



Access of ICT benefits for underserved rural communities in developing countries: A case study from Nepal

Rajendra Prasad Poudel, Nepal

Abstract

Policy-makers and governments in developing nations can implement more effective policies and frameworks by gaining a better understanding of the factors that support stakeholders and partners to extend the benefits of information communication technology (ICT) to rural communities. The aim of this paper is to answer the framework to follow for extending access to ICT benefits in underserved rural areas of a developing country. It is based on the experience of Nepal's wireless project, where the researcher has worked as a technical team member and social worker for the past number of years. It is conceptually grounded on previous documentation of the Nepal wireless project and local tele-centre operators including end-users and team members who have been involved in the project since its start. Three hundred surveys were carried out among villagers, twenty-five policy-makers were interviewed, three focus groups were used for discussion among end-users, and one formal discussion was held with a professional from an aid agency.

This framework will be important for designing future rural ICT projects in Nepal and other similar developing countries. To achieve maximum benefits from the ICT access, parallel incentives should be given to establish small ICT-based business enterprises in rural areas that can become potential users of the modern ICT. This study found that existing infrastructure and human skill is enough to run many small-size businesses to support ICT access in rural areas. From the research it has been identified that available local resources, including human skill, have not been wisely utilised. To see a rapid impact in the rural economy, simultaneous focus should be placed on the utilisation of local resources by sharing ICT infrastructure from national to local level. Local government itself should become the first users of ICT and provide applications for the local people. Frequent revision of national policy related to the use of ICT tools and applications will help upgrade public demand, which will ultimately show the impact in the national economy. Many small-sized businesses - such as tourism, animal husbandry, dairy product, small agro farming - should utilise ICT applications and tools. Major initiative must be taken by the government and the government itself should become an ICT user. Local content and localisation is a stronger factor that helps to extend the ICT benefits in rural areas of Nepal.

Keywords: ICT access; rural communities; Nepal; Nepal wireless project

Introduction

Background

It is widely accepted that the benefits of information and communication technology (ICT) is rapidly growing and becoming a major backbone for national economies everywhere. It offers unique opportunities for developing countries. ICT allows people, anywhere in the world, to access information and knowledge almost instantaneously. Individuals, organisations, and com-

munities should benefit from access to knowledge and information. It should be assured that everyone has the necessary skills to benefit fully from the Information Society. Moreover, access to information is essential for the emergence of global information and a knowledge-based economy and has the ability to empower poor communities, enhance skills, and link various institutions involved in poverty reduction.

Rural areas of the developing world are still far from accessing technology. Telephone and

Internet penetration in these areas are still very low comparatively, not only in developed and developing countries but also between city and urban and rural: a large population living in rural areas in the world are isolated from the global economy. Road and electricity access always get priority and then it's ICT. While modern ICT has fallen behind road and electricity facilities, it should not be forgotten that where road and electricity infrastructure is in place, the benefit of ICT can be multiplied and have a multiplied economic impact in community development. From an implementation prospective, the cost of ICT provision to rural areas tend to be higher than to more densely populated urban and city areas; also, the ability to pay user fees for the service is extremely low. Rural communities can find the resources to pay the service fees but they need to recognise its potential and commercial viability.

Despite this being widely recognised, access to information has been limited in reality and very few empirical studies exist which assess the impact of investment aimed at providing access to information (Bhavnni *et al.*, 2008). Caspary and O'Connor (2003) have claimed that the fact remains, however, that there are enormous gaps in ICT access not only between developed and developing countries, but also between urban and rural areas of developed countries. Looking at this in depth, this gap is wider in the remote rural areas where poor and marginalised communities are living.

Many developing country governments and developing agencies are focusing on extending telecommunications services into rural areas, as they seek to alleviate poverty, encourage economic and social growth, and overcome a perceived 'digital divide' (Bhavnni *et al.*, 2008).

According to the report presented during regional workshop in Bali 2004 (UN – ESCAP, 2005) in China where over 400 million kilometres of fibre optic cable have been laid, there still remain many unreachable areas, such as remote or mountainous areas. It is not commercially viable to build a fibre optic service which is able to cover all of the country. Commercial viability and sustainability are major issues for ICT projects deployed in remote, rural areas. Due to these concerns, communities living in such

areas are always excluded from access to ICT services. This paper will do its best to explore a framework to expand ICT services in such isolated, unaddressed rural and remote areas.

