Innovation and Entrepreneurship for eHealth in Africa: A Conceptual Framework

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Abstract

User-led service design and development present new solutions for existing challenges to innovation, development and growth. In this paper is proposed a model for using user-driven innovation and mobile/wireless technologies to address some of the major challenges on the African continent in health services and products. As existing mobile health projects in Africa are finding it difficult to achieve sustainability, new measures are required that create real and self-sustainable economic systems for local small and medium-sized enterprises. The model proposed here involves stimulating demand and lowering barriers to innovation through user-driven innovation and early adaptation in lead markets, defined as the 'living labs' methodology. This approach has been piloted in rural regions in India and South Africa, and through the 'mAfrica' project, the approach will now be piloted on a broader scale in sub-Saharan Africa.

Introduction

This paper addresses the challenges of developing adequate health care systems for the sub-Saharan population in rural Africa, and examines how mobile/wireless technologies combined with user-driven innovation can form part of a new innovation paradigm to develop alternatives means of providing health service to the citizens in question. The paper is developed on the basis of the research completed in the mobilisation phase of the 'mAfrica' project, a project currently at the concept development stage aiming at attracting investments and stimulating local innovations and businesses in information technology-enabled health care services in Africa. The paper is an empirical examination of current mobile health care initiatives in Africa in the context of contemporary ideas regarding societal-innovation, to create awareness of the possibilities related to developing innovative systems in rural areas that function on the basis of local premises. The 2009 United Nations Foundation (UNF)/mHealth Alliance report on mHealth in Developing Countries in which a co-author of this paper contributed to, highlighted deficiencies of current projects on the continent.

Up to 36 out of 50 projects reviewed from the developing world are from Africa. And most are at different stages of piloting, with concerns on their future sustainability raised as a major developmental concern. Projects are usually donor-driven and funded hence their short-term rather than strategic or long –term commitment led them to struggle after withdrawal. Call for more innovations, ingenious entrepreneurship and scaling up of pilots were essential practices required for achieving sustainability according to addendum to this UNF report. The Ugandan Health Information Health (UHIN) mHealth project best illustrates the need for both funding and technological innovations in Africa. Started as a donor-funded project in 2003, its post-pilot sustainability is currently in jeopardy due to fund withdrawal since 2009. Struggle with externally transferred technologies and technical expertise were also challenges faced during this period. Therefore, proposing alternative and innovative means to these challenges forms the bedrock of our idea. Turning supply- side (donor-driven) to demand-side (local innovations and enterprises) solutions is deemed strategic.

The paper takes departure in the current status of initiatives to stimulate and enable the uptake and adoption of mobile/wireless and renewable energy technologies for creating mobile health care services for meeting the health care needs of Africans, and develops a conceptual framework for an alternative innovation model. This model presents a method of ensuring sustainable socio-economic development through engaging African small and medium enterprises (SMEs) in business, service and products creation and development. Consequently, the paper aims to develop a sus-

tainable framework for the project in the form of rural living labs that can function as rural innovation environments based on new services using mobile/wireless technology. Hence, the paper departs in the interesting development of a low-tech mobile business system that creates advanced usage models such as mobile banking, microloans and several other business models, that parallel and sometimes exceed the advancement of mobile services in the developed world. This interesting phenomenon is the basis of the underlying notion of this paper that sub-Saharan Africa possesses an innovation potential not yet fully utilised. This innovation system might hold the key for changing fundamental conditions for the benefit of needy African citizens.

1. African Strategies for Health Care Innovations

The AU/NEPAD Health Strategy for the year 2007-2015[56] concludes that telecommunication innovations are integral to the development of functional health systems on the African continent. Key priorities in this context are a) building an effective communication system, b) the integration and access to distributed health information systems; and c) the extension of health services to isolated and rural health facilities and health personnel in Africa.

The AU/NEPAD Health Strategy positions health as an integral, and a major prerequisite, to the achievement of human resource, economic, infrastructure agricultural and environmental developments of the continent The strategy documents further shed light on the "triple burden" of communicable, non-communicable, and violence and traumatic injuries – as well as their associated social consequences on Africa's development. The possibility of missing the set targets of the health-related Millennium Development Goals (MDGs) by the year 2015 was also highlighted in these documents, especially with relation to grim statistics for the African continent.

