

# Critical success factors for mHealth services in rural Ghana

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## Introduction

Ghana is a developing country in Sub Saharan Africa (SSA) with a population of more than 30 million [1], 44% living in rural areas [2] and a low health worker density [3]. The ‘doctor-to-population’ ratio is 0.12 and as low as 0.04 per 1000 people in the Upper East making healthcare not easily accessible. Although the number of communicable diseases like malaria has decreased in recent years, there is a substantial increase in non-communicable diseases like hypertension and diabetes [1]. In the last decades, innovative information and communication technologies have offered solutions in several fields including healthcare, not only in developed countries. In 2010, Ghana defined an eHealth strategy [4] and several mHealth projects have been initiated [5]. mHealth, or “mobile health”, is a component of eHealth being the use of information and communication technologies (ICT) for health. The World Health Organisation (WHO) defined mHealth as “the medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs) and other wireless devices” [6]. Given the shortage of medical professionals, the need for improving health care delivery and a mobile phone ownership of 80% mobile health services are very promising, especially for people in rural and remote areas [7]. However, transferring successful pilots to scaleable and sustainable solutions is a real challenge. This paper presents the lessons learnt from a selection of successful mHealth services developed and deployed in Ghana: MDNET, mPedigree and MoTeCH. Furthermore, relevant insights of recent research into the opportunities and barriers for mobile solutions are discussed. This paper highlights the most critical success factors for the implementation of mobile services in rural and remote areas in Ghana that could possibly be applied to other developing countries in a similar setting.

## Mobile health initiatives

In the past decade, several mHealth pilots have been started in Ghana. Lacking a central repository of initiatives, a study identified 22 projects in 2014, most of them initiated by donors [5]. This study observed “a limited role, but growing interest in opportunities, especially in remote locations”. A review of 44 mHealth projects in SSA, almost half of them aimed at “patient follow-up and medication adherence”, showed positive health-related results. This review pointed out that accessibility, acceptance and low-cost of the technology, effective adaptation to local contexts, strong stakeholder collaboration and government involvement are key for success [8]. Threats for implementation mentioned are dependency on funding, unclear responsibilities, unreliable infrastructure and lack of evidence on cost-effectiveness. In addition to these challenges, data and interoperability standards and enabling policies are considered important by the World Bank [9]. In this respect the national eHealth Strategy of Ghana is seen as a positive step, as “it addresses governance, stakeholder involvement and coordinating mechanisms for evaluation” [9]. A scientific review of the eHealth strategy in 2013 concludes that “it aims to streamline the regulatory framework, build capacity and increase health access by digital means and full implementation is expected to lead to a robust health information system improving health services for patients throughout the country” [10]. A successful mHealth initiative mentioned in this review is MoTeCH [11].

### *MDNet*

Mobile Doctors Net (MDNet) is an interesting case study [12]. It’s launched by the Ghana Medical Association (GMA) in 2008 in collaboration with a mobile phone provider and Switchboard, a US-based non-profit making organisation [6]. It provides free mobile voice and text services to all registered physicians in Ghana. MDNet is highlighted as an innovative practice where physicians are able to connect together and receive health alerts [13]. Better informed physicians are valuable for government and patients. This application fulfils a real need in a country with a low doctor density and long travel distances. The start-up costs of MDNet were minimal and the business model is interesting, providing incentives for participating telecom providers [6]. One of them donated free SIM-cards, with the hope of earning money in the future from private calls. Switchboard delivered technical knowledge, skills and tools. A crucial success factor has been partnering with the GMA as an important health institution and the telecom providers. Furthermore, it’s learnt that recurring revenues are needed to become sustainable [6]. Evidence of scaleability of this service is given by roll-outs in Liberia and Tanzania [13].