ICT in Nepal

Nepal is now passing through a politically transitional phase and doing its best to build a national constitution through a publically elected constitutional assembly. As the majority of this young generation has grown up in the political mainstream, the new leadership has acknowledged the importance and potential of ICT for national development, although it has yet to actively adopt and promote it.

Already the government of Nepal has announced an e-governance project with funding support of the Asian Development Bank (ADB). This has somehow increased awareness at government level for adopting technology for government offices. Another encouraging step is the deregulation of the Industrial, Scientific and Medical (ISM) wifi band to promote wireless communication in rural areas of Nepal. This has opened lots of opportunities for extending services such as education, health, and communication in these areas.

With funding support from the Indian government, a 900-kilometre fibre optical network covering the southern part of the country from east to west and connecting with India via several points has created lots of opportunities to extend the Internet and telecommunication network in the country. Similarly, there is funding support from the Chinese government for a fibre optic project along the 115-kilometre Arniko Highway linking Kathmandu to Khasa, which borders China on the north. This has drastically decreased the cost of Internet bandwidth to connect with the global network; Nepal is also connected with the Asian Information superhighway connecting with many countries.

Nepal Telecom, United Telecom, Spice Nepal, and NCELL are the major telecom operators connecting people through their available infrastructure. This has shown encouraging evidence in the telecommunication market in Nepal.

Nepal had 10.20 million telephony users at 14 November 2010, up from 9.92 million telephony users at 14 October 2010, according to figures from the Nepal Telecommunications Authority (NTA). The mobile operators ended the period with 8.85 million customers, up from 8.58 million a month earlier. Of the total, 7.99 million were GSM users, up from 7.72 million a month earlier, and the remainder use Nepal Telecom's CDMA service called Sky Phone. Nepal Telecom led in GSM subscribers with a customer base of 4.11 million, followed by NCELL with 3.88 million. The number of fixed telephony users in Nepal stood at 843 472, up from 843 216 in mid-October 2010. Of the total, 601 462 were PSTN users and 242 010 were WLL users. Furthermore, Nepal counted 1.62 million Internet users, down from the 2.46 million the regulator reported mid-October 2010 as the number of GPRS users dropped, and the penetration rate stood at 5.79%. Some 1.39 million people connect to the Internet using GPRS, followed by 109 152 Internet users that connect through CDMA 1X. Some 55 080 people use ADSL and there were also 32 500 cable Internet users, and 26 582 dial-up users. Furthermore, 13 000 Internet users connect through wireless or fibre optic technologies (NTA MIS report, October 2010).

Government bodies, such as the Ministry of Environment, Science, and Technology

(MOEST) and the Ministry of Information and Communication (MoIC) are respectively working on formulating ICT policy and managing telecommunication and radio broadcasting policy including mass media sectors. In addition, the Nepal Telecommunications Authority (NTA) is the regulatory body for telecommunications, including legal issues for Internet service providers (ISPs). The National Information Technology Center (NITC) is one the technical organisations to support all these ministries. Another, an apex body, the High Level Commission on IT (HLCIT), under the chairmanship of the Prime Minister, provides vital strategic direction and helps to formulate appropriate policy responses for the development of the ICT sector. The Internet Service Provider's Association of Nepal (ISPAN) is the umbrella organisation for ISPs. ISPAN is committed to advocate for and support a healthy Internet industry in the country. It works closely with telecom operators, ministries involved in ICT-related matters, and various other organisations on various issues that affect the implementation of the ISPs' projects.

Many emerging private commercial banks now offer Internet banking services on the available infrastructure. A full range of services is provided to clients, from basic services such as viewing and printing account statements and requesting cheque books, to advanced functions such as

Figure 1. Mobile coverage of Nepal Telecom.



transferring funds to different accounts, opening letters of credit, and bank guarantees.

Situated between two giant countries such as China to the north and India to the south, east and west, Nepal has enjoyed a lower-coast computer hardware and software market. So the Nepali IT market consists of hardware and software services, call centres, and software development. The lack of the Internet and communication infrastructure, including long time electricity cut off has becoming one of the barrier for deployment of ICT tools around the country and such services are limited it in only a few bigger cities like Kathmandu, Pokhara, and Biratnagar. Even in such situations, encouraging evidence has been shown by organizations such as D2Hawakeye, Serving Minds, HiTech Valley, and Yomari in the international IT arena. The Computer Association of Nepal (CAN) is an umbrella organisation for all the IT industry and estimates that the country has gained around USD\$40 million of software business from abroad.

