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Digital Health Challenges in the South: Towards Better Integration of Digital Health Practices

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Much like any innovation, diffusion of digital health technologies in different countries depends on their level of development, availability of infrastructure, socio-economic conditions and indigenous strengths and weaknesses, political will and stability, demographics as well as social norms. Naturally for developing countries, social, economic, and technological set-backs make digital health adoption, implementation and mainstreaming more challenging. Using WHO's e-Health components, this article highlights key challenges impacting digital health adoption in developing countries in the light of COMSATS' experience.

À l'instar de la plupart des autres innovations, la diffusion des technologies de santé numérique dans les différents pays dépend de leur niveau de développement, des infrastructures disponibles, de la situation économique et sociale et des forces et faiblesses locales, de la volonté des autorités et de la stabilité des institutions, de la démographie ainsi que des normes sociales en vigueur. Dans les pays en développement, l'adoption, la mise en œuvre et l'intégration de stratégies de santé numérique sont freinés par des obstacles sociaux, économiques et technologiques. En s'appuyant sur les lignes directrices de l'OMS sur les interventions de santé, le présent article met en lumière les principaux défis liés à l'adoption d'une stratégie de santé numérique dans les pays en développement, à la lumière de l'expérience de COMSATS.

Al igual que ocurre con cualquier innovación, la difusión de las tecnologías de salud digital en distintos países depende de su nivel de desarrollo, disponibilidad de infraestructura, condiciones socioeconómicas, fortalezas y debilidades locales, voluntad y estabilidad política, demografía y normas sociales. Naturalmente, en el caso de los países en desarrollo, los contratiempos sociales, económicos y tecnológicos dificultan aún más la adopción, la implantación y la generalización de la salud digital. A través del uso de elementos de la estrategia de ciber salud de la OMS, este artículo pone de relieve los principales retos a los que se enfrenta la adopción de la salud digital en los países en desarrollo a la luz de la experiencia de la COMSATS.

INTRODUCTION

Developed and developing countries alike are recognizing digital health as a tool to ameliorate efficiency and effectiveness of healthcare systems. Growing penetration of the Internet, vast coverage of mobile networks, better digital literacy of the young population and exponential growth of projects targeting digital healthcare over the last two or so decades are an opportunity for the developing countries to adopt appropriate use of digital technologies^[1] for more efficacious health systems which are at par with the developed world.

With 26 common Member States, the parameters, guidelines, and strategies devised for Member States by the World Health Organization (WHO) are of great relevance to The Commission on Science and Technology for Sustainable Development in the South (COMSATS). Conversely, as regional pioneer of digital health technologies through related projects and collaborations that started as early as 2001 with projects on Information and Communication Technology (ICT) and related education going further back to late 1990's, COMSATS' invaluable experience has been a source of relatable intellectual output and useful learning. These are in alignment with contemporary global digital health parameters and the ensuing knowledge and information could help consolidate evidence-based approaches towards application of digital health in the context of developing countries.

In this article, the authors recall from COMSATS' experience of challenges and opportunities gained through pioneering work on telemedicine in remote areas of Pakistan in collaboration with organizations within Pakistan – partners and supporters of COMSATS Telehealth (CTH), including local Internet

Service Providers (ISPs), Telecom Sector, government agencies, hospitals and local Basic Health Units. It also takes into account the learning made over the years through engagement with relevant national, regional and development-sector stakeholders as well as knowledge and experiences of relevant experts and practitioners from South Asia, Africa, Middle East and Central Asia presented during COMSATS' capacity-building activities pertaining, *inter alia*, to innovation and acceptance of digital health, and digitally enabled Efficient Health Systems (see Figure 1 in next page).

