

“how do we make community owned information networks work for the poor?”

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Abstract: ICTs have been identified as the catalyst to assist developing countries bridge the development chasm thus alleviating the effects of poverty. However, Africa is littered with ICT projects that have failed or struggle to survive. The key question asked in this paper is how do we make community owned information networks work for the poor? A case study from Angola shares key lessons learnt in developing shared cost models in telecentres in the face of exorbitantly high connectivity costs. The real challenge faced by such projects is to build enough demand to make such a network financially sustainable. New work shows that a new business model is emerging that can harness the expanding power of wireless networks combined with VoIP and WISP technology and entrepreneurship to create community-owned communication networks and to provide over these networks a range of pro-poor products and services.

Keywords: ICT for development, wireless networks, community owned networks, VoIP, sustainability, business models, entrepreneurs.

1. Introduction

The international donor community and governments of the developing world have made significant investment over the years in Information Communication Technology (ICT) for development (ICT4D) and the landscape is littered with ICT pilot projects that are either abandoned or struggling to survive. In South Africa the strategy to aggregate access and usage through the rolling-out of tele-centres has not been successful due to high operational costs [1].

The Connect Africa Summit [2] examined key success factors relating to ICT infrastructure, training, content and policy and regulatory environments. However, is this top-down approach the right way to roll out infrastructure in Africa? How do we make it sustainable?

CK Prahalad [3] argues that capitalism can be the engine to eradicate poverty," if we stop thinking of the poor as victims or as a burden, and start recognising them as resilient and creative entrepreneurs, a whole new world of opportunity will open up”.

“While development aid and political reform are essential components in poverty eradication, equally important are business models that would engage low-income communities as producers and consumers in their own robust economies” [4].

“Successful business models—inherently versatile, innovative, and driven by the profit motive—can sometimes tackle development challenges more quickly and effectively than government and aid mechanisms” [4].

With the above references in mind, this paper discusses results from a series of multi-disciplinary projects that research cost and benefit models in the use of ICTs and how community owned networks can be supported through innovative business models in order to address the fundamental question: “how do we make community owned information networks work for the poor”

2. Objectives

The objectives of this paper are to highlight innovative ways of identifying and implementing pro-poor products and services and to create business models for the ongoing sustainability of ICTs in low income communities. The approach is essentially to foster “bottom-up” collaboration with communities to achieve sustainable technical innovation that is scalable and replicable.

The research results need to inform donor and government policymakers of the importance of understanding and supporting rural business models in the implementation of ICTs in rural areas.

3. Methodology

The methodology is based on a review of case studies and research results from a series of multi-disciplinary projects collectively known as First Mile First Inch (FMFI) [5] and a current research initiative Wireless Africa [6]. In addition to development and application, researchers explored how innovative business models could be created in order to make these projects sustainable.

The first round of research identified policy and regulatory, cost of technology, the absence of power and the shortage of skills as the major obstacles to successful deployment of access technologies. Wireless Africa, a new initiative, seeks to address these issues by taking the previous access pilots further by incorporating valued added services in the wireless networks as part of a business model that will drive VOIP usage and enable Wireless ISPs to be rolled out.

4. Case study

First Mile, First Inch (FMFI), funded by the Canadian IDRC, is a multi-disciplinary series of projects exploring the technological and social consequences of low-cost telecommunications implemented in remote schools, clinics, and telecentres.

FMFI aimed to overcome failures in addressing the needs of rural communities through promoting innovative, cheap access in various contexts and to compare the sustainability of each of these for remote rural communities. The results showed that innovation requires a different mindset, an approach that empowers communities with a sense of ownership and control of their local communications infrastructure.

The FMFI projects delivered a number of different services to its users and researched the overall cost and benefits in order to understand the new emerging business models. The

ANGONET telecentre project is presented here as an example of a business model tackling financial sustainability.

AngoNet is a non-profit organisation based in Luanda, Angola working to improve living conditions for the poor in less-developed communities. The program was launched in 1989 with the objective to supply ICT services to non-profit organisations, community organisations, and individuals. The program has been funded by donor contributions including the IDRC and the UNDP.

