

Challenges in Smartphone Health Informatics in Africa

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Abstract

Mobile phones are growing rapidly in developing countries, and it is estimated that the number of mobile phones will exceed the number of people in many African countries in the next decade. Many international players, like the United Nations and telecommunication companies, have invested in hundreds of projects throughout Africa to improve public health using mobile technology (mHealth). Although there is an enormous potential in this field, there are several limiting factors which may undermine the future of mHealth in Africa. In this paper we will identify the challenges posed in terms of funding the development and deployment of mHealth projects, their acceptance and adaptation by local users, and the effectiveness of such projects. We consider the technical aspects of launching mHealth projects including data exchange, data security, and patients' privacy. We identify the wide range of possible stakeholders from the local health workers to national, multinational, and international health organizations, as well as NGOs and telecommunication industry. The growing need for a simple and universal standard on data processing through different levels of the project and among different stakeholders is the main challenge for future development of any mHealth project.

Keywords: mobile, mHealth, development

1 Introduction

Recent studies document that many well intentioned NGOs have introduced mobile health (mHealth) informatics systems into African villages only to face unsuccessful outcomes [1]. In Uganda, the Ministry of Health has become so frustrated with NGOs' implementation of mHealth applications that they have banned the deployment of new projects. Many of the mHealth implementers have usually not consulted key stakeholders about:

- How to develop consistent user interfaces
- What data needs to be captured and provided to the Ministry of Health and World Health Organization (WHO) for surveillance and evaluation purposes
- What data exchange, identity, security, and privacy standards need to be implemented to support the needs of all stakeholders
- How to reimburse village health workers for their time the costs of their apps, cell phones and connectivity

- The role of the community in decision-making about the role of the cell phone enabled health worker in the community as a provider of health and a catalyst for community sustainability

There have been very few discussions about pan-African mHealth standards and how they fit into global health informatics standards. To date, there has not been an attempt to lower application development costs per village by developing solutions that are implemented in all African countries.

2 Mobile Market in Africa

The number of mobile connections and the mobile penetration rate has grown quickly in Africa in recent years. The World Bank and the association of mobile operators (GSM) estimate that the number of mobile phone subscribers in Africa has reached 620 million, which is larger than either the United States or the European Union. The number of mobile phones in Africa has grown drastically since 2000 and mobile operators have reduced prices an average of 18% between 2010 and 2011. Figure 1 shows the rapid pace of mobile connection growth in Africa over the past decade.

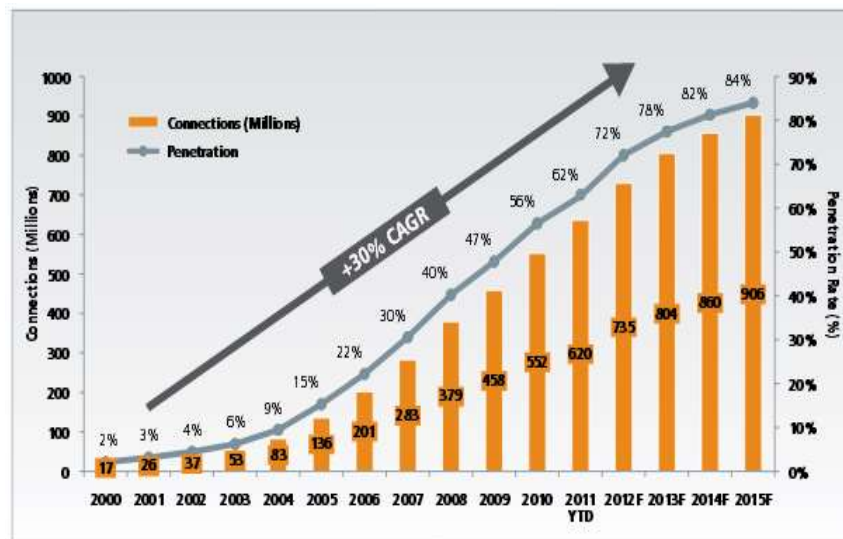


Figure 1: Total African Mobile Connections and Penetration Rate (million, % penetration)[2]

As in many other parts of the world, the high rate of mobile phone penetration has brought many opportunities for doing business and providing services through network connection or online (smartphone applications) in domains such as utilities, health, education, banking, and finance. The mobile internet is at the heart of this dynamic ecosystem of innovative tools and applications. However, there are several factors undermining the promising future of mHealth projects in Africa. This paper will review these issues and highlights the main obstacles for mHealth projects' success in Africa.

