

Scalable Models for Establishment of Sustainable Broadband Services in Rural Areas of developing regions

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Abstract

We discuss how demand and supply of broadband communication services can find each other in geographical areas where most telecommunication operators see too high risks and too slow return on investments. We focus on rural areas of developing regions where the general level of education is low and competence in the area of communication systems is a bottleneck.

We argue that communication infrastructure is as important for society as roads, power, water and sanitation. We also argue that a knowledge society will develop faster where there are open policies and regulatory regimes in the communication sector and multi-stakeholder partnerships including what business models of traditional operators regard as externalities during a market development phase.

Our approach is to target basic public sector services, such as education, health-care, local government and support to local entrepreneurs, to attract investments covering capital expenditures and to leave no stone unturned to add to the revenues required to cover operational expenditures. The capacity building of human resources required to populate all links in the value chains is problem-oriented and project driven and involves close cooperation between user communities, universities, local entrepreneurs, industrial and public partners in four basic dimensions: usage, technical solutions, entrepreneurship and impact analysis, using local tertiary level education and research institutions as a neutral platform.

The purpose of the workshop is to inspire others to initiate similar stakeholder partnerships and join a knowledge society development and capacity building network.

Introduction

The challenge in focus in this paper is to establish “markets” where demand and supply of broadband communication services can meet in areas where both are small but not negligible. Demand is provided by consumers, users and their usage and their ability to pay. Supply is provided by technical solutions and entrepreneurs that manage to provision affordable services sustainably. We regard Usage, Technical Solutions and Entrepreneurship as the three enabling pillars of our approach and add Impact Analysis as a validation mechanism.

Usage

To attract infrastructure investments (Capex) the usage initially targeted is focused on basic public services, education, health, local government and support to rural entrepreneurs. In the operation phase, no stone should be left unturned in the search for customers willing and able to contribute to covering the operational costs (Opex). The trick is to find real value for users, often by rethinking how

traditional work procedures can be redesigned to produce more for less.

In the education sector, tertiary, secondary and primary education have very different needs and impact. Universities are in many ways self-sufficient and prime motors in the establishment of the knowledge society in most countries. Most of them have private campus networks that are, or are in the process of becoming, interconnected via national research and education networks and regional backbones interconnected between continents to share global resources for research and education. Tertiary level ICT education is, however, a severe bottleneck in the development process in all sectors of society..

Secondary and primary level education need teacher training in ICT usage, both pre-service and in-service, connectivity and learning material taking advantage of the medium. It is also important to stimulate talented students to go for higher education in the area.

In the health sector, the obvious targets include acute logistics (ambulance), sentinel surveillance, remote consultations, patient records, hospital information systems and continuing education of health workers.

Local government can benefit from ICT usage in most their responsibilities, including budgeting and accounting, education and health, a wide spectrum of environment issues , administrative services to the citizens, utility services such as water supply, etc. Another responsibility of local government is to support local entrepreneurs, both as users of ICT and as service providers.

Technical Solutions

The potential technical solutions in a specific area, depends a lot on what communication infrastructure is available or can be deployed, be it radio spectrum or some sort of wire or optical fiber cables. The most powerful communication infrastructure, when it comes to capacity, is optical fiber. It is our strong recommendation to include deployment of fiber in all infrastructure projects, such as power networks, pipelines, railways, roads, etc. The marginal cost is mostly negligible.

Offering excess capacity in fiber cables deployed along other infrastructure to operators and private users on the communication market will bring benefits to the whole society, including the fiber owner in its core business due to an expected increase in the demand for power and all sectors of the society that need communication to expand. Externalities, from the infrastructure-owner point of view, stemming from usage of the own communication infrastructure by others, can be developed by stimulating Public-Private partnerships with a broad spectrum of stakeholders, many of which are most likely already involved in the implementation of the National ICT Policy. The approach to the development of such externalities should be based on a stakeholder analysis including all market actors, such as policy makers and regulatory bodies, producers and consumers. Some of the starting points for this analysis include the assessment of possible synergies and overlaps with the National ICT Policy and Plan and other development efforts.

The network equipment needed to build networks with reasonable availability is relatively inexpensive and straight forward to use. Servers and clients are also becoming inexpensive but require more competence to configure, maintain and use. Competence in the areas of network design implementation and administration, computer system configuration and administration, and information systems design and implementation is in short supply, as well as education in these areas. Universities have a role to play in this field, by encouraging and stepping up the exchange, production

and dissemination of educational information.

Where fibre is missing, inexpensive wireless broadband technologies can be used to extend network coverage below 100 Mbps. A mixture of point-to-point and point-to-multipoint technologies can form backbones providing connectivity to remote villages over distances up to tens of kilometers. Beyond the horizon, the resort is broadband VSAT or narrowband shortwave radio links up to a few kbps.

Entrepreneurship

The availability of end-user applications and of technical solutions are both necessary but not sufficient conditions for services to be provisioned. There is also a need for entrepreneurs spanning the value chain for providing communication services, from passive infrastructure, cable deployment, equipment distribution and repair, to systems and network administration, software support, help-desks and business development to take advantage of ICT. Missing links in the value chain may define business opportunities or may call for special arrangements, such as the entrepreneurial cooperative efforts of user-communities to cable deployment to remote villages in northern Sweden.

Impact analysis

There are no generic methods for benchmarking the development of sustainable broadband communication markets in rural areas. Such methods would support the structuring of the development process and track progress, stimulate discussion and cooperation and facilitate for donors and funding agencies to monitor, document and communicate progress in its development programmes. Attempts have been made to outline such a generic benchmarking method based on the development strategy outlined above. The benchmarking parameters suggested to describe progress include:

- Relevant policies and regulations, in particular in the areas of communication and competition, including law and law enforcement
- Stakeholder analysis describing value chains, actors and business models
- Maturity of the usage of ICT and business development activities in the public and private sectors and in the civil society, with a focus on the most important areas for the progress towards the Millennium Development Goals: healthcare (eHealth), education (eSchools), support to local entrepreneurs, and local administration (eGovernment)
- A generalized teledensity parameter including the penetration of terminals for data communication, broadband access and backbone capacity.

Conclusion

The objective of the workshop is dissemination and localization of experiences from the referenced projects and particularly discuss:

- Integration of development and capacity building
- Open access models
- Stakeholder analysis and formation of local multi-stakeholder partnerships.
- Case studies including usage in education, health, local administration, water management, support to

entrepreneurship.

- Localization of the model into similar processes in other environments.
- Creation of a network of organisations interested in cooperation based on the discussed concepts.

References

- [1] Amos Nungu, Björn Pehrson, "Interconnection of Broadband Islands in Developing Regions", IEEE 3rd International Conference on Testbeds and Research Infrastructures for the Development of Networks and Communities, Orlando, May 2007 ([IEEE TridentCom 2007](#))
- [2] Marco Zennaro et al, Online Water Quality Monitoring, Ongoing project in the Communication Systems Design framework integrating advanced development work and capacity building (www.tslab.ssvl.kth.se/csd/)
- [3] Victor Kyalo et al: ICT for Community Empowerment in Kenya, Ongoing project in the Communication Systems Design framework integrating advanced development work and capacity building (www.tslab.ssvl.kth.se/csd/)
- [4] Antoine Bagula, Victor Kyalo, Americo Muchanga, Amos Nungu, Albert Nsengiyuma, Umelu Nyasulu, Björn Pehrson, "Integrated Development and Capacity Building supporting the establishment of the African Broadband Infrastructure", [4th International Workshop on Open Access](#), Stockholm, December 2006