### *mPedigree*

The mPedigree initiative, launched in 2010, is a mobile consumer application to detect counterfeit medicines. Fake drugs are a major concern in the health sector, especially in developing countries, causing a lot of deaths and decreasing revenues to genuine drug producers [14]. It’s estimated by the WHO that 25 percent of medicines in developing countries are counterfeit or substandard [6]. As a solution mPedigree applies a unique alphanumeric code to medicine packages. Scratching off a panel reveals this code to the consumer. After sending the code by text message to a toll-free number, consumers receive a message confirming the product as authentic or counterfeit. The World Bank considers strategic opportunities for mPedigree, as it contributes to the solution of a major regional problem and serves individual consumers with cost-effective technology [9]. Also in this case a public-private partnership was essential for success, with benefits for all parties having a collective interest (government, pharmaceuticals and telecoms). Pharmaceuticals are willing to fund this service motivated by lost sales. For governments, lost tax revenues and increased public health costs are drivers. Telecoms gain increased usage of their services and the consumer is well engaged. mPedigree has expanded to Nigeria, India, East Africa and South Asia. A lesson learnt was that facilitation of common standards was needed to benefit from economies of scale [15].

### *MoTeCH*

Mobile Technology for Community Health (MoTeCH) was introduced in 2010 to improve prenatal and neonatal care in rural Ghana by means of mobile phones [14]. It's aimed at mothers as well as babies and fits well into the Ghanaian development agenda. Reducing child mortality as well as maternal mortality are part of the 2015 Ghana Millennium Development Goals [16]. The project has been adopted by the Ghana Health Service [9]. MoTeCH consists of two components [11]. The Nurse Application helps community health workers monitoring, recording and retrieving data of pregnant women. The Mobile Midwife application sends weekly voice or text messages to pregnant women. Information provided includes educational and time-specific pregnancy information and advice to cope with challenges related to pregnancy [14]. In the pilot phase in two provinces in 2011, 90 percent of the women preferred IVR to SMS, since voice messages were available in local languages and SMS only in English [9]. In a study in 2017 it's strongly recommended to support alternative channels like USSD or SMS to improve the ability of timely message delivery, although it's recognised as maybe not appropriate for illiterate users [17]. The World Bank considers strategic opportunities for MoTeCH, as it's tailored to individual's health context and based on open source [9]. Program and scaling costs of MoTeCH haven been evaluated in a cost-effectiveness study in 2018 [18]. This study was the first to estimate the value for money of the supply- and demand-side of an mHealth initiative and concluded that the adoption of MoTeCH represents good value for money. MoTeCH has scaled up to five regions within Ghana [13] as well as to other countries like India with other health solutions based on the same flexible platform [19].

In 2019 a paper on telemedicine implementations in Ghana presented all known telemedicine initiatives up to that point as well as recommendations to improve the advancement [14]. "Telemedicine signifies the use of ICT to improve patient outcomes by increasing access to care and medical information" [20]. The major challenges recognised are low investment in fast internet and data infrastructure (especially in the rural areas), funding to maintain and scale up and relatively little contribution by the government in promoting telemedicine implementations. The absence of structured frameworks and policies to ensure implementations is also mentioned. These observations differ from former positive reviews by both Afagbezi et al. [10] and the World Bank [9]. It's understandable that the Sustainable Development Goals for 2030 don't have goals for improving the data infrastructure, as substantial progress has been made on Millennium Development Goal 8 [16]. The cellular users target has been largely achieved and substantial progress has been made on internet users. However, differences within the country are great and rural communities still lack access to the internet [22]. People living in these areas could especially benefit from well accessible mHealth services. It's a real risk that the urban-rural digital divide won't be bridged, but enlarged.

A very recent, interesting and qualitative study with 30 healthcare users and 15 healthcare providers showed that these groups are both willing to use mHealth services involving phone call as they considered the technology to be important to bridge the existing healthcare gap [21]. This also applies to the users, although their knowledge and awareness about mHealth appeared to be low, contrarily to the providers. However, illiteracy, language barrier, trust, quality of care and mobile network connectivity are seen as barriers in rural areas.

Given the need for low-cost and accessible technology in rural areas with low resources, an interesting contribution to bridge the web's digital divide could be offered by the Voice Service Development Kit (VSDK) of the KasaDaka platform [23-24]. It's based on open source and supports voice-based services and local content creation, so it's financially sustainable, internet independent and suitable for illiterate users. As technology alone can't offer the solution, collaboration with stakeholders and adapting to the local context is important. For a systematical approach the Framework for ICT4D Service Development could be used [25]. It's especially designed for innovation in a low-resource development context and covers the full lifecycle of ICT development. The framework components Context analysis and Needs assessment as well as the iterative and co-creative way of working are important for ensuring value for the user. The Sustainability assessment ensures the focus on key requirements and cost considerations including maintenance and operations. Employing the e3-value method [26] to define the value exchange between all stakeholders is an essential step to prevent initiatives from stopping, after the pilot has ended. As already discussed above, public-private partnerships can be a key success factor for financial sustainability.