3 Mobile Infrastructure

The first set of issues relate to dealing with the future growth of mobile connection in Africa. They can be categorized in two main groups:

3.1 Technical issues:

The amount of licensed spectrum in African countries is significantly lower than other parts of the world and it hinders the provision of future mobile broadband services. A study by the World Bank shows that among selected countries, only Nigeria has assigned more than 250MHz of spectrum to public mobile services. Mobile services including mHealth apps will create a significant increase in data. Data traffic from a smartphone is about 24 times that of a basic feature phone. To catch up with this fast growth, many African countries have started releasing their 3G spectrum but the pace is slow. Using “Digital Dividend” (the spectrum that is freed up after analogue television broadcasting switches to a digital transmission) can be looked upon as a solution to connect rural areas to mobile and ITC broadband since it is a lower frequency band and will cost less than high frequency bands.

3.2 Regulatory issues:

Spectrum allocation and harmonization remain the main challenges for mobile services in Africa. If done in harmony with allocations in other part of the world, any additional spectrum made available for mobile wireless applications (such as Digital Dividend) increases greatly the value and utility to service providers. In addition to promoting adoption, it can provide other benefits like cost effective roll-out of networks and devices (technology harmonization), and reduction in cross-border interference which also facilitates international roaming. In addition, the spectrum allocation procedure should be efficient and transparent to encourage competition from the mobile operators and generate revenue for the public sector. Technology neutrality and fairness should be considered for spectrum licensing and pricing.

3.3 Investment issues:

Weak public infrastructure remains a hindering factor for developing a sustainable mobile network in Africa. Most parts of the continent have very limited access to electricity, which limits the expansion of mobile operators to remote areas of Africa. Introducing solar and wind powered base stations and providing excess power to local communities who live around base stations are among the alternative solutions for tackling this problem. In addition to the need for transparent, predictable and consultative regulatory policies, African governments have adopted Universal Service Funds (USFs) to collect funds from revenue making operators and redistribute it to providers of costly services for rural and remote areas. However, the effective collection and redistribution of levies require a great deal of transparency in objectives and procedures which is absent in many of African governments.

4 Health Infrastructure

Despite the recent fast economic growth in Africa, the health and wellbeing of most of its population is still far from the world standards.

4.1 Public health issues:

African countries are challenged by a set of public health issues that distinguish them from other parts of the world:

- People living in the African Region are more exposed to a heavy and wide-ranging burden of disease partly because of this Region’s unique geography and climate. In Africa 72% of deaths are caused by communicable diseases, such as HIV/AIDS, tuberculosis, malaria, respiratory infections, other infectious diseases, and complications of pregnancy and childbirth. This ratio is only about one-third in non-African countries[3].

- The number of armed conflicts and other humanitarian emergencies like drought, famine, flood, civil war, or refugee crisis in Africa is incomparable with other parts of the world.
- The population of the African Region represents about 10% of the world's population, but an estimated 45% or more of its people live below the poverty line, on less than US\$ 1 a day. About 330 million people in this region — one-third of the world's 1.1 billion poor — are caught in this poverty trap, in which low household incomes lead to low household consumption and, in turn, the countries in which they live have low capacity and low productivity[3].

Some of other Africa's public health problems are shared internationally: WHO estimates that only about 10% of research and development funds for medicines and vaccines go into diseases that account for 90% of the global disease burden. This demonstrates the unbalanced and uncoordinated approach prevalent in allocating R&D resources for public health research. mHealth projects in particular have a potential to bridge the technology gap and bring the equal public health solutions to African masses[3].

4.2 Investment issues:

Many African countries are spending a small portion of their GDP on health. Most African countries spend only about 3 to 10 percent of their GDP on health while this ratio is much higher in developed countries. The US in particular spent about 2.6 trillion dollars on health in 2010 which is about 18 percent of the GDP.