Most of the private schools, which are located in major city and district headquarters, have included computer studies in the curriculum even as early as Grade 3, but many other schools have never seen a computer. Schools in the rural areas, many of which are jointly run by local community and government are comparatively

poor in quality of education and infrastructure. These schools have not seen and have never heard about computer education. On the other hand, the government has already announced computer science as a part of the secondary education curriculum as an elective subject.

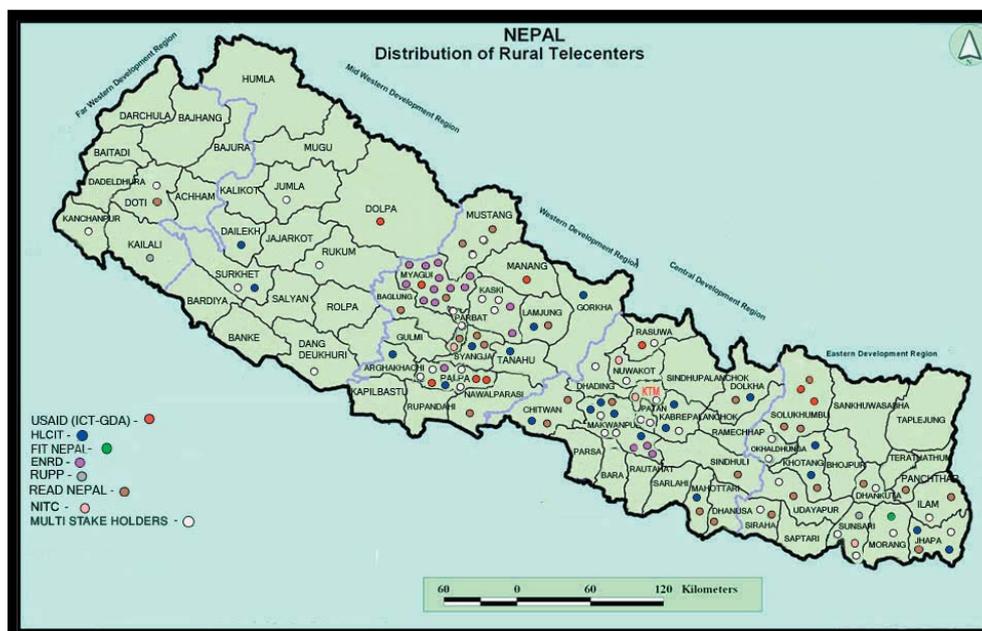
In higher education, formal programs in ICT are offered in each of Nepal's four universities, namely, Tribhuvan University, Kathmandu University, Pokhara University, and Purbanchal University. In addition, there are 56 ICT colleges operating in the country.

More work needs to be done to make ICT services accessible to the large population. Still 75% people in the country are not able to access telecommunication service, which is a very basic need of a community.

More than 3500 village development committees (a local government body) are totally isolated from the government without communication. The Nepal Wireless Project (NWP) is one of the nationally recognised projects has connected more than 200 villages and provided Internet including tele-teaching services in rural and remote areas of Nepal.

Nepal also shown remarkable improvement among the countries in the South Asia region. FM radio has gone the furthest in Nepal because

Figure 2. Tele-centre Map of Nepal (Source: HLCIT)



of the relatively more flexible legal regime for broadcast media (Onta, 2001). Beyond this, privatisation in the telecommunication sector has rapidly increased the telecom service coverage area (NTA, 2010). There have been more than a dozen of organisations working for ICT development in Nepal. The government has formed the High Level Commission for Information Technology (HLCIT) as an apex body under the presidency of the Prime Minister to provide strategic direction and support to formulate national IT policies for development of the ICT sector in Nepal.

Despite these efforts from Government, international donor agencies and private sectors are limited in the city and urban areas. Comparatively, from the national level, a larger amount of the government budget is allocated for the improvement of services in city and urban areas than in remote rural areas. As a result, many qualified engineers, teachers, and doctors are not interested in going to rural and remote areas to serve the people. As a consequence, most of the communities residing in mountain areas find themselves excluded from access to the benefits of basic social services, such as education, health, and communication. The life of people living in rural communities in mountain regions is very hard in terms of the availability of such services. ICT is one of the effective

tools that can bring such services to the hands of these people and make their lives happier.