The HIV/AIDS epidemic on the African continent is extremely alarming with 2.4 million people to have died from AIDS and with estimated 3.5 million new HIV infections in 2002. HIV prevalence is reported to be as high as 30% with an estimated 2.6% economic growth retardation in some African countries. Malaria causes 1 million deaths annually 600,000 of which are children under the age of five years old. Malaria has a reported 1.3% negative impact on economic growth in severely affected countries.

Deaths among children below five years of age also occur from AIDS-related diarrhoea accounting for 800,000 deaths, as well as 500, 000 from measles and 1.2 million from pneumonia. Health personnel shortage due to high mortality rate is further complicated by massive brain drain within the health systems of most African countries. Africa is reported to have 10% of the world population but bears 25% of the global disease burden managed by only 3% of the global health workforce. Looking at the statistics, health care to the rural populations of Africa is one of the major challenges of the continent in its path to developing modern and sustainable societies. Years of foreign funded health care project have traditionally not been able to sustain themselves once funds have dried up, leading to a situation where there are millions of African citizens without proper care. Many rural Africans still face the same lack of basic health care services as before the arrival of these programmes, since no long-term sustainable systems have been built. The programmes have also had the effect that local markets for health care have been crowded-out or not allowed to develop naturally according to local economic conditions, and these distortions might have added to long-term lack of adequate development of rural health care systems.

To address this challenge, new ideas are required to cope with the continuing and growing challenges of the African continent. One model, suggested by this paper is to aim at creating stimulating demand-side measures instead of supply-side instruments. This would allow for the development of a long-term sustainable economic system for supplying health care services on local terms tailored to the conditions of the rural citizens of Africa. The immediate effects of such a model might be less significant than a massively funded health care program. Developing a sustainable system for delivering basic health care might have a more significant long-term impact not only in terms of health care, but also in terms of secondary effects on the local economy such as job creation, technology adaptation, and development of rural innovation systems that can affect other industries as well. Hence, the intention is to tap into the informal economy and stimulate the creation of a 'social economy'. That is, in attempting to solve health problems which are social in nature, values such as innovation and economic growth are also created in the process. In other words, 'creating values while solving a problem', and 'instead of technology transfer we should look at technology creation'.

56 NEPAD, "Strengthening of Health Systems for Equity and Development in Africa: Draft Rev 2 Africa Health Strategy 2007-2015," African Union, Addis Ababa

2. Possibilities for User-Driven Innovation

Africa is currently evolving as one of the most advanced continents concerning mobile infrastructure based on satellite, wireless internet and cellular technology. The advanced infrastructure presents a major opportunity for Africa to evolve as a leading international region for developing new mobile services, which in turn can stimulate the development of industrial advantages and sustainable economic growth. For instance, the mobile telecom subscriber base is put at 400 million as of early 2010 by the International Telecommunication Union and this is expected to expand based on this current trend. However, the usage of mobile technology should be interpreted beyond this figure as shared, and community access patterns predominate. For example, it is common for a single mobile phone to be shared communally. Moreover, Africa has up to 50% of the geography covered with mobile networks, but these are mostly in the urban regions. With up to 60% of Africans residing in rural communities, innovative solutions aimed at rural areas could thus carry a significant impact on African societies.

The overarching aim of the model proposed here is to develop rural living labs, defined as organizations whose aim it is to explore and evaluate the implementation of mobile services in health care in selected rural areas, and to develop and validate models for creating sustainable demand and supply for the services in line with local conditions. Emerging findings from ongoing living labs in rural South Africa are encouraging. As reported, local innovations through bottom-up enterprenuership and technological inventions were constructed by rural users, including patients and health workers. This provides a platform to extend it to other parts of Africa. Similar experience from similar rural living labs in Eastern Europe has also shown that the development of a number of pilot projects to validate business models and stimulation of local demand will work as a catalyst to the development of self-sustainable ventures by local entrepreneurs. The resulting dynamics quickly evolve into a dynamic ecosystem stimulating entrepreneurship, innovation and investments, thus transforming local economic conditions and stimulating economic growth.