AngoNet is a programme of humanitarian activities that is directed towards improving access to internet services, education, and business development in Luanda and other regional centres in Angola. The main activities aim to resolve the disastrous effects of a 30-year war on the country's communications infrastructure, bringing access to Internet and technology training to those in remote regions. AngoNet has primarily focused its activity as a service provider seeking to support community networks in Luanda and Huambo serving Civil Society Organizations (CSO's) and individuals – thus, universal access is a central part of its objectives. It is expanding its community access activities to the outer provinces of Angola in a sustainable manner.

The AngoNet telecentre distributed VSAT to its clients via WiFi technology. They developed a shared cost model in which the primary cost of their backbone connectivity is shared among their wireless and dial-up customers. The current cost for the satellite connection is US\$2250 per month which is shared among the 8 wireless and 24 dial-up customers as well as providing the needs of the Huambo telecentre. For the 33 points served, this is an average of around US\$70 per site. AngoNet uses differential pricing and charges US\$200 per month for the wireless connections (for a total of US\$1600) and has to recover the remaining US\$650 from the 25 users, including themselves. The connectivity in this regard averages out at US\$26 per user.

The cost must be reconciled with the bandwidth of 256 kb/s down and 128 kb/s up. This is shared among the 8 wireless users to provide a shared average of 32 kb/s. The dial-up customers have to be factored into the mix, which will bring effective bandwidth down even further, should everybody be on line at the same time. Intensive bandwidth applications like certain downloads, VoIP and peer-to-peer file sharing, creates the need for bandwidth control of AngoNet broadband services. Subscribers could tie up more than their share of bandwidth, reducing the quality of the service for all the subscribers in the network.

On average the costs are:

Wireless customers	US\$200 per month for an effective 32 kbps connection
Dial-up customers	US\$26 per month for dial-up access

It is clear that the AngoNet connectivity services are not low cost in comparison to other African countries. Similar connectivity in South Africa would cost:

Wireless customers	US\$50 per month for an effective 128 kbps connection
Dial-up customers	US\$10 per month for 56 kbps dial-up access

In Huambo it therefore seems to be a demand and supply situation, where the options are AngoNet or the fixed line operator. The competing fixed line connectivity is available, but it is also unreliable with low bandwidth. The premium of US\$200 dollars for wireless

connectivity may be a severe strain on the budgets of some of the NGO's AngoNet serves. At present the perceived benefits seem to balance the cost premium.

The AngoNet business model was based on the original desire to supply connectivity in an under-serviced area to provide resources for development. The desire has been tested against the local demand and the response has been favourable, in the sense that AngoNet have succeeded in gathering a range of subscribers and even proving that they can provide a better and more reliable service in the face of competition from a national telecom provider. The demand for bandwidth provision necessitated an ever increasing backbone bandwidth source, raising the total cost in terms of infrastructure as well as operational costs. AngoNet is in the process of cost recovery through cost sharing of the resource, by charging a premium price.

The role of AngoNet as ICT experts and the local ISP in Huambo also shows potential for securing additional streams of revenue in consulting and content services. These are typically higher margin activities which can lead to better coverage of overheads, increases the profitability and enhances the overall business model.

In the discussions with AngoNet, the issue of commercialisation was a prominent consideration, not only in Huambo, but also for the replication activities they are engaged in. They felt that the case had been proven that the infrastructure as it stands in Huambo has business potential and that it could be expanded further or sold off as a viable enterprise.

The dilemma AngoNet and their principals, DW faced was how they, as an NGO focusing on social service delivery could possibly make this transition, whether they should do it and what the implications would be.

5. Lessons learnt

The lessons learnt from the FMFI projects focused on the key issues of sustainability and involved consideration of connectivity cost sharing and the development of new business models.

The first lesson from a number of projects is that the satellite and leased line backbone connectivity distributed through WiFi introduced in under-serviced areas and can be made affordable through sharing the costs between the primary users.