Still, the government of Nepal has as a first priority, political stability, peace, democracy, food, clean drinking water, quality health services, and employment - the major aims of the Millennium Development Goals (MDGs). Most of time government bodies don't consider ICT as a major factor for the community. But from experiences of developed countries like S. Korea and Japan, they have gained their existing economy from the adoption of technology in their daily lives. It should not be overstated: ICT is not only tool for supporting other development factors but is itself an industry which can improve education, health, and prosperity of a country.

Research context and method

Research location

Villages from five districts of Nepal were selected, villages which have been connected by the NWP. They were chosen because they have established a number of community centres with the support of the local community. Another reason is that most of these connected villages are at a high altitude - up to 3600 meters - and are not connected by any means of transportation

Figure 3. Network Map of villages connected by Nepal Wireless Project in Kaski, Myagdi, Parbat districts.

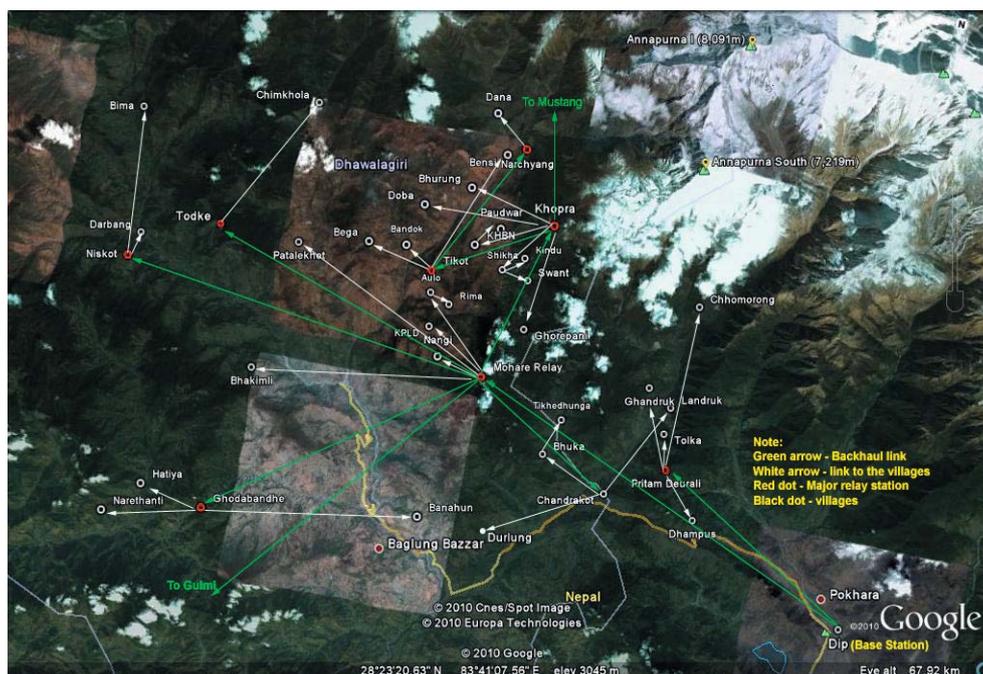


Table 1. Data on villages that have been visited during the data collection time.

Village Name	Population	Computers	Walking distance from Motor-able road	Available services
ChandraKot	780	6	2 hours	Internet and VoIP phone
Bhuka	1250	2	6 hours	Internet and VoIP phone
Thike Dhunga	845	4	7 hours	Internet and VoIP Phone
Kaphaldand	945	3	4 hours	Internet and VoIP Phone
Aulo	1135	4	4 hours	Internet, Tele-medicine and VoIP phone
Jhin	1425	4	4 hours	Internet and VoIP Phone
Chimkhola	1254	6	8 hours	Internet and VoIP Phone
Lete	735	3	8 Hours	Internet, Tele-medicine and VoIP phone
Kobang	600	4	4 Hours	Internet, and VoIP phone
Tukche	785	6	6 Hours	Internet, and VoIP phone
Marpha	750	8	8 Hours	Internet, and VoIP phone
Syang	688	3	6 hours	Internet, and VoIP phone
Jomsom	2234	6	District head quarter	Internet, Tele-medicine, Credit card transaction service and VoIP phone
Kagbeni	595	3	4 Hours	Internet, and VoIP phone
Muktinath	550	2	6 Hours	Internet, and VoIP phone
Nangi	780	20	9 hours	Internet, Tele-medicine, and VoIP phone
Ramche	655	3	11 hours	Internet, Tele-medicine, and VoIP phone
Tikot	845	10	8 hours	Internet, Tele-medicine, and VoIP phone
Khibang	900	4	11 hours	Internet, VoIP phone
Ghara	2,400	4	11	Internet, VoIP phone
Paudwar	2,254	15	2 days	Internet, Tele-medicine VoIP phone
Narchyang	735	6	1 days	Internet, VoIP phone
Shikha	1,200	6	1 day	Internet, Tele-medicine VoIP phone
Ghorepani	2,485	8	2 days	Internet, Credit card transaction service, VoIP phone
Majhgaun	1,125	4	2 hours	Internet, VoIP phone
Tolka	900	6	1 day	Internet, VoIP phone
Bhichuk	735	2	1 day	Internet, VoIP phone
Landruk	1,230	4	1 day	Internet, VoIP phone
Ghandruk	2,800	17	1 day	Internet, VoIP phone
Chomgrung	450	4	2 days	Internet, VoIP phone