The model rests on methodologies that have proven to stimulate the development of innovation systems in rural societies in Europe and South Africa, and that could leverage the outcomes of existing supply-driven mobile health programs in Africa. However, the model has not yet been tested in Africa, and thus the current design of the model serves as a pilot that might or might not have the same success under African conditions.

3. Development of Rural Living Labs

The model aims at developing living labs organizations in selected regions in Africa. The living labs will act as the anchor for subsequent activities required for successful implementation of the mobile health care pilots, and are relatively new modes for creating local and regional innovation environments, involving users and producers of new technology applications. By enabling the collaboration between public, private and scientific sectors, innovation processes are accelerated and solutions developed in close interaction with end-user groups.

With Africa's leadership in mobile/wireless infrastructure, and continuing strategies for placing Africa on the digital map, living labs provide important platforms to translate these opportunities into marketable solutions. Innovative solutions prototyped in any one living lab can be marketed across the other regions. This network-effect gives each living lab the critical mass to focus on innovative solutions tailored to the larger regional needs and markets, triggering entrepreneurial developments in the information society. As a result, even small-sized urban areas and low density regions can tap into these markets.

The ambition is to ensure that the universities, local health care providers as well as the local public administration and the business community will benefit directly and indirectly from new mobile solutions and related project activities, developed in cooperation between the users and the producers of mobile applications.

4. Technology Pilots

Developing technical pilots are pivotal to raising awareness, and to test local market conditions. The technical pilots allow for developing business cases to convince local entrepreneurs and innovators that the mobile health services carry with them sustainable business models that provide attractive opportunities to develop new businesses.

The technical pilots will test the basis for conducting and transmitting health services through voice, image, video and data via mobile networks, wireless protocols and satellite & fiber uplinks. Furthermore, different technologies and solutions will be examined to determine the innovations available for supporting health services delivery such as mobile payments, data security, broadcasting, database technologies, web services, application programming interfaces and similar key technologies required for successful implementation of mobile services in the selected rural communities.

On the hardware side, technical pilots will be carried out looking at devices (mobile phones, PDAs, low-cost laptops & UMPCs), micro-base stations, chipsets, routers, receivers, antennae and other hardware required to successfully provide access to mobile services. In this context special solutions could be investigated, which cater for the local markets and take advantage of the existing uptake of certain devices providing the baseline for the expected developments.

Significant challenges arise on the question of accessibility and reliability of power in the rural African regions. Hence, the technical pilots might depending on local conditions be required to involve different solutions for power and energy including solar cell technology and other sustainable sources of energy that can provide the necessary basis for the availability of technology and networks in the long term.

Finally, issues such as usability, technology and mobile readiness will be part of the technical pilots as the current state of uptake, adaptability and skill sets need to be understood for purposes for designing adequate training, education and knowledge diffusion programmers for the future users involved.

5. Developing Local 'Lead Markets' for Sustainability

Developing adequate demand and ensuring uptake is paramount for ensuring the long-term sustainability of the piloted health services. Sustainability based on user-financed models changes the drivers of such projects from being supply-driven technology-push projects, to become demand-driven based on real user needs. Furthermore, development of client-based business models can inspire entrepreneurs to further develop new services based on existing and proven go-to-market models, further stimulating the uptake and demand for new services.

The initial demand must either stem from governments transforming existing public spending into opening the markets for digital services for existing as well as new potential suppliers, or from intelligent financing schemes such as micro-loans. For the first option to work, hospitals, public health care systems, government agencies, insurance companies and several other large-scale actors can promote and support the uptake of new services by actively defining strategies as part of the existing and future procurement schemes and business models.

Alternatively, successful micro-financing schemes can be developed to enable citizens to finance health care services by taking up small loans. The Grameen Bank model is an example of such. Creating such positive economic feedback loops can build economic activity by increasing economic output.

The technical pilots will serve as anchor services, which can be opened up to micro-entrepreneurs, such as local doctors, nurses, and teachers, for making new and innovative services available to users on a low-cost basis, with little risk involved in the upstart phase. The value of these services will lie in diversity from which best-in-class solutions will emerge. Furthermore such eco-systems will provide cross-fertilization, inspiration and knowledge exchange from which communities of practices between micro-entrepreneurs will stimulate local innovation eco-systems without jeopardizing the livelihood of the involved parties.

