary to gain and sustain a world-class d-Education system.

5.2. Recommendations' Profile

a. Government Prioritization of d-Education

To reap the benefits of ICT across the education system, a clear and integrated ICT centric Education Ecosystem must be created. Yet, it is important to note that this only possible if digitalization is prioritized by the nation and endorsed from the highest level of authority. This can be at the Federal level, as well as the provincial level which should cascade down to the relevant education bodies. Accelerate to the Digital State,[70] the precursor to this report, suggests a set of recommendations that can be followed in order to expedite digitalization in Pakistan.

• Establishment of the Committee on Digital Education

In order to highlight the importance of d-Education, a separate National level Committee on Digital Education must be created. This would ensure a minimum level of standardized education. By establishing a clear governance structure that endorses and prioritizes the digitalization of the education sector, bigger impacts can be made. Policy-makers and educational institutions who are the ultimate orchestrators of this transformation need to get a clear, holistic view of the opportunities ahead and create levers for all parties to realize them.

Furthermore, distinct targets must be set along with a clear action plan to integrate ICT in teaching. Progress should be continuously followed up and evaluated. Following implementation, the Committee would benefit from annual or biannual examination and evaluation of the current state in terms of ICT maturity set against the desired state, and outlining of clear action plans to close the gaps. Prerequisites should also be required for teachers to integrate ICT into their teaching by, e.g. allocating time and funds for training. Support should also be available to share digital content and teaching practices across provinces and districts.

maturity set against the desired state, and outlining of clear action plans to close the gaps. Prerequisites should also be required for teachers to integrate ICT into their teaching by, e.g. allocating time and funds for training. Support should also be available to share digital content and teaching practices across provinces and districts.

• Allocate and Create a d-Education Fund

A separate fund should be allocated for d-Education by the Government. A digital education fund means that d-Education would be both prioritized and expedited. Funding can help provide hardware, software, and training that would ultimately reform the education sector in the country and help students to uptake digital skills.

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[70] Accelerate to the Digital State, 2017

b. Enable Access

Without the provision of the correct infrastructure and connectivity, access to d-Education remains futile and untapped.

• Invest in ICT Infrastructure

ICT Infrastructure can be broken down into two distinct components – hardware and software. Hardware devices used in d-Education are handheld, Internet capable and are carried by most people. Most commonly, they are mobile phones, personal listening devices such as mp3/mp4 players or lightweight, portable computers such as slates, tablets, netbooks and small laptops. e-Book readers are also increasingly common. However the range can include games consoles, digital voice recorders, electronic dictionaries, and assistive technologies for learners with disabilities. Increasingly, the distinction between these devices is blurring due to a high rate of convergence. New devices designed specifically for educational purposes are also coming to the market.

The software utilized in d-Education primarily consists of content creation and provision. The range of potential content providers is huge and includes small and large companies in a number of education and media segments, government and education organizations and institutions, and even individual or groups of learners and educators, through user-generated content and custom publishing. Importantly, for use in formal education settings, content must be mapped to some kind of curricula or learning outcome, or educational need.

• Provide Connectivity

While infrastructure is the main tool to disseminate d-Education amongst the masses, another critically important tool is connectivity. This connectivity is what will enable the devices to connect to learning materials, other students or teachers and to the Internet. Increased access to affordable and reliable networks is seen as a significant driver of the growth of d-Education. Hence, MNOs can be the drivers of initiatives to increase connectivity through wireless broadband, 3G, and Fixed Mobile Convergence (FMC). This has the potential to significantly reduce user costs and increase access to information and knowledge.

c. Promote Digital Literacy

In order for there to be an uptake of digital technologies and eventually, d-Education, it is imperative for the society to become digitally literate.

• Introduce Digital Strategies and Curriculums

Many nations recognize that the only way for digital skills to penetrate down to the grassroots is by introducing strategies and curriculums that push the digital agenda forward. These strategies must focus on ensuring that digital technology is a central consideration in all areas of curriculum and assessment delivery. They ought to drive innovation and investment in digital technology for learning and teaching.

