Connectivity in the community: experiences from Bolivia

Since 2000 the International Institute for Communication and development (IICD) actively supports a large-scale ICT for development programme in Bolivia: TICBolivia (www.ticbolivia.net). The programme is operational with 15 projects at department and national levels in Bolivia in the sectors agriculture, governance and education. At this moment 50,000 end-users using information and communication technologies (ICTs) are reached directly through the 90 information centres or school laboratories operating in all departments of Bolivia and around 500,000 farmers, indigenous people, teachers and students benefit indirectly through a combination of access to rural information centres, radio programmes, websites and printed information materials. However, since the start of the programme, project partners and end users have indicated that lacking access, low quality and high pricing of telephony and Internet connectivity remains a key limitation to effective and sustainable implementation of ICT for development.

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May 2006

Despite the multiple efforts of the government to engage in rural universal services schemes and to deregulate the sector over the last years, none of these initiatives have resulted hitherto into universal access to information and communication serving development needs outside the main cities. As a result IICD and the local partner organisations, including both grass-root organisations and non-governmental organisations (NGOs) bundled efforts and have searched for more effective technical and organisational models for rural connectivity. This paper describes possible technical and organisational solutions for sustainable universal services solutions in rural areas on the basis of 3 years of on-the-ground experience with a shared satellite connectivity model operational in 11 communities in Bolivia. It focuses on the lessons learned for regulators in Latin America.

In search of a sustainable rural connectivity model

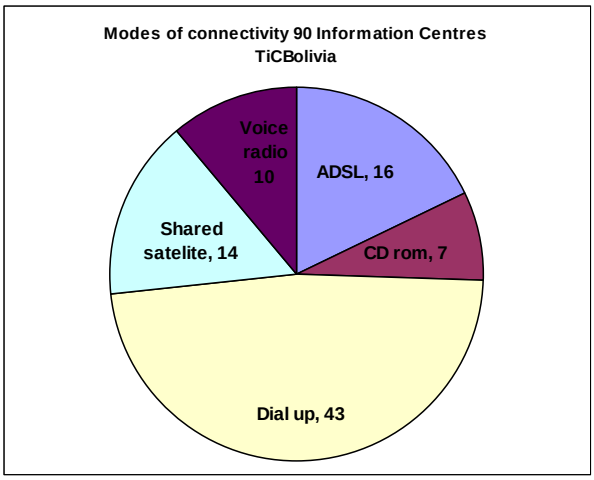
In order to satisfy the needs for information and communication, partners have experimented with combinations of traditional and modern digital connectivity modes that respond to the technical and financial possibilities in each particular area:

- the off-line exchange of information via CD-rom can be functional in cases where users want to access non-time bound information;
- traditional voice radio is found to be a cost effective and reliable solution for irregular two-way communication needs in isolated communities with limited potential users;
- dial-up is a cost-effective solution for users requiring basic communication and document exchange via e-mail. Yet, this solution is found often unreliable due to limited quality of basic fixed telecom lines in rural areas. This limits the possibilities of web-searching and Voice over Internet Protocol (VoIP) solutions;
- ADSL is found a good and cost-effective solution, but is only available for centres located in the larger urban areas;
- the most challenging solution for rural connectivity is found in the shared

satellite connectivity model, very suitable for regular high-quality access. This model can allow multiple partners, if properly addressing technical, financial and particularly management issues, to make optimal use of the exchange of information and communication services at an affordable level.

Shared satellite connectivity as an option for the community

The shared satellite connectivity model is based on the sharing of a satellite - VSAT - link between local organisations at community level. In this case, one organisation active in the community contracts a VSAT service. The costs of investment and operations are then distributed among a group of local organisations. Local organisations are linked to the connection via Wireless linkages, either through WIFI or Mesh solutions.



The following partners have experimented with shared satellite connectivity:

- NGO Instituto de Campesinado del Oriente (ICO) in 3 communities in the Valles region, north of Santa Cruz;
- NGO Accion Loyala (ACLO) in the department of Chuquisaca in 4 communities;
- Farmer association Asociacion de Organisaciones de Productos Ecologicos de Bolivia (AOBEP) in 1 community in the northern part of the department of la Paz;
- NGO Apoyo al Campesino-Indigena del Oriente de Bolivia (ABCOP) in 3 communities in the Chiquitania region.

The first initiative in this direction was taken in 2003 by the joint project partner group in Bolivia and micro-finance association Finrural. Together with Finrural a connectivity study was conducted to get a better understanding of the current satellite service providers and available bandwidth. Despite the presence of 5 different providers of satellite services in Bolivia, only 2 companies responded to a call for proposals for 14 access points for IICD partners and 60 access points for Finrural.