LESSONS FROM THE SOUTH

For initiating national Digital Health strategic planning process, countries need to have a clear understanding of challenges and opportunities related to leadership, governance mechanisms, key stakeholders, strategic issues, as well as the existing eHealth environment. Taking stock, therefore, of the e-health landscape of a country can help in creating missing links, useful connections and synergies at national and international levels. In this respect, important parameters can be drawn from the eHealth components proposed in the WHO-ITU (International Telecommunication Union) National eHealth Strategy Toolkit (WHO & ITU, 2012) (see Figure 2 in next page), which have been found pertinent to this study and have been used to categorize the challenges identified and indicated herein.

Leadership and Governance

There is a wide gap between the realization of the importance of digital health and its uptake by the relevant ministries, departments, and health authorities in developing countries. COMSATS Telehealth had a similar experience in that its telemedicine project got more patronage from the Ministries of Information Technology and Science and Technology rather than the Ministry of Health whose mandate is closest to digital health. However, a number of international organizations like WHO,

[1] World Health Organization (2021) definition of 'appropriate use of digital technologies': "Information and communications technology that takes into account safety, ethical use, cost-effectiveness and affordability and is people-centred, evidence-based, effective, efficient, sustainable, inclusive, equitable and contextualized."

FIGURE 1: KEY INFORMATION ON COMSATS’ REGIONAL WEBINARS ON DIGITAL HEALTH 2020 - 2023

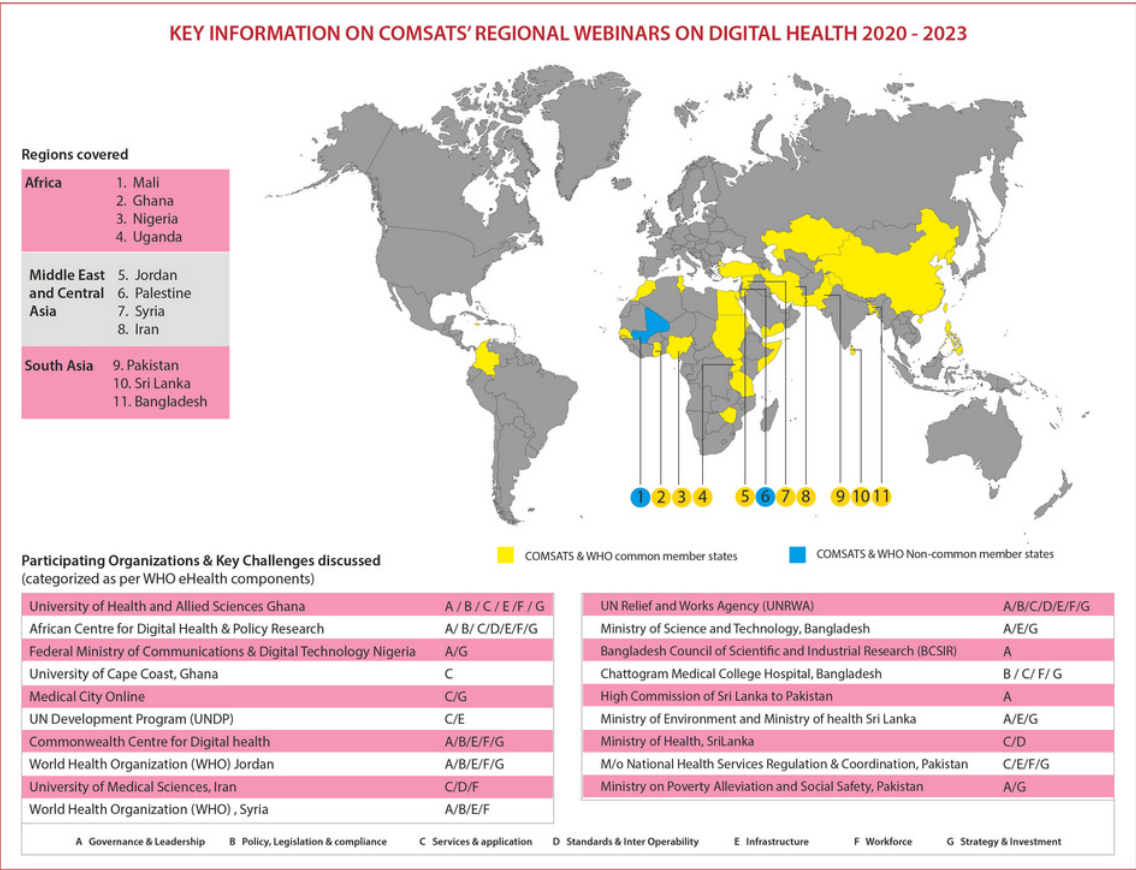
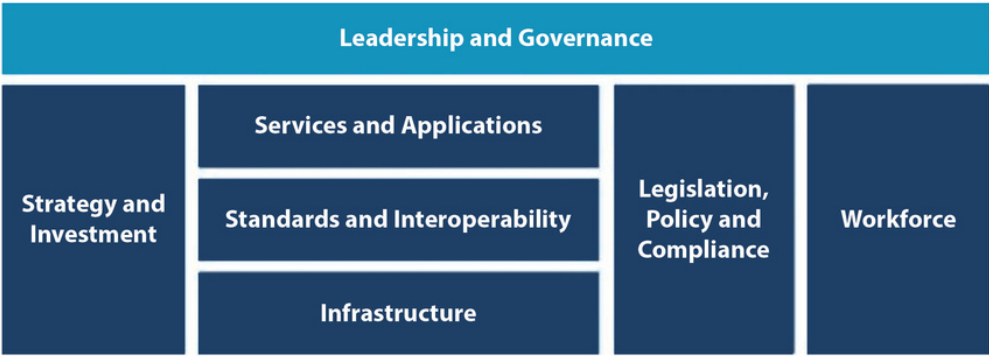


