TELEMEDICINE PROJECT IN REMOTE AND RURAL COMMUNITIES – EGYPT

Hoda S Dahroug BA(Elect Eng), MBA

Egypt ICT Trust Fund, Ministry of Communications and Information Technology

Abstract

While many forward strides had been made over recent years in the Egyptian health ecosystem, in terms of overall mortality rates, vaccination and immunisation efforts, and expansion and improvement of medical infrastructure, some challenges remained unresolved. One major challenge is the centralisation of specialised medical services in the country’s major cities, leaving more isolated and rural communities with less than adequate medical services. The Egypt ICT Trust Fund felt that offering remote telemedicine diagnostic services would be a major asset to such communities. A telemedicine project, using open source, cloud technologies to connect small clinics with major hospitals in the country was initiated. Future plans include expansion to multiple nodes covering many more governorates in the country, with connection to multiple hospitals covering all medical specialisations. While the project aimed at improving medical services to rural population in general, field assessment studies have shown that women benefitted from the project due to the fact that women in these areas usually face cultural and traditional barriers preventing them from travelling freely if unaccompanied by a male guardian, rendering it very difficult for them to receive medical services from distant cities. This paper describes the process of successful implementation of each telemedicine session, and highlights the possible policy implications for future expansion of a workable model.

Keywords: ICT for development; eHealth services; telemedicine project; remote and rural community development

Introduction

While there have been many advances in the Egyptian health ecosystem over the past three decades, many challenges remain unresolved. Child mortality and maternal mortality rates have dropped significantly, and average life expectancy reached 71 years in 2014. Several noteworthy initiatives by the government have successfully tackled some of the major health concerns in the country, such as mandatory immunization which has eradicated Poliomyelitis in Egypt, the establishment of an Egyptian national programme to combat tuberculosis, and the near eradication of Bilharziasis. There is a high degree of diversity in the types of hospitals and clinics available in Egypt. Government and private sector hospitals are the two main groups of healthcare providers. They are further divided into 14 Faculties of Medicine affiliated with the major universities and 36 university hospitals, as well as hospitals affiliated with specific governmental ministries such as the Ministry of Interior, Ministry of Religious Affairs; Ministry of Defence etc.. Private sector healthcare services are also quite varied, ranging from traditional healers and midwives, private pharmacies, private doctors, to private hospitals of all sizes. A large number of NGOs provide healthcare services, including religiously affiliated clinics. The breakdown of the 539 public sector hospitals across the country, by governorate is shown in figure 1. There are also 937 private sector hospitals across Egypt.

Despite these achievements, the sector suffers from some challenges that are felt more strongly in remote and marginalised areas of the country. Official statistics show that there are 1.7 beds and 2.8 physicians for every 1,000 population in 2010, and in 2014, per capita health expenditure was US$177.80. These figures reflect the modest expenditure and infrastructure available in the country. One of the main developmental challenges faced by Egypt is the unequal distribution of resources between cities and rural governorates. The further one goes from the capital city, fewer services are found. Not only that, but field assessments by the ICT Trust Fund...
Figure 1. Number of public hospitals by governorate in Egypt.

(ICT TF) conducted in the Siwa region revealed that even when medical facilities exist, not all medical specialisations are available. Siwa Oasis is located in the Matruh governorate and is one of Egypt’s most isolated settlements located in the heart of the western desert of Egypt. Siwa citizens still follow traditional customs especially those related to gender inequity. To receive medical services a patient usually has to travel to either the capital of the governorate he/she is in, or travel to the capital city of the country, incurring high costs of transportation, and rendering it quite a difficult journey for severely ill patients. Women are more severely affected than men because traditional customs prevent them from travelling unaccompanied.

The ICT Trust Fund was established in 2002 as a partnership agreement between the Ministry of Communications and Information Technology and the UN Development Program (UNDP). Most of its finance comes from the Ministry, external donors and grants, with a small portion from the UNDP. The ICT TF is considered a mechanism by which ICT tools can be used to improve citizens’ living standards, achieve sustainable social and economic goals. The Fund uses partnerships between the private and the governmental sectors to support local communities in gaining the needed skills for maximising the benefits of using various ICT tools. The Trust conducted a thorough field investigation, and identified the need to improve medical services offered to remote and marginalised areas of the country.