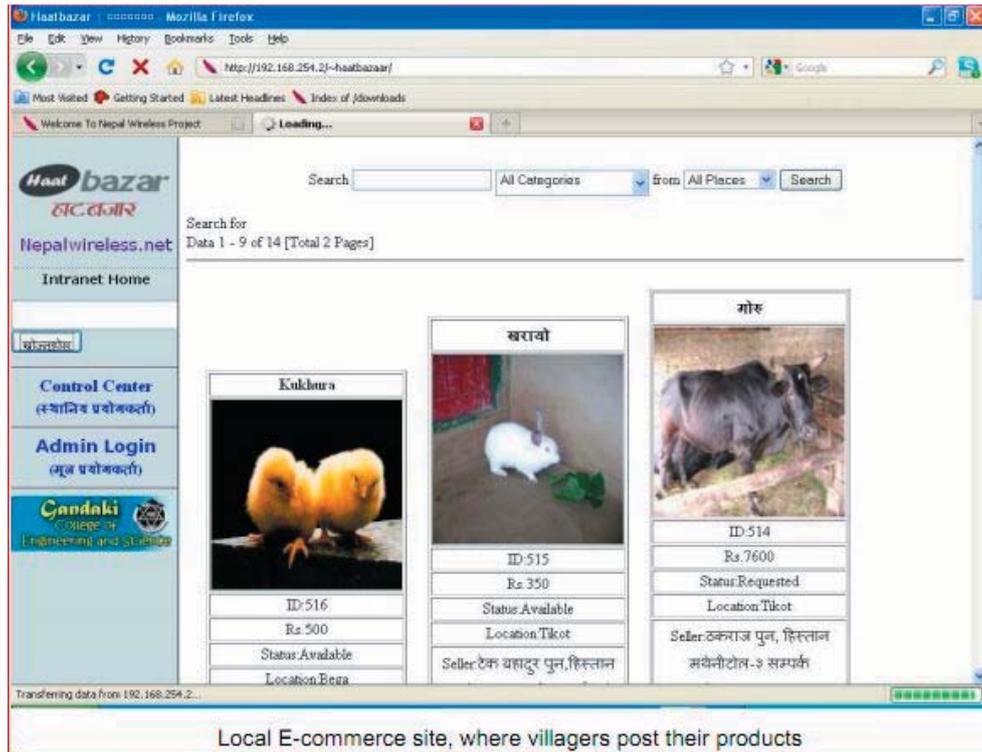
or roads. The final reason is that, comparatively, these villages have adopted Internet technology faster than other villages in the country. Since the growth of Internet, connection in rural villages of Nepal is growing rapidly. Apart from the NWP, few projects are sustainable for providing regular high broadband Internet services in Nepal.

Up to now, the project has connected more than 150 villages in 7 districts. The project has provided multiple services such as e-mail/Internet service, VoIP phone service, Tele-medicine and Tele-teaching. In some areas, the project has provided credit card transaction and remit-

tance services. In addition, the project has provided local online business portals to sell local products of the villagers inside the village.

The project has also integrated basic social services such as tele-education and tele-medicine in a few villages such as Nangi, Dolkha, Makwanpur, and Jomsom. The wireless network has connected Kathmandu Model hospital with these villages and with a live video conference system. So a patient in these villages can get a medical consultation for primary treatment during an emergency.

Figure 4. Local e-commerce site.



Local E-commerce site, where villagers post their products

Research design

The research focused on developing a framework for extending ICT access benefits for the underserved remote communities of developing countries. The basis for developing the framework is the experience and collected past documentation from the project areas as well as from people who have been continuously working in the NWP since its inception. Also, an analysis of the successes and failures and their cause will support the justification of the effectiveness of the framework. Basically three areas have been explored to define the framework.