FIGURE 2: E-HEALTH COMPONENTS



Source: WHO & ITU, 2012

Commonwealth Centre for Digital Health and COMSATS are trying to bridge this gap. Since the advent of the COVID-19 pandemic, there has been a growing realization among developing countries' leadership of the need for swift adoption of digital technologies at local and national levels. For example, in Sri Lanka, the Ministry of Health initiated an electronic health record system as early as the very first few detections of pandemic cases.

Also for other developing countries, COVID-19 became an accelerator of digitalization in the health sector as top policy-priority of governments. Earlier, 22 out of 54 African countries had Digital Health related documents (strategy/policy or guideline) while, in 2019 with the pandemic looming, the number rose to 44 out of 54 (Mburu and Kamau, 2018). COMSATS' member countries like Egypt, Sudan and Iran developed a digital policy or strategy by 2021 while recently, Sri Lanka and Pakistan have also published a National Digital Health Blueprint and a National Digital Health Framework, respectively.

While commitment and adoption of e-health at top-level has considerably increased in some form, it has not yet been fully institutionalized in developing countries, resulting in absence of a strong stasis as well as integration in the mainstream healthcare systems. Merely adoption of digital health at the government level is no guarantee of a coordinated effort by the other stakeholders towards its implementation. Countries of the South in general face fragmentation between relevant government entities like those working in Information Technology, planning and healthcare that are usually found working in silos. In Pakistan and most developing countries, private sector constitutes a large part of the health system. In Lebanon, for example, more than 80% of the total hospital beds are in the private health sector. In Egypt and Jordan, numbers of private sector hospital and those in public sector are 1,351 against 646 and 103 against 97 respectively (WHO, 2014). Under-representation of private health sector in the policy process at the Government level(s) in these countries lead to gaps

in problem identification, decision making and governance related to Digital Health.

Strategy and Investment

At strategy level, lack of coordination, duplication of projects and programs, and lack of harmony among these causes waste of resources, hinders development of effective policies and acquisition of funds for implementation and sustainability. Challenges to developing Digital Health strategies are interconnected and require a comprehensive and multi-stakeholder approach. Literature on digital health technologies in developing countries confirms that three kinds of expertise and competence, i.e., clinical, Information Technology (IT) and telemedicine, are pivotal for telemedicine (a predominant digital health component in developing countries) operations.