In the end only one service provider was able to provide a service on the short term, with all required licences and with sufficient technical support in various parts of the country. ICO, ACLO and ABCOP started first with VSAT connections ranging from download 128 and upload 32 kbps and in best cases download 512 and upload 128 kbps with costs ranging from 350 to 450 us$ per month. Other interested users in the community were connected by Wireless Wifi links so costs could be shared with local governments, other NGOs and grass-root organisations in the community.

The introduction of the new service was accompanied by two-week training courses in VSAT installation, maintenance and administration of the information centres. Later a technical seminar on connectivity in the community was held in Santa Cruz, to exchange experiences among the different partner organisations.

Soon after the services provision started it became clear that the service quality level was way below expected and suffering from frequent fall-out, particularly related to outdated VSAT equipment supplied by the provider. Claims with the service provider were difficult because the provider did not dispose of an on-line service monitoring system. This resulted in high payments without actual service delivery. Another complicating factor was the problem with

installation of Wifi links by another company, which resulted in confusion and disputes about the actual cause of service failure.

In 2005, a new market study was conducted resulting in a small number of new connectivity offers. This indicates that market conditions can change rapidly and require frequent updates on potential new offers in the market. This time a small service provider was chosen for more flexible bandwidth packages and lower service costs. As a result, the monthly service costs could be brought down from us$ 450 to 200-250 us$ per month. In this case, partners did directly acquire VSAT equipment and linked Wifi solutions. This required an investment including installation costs of us$ 5,000 to us$ 7,000. Installation was now more feasible as a result of better installation services of the provider and increased internal capacities built up among the project partners. Service levels are currently at a good level and people are increasingly using a combination of telephony and Internet services.

At this moment, and after three years of study and trial and error, the shared connectivity model is operational in the 11 participating communities. In five of the communities, the service is technically and financially sustainable, whereas others are still in the process of finding a fully sustainable approach.

Lessons learned on shared satellite connectivity

The shared connectivity model has shown to provide a community access model that can be sustainable from an organisational, technical, financial and ownership perspective. On the basis of both the successes and especially failures, a number of lessons can be learned:

Organisation and capacity aspects

During the pilot projects, the organisational aspects have shown to be a key success factor. It is important to set a clear and formal organisation structure including a service agreement with all parties in the community involved. The agreement is to address issues of network administration, service levels and billing conditions.

APCOB, participants

Our partner organisations played a key role in ensuring collaboration between local organisations to certify joint negotiation with service providers. Due to differences in management style, collaboration among potential parties at community level is often difficult to establish. Professional legal advice was found to be necessary to ensure good contractual terms and conditions of the service agreement.

From the start of the project it is important to ensure involvement of participating organisations' management and the mayors of the communities. This requires that project manager and technician explain the concepts, consequences and the importance of making these major investments in connectivity. A solid understanding of the way these installations are structured saves lots of time and makes management an ally in promoting the model.

Administrators of the information centres need to be trained in organisational and financial management to ensure that the centres are run in a viable way. The most successful information centre administrators are those with a thorough knowledge of their target group. A related problem is the fast turnover of trained administrators, which requires a continuous training programme integrated as part of the project.

It is important to start training of the local technicians from the start. Therefore the projects have consistently focused on building strong technical teams on the ground. The other key component is to have

regular knowledge exchanges between different projects throughout the country.

Technology aspects

Our partners had to learn the hard way that service provision is not guaranteed. The biggest problem encountered during the last years was the low service quality. In many cases the actual bandwidth provided was below promised or no bandwidth at all was available for days. A lacking regulatory framework currently makes it difficult to claim restitution of service costs or to change to alternative providers. The only counter measure available was to withhold payments, until service was re-established.

The service descriptions given by providers are often so limited that there is almost no possibility to have any guarantees to what service was bought. It is very difficult to find out whether a "clear channel" is really clear channel, as in many cases a connection is shared up to even 1:100. Furthermore, measurements of the actual capacity provided indicate much lower bandwidth than promised.

If there was upload speed, lag-time of in certain cases 16 second delays made voice communication impossible. This directly affects the willingness of partners in the community to share costs. More so, it de-motivates end users from using the ICT services, especially painful when users have travelled to visit the information centres. As a result of poor service levels the sustainability of the services is difficult to secure.