Key focus areas of different strategies highlight the provision of ICT trainings to develop the skills and confidence of teachers and also aim to improve access to digital technology for all learners.

Furthermore, relevant curriculum intervention should also be looked at. Introducing more STEM programs into the curriculum will help develop a more digitally literate society. While it is important to train for digital skills, it is also important to upgrade the existing curriculum to inculcate the teaching of more digital centric content such as Artificial Intelligence and Robotics in Higher Education institutions.

• Create Programs for Digital Skills

The Government must initiate more programs focusing on promoting the uptake of digital skills. These programs should seek to bridge the digital divide, i.e. the gap in the skills to use computing devices for the purpose of teaching and learning among urban and rural teachers and learners in Higher Education domain and empower those, who have remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

• Provide Teacher Training

Programs focused on providing teacher training must be initiated in order to guarantee the sustainability of d-Education. For example, Microsoft has partnered with many states throughout India to provide free basic technology training to teachers of state-funded schools. This includes 'The Innovative Teachers Forums' that encourage innovative teachers to adopt ICT, award best practices in ICT integration, and support teachers in building global communities of practice.[71]

Other examples include, Indian company Aptech who have partnered up with the Indian Technical and Economic Co-operation (ITEC) as part of a Government of India initiative to provide software design and applications training to local and international participants from a range of sectors, including education.[72] Aptech has also initiated the India Window Program where foreign students and corporate executives are trained in information technology and multimedia in India and participate in a mandatory internship at IT firms in Bangalore, the 'Silicon Valley of India.[73]

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[71] Hitendra Pillay and Greg Hearn, Public-private partnerships in ICT for education
[72] Ibid
[73] Ibid

d. Utilize Public-Private & Private-Private Partnerships

Governments around the world are cognizant of the fact that without the support of the private sector, the adoption of d-Education is limited and the process has the potential to be inefficient. Partnerships with international donor agencies, private companies, and NGOs have the potential to have large impacts in the digitalizing the education sector. Governments can partner up with different stakeholders to provide infrastructure, training, security, digital identities and Digital Financial Services to name a few – to the masses.

In Bangladesh, the Grameen Telecom Corporation has the Village Phone Program, which provides access to telecommunications services in remote, rural areas. A partnership between the government's rural development programs and the Grameen Telecom Corporation provides subsidized connectivity to rural and remote villages using more cost-effective technologies such as 3G and wireless.[74]

In Australia, the federal government has allocated A$4.7 billion to build a national broadband network based on joint public-private funding. The private sector partner is to provide access to the existing IT network, technical expertise, and financial investment to expand the network coverage to include the rural areas. This would allow rural schools, farmers, and other regional communities to participate in global knowledge sharing.[75]

'Finding a Voice' is a partnership funded by the Australian Research Council, United Nations Educational, Scientific, and Cultural Organization (UNESCO) India, and United Nations Development Programme (UNDP) Indonesia, being implemented by researchers from the Queensland University of Technology and several NGOs from Nepal, India, and Sri Lanka.[76] The project works with grassroots communities to develop ICT skills in generating local content. Aside from developing computer and multimedia skills, these kinds of projects deliver integrated education services for farmers, fishermen, and other community folk on topics that are relevant to them, such as public health, parenting, and nutrition.[77]

These partnerships also have the potential to overcome urban-rural and gender-based divides. For example, the Indian government has established partnerships with NGOs and not-for-profit trusts to deliver its ICT education programs to rural and remote areas. The partnership leverages the strength of NGOs in working with grassroots communities, which is critical for the success of this initiative. The Indian government plans to establish some 2,500 ICT community centers that will not only provide ICT learning opportunities but also act as the delivery point for government services.[78]

5.3. Stakeholders and Roles

The development of a holistic ecosystem is possible only through the involvement of various stakeholders, with the converging agenda of digitalizing the education sector. The vision and goals, led by the top-most echelons of national policy-making has to eventually be translated in to SMART targets which are subsequently monitored and evaluated. For this whole process to work, the collaboration of various partners is needed:

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[74] Hitendra Pillay and Greg Hearn, Public-private partnerships in ICT for education
[75] Australia (Hitendra Pillay and Greg Hearn, Public-private partnerships in ICT for education)
[76] Ibid
[77] Ibid[78] Ibid

Policy Makers (National and Provincial) & Education Authorities

- Ownership of policy development and implementation
- Appropriate governance structure at national & provincial levels
- Deployment of technology infrastructure (such as, access to broadband and mobile handsets)
- Formulation of supportive and transparent regulations
- Local examples: Ministry of Federal Education and Professional Training (MoENT), Provincial Education Bodies, Higher Education Commissions, Khyber Pakhtunkhwa Information Technology Board (KPITB), Punjab Information Technology Board (PITB)

Educators

- Implementation of policies and programs
- Provision of ICT trainings to teachers and institution educators
- Maintenance of technology infrastructure (such as, access to broadband and mobile handsets)
- Monitoring of new policies and initiatives
- Liaison with education bodies and IT Boards
- Local examples: Schools, Higher Education Institutions, Vocational Training Institutes

Device Manufacturers, Content & Software Providers, & Distributors

- Provision and distribution of technology & software to education institutions
- Digitization of existing content
- Creation of user friendly content
- Monitoring and maintenance of software & hardware
- Training of instructors on ICT equipment
- Local examples: Huawei, Teletaleem

Mobile Network Operators

- Provision of Connectivity
- New business opportunities using a proven model that increases readiness for technology adoption
- Ability to reach new customer base early, for longer-term benefits
- Opportunity to achieve business and social benefits by increasing access to technology
- Local examples: Jazz

Local NGOs

- Direct access to otherwise unreachable students
- Ability to test and validate academic research and innovation in real-world applications
- Opportunity to solve practical problems and share best practices with communities
- Enhanced student learning through hands-on projects
- Local examples: Pakistan Coalition for Education

Multilateral Agencies

- Ability to create the bridge between grassroots and the governments
- Expertise and best practices brought in from other markets and countries
- Availability of technical assistance and funding
- Access to the grassroots and on-ground problems
- Local examples: USAID, World Bank (WB), Asian Development Bank (ADB)

Device Manufacturers

- Manufacturers of Mobile phones, incl. smartphones
- Personal listening devices
- E-readers Lightweight portable computers
- Games Consoles

Mobile Network Operators

- Mobile Network Operators (MNOs)
- Cloud-based Service providers
- GPS navigation

Content & Software Providers

- Publishers
- Search Engines Software and app developers
- Platform/LMS providers
- Curriculum & learning providers
- Games developers
- User generated

Distributors

- Education Authorities
- Awarding bodies
- E-Tailers
- Retailers
- Libraries

Enablers

- Academic institutions and researchers
- Industry and member associations
- Think tanks
- NGOs and NPOs
- International Organisations

End-users

- Teachers
- Students
- Employee
- Administartor

Policy Makers

- National Government
- Employers and Employers organisations
- Local/regional Government
- Awarding bodies
- NGOs and NPOs

Education Authorities

- Education ministries
- National/specialist education agencies
- Local/regional education bodies
- Educational companies
- Curriculum authorities

Educators

- Elementary, Junior High, Senior High Schools
- Colleges of technology Junior colleges
- Universities
- Specialist training colleges

Source: Mobile Education Landscape Report, GSMA

6. Conclusion

Education is the most powerful lever for individual wellbeing, equality and economic growth. It is a fundamental element to elevate societies to a more prosperous future. Digitalizing education is helping enhance reach, develop skills, and ultimately enable the spread of education amongst the population.

Although technology is a powerful tool to address some of the challenges, in the end it only remains a tool – its actual impact is very much dependent on the quality of the content it helps to disseminate and on the quality of the education infrastructure it supports. Hence, the roadmap to digitalize the education sector highlights the important steps that must be taken by the Government to push forward the digitalization of the education sector in Pakistan. Scaling up the education initiatives mentioned in this report, which have been marked as key initiatives around the world, have the potential to reap large benefits for Pakistan.