The development of business models will also deal with issues of intellectual property management for micro-entrepreneurs as part of the activities. For those ventures which show the potential for wider implementation, professional investors and business expertise will be brought in to define wider-ranging activities associated with expanding business beyond the local or regional contexts in Africa. For example, what will fit for Nigeria with relatively bigger economic density might be different from that of Rwanda's.

6. Vision for Long-term Sustainability and Scalability

A principal idea for the model is to promote information exchange among the business community, research and health care sector pursuing similar projects in other parts of Africa to create a marketplace for mobile/wireless services and products in health care, based on the network relationships among cooperating partners. Using interactive com-

munications tools, the communities of practices emerging from the project could work closely with their sister institutions in other regions across Africa.

Furthermore, the living labs also serve as platforms for SMEs to market highly-specialized services across other user-groupings, providing new sales and marketing channels for innovative mobile business solutions in markets traditionally beyond the reach for African SMEs – even in the early marketing and sales phases. The communities may offer fairly limited local market potentials and could be difficult to access via traditional commercial links and services. Yet, taken as a user group across Africa, they offer a tremendous market potential.

Key to the long-term sustainability is a number of factors, which insures that the results of the living labs are not dependent on the further funding from public agencies. Ownership of the results must be defined early on in the development and should ideally by focusing on the commercial entities involved having the ability to commercialize the results. Here special emphasis should be on creating the necessary frameworks for entrepreneurs and small- & medium-sized enterprises to develop and expand from the local and regional markets to national and international market. Aside, understanding and managing users' needs, contextual organizational, institutional, environmental, social and political imperatives are also more important issues to be considered in ensuring sustainability.

Sustainability is this context links to a number of measures that ensure the continuation of the activities associated with the model. Firstly, the model is meant to actively engage SMEs and business communities to promote the integration in local business eco-systems and integrate the knowledge and know-how of local business to adopt the results and methodologies of the living labs and tailor these to specific needs that fit current economic conditions.

Secondly, through organization of demand by targeting micro-markets, the living labs will incorporate end-user communities and anchor findings in active support and integration of users in the innovation and commercialization processes. The strong end-user involvement will ensure that products & services are tailored to real and expressed needs, and that solutions have pre-commercial market adaptation.

The model will ensure pre-commercial development of business models, and thus lower the risks of failure through real-life market trials before each venture has to become self-supporting. Furthermore, by continued use of the living labs structures, rapid user-adaptation can continue with the involved firms and new ventures, creating perpetual innovation processes on the basis of the existing business ecosystems.

Thirdly, the living labs are designed to have wide support from public & private stakeholders ensuring that business-friendly framework conditions can continue after the end of the funding period. The integration of stakeholder interests from the onset of the venture will ensure that actors from industry and public sector will continue to support the development of the products and services.

Finally, the export of services to other markets will create cross-regional synergies that will further support regional economic development, and enhance the demand-side through increased efficiencies, job creation and improved purchasing power.

Conclusion

The model presented is aimed at targeting some of the major challenges on the African continent to create models for sustainable growth, and tackling some of the health problems that are persistently haunting African citizens. The model also presents a new approach to addressing key barriers to innovation and economic growth by focussing on demand-side measures based on methodologies proven in rural areas, in South Africa and Eastern Europe. However, the model is still not validated through implementation under African conditions, and thus significant challenges lie ahead, especially in relation to identifying technology and innovation projects suitable for the first pilots under the rural living labs innovation model.

Up to 25 of such projects that meet the criteria, have been identified in eight African countries. There are different types of actor and agencies involved in these projects, including public, private and voluntary/civil organizations, both foreign and local focusing on health, developmental, financial services and information technology implementation.

Furthermore, demand-side based innovation models gather an increasing amount of support from the European Union, Rockefeller Foundation, Bill Gates Foundation and the World Bank InfoDev programme on information technology. Consequently, it is our expectation that the model can be implemented.

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Dr Adesina Iluyemi is an executive Board member of the NEPAD Council and has personal interest in Africa's sustainable socio-economic development. Dr Iluyemi has represented and delivered lectures on behalf of the NC in various international conferences and meetings. NC supports and instigates projects, as well as promoting innovations, invest-

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