Lack of funds for the implementation and sustainability of digital health initiatives is the most significant challenge in resource-constrained developing countries. Most digital health solutions and programs in developing countries tend to rely on government funding, particularly during their initial phases. However, if government funding ceases for various reasons, the system becomes financially unsustainable, as alternative business models are lacking. Many proposed telemedicine programs never take off or fail to sustain themselves in the long term. Most telemedicine pilot projects experience failure due to the burden of high initial costs and not getting enough returns. The initial model of COMSATS' Telemedicine implemented with project funding could not be sustained due to similar constraints.

Governments' priorities are a big factor while formulating policies and strategies towards promoting adoption and scaling up of digital health systems and technologies. In countries like Syria where the country is facing international sanctions and 90 per cent of the population currently lives in poverty, most of the government funds are diverted to tackle the humanitarian crisis and organizations like the United Nations (UN) and WHO also face restrictions with very limited or no finances to spare.

Infrastructure

The digital health strategy toolkit mentioned earlier bifurcates the basic components of the Digital Health ecosystem into those related to enabling environment and those pertaining to ICT environment. The latter includes the Infrastructure, and Services and Applications developed for digital health. These components include hardware (computer systems/mobiles etc.) and software (mobile apps/computer software), data exchange or storage tools (EMRs), analytics and Artificial Intelligence (AI) systems, cloud services and wireless tools. Both components have their respective challenges that may affect a digital health intervention, especially in developing countries.

Significant hurdles are faced in implementing digital health solutions due to limited access to even the most basic infrastructural components. Reliable Internet connectivity, for instance, still remains a major challenge for developing countries, which is unfortunate as these countries and their remote populations are in dire need of affordable healthcare. Owing to similar challenges during its initial phase in 2001, COMSATS had to setup its own ISP in Skardu (a remote town in a mountainous region of Pakistan) to provide Internet connectivity for the duration of the project.

In absence of local manufacturing in most cases, the need for importing digital devices and equipment from developed countries and dependence for maintenance exacerbates inequalities in healthcare, and distribution of digital health resources. Things are even more difficult for countries like Syria and Palestine that face international sanctions and have limited technological options and capacity.

Although some countries, such as Pakistan, have considerably reduced Internet costs, a number of developing countries in Africa and Middle East still have very high cost of access to technology. For some countries of the Middle East and South Asia, insufficient electricity supply and power infrastructure have also been identified as a key

challenge in execution of digital health initiatives. Research and Development (R&D) focused on long-term resolution of issues related to power and affordable Internet is generally amiss in developing countries.

Services and Applications

Services and Applications – the second component of ICT environment – available in developing countries, as also identified by experts at COMSATS' Digital Health events, include: Mobile Health; Electronic Medical cloud based databases/records; Telehealth/Telemedicine/Online Call Centres for Health; Disease tracker (for COVID-19); and at-Home Monitoring, etc. Different developing countries are at varying levels of adoption of these technologies. For example, Iran has partly developed and implemented a national Electronic Health system of the citizens; a number of preventive and diagnostic mobile applications are in effect in African countries; and countries like Pakistan and Sri Lanka excelled in contact tracing and disease-tracking through digital applications during the COVID-19 pandemic.

Generally, telemedicine is becoming an acceptable way of seeking healthcare in developing countries in some form. Patient data in the healthcare facilities is in the process of digitization, mobile-based applications are used by the community health workers for coordination and data management, and wearable health gadgets are trending. However, in many developing countries, adoption of digital health technologies is often driven by trends and fashion rather than based on mapping of local needs related to digital health and fair idea of tangible benefits to healthcare and health systems. Very few solutions available in these countries are customized to their needs and environment. Relying on off-the-shelf digital health tools and products without assessing their necessity, quality, relevance, and utility does not serve digital health objectives for the long haul. Moreover in digital health elements like Telemedicine, all required services and applications do not exist as single platform solutions that makes it difficult to approach a teleconsultation holistically.