1. How existing National Policy is contributing.
2. How local resources have been utilised.
3. How technology has been adopted.

In-depth analysis has been done to explore which factors are becoming challenges and contributing to extending ICT access benefits on the basis of the individual projects and their analysis, which has been ongoing for a few years. Quantitative and qualitative data were collected from the project areas as well as from the governments and policy-makers through the survey and face-to-face interviews. Also focus group discussion was arranged to get the inside view

of end-users and tele-centre operators who have been working for a long time with the NWP. Supporting data are also taken from previous project research documents and a few available documents found in an Internet search.

Participants

Completed surveys were received from the 300 respondents including 25 government policy-makers, 3 focus group with the tele-centre operators, and 1 formal discussion with an aid agency in Tokyo, Japan.

Data collection

Of the 300 questionnaires, 200 were collected by using Google.doc survey form; 20 were done by the researcher himself; and 80 forms were filled by villagers as end-users with the facilitation of 4 self-centre operators. The respondents were only from project areas; those from the online 200 were selected randomly as more focused on the end-users of the ICT. Twenty respondents from the project areas were known as enablers of the project over the last seven years and work in their villages to

extend the ICT services. Another 80 respondents were selected randomly from the villages.

Structure of the questionnaire

As the benign researcher has himself continuously worked with the project since the beginning, the design of the questionnaire would have been influenced by his knowledge and perception. This could have omitted important information from the respondents. To balance this, the researcher sought support from an external assistant, Ms Ayako Ogawa, from Japan. She had very little information about the NWP and the communities living there. Ms Ayko Ogawa had been working with the rural ICT project in India basically focusing on Business of Pyramid (BoP) business project. The researcher has provided her with some study material from the past which helped her to define some parameters for the questionnaire. After the first questionnaire was developed by Ms Ayoko, it was revised and translated into the Nepali language and the researcher himself did an informal test survey for 10 respondents and made a few changes to the final version.

Seven of the 25 interviews were completed face-to-face by researchers. Among them, five were with senior policy-maker representatives from the apex policy-making body of the Nepal government and two were political leaders. The other 18 interviews were held over the phone and through Skype.

Two of the focus groups were carried out in the tele-centre with the operators and one took place in the E-Networking Research and Development (ENRD) office.

Analysis and discussion

The basic social services, such as education, health, and communication are the minimum requirements for people who are living in remote mountain regions. These are developmentally challenged areas for developing countries in the rural areas. These challenges are not only because of the social or political structure but also because of the geographical landscape.

ICT is becoming one of the effective sectors which can make life easier in rural mountain areas. Mobile telecommunication, including Internet, has created lots of opportunities for people living in such remote mountain villages.

Nepal has had lots of practice with community developments. Community forest and community frequency modulation (FM), Mothers for micro finance, and the community library are major sectors where Nepal has been globally recognised as a pioneer practitioner.

In a similar way now Nepal is doing its best to enjoy the benefits of ICT. This paper explores some of the best practices used in adopting ICT in rural areas of Nepal. This study is not extensive; rather is it an attempt to establish a basic foundation for developing a framework to extend ICT benefits for rural mountain communities. Basically this analysis and discussion are grounded in past reports and documents that were developed during project implementation, alongside the experiences and comments from tele-centre operators who have been involved in this project for a long time, the end-users who are using the network, and the policy-makers who are involved in the process of developing ICT policy in Nepal.

Use of ICT in mountain villages

The hills and mountains of Nepal are home to 80% of the country's population. Forestry, farming, and tourism are sources for sustaining life in these areas. Mobile phone and Internet have been used as the communication means to keep in touch with their families within the country and abroad.

During the study, it was found that out of 300 respondents, only 36 (i.e. 12%) use Internet and computers for documenting their work; 88% use them as means to communicate with their relatives and friends. Within this 88%, 47 respondents use e-mail and instant messenger, but the majority of the respondents have adopted VoIP phone services from the tele-centre. This is because VoIP is easy to use and mostly women and seniors are living in villages, both groups with low levels of literacy and