The partners in most of the FMFI projects have taken the responsibility to secure backbone connectivity and distribute this to a range of community and institutional users. All of them have financial and funding constraints and have to ask a fundamental question: "Who is going to pay for (our and their) connectivity?"

There are some other issues and questions in this regard from an FMFI partner perspective:

- How do I motivate users who have enjoyed free connectivity up to now, to start paying?
- How much do I need to charge to recover what it costs me?
- Will people be prepared to pay for the service I provide?
- If I start charging, how will I explain this to the regulator?

The business models developed deal with these issues and set the scene for another lesson learnt that principal connectivity providers in a community context can introduce successful cost recovery mechanisms to ensure the sustainability of the resource.

The lessons learnt here are at different levels, starting with connectivity provision as seen in Huambo that as the demand for bandwidth increases, provision must be made for the scalability of bandwidth to provide a reliable service to satisfy a growing demand.

Existing telecentres can provide a range of connectivity and ICT services and progress to the level of becoming the local ISP as shown in Huambo. Telecentres run by NGO's can develop to enjoy the status of a local ISP, providing connectivity and ICT services to a range of users.

6. Challenges

FMFI faced a number of challenges, high costs, regulatory constraints, unreliable power, skills shortage and stimulating new business. Although regulatory and market barriers have stymied deployment of wireless technologies in Africa, even if enabling regulation allow unlicensed use of the WiFi spectrum, it seems unlikely that entrepreneurs are going to go in a hurry to rural areas unless the underlying factors for high cost of domestic and international leased lines and bandwidth are addressed and pro-poor products and services developed.

Despite the efforts to make the FMFI projects financially sustainable, they were all burdened by the considerable costs of internet access. For example, the largest cost component of Angola's ISP was the cost of connectivity to the international backbone and in Mozambique it was the local leased line to the national network. These expenses contributed 60 – 80% of the ISP's total monthly cost.

The first round of research identified the cost of technology, the absence of power and the shortage of skills as the major obstacle to successful deployment of access technologies. Wireless Africa seeks to address these issues and take the previous access pilots further by incorporating valued added services to the wireless networks as part of a business model that will drive VOIP usage and enable a Wireless ISPs to roll out.

The major challenge identified was how to build enough demand to make such a network **financially sustainable**.

7. Emerging Business models

What is emerging is a new model that can harness the expanding power of wireless networks combined with VoIP and entrepreneurship to create community-owned communication networks and to provide over these networks a range of pro-poor products and services.

The real challenge is to build enough demand to make such a network financially sustainable. The best way to do this is through telephony. A considerable latent demand for person-to-person communication already exists, and phones are easy to use, have low maintenance and support costs, and can support a wide range of voice-based and data services. Significant advantages can also be gained by using VoIP (Voice over Internet Protocol), the technology behind the Skype and Vonage services. VoIP sends voice traffic as data packets, which uses network capacity much more efficiently and far less cost [7].

Wireless networks plus low-cost VoIP services can mean significant cost reductions for end users, compared to mobile telephony and thus enable use by many additional people. Costs can even be lower for VoIP calls that stay within a local, fixed wireless network. Research has shown that up to 60% of calls are made within a local community [8].

Building a community-owned wireless network will enable the development of pro-poor products and services that are appropriate to community needs. Although voice is the killer application, other internet based services can be introduced over the wireless network to address the needs in communities. Wireless networks make possible business and service delivery models better adapted to rural, low income communities such as content for health, education, agriculture and e-government.

8. Technology

Creating a local community owned wireless networks can be done quickly using off-the-shelf components. VoIP, in conjunction with low cost wireless technologies, can bring voice and data services to digitally excluded areas, while promoting the creation of community operated and managed telephone networks.