As such, the ICT TF felt that the best solution was to use telemedicine technologies in these remote regions. The term “telemedicine” was coined in the 1970’s to signify the use of ICT infrastructure and resources in providing remote diagnostic services. The World Health Organization defined it as, “The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities.” Rapid advances in ICT over the past decades have sparked a global interest in telemedicine. The commercialisation and widespread use of Internet services, and the creation of specialised software packages on top of the existing systems, has facilitated the adoption of telemedicine solutions in developing countries.

The project’s vision stemmed from the Millennium Development Goals (MDG’s) and Sustainable Development Goals (SDG’s), as well as from Egypt’s Sustainable Development Strategy 2030. The project was initially conceived to tackle goals 4 and 5 of the MDG’s which aimed to reduce child mortality and improve maternal health, and as such the first phase of the project (which is considered a pilot phase) specifically targeted these two goals. With the introduction of the SDGs, as well as the expansion of the project into two new geographical regions in the country, the focus shifted towards providing access to health services for all segments of rural society, while retaining a special focus on facilitating women’s access to clinics. This is in line with the SDGs third goal, the promotion of good health and well-being. The project also addresses SDG goal 10 in contributing towards the reduction of inequality within and among countries through promoting the social, inclusion of traditionally marginalised societies. As such future expansion models of the Telemedicine Project envision the creation of more nodes serving remote and marginalised communities in the country.

Egypt’s Sustainable Development Strategy – 2030, made the improvement of healthcare a national priority, with a vision where “all Egyptians enjoy a healthy, safe, and secure life through an integrated, accessible,
high quality, and universal healthcare system capable of improving health conditions through early intervention, and preventive coverage. Ensuring protection for the vulnerable, and achieving satisfaction of citizens and health sector employees.” Eight major work areas were identified as strategic pillars to be addressed in the coming years, three of which align with the establishment of a Telecentre Project, namely, improving the quality of healthcare services, decentralisation of healthcare provision, and the development of ICT infrastructure to support healthcare provision.

The Telemedicine project offered an ideal solution that bypassed the need for expensive infrastructure, which would require months to establish. Moreover, the technology, through offering on-the-job training for physicians in the area, enables a valuable opportunity for capacity building which would be difficult to achieve otherwise. The Telemedicine Project was launched as part of the Integrated Development for Remote and Rural Regions Initiative, alongside three other intervention areas in education, women’s empowerment, and entrepreneurship. Siwa was chosen as pilot location of implementation, after which two more project nodes were established in Nubia and El Kharga regions. Nubia, in the Aswan governorate, is considered one the remotest regions in the southern part of the country and therefore has some developmental challenges that are unique to its location. The Kharga Oasis is part of El Wadi El Gadid Governorate and is the southernmost of Egypt’s five western oases. It is located in the Western Desert, about 200 km to the west of the Nile valley.

A nation-wide dissemination of the project is planned through several phases of expansion. The aim of this paper is to describe the evolution of the Egypt – Telemedicine Project.

Method

The ICT TF, was successfully able to use open source, cloud technologies in providing remote diagnostic tools to remote regions in the country. The system relies on synchronous, or real time, data transmission which translates into conducting live consultation sessions with physicians located in major cities across the country. Hospitals and clinics are equipped with videoconference solutions in the form of a Telemedicine kit that includes a webcam, a scanner, a TV monitor connected to the Internet by ADSL cables and 3G. The system also allows for the creation and maintenance of patient medical records.

On the job training for medical staff in the remote region is provided by practitioners in the city, as well as the provision of up to date specialised content that helps in teaching good health practices. Moreover, the Telemedicine Project is unique in offering free hosting services for patient records as well as having fixed scheduled medical sessions, instead of relying on volunteer effort by physicians. Figure two shows the workflow adopted by the ICT Trust Fund in its project.
The second phase was initiated in 2013 in the Nubia Region in the Aswan Governorate, in co-operation with El Gasem Medical Centre in Nubia and the Magdy Yacoub Foundation – Aswan Heart Centre. In 2016 the model was expanded into El Kharga Oasis in the New Valley governorate, and a co-operation protocol was signed with Cairo Medical School - El Kasr El Ainy Hospital to include medical sessions in both the Nubia and El Kharga regions.