Standards and Interoperability

Digital health applications, both in developing and developed countries, often operate independently, lacking interoperability. Custom-made tools designed for specific programs and projects have limited compatibility with other systems. In context of developing countries specifically, COMSATS faced and continues to come across issues of incompatible hardware and software available for telemedicine. This hinders smooth telemedicine operations resulting in waste of time and frustration among the users, and hence negatively impacting the desired outcomes of acceptability, effectiveness and mainstreaming. Furthermore, even when interoperability is possible, lack of standardized data collection and sharing poses challenges to data exchange and integration. Developing scalable and interoperable digital health solutions that can be integrated into existing healthcare systems remains a difficult task.

In COMSATS' experience of telemedicine, there is a monopoly of big players in hardware and software solutions. This gives rise to persistent issues of lack of interoperability among the available solutions, as, generally, only software and hardware of the same company are compatible with each other.

Legislation, Policy, and Compliance

In developing countries, design, realistic implementation of and compliance with digital health policies and strategies, including translation in legislative terms still remain far from desirable, with a few exceptions of Ghana, South Africa, Kenya and Uganda that seem to be moving in the right direction in terms of related policies. Around 60 percent of African countries do not have separate Digital Health policies. This is largely attributed to concerns regarding risks of exposure to the violation of privacy and ethical practices.

Digital health regulations worldwide lack uniformity. In telemedicine practice, for example, clear

regulatory policies and guidelines do not exist owing to which physicians are hesitant and fearful to engage in it. Low data privacy and security associated with digital health in developing countries has been established as a point of concern by digital health researchers. Limited regulations and enforcement mechanisms amplify the fear of misuse of online personal health information. Lack of clarity as to what should be regulated further compounds such and other issues related to collaboration, privacy and data transparency and accountability.

In case of COMSATS Telehealth, regulators in Pakistan could not perceive telemedicine as a part of the health system and viewed it as a new and untested field. However, this lack of regulation somehow also favored the expansion and acceptability among doctors and other stakeholders as, back then, digital health fell in a policy grey area and posed fewer restrictions.

Despite advancements in healthcare provision and improved geographical access, some cross-sections of the local demographic, such as women, may still opt not to benefit from the services. From Telemedicine experience in Pakistan, it is found that women are usually reluctant to sit in front of a camera or get photographed. In the tele-clinics connected to COMSATS Telehealth, local paramedics were able to overcome such challenges through social skills, such as trust-building and use of same language, to build and gain their confidence to face the camera and seek healthcare from the remote physicians.

The aforementioned issues need to be taken into account to improve social acceptability, compliance, and, hence, better adoption and permeation of digital health.

Workforce

Historically, delayed acceptance by health professionals has also created a gap between developing and developed countries in terms of Digital Health adoption. At the initial stages working in remote areas of Pakistan in 2001, COMSATS Telehealth met its

human resource and related needs from its IT training institute and an ISP. Overall, very few of the health professionals welcomed the idea in the country at the time, mainly due to the unfamiliar mode, associated time-lapse and technical glitches. Long way since, the widespread popularity of telehealth during the COVID-19 pandemic has further changed mindsets improving social acceptance of digital health exponentially. Among COMSATS' Member States, having medical doctors specializing in health informatics and digital health was an advantage for Sri Lanka at the onset of COVID-19. It helped the country in early adoption, *inter alia*, of digital health solutions for symptoms detection, contact tracing, and management of patients and telemedicine.