In the case of the shared connectivity model, a community obtains access to Internet, e-mail and chat services but has also an option to telephony via VoIP. A combination of Internet and telephony will allow communities to dramatically enhance the changes to introduce financially sustainable connectivity solutions. Yet, there are two main barriers that currently complicate the introduction of VoIP. Whereas the download bandwidth of satellite connections is fairly decent and reliable, upload bandwidth is often is very poor directly affecting VoIP calls.

ACLO, satellite room

We have witnessed big delays and lag time, which essentially make it necessary to say "over" when you have finished talking, so the other party knows he/she can start talking.

Communities providing VoIP over their shared community network can also be accused of making illegal phone calls and false competition with service providers. A license fee requires a lengthy legal process and extremely high costs beyond all means for most remote communities. In Europe and the United States the major telecom providers are now rapidly switching their revenue models. Telephony both local and nationally is almost free, because the existing infrastructure can transport voice and data over copper wire and fibre optics facilitating broadband Internet. Almost all calls are now switched over Internet as Telecom operators are using the different distribution networks already available. South-America is different in that there is no widespread network of copper or fibre yet.

It was noted that clients were supplied with old and outdated VSAT equipment. In certain cases the installation costs could have been less costly if a newer, and often, smaller satellite would be installed. This would have reduced transportation cost and reduce installation time. Some of the VSAT installations were so bad, that after a few months the VSATs were already damaged. This problem could be overcome with the selection, installation and acquisition of

equipment by the partners themselves, under the contract with the new provider.

Electrical engineering was a serious problem. Wiring of and connecting to the other locations in the community were often done in a haphazard way. Open, unprotected wiring was hanging loosely in the air or over the ground without any tubing. Electricity installations sometimes were connected with loose ends and risk of power failures. In some cases lightening struck installations, causing routers and modems to be fried. In many places stable electricity is a serious problem. Therefore back-up generators are needed to guarantee maximum uptime. Power backup systems are often costly and weigh heavily on the installation budget.

Many of the installations did not have any proper security measures in place. No firewalls were installed, no anti-virus software, which resulted in some cases to servers completely being infected and no longer workable. To resolve these issues servers need to be re-installed from scratch. In many cases the technicians providing support would come out to very remote locations and not bring any accessories, cables, nuts and bolts. In some cases they could not repair, nor work, because they did not have the spare parts needed. Also the provider would send technicians who were insufficiently trained and/or knowledgeable to resolve the problems.

Financial aspects

To sustain the service financially the project experience indicates that at least four community organisations should commit to sharing the costs of satellite services. These can include the local government office, schools, hospitals, farmer associations, etc. In some cases, the organisations have to make available a specific budget for communication. In this, the members of the organisation - in case of farmer associations or the partner association in the schools - introduce an additional fee. In most cases however, the organisations have replaced the regular budget for telephony and part of travel costs for the payment of connectivity fees. It was found that organisations have been spending high costs for communication anyhow due to high travel and telephony costs.

Experience with the 11 connected information centres indicates that roughly 95% of the income will be generated from the service cost sharing among the community organisations. The other 5% is directly generated by visitors of the information centres that are not directly members of the community organisations.

To ensure sufficient organisations to participate in the cost sharing model, it is advisable to focus on a medium sized community which is able to sustain the cost and then in a later stadium try to link up a smaller community. In this way the same infrastructure is shared and the cost benefit of sharing goes to both communities in the long run.

Another challenge is the presence of a simple but reliable financial control system to charge for use of the Internet in the information centres and the development of a coherent pricing strategy for use. Additionally, from an accounting perspective the centres only charged for the Internet connection, but forgot to charge for any of the other overhead costs to operate the centre such as office rent, electricity, and salary for the administrator, maintenance and expenses for technical support.

APCOB, setting up satellites

Ownership and local content aspects

From our experience we have seen that the key factor to sustainability is related to ownership in the community and the development of relevant information content. If these conditions are met, the shared connectivity model is found to be financially sustainable.

As for the ownership issue, it is found essential that the community organisations directly involve their users in the set-up and operation of the information centres. Once directly involved, awareness about possibilities of innovative instruments such as ICT can be build and local organisations can identify information needs among the different user groups. This requires that the initiating organisations are very familiar with the local context and need a level of trust in the community. The partner organisations as ICO, ACLO, APCOB and AOPEB have all been working for over 10 years in the participating communities.

This explains why many earlier telecentre initiatives in Bolivia set up through national initiatives and organisations without local linkages have a small change to succeed.

Interestingly, the cases shown in this article provide evidence that users are found willing to pay for high-quality services if addressing their needs. In all centres the users have shown a clear demand for two-way communication and information relevant to particular user groups.