In order to bring down the costs of conventional PABXs a simple technology called VoIP in a box can be deployed over existing community networks providing free voice communication. Such a technology can stimulate community demand for ICT products and services and lower the barriers to entry for a local entrepreneur into the communications market [8]

To date significant work has been performed in the area of technology development. Commodity wireless equipment (with customised firmware) and now open VOIP telephony hardware are available. This combination enables manufacture of low cost telephony hardware (a few \$10's per phone connection) if sufficient demand is present.

What is now required is a way of deploying telephony to developing regions without constant external funding. This can be achieved with a business model that encourages viral growth of village telco networks. One of the aims of this project is to develop and field trial several candidate business models.

A key element of the business model will be "plug and play" - it must be easy for a local person to set up and maintain, thus minimising training needs [8].

Project collaborators include IT46 and developers of The Free Telephony Project [9] that provide free hardware designs for telephone systems. Both the hardware and software are open. The hardware for a complete embedded Asterisk IP PBX (including multiple analog ports or a T1/E1) can be built for a few hundred dollars. No PC is required.

The first product is the IP04. The IP04 is a low cost phone system that can switch phone calls from analogue phones or phone lines over the Internet using VoIP. The IP04 is a professionally designed product that is in volume production today.

In order to bring down the barriers to entry to internet services the VoIP will be integrated with a WISP in a box. The "techies" have come to realise that establishing a mesh network isn't as simple as often described. There are many small steps that a techie takes for granted that would frustrate an entrepreneur hence the development of the WISP

in a box. This project will support the co-development of the WISP with the VoIP in a box and both these technologies will be piloted in support of establishing community owned networks and stimulating demand for new products and services [11].

9. Conclusions

This paper addresses the question ““how do we make community owned information networks work for the poor?” and highlights the need for developing new business models for the ongoing sustainability of donor funded projects.

The AngoNet case study demonstrated how community-owned networks can grow, be self-maintained and can be managed on a commercial basis. The business models are based on affordability, cost sharing and covering operational costs – but hardly an exciting prospect for a budding entrepreneur! The major challenge identified is how to build enough demand to make such a network financially sustainable.

A measure of success of a project could be found in the potential for it to commercialise and franchise models were recommended. The importance of community ownership of infrastructure was stressed and the subsequent development of new business models and community ICT enterprises.

One of the key lessons learnt from FMFI was that few of the individual services of telecentres are substantial enough to provide economies of scale. By increasing the range of services, economies of scope are introduced. The role of AngoNet as ICT experts and the local ISP in Huambo also shows potential for securing additional streams of revenue in consulting and content services. These are typically higher margin activities which can lead to better coverage of overheads, increases the profitability and enhances the overall business model.

The implications are the basket of ICT and related services is a crucial part of the scaling potential of telecentres. It is crucial to think of innovative ways of identifying and implementing pro-poor products and services and to create business models for the ongoing sustainability of ICTs in low income communities.

Just delivering wireless connectivity as 'common carriage' whilst important - is not maximising the added value. New ways of working with communities need to be found in order to identify potential products and services that carry higher margins. This would help the network to become self-sustaining more quickly whilst delivering more relevant development outcomes.

New research is aimed at developing emerging new business models that can harness the expanding power of wireless networks combined with low cost, low powered VoIP and WISP technology and entrepreneurship to create community-owned communication networks and to provide over these networks a range of pro-poor products and services

Wireless Africa is a new Pan-African research project involving 15 countries that in the words of C K Prahalad, aims to create the opportunity to expand markets for telecommunication services, to empower local communities, and to expand economic capacity and commerce in rural areas.

Each of the FMFI projects faced the main challenge of how to provide community services in the face of high backbone connectivity costs. International bandwidth costs need

to drop dramatically so that community owned networks can grow and proliferate throughout Africa. In Africa, the telecommunications regulator needs to be briefed on such initiatives in order to understand and accept these unlicensed models.

It is recommended that policy and decision makers acknowledged and consider the research results of this study to understand and accept these unlicensed community-based models in the roll-out of ICT infrastructure in Africa.

Further research is required into achieving scalability and replication models for rural access which are supported through innovative business models that empower communities.

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