In developing countries, insufficient training and capacity-building opportunities and lack of general knowledge in ICTs and other digital technologies suitable for end-users negatively impact any progress in digital health adoption. Limited awareness and understanding of digital health technologies among healthcare providers delay the implementation of digital health initiatives. For example, during institution of UN Relief and Works Agency's (UNRWA's) eHealth software it was realized that even those proficient in computer skills faced difficulties in simultaneous training and implementation, as it slowed down or disrupted service provision. While for older staff members, who are often less familiar with basic digital skills, execution was even more challenging.

Trained staff and digital health experts are high on demand but not paid enough. Further, Government projects face insufficient budgetary allocations, longer processing time and delayed releases in funds, and uncoordinated purchases. These result in demotivation of those working in this technology-intensive field thereby causing high turnover rates among IT and health staff and creating gaps in the implementation and utilization of digital health solutions.



CONCLUSION AND RECOMMENDATIONS

As indicated in earlier parts of this article, implementation of digital health initiatives in developing countries faces numerous interconnected challenges. Addressing these challenges calls for comprehensive, multi-stakeholder approaches. Prioritizing digital health at policy level in national plans and establishing an enabling regulatory environment are essential to ensure appropriate, sufficient, and high-quality delivery of healthcare services. Forward looking digital health policies that are also conscious of socio cultural sensitivities of the target population are needed, with inclusion of all stakeholders including private sector and civil society. Expert advice at COMSATS' events highlighted the need for formulating well-thought out policies, their proper implementation and periodical review, and dissemination of published policy documents/guidelines to the stakeholders.

Some financial constraints and the sustainability issues could be addressed through strategic integration of digital health solutions and merging them with conventional health systems. COMSATS, for example, has been able to sustain its telemedicine activities by experimenting with the adopted model, creating partnerships with the public sector organizations and securing funds from the ones allocated to the existing government health facilities for their routine spending. This has resulted in sustainability and continuity of telemedicine at these health facilities.

Developing countries may utilize their comparative advantage for meeting their basic infrastructural needs, such as their renewable energy potential as many of the developing countries are blessed with ample hours of sunshine and wind power. This can be achieved through applied and targeted research and development that needs to be prioritized by governments.

Integration and customization of digital tools in the existing health systems according to the processes already in place are better adopted by the professionals. For example, bringing health data into the form of Electronic Health Records has gained acceptance within the practitioners in developing countries. Public concerns related to security, privacy of the data and trust, however, need to be assuaged through all means possible. Bridging the digital health literacy gap among the health professionals and continuous mutual support between them and IT professionals are a must for sustainability of digital health solutions.

IT, both hardware and software, is the fastest growing and evolving field. Moreover with recent spurt of AI applications that have diffused to the masses like never before, any services that involve the use of the same need to keep pace with this evolution to stay at par. Ubiquity and user-friendliness in digital health tools can be achieved with timely and, more often than naught, simultaneous upgradation of software and hardware. Cooperation among tech companies with regard to compatibility and establishment of enabling governance mechanism between the two could go a long way in addressing the interoperability and standardization issues. Public-Private partnerships are of pivotal importance in this regard.

To prepare future health professionals to meet the human resource need related to Digital Health in developing countries, medical schools need to incorporate relevant courses in their syllabi. More focused subjects, such as health informatics may also be introduced in universities to produce experts

in the field further augmented by training on handling the equipment and social aspects related to digital health. Such incorporation and mainstreaming in medical education will also help address issues related to pay parity faced by digital health professionals in developing countries.

Programmatic assessment of existing digital health programmes, technologies, and ground realities by development, governmental and non-governmental organizations could help bridge the knowledge gap aiding evidence-based learning. This could greatly contribute to the policy process in the developing countries to develop more informed policies and strategies based on assessment of indigenous knowledge, problems and solutions. As summarized by the Global Strategy on Digital Health 2020-2025 (WHO, 2021), the way forward is to commit, catalyze, measure, enhance and iterate. The foregoing is hoped to provide necessary perspectives for progress in this direction.

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