This indicates that users want to be able to communicate and share information for which users need to have access to a combined basic telephony and Internet service. It also implies that a basic dial-up link with limited bandwidth is in most cases not sufficient to address the needs of the user.

In the current projects, evidence of evaluations among users indicates a direct economic and social impact of the use of ICT. Participating farmers experience a direct economic benefit from using telephony and Internet services in the centres. They particularly value agriculture information related to market opportunities, prices and better production methods, but also want to use ICT to promote their produce to a wider public via the Web. Teachers and students participating in the projects have indicated that the use of e-mail and Internet, more than telephony, has directly enhanced the quality of education in rural areas. Through the Internet, they receive better teaching materials for both the teacher and student, but they also enhance the cultural awareness through communication with peers in other parts of the country and in the world.

In all the cases we have worked on, it was key that the users were trained in the search and selection of information available on the Web or in the use of information collected by the initiating NGOs or grass-root organisations. Yet, equally important is that the users can develop their own content for direct use among their peers and to promote local products and content.

Conclusions and Recommendations

The experience in Bolivia shows that it is possible to implement connectivity in rural areas in a sustainable way. With strong local demand from the farmer and education communities and local governments these connectivity solutions can greatly enhance the universal access policies sought by the government in Latin America.

This is not only about connectivity. This is also about creating social and economic development and creating new opportunities for people in rural areas: People do no longer need to make a five hour journey to get access to information and knowledge. Based on these on-the-ground experiences of IICD and the project partners the following recommendations can be formulated for regulatory agencies.

Ensure and enforce transparency and regulation of services

At present the lack of transparent regulation and enforcement mechanisms of service delivery by telephony, Internet and satellite service providers unnecessarily hampers the expansion of rural access. Therefore the following recommendations can be made:

- Clearly defined and controlled regulations can help improve the rollout

of connectivity on the basis of effective demand - of joint efforts user groups at community level - as shown in the of the IICD partners in Bolivia.

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ACLO, watching the progress at the telecentre

- In order to be able to contract and pay for services, communities need to be able to rely on the service providers. Service providers must be more transparent and specify what ratio the same connection is shared with. This will provide the clients with important information, whether the type of connection will be able to handle the data traffic that is foreseen.
- The use of VoIP should be made licence free for community-based initiatives in Latin America.
- To enable VoIP solutions, better regulation and control of the quality of hardware, software and service levels of service providers is required to keep latency to a minimum and guarantee better quality Internet connectivity as a result. It might be sensible to give financial incentives to those private companies that provide assurances with regards to limiting latency and lag-times.
- Initiatives such as the E-links programme in Canada (providing a 2Mbits downlink and 2MB uplink at limited service costs with partitioning of some bandwidth solely dedicated to VoIP calls) could be replicated in Latin America. Cost calculations indicate that this can easily bring down telephony costs with a factor 10.

Promote and support innovative connectivity models

Many remote communities never got any attention from the government or telecommunication operators. In certain cases villages have only been connected to the electricity grid within the last two to three years, but still with highly unreliable power levels and frequent disruptions. The same is true for telephony. Even though the government and operators are proud of the provision of rural connectivity through rural public phone booth services, the quality of a simple phone call is often poor and very expensive.

To overcome this situation, the following recommendations are made:

- There is a clear demand for services for which users in rural areas want to pay if provided as a combination of telephony and Internet, providing them access to communication, information and knowledge.
- It is crucial to create awareness among regulators, service operators and foremost community organisations about the actual market demand for innovative rural access models, particularly those providing combined telephony and Internet services in rural areas.
- If demand is bundled, the cases clearly indicate that there is a market for rural connectivity if applying a clever connectivity model. Whereas incumbent operators may be more interested to stay into high-revenue urban areas, newcomers can be motivated to enter rural markets if properly informed.
- Government supported incentive programmes can assist in a faster rollout of access in rural areas. While earlier exclusively private sector undertakings have failed in most countries in Latin America, this article show that new types of collaboration between private service providers and community organisations

can provide an alternative model for sustainable and still commercially attractive connectivity. These incentive programmes are to include the funding of local technical and organisational capacities of community organisations.

- Technological innovation in ICT is fast changing the basic conditions in the market. This is particularly so for wireless network technologies, allowing for an increasing provision of high bandwidth at larger distances at lower costs. Examples are Mesh and WiMax services. With wireless networks we can implement combined Internet and telephony solutions with local phone exchanges at lower cost, more flexible and scalable at a faster pace.

More information

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