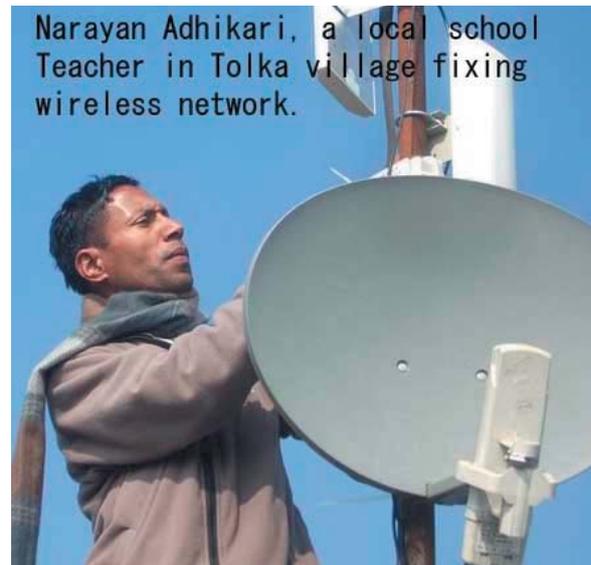
lack of skills. Young people live far from the vil- lages because of access to education or work.

Although computer training and access to the Internet came to their village six years ago, people have not bought personal comput- ers for their homes. The reason behind this is that the computers are used mainly for com- munication and they can access Internet free of charge in the tele-center (or in some vil- lages, for a minimal cost). From this data we can see that people have adapted with ease to the use technology in their daily life.

Narayan Adhikari, a technical member of the NWP and a teacher in Tolka village knows how to use Microsoft Word and Excel and can also maintain computer hardware and wireless net- working but still he uses Word and Excel very rarely because he does not have such work there in village. He is trying to use comput- ers to support his teaching profession but he could not get enough content in the local lan- guage and other accessories, such as projec- tors and a sound system, are not available. If he had a small fund, he could run a small computer repair centre and provide training to others.

These facts show that even people skilled in ICT do not practice it in a busi- ness model. So, it is necessary to use exist- ing ICT skill in a business model to improve the income level of the people and to extend ICT access to underserved village areas.

Another case is Bijaya Gurung, a 27-year-old mother from Landruk village who is a member

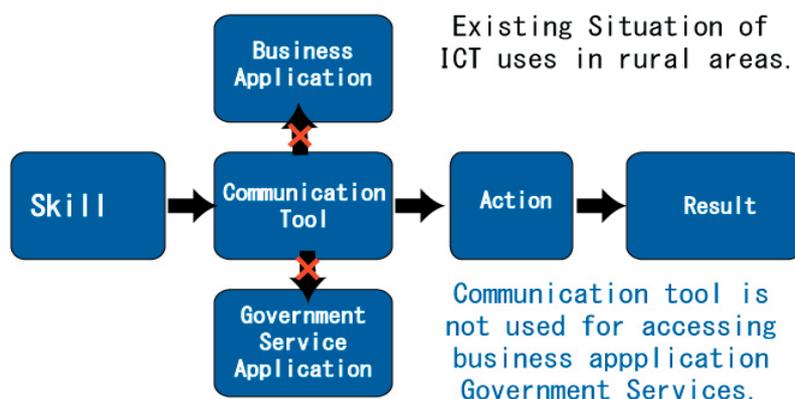


of Landurk Mothers group as well as the owner of a tourist hotel in her village. She has received nine months of computer training from the PAN Phase II programme. She learned about open office, and applications such as editing applica- tions and spreadsheets. She has enough skill to operate secretarial work on a desktop PC and she can operate a CMS-based web application. But in her village there is only one tele-centre with three PCs and they are mostly old. After train- ing she did not get enough time to access those PCs because of crowds around there. Now she has forgotten some features of the applications.

Bijaya Gurung has enough capacity to pur- chase a computer for her hotel account- ing system and host one simple blog or CMS-based website for her hotel.

These facts show there is a lack of coor- dination between Mr Narayan Adhikari

Figure 5. Existing situation of ICT uses in rural areas of Nepal.



and Mrs Bijya Gurung. Bijaya Gurung is a potential client for Narayan Gurung.

According to the technical engineer of the District Development Committee (DDC) Makwanpur, Hetuda, Makwanpur DDC has adopted ICT and connected the 7 Villages development committee by wireless Internet services and established seven tele-centres. DDC has its own website (<http://www.ddcmakwanpur.gov.np/>). It has provided technical training to the villagers on how to use the DDC website and offers various services. But fewer than 2% of end-users are using the DDC website for their birth application and registration process. But, on the other hand, among the 35 respondents from different tele-centres, 28 have frequently accessed their Facebook account.