The geographical regions selected for implementation of the project shared several characteristics, demonstrating a strong need for the implementation of this initiative. First, they are considered the most remote and cut-off regions in the nations, which make it very difficult for the people living in those areas to travel long distances to get specialised medical consultation services. Second, the existence of poorly staffed medical facilities makes it imperative for the population to either seek consultation with physicians in their governorate’s capital or in Cairo. Third, willingness, and a strong need by medical staff to improve their capacities through on the job training services. The three locations in which the tele-medicine project is currently taking place, namely Siwa, Nubia and El Kharga are shown in Figure 3.

Several data gathering methods and sources were used throughout the project. Outside consultants and ICT TF personnel were responsible for gathering data in the needs assessment and monitoring and evaluation phases, using face to face interviews with the project’s beneficiaries. Patients’ written consent is obtained prior to consultation sessions by the doctors.

Results

At the Siwa node, a pilot model of the Telemedicine Project, “Tele-Consultation on Child Health”, was implemented in the region in 2009 - 2012. This was established to assist in the reduction of child morbidity and mortality in the district. Through a public private partnership, the Siwa main hospital was connected to the Paediatric Department of El Shatby Hospital in Alexandria. The programme has shown that the teleconsultation approach can effectively improve the performance of healthcare providers in Siwa. Regular communication conferences were held, where physi-

![Figure 3. The sites of the three telemedicine services.](image_url)
cians in Siwa prepared cases for which they require consultation from the paediatric department specialists and professors of El Shatby Hospital. Moreover, teaching staff might decide to hold a distance-learning videoconference with their counterparts in Siwa during the regular teleconsultation. Healthcare personnel from Siwa Hospital also participated by videoconference on a bi-weekly basis in the scientific meetings held in the paediatric department in Alexandria.

An interactive mechanism is set for the teaching process between doctors in Siwa and their counterparts from the Faculty of Medicine of Alexandria University. Two teaching labs were set up in Alexandria and Siwa, including videoconference technology and Internet landlines.

The ICT TF has successfully developed and handed over four IT solutions and teleconsultation tools to the Siwa Central Hospital and Al Shatby Hospital, consisting of two telemedicine kits in each governorate, and two conference centres in each hospital. A Centre of Excellence for Remote Consultation at Al-Shatby Hospital in Alexandria governorates was constructed consisting of Internet infrastructure and videoconference facilities. This has enabled the live broadcast of regular lectures taking place in Alexandria to their Siwan counterparts. The ICT TF provides sponsorship with an Internet Service Provider (ISP) to sustain the workable model of medical development in Siwa Oasis. More than 50 children have benefited from the teleconsultation services, while seven doctors from Siwa Central hospital were trained on the Remote-Diagnosis-procedures, in addition to medical eLearning, and using the software for diagnosis, while three medical staff were trained on how to operate the teleconsultation system.

The Siwa phase spanned over the course of three years, from 2009- 2012. The 2009 – 2010 period was an inception phase for the project where needs assessment was carried out, as well as establishing partnerships with project beneficiaries. In 2011 the Egyptian revolution occurred, which marked the start of a political and economic turmoil period in the country. As such the project effectively started its operations in 2012.

The modest numbers achieved in terms of patients were due to several reasons. Siwa, due to its remoteness, as well as the Bedouin nature of society suffers from lack of availability of local doctors. Available physicians are usually placed there as part of an internship required by their medical programme. As such there is a very high rate of physician turnover, whereby a doctor could leave within two months. This posed a challenge to the ICT TF team, since they had to re-teach the physicians how to operate the technology, thus wasting time that could be used for medical consultations. Moreover, the lack of financial compensation for the Siwan based physicians proved to be a hindrance to their willingness to continue in the telemedicine programme. These two issues were taken into consideration in the following phase of the project, which was to be implemented in Nubia.

After the completion of the pilot phase in Siwa, and in accordance with Egypt’s national strategy of providing decentralised medical services to all regions in the country, the Nubia Node was designated, in 2013, to receive the Telemedicine Kit. The region is remote and it is relatively difficult to access medical facilities. A local NGO hosted the Nubia Node - Al Gasem Medical Centre (GMC) – was willing to invest financially in the set-up cost of the technology, thus ensuring ongoing sustainability of the model. The project’s work mechanism relied on the ICT TF providing the ICT infrastructure needed for the creation and hosting of highly-secured patients’ records, ensuring complete privacy of the patient’s records. Training was provided to GMC staff members by the ICT TF on operation and maintenance of the provided medical kit, as well as on uploading patient medical files on the software. Beside the NGO partner, the private sector represented by TeleMed Int., provided the project with the needed software, and co-operation was established with healthcare institutions such as Cairo University – Kasr Al Ainy- and the Magdy Yacob Foundation.