### Conclusion

Given the context of rural Ghana with a low health worker density and a need for improving healthcare mobile technology applications are promising. Several mHealth initiatives started in the past decade in rural Ghana, scaling to a sustainable service being challenging. Based on scientific research as well as evaluation of three successful initiatives critical success factors are government involvement, cost-effectiveness, fulfilment of a real need and effective adaptation to the local context. With respect to financial sustainability, public-private partnerships sharing a collective interest play an important role. Unless the Ghanaian eHealth strategy and substantial investments in data infrastructure, rural communities still lack access to the internet and government policies and budgets appear to be insufficient to ensure mHealth implementations. It's a risk that the urban-rural digital divide will be enlarged. As a development project approach, the Framework for ICT4D Service Development in combination with the Kasadaka-VSDK as a supporting technology platform could contribute to bridge this gap. It's strongly recommended to use both framework and platform for building mHealth services for people in rural areas.

## References

- [1] Institute for Health Metrics and Evaluation. Ghana. Available from [www.healthdata.org/ghana](http://www.healthdata.org/ghana). Accessed 2020-05-24.
- [2] Trading Economics. Ghana. Available from <https://tradingeconomics.com/ghana/rural-population-percent-of-total-population-wb-data.html>. Accessed 2020-05-24.
- [3] Ghana SDGs Indicator Baseline report 2018. Available from: <https://www.ghundp.org/content/ghana/en/home/library/poverty/ghana-sdgs-indicator-baseline-report-2018-.html>
- [4] Ghana E-Health Strategy. July 2010. Available from: [https://www.isfteh.org/files/media/ghana\\_national\\_ehealth\\_strategy.pdf](https://www.isfteh.org/files/media/ghana_national_ehealth_strategy.pdf).
- [5] Afarikumah, E. (2014). Electronic Health In Ghana: Current Status and Future Prospects. *Online Journal of Public Health Informatics*, 5(3), (p.1). Available from: <https://doi.org/10.5210/ojphi.v5i3.4943>.
- [6] World Health Organization. mHealth: New Horizons for health through mobile technologies. 2011 (p.6). Available from: [https://www.who.int/goe/publications/goe\\_mhealth\\_web.pdf](https://www.who.int/goe/publications/goe_mhealth_web.pdf)
- [7] Pew Research Center. Internet connectivity seen as having positive impact on life in Sub-Saharan Africa. October 9, 2018. Available from <https://www.pewresearch.org/global/2018/10/09/majorities-in-sub-saharan-africa-own-mobile-phones-but-smartphone-adoption-is-modest/>. Accessed 2020-05-24
- [8] Systematic Review on What Works, What Does Not Work and Why of Implementation of Mobile Health (mHealth) Projects in Africa. Aranda-Jan CB, Mohutsiwa-Dibe N, Loukanova S. Systematic review on what works, what does not work and why of implementation of mobile health (mHealth) projects in Africa. *BMC Public Health*. 2014;14:188. Available from: <https://doi.org/10.1186/1471-2458-14-188>,
- [9] World Bank Group. Information and communication technologies for health systems strengthening (2015). Available from: <http://documents.worldbank.org/curated/en/111611468004162764/pdf/949430WP0ICT0f00Box385445B00PUBLIC0.pdf>
- [10] Afagbedzi, S.K., Obuobi, H. Aryeetey, R, Bosmprah, S. (2013). A Review of Ghana's E-health Strategy. *Journal of Health Informatics in Africa*, 1(1). Available from: <https://doi.org/10.12856/JHIA-2013-v1-i1-52>
- [11] Software System for Supporting Community-based Primary Health Care with Mobile Technology: The Mobile Technology for Community Health (MoTeCH) Initiative in Ghana. *Online J Public Health Inform*. 2012;4(1). Available from: <https://doi.org/10.5210/ojphi.v4i1.3910>.