5 Opportunities for mHealth projects in Africa

Despite the increase in research related to mHealth, a recent literature review of Mobile Health evidence conducted by A.T. Kearney on behalf of the GSMA found that the existing published research has not focused on the issues that drive adoption: the efficacy of clinical outcomes; cost comparisons; and the influence of mobile health on the wider healthcare system (i.e. reduced hospital attendance, resource utilization, or improved access). Instead, the research has predominantly focused on demonstrating that the technology for mobile health works from a technical perspective and that patients like to use mobile health solutions[4]. There are several opportunities for mHealth projects in Africa:

- With the rapid penetration of mobile networks and their impact on consumer communication and transactions, they could be further used to enable and simplify consumer and institutional healthcare service delivery funded by out-of-pocket and insurance transactions.
- Mobile supply chain management using data collection and monitoring can address the supply chain issues that impede procurement and delivery of equipment and medical supplies.
- ICTs can also help in outreach to rural areas, and by providing communication between rural healthcare extension workers and trained nurses and doctors in peri-urban facilities[5].

6 Conclusion

Although the opportunities are vast and there is significant excitement about the deployment of mHealth projects in Africa, there are several issues challenging this new industry:

Stakeholders' Interests: There is an urgent need for serious academic study or a distance learning mHealth course that conducts a wide range of studies on identification and analysis of the stakeholders in mHealth in Africa including:

- Village health workers
- Doctors and hospitals
- Ministries of Health
- Telecom companies
- Telecom equipment and smartphone manufacturers
- Pharmaceutical companies
- Computer consulting companies
- NGO implementers
- WHO/GAVI/Gates Foundation and other donors

Adaptation: The potential consumers of any new technology need to clearly see and feel the benefits of switching to a new system in as short a time as possible. Many mHealth pilot projects suffer from the lack of skilled healthcare workers, inefficiency in allocating existing workers, insufficiency in monitoring and motivating them, and the absence of training and knowledge support in the field. Any mHealth project should recognize the need for training and monitoring the health workers who are using apps and ITC solutions. What is seen in theory as a great opportunity for having all data uploaded in a timely manner may not be possible in many cases, as many health workers share their mobile phones with other members of their family and have limited access to them. mHealth applications should be simple to use but at the same time capable of transferring important health information which can significantly contribute to the public health improvement.

Sustainability: A study of mHealth projects in Africa showed that the successful projects are those that follow a sustainable business model. A project named “Living Goods” uses the Avon model to sell health and sanitary items. Having both businesses help the sale agents stay in business also attracts customers whose primary interest might not be the health services [6]. This strategy can provide well-subsidized health products for remote villagers with limited access to public health, and earns profit from selling non-essential items such as sanitary pads or detergent.

Standardization: The rapid growth of mHealth pilot projects in Africa has brought an increasing need for a uniform health information system which enables communication between households, care providers, and eventually, policy makers. There are other players such as NGOs, mobile providers, software developers, and international organizations (i.e. UN and WHO) whose interests should be aligned with the local community’s public health interest in sharing and accessing data. Standardization would enhance the mobile health systems and dramatically improve their efficiency by avoiding redundant and conflicting record keeping [7].

Coordination: As mentioned before the health sector is underfunded in most of African countries. While mHealth projects aim to improve the monitoring and collection of data, they should identify the critical resources for treatment and prevention and assist in allocating limited human and supply resources to where they are needed in a timely manner. Customers of mHealth services are often non-governmental organizations (NGOs) with small revenues who primarily rely on the donations from developed countries or international organizations to continue providing their services [8]. There are major funders including USAID, PEPFAR, PMI, the Global Fund, and GAVI, that would benefit from more coordination, standardization, interoperability, and overall knowledge sharing. In addition to providing shared knowledge among mHealth workers, the funders and implementers should share knowledge about tactics

and terms for negotiating contracts and striking mutually beneficial deals with operators and developers and national policy makers.

Residency Program for Doctors in Global Health: Currently there is no residency program and peer reviewed board certification for medical doctors in global health informatics. This has led to a situation where there is growing distrust between doctors and computer scientists that results in inefficient decision making in international organizations like the CDC and WHO, as well as the Ministries of Health in African countries. We believe that a global health informatics program can be designed and offered jointly by top ranked medical and technical schools like Emory University and the Georgia Institute of Technology, or Harvard University and MIT. This would have a great impact on developing global health informatics standards and implementations that greatly reduce morbidity, mortality, and human suffering.

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