The track has become increasingly responsive to local needs as evidenced through visits. Project staff considered the concept of peer education (from reference doctor to GP) as an innovative educational approach. Discussions and interviews with participants indicated that beneficiaries were satisfied that their opinions were sought and incorporated in the track design. Patients reported to the final assessment consultant in written interviews that they saved around 1,000 Egyptian pounds (EGP = USD $64) in travelling expenses per patient. Moreover, EGP 60 (USD $3.80) was gained in income for the physicians and the NGO for each session.

The track used a software level tele-medicine framework instead of depending on hardware connectivity to save cost on multiple levels by using
open source certified codes and thus making it more flexible and easy to include extra nodes without the need to reinvest in new hardware or get more licenses. The needed hardware was limited to include an HD display screen, HD audio system, a laptop, and a cart to put all things together for better mobility.

The track developed a training manual for the IT specialist and the General Practitioner (GP) and deployed this training successfully. To extend the services to include more specialisation, the track contacted leading healthcare providers such as: Magdy Yacoub – Aswan Heart Centre, and Cairo University – EL Kasr EL Ainy Hospital. The success of the project in Nuba has led to the expansion of the project in 2016 into a third node in El Kharga Region, in the New Valley governorate.

Traditional gender roles in rural areas proved to be a hindrance for women in accessing the Telemedicine project due to the traditional prohibitions of communication and movement on women. To resolve this issue, a volunteer female physician was recruited to specifically cater for women attending the clinic in Nubia. As such, more women sought medical assistance from the Telemedicine clinics. (Figure 4) Dermatology is a new specialty that was added in October 2016.

The latest achievement in the project was the signing of an MOU with Cairo University Kasr El Ainy Hospital, to replace the previous voluntary based model of physician participation into one with fixed scheduling. As such, currently there are two specialties available for Telemedicine Consultation, Dermatology and Internal Medicine. Two doctors, one from each specialty, give four to five consultative sessions per month, and as such there have been 16 sessions conducted in the region. The total sessions conducted in Nubia and El – Karga, divided by Internal Medicine and Dermatology are shown in Figure 5.

![Figure 4](image)

**Figure 4.** Total patients by specialty and gender.

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![Figure 5](image)

**Figure 5.** Total number of session by type and geographic region. **Discussion**

Building on the experience of the project in its three nodes, it was noted that the model’s functionality is highly dependent on choosing the proper environment to host the model. Several criteria were put in place to maximise the benefits received from the project, namely the need for a more open environment in terms of gender roles, developing strong partnerships with civil society, and public/private sector hospitals, and the development of a sustainable model using out of pocket fees (paid by the beneficiaries directly) and avoidance of the free of charge model.

Moreover, several criteria were placed for the selection of the clinic to receive the Telemedicine Kit, namely the availability of Internet infrastructure, high incidence of patients at the registered clinic, availability of basic medical infrastructure equipment (x-ray, sonar, ..), availability of key human resources, belief in the tele-medicine initiative and aim to improve the level of service offered to the local community, and the willingness to share the initial establishment costs and future investments along with holding awareness sessions to promote the track.
Conclusion

Out of a firm belief in the necessity of providing affordable and high-quality health services for all Egyptians, the future vision of the project includes an ambitious plan to expand the model into all of Egypt’s governorates, through the creation of strategic partnerships with major health consultation institutions. Moreover, the project’s expansion model envisions the inclusion of all medical specialisations, on a 24/7-hour basis, to ensure equitable access to health services across the country. As such the project’s future- map includes expanding co-operation with corporate social responsibilities (CSR) units in major private sector entities in the country, and an agreement protocol has been already signed with Orange Foundation - Egypt to expand the number of telemedicine kits available in remote and marginalised regions of the country.


Corresponding author:
Hoda Dahroug
1 Mahmoud Khalil El Hosary St
Sphinx Square
Mohandseen, Giza
Egypt
Tel: (202) 3534 1830
Fax: (202) 3344 4534
Email: hdahroug@mcit.gov.eg

Conflict of interest. The author declares no conflict of interest.

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