- [12] mHealth Technology in Global Health. Available from <http://www.uniteforsight.org/global-health-university/mhealth>. Accessed 2020-05-24.
- [13] Chen C, Baird S, Ssentongo K, et al. Physician tracking in sub-Saharan Africa: current initiatives and opportunities. *Hum Resources for Health*. 2014;12:21. Available from: <https://doi.org/10.1186/1478-4491-12-21>
- [14] Tchao, E.T., Acquah, I., Kotey, S., Aggor, C.S., Kponyo, J.J.. On Telemedicine Implementations in Ghana. April 2019. *International Journal of Advanced Computer Science and Applications* 10(3):193 – 202. Available from: <https://doi.org/10.14569/IJACSA.2019.0100325>.
- [15] African Strategies for Health. mHealth Compendium, volume 2. Available from: <http://www.africanstrategies4health.org/uploads/1/3/5/3/13538666/mpedigree.pdf>. Accessed 2020-05-24.
- [16] Ghana Millennium Development Goals. 2015 Report. Available from: <https://ghana.un.org/en/19078-ghana-mdgs-report-2015>
- [17] Mobile Technology for Community Health in Ghana: what happens when technical functionality threatens the effectiveness of digital health programs? February 2017. *BMC Medical Informatics and Decision Making* 17(1):27. Available from: <https://doi.org/10.1186/s12911-017-0421-9>.
- [18] Willcox M, Moorthy A, Mohan D, et al. Mobile Technology for Community Health in Ghana: Is Maternal Messaging and Provider Use of Technology Cost-Effective in Improving Maternal and Child Health Outcomes at Scale?. *J Med Internet Res*. 2019;21(2):e11268. Published 2019 Feb 13. Available from <https://doi.org/10.2196/11268>
- [19] Wood, T. Scale Can Happen: The MOTECH Experience. February 20, 2013. *Stanford Social Innovation Review*. Available from: [https://ssir.org/articles/entry/scale\\_can\\_happen\\_the\\_motech\\_experience](https://ssir.org/articles/entry/scale_can_happen_the_motech_experience). Accessed 2020-05-24.
- [20] World Health Organisation. Telemedicine: opportunities and developments in member states: report on the second global survey on eHealth 2009. (Global Observatory for eHealth Series, 2, p.8). Available from: [https://www.who.int/goe/publications/goe\\_telemedicine\\_2010.pdf](https://www.who.int/goe/publications/goe_telemedicine_2010.pdf).
- [21] Peprah, P., Abalo, E.M., Agyemang-Duah, W. et al. Lessening barriers to healthcare in rural Ghana: providers and users' perspectives on the role of mHealth technology. A qualitative exploration. *BMC Med Inform Decis Mak* 20, 27 (2020). Available from: <https://doi.org/10.1186/s12911-020-1040-4>.
- [22] DW Akademie. Despite Ghana's commitment to Internet expansion, problems persist. November 29, 2018. Available from: <https://www.dw.com/en/despite-ghanas-commitment-to-internet-expansion-problems-persist/a-46508524>. Accessed 2020-05-24.
- [23] Kasadaka, Knowledge Sharing In A Box. Available from: <https://www.kasadaka.com/software.html>. Accessed 2020-05-24.
- [24] Baart, A., Bon, A., De Boer, V., Tuij, W., Akkermans, H. (2018). Ney Yibeogo – Hello World: A Voice Service Development Platform to Bridge the Web's Digital Divide. Available from: [https://w4ra.org/wp-content/uploads/2018/08/WEBIST\\_2018\\_6\\_CR.pdf](https://w4ra.org/wp-content/uploads/2018/08/WEBIST_2018_6_CR.pdf).
- [25] Developing ICT Services in a Low-Resource Development Context. Bon, A., Akkermans, H., Gordijn, J. (2016). Available from: <https://w4ra.org/wp-content/uploads/2016/09/CSIMQ-Anna-subm-16Sep2016-HQprint.pdf>
- [26] J.D. Sachs and J.W.McArthur, "The millennium project: a plan for meeting the millennium development goals," *The Lancet*, vol. 365, no. 9456, pp. 347–353, 2005.