Out of 35 respondents (end-users) of the Makwanpur wireless network, 23 did not see any benefits of using the DDC website; eight said they do not know why they were not using it; and four said they were not aware of it. Figure 5 shows that communication tools (Internet/Mobile/e-mail/chat/VoIP) have not effectively connected to access business and government applications. Since there is lots of action which is limited to communication, that majority use is in connecting families, friends, and relatives.

From this fact, we can see that there is not issue with skill and awareness about the use of ICT in rural areas but rather than the use of ICT is not being practiced in daily operations. People are not aware of its uses in their governing system and in other areas. To get the maximum

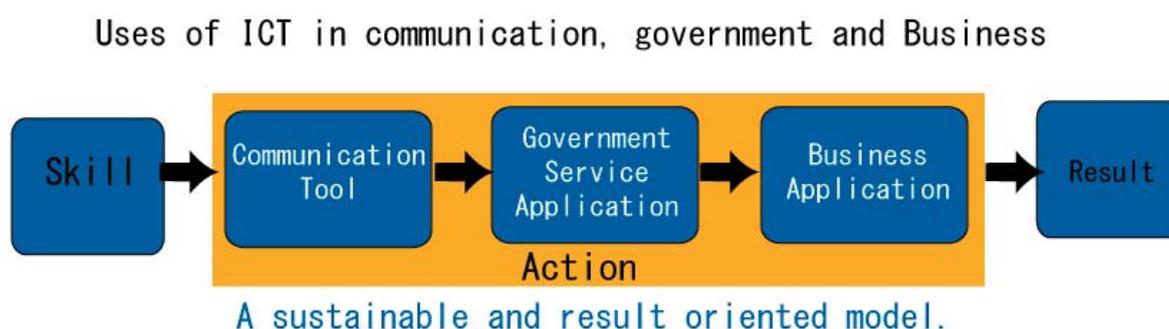
benefits from the existing infrastructure and available human skill, work is needed on application adoption. The first entry door for the application should be government services and then connections with business. This framework gives an effective economic result.

ICT infrastructure in mountain regions

Data on available ICT infrastructures from the study area were collected. All the villages from where data was collected are connected with the broadband wireless network. Except Makwanpur DDC, the majority of tele-centres are located inside the building. Few of them - Dolkha, Makwanpur, Nangi, Jomsom - offer tele-medicine and tele-education services via Kathmandu Model hospital. A high-end video conferencing system has been installed in these centres. There are other many centres such as Pawdar, Narchyang, Ramche, Aula, and Tolka that also have a cheaper video conferencing system to contact doctors in the city.

The majority of centres have old model computer systems with PII, PIII and PIV and a minimum 64Mb of RAM size with minimum 10 GB of hard disk. The villages that have been connected with the National Electricity Authority (NEA) main gridline have higher risks of the lines being cut off, blackouts, and electricity voltage fluctuations. But some villages, such as Bhichuk, Tolka, Landruk, and Chomrom, have significantly fewer electricity blackouts and less risk because these village have developed their own micro-hydro power station from their nearest waterfall.

Figure 6. Uses of ICT in communication, government and business.



All centres have enough space to house the computers with enough chairs and tables for the end-users. All the furniture is made from local wood products by the local labour force.

According to the budget formats of each tele-centre, almost all tele-centres have built their buildings and furniture from local resources using local funding. Few centres have received full support from government such as 7 Villages from Makawanpur district. But some villages have collected funds from different sources and from different community-based organisations such as Mothers groups. For example the tele-centres located in Landruk and Ghorepani have been totally funded by the local Mothers group. Except for wireless radios and some networking equipment and a few computers, all other costs have been managed by those local Mothers groups.

A good practice among the villages is that they share. One example here is Tolka tele-centre.

1. Building, teacher, and furniture were provided by the school community.
2. Computer and networking equipment were provided by local government committee.
3. Local community groups provide electricity power.
4. Wireless networking equipment with a VoIP set was provided by Nepal wireless.
5. Tele-medicine services are provided from the local health post.
6. Local hotel association has been collecting funds and supporting the tele-centre when the system was damaged.

This is a very encouraging model for building infrastructure as well as for sharing the benefits of the infrastructure. Also in the same way, two or more villages have been making lots of effort to build a relay tower and manage back-up as well as regular solar power for the relay station. For example, the relay tower placed in Deurali in the Kaski district offers a network for Ghandruk, Tolka, Chomrong, etc. All villages and communities organisations based in these villages have been continually supported to manage the tower and maintain a regular Internet connection.

This tower was built in Durali, and has provided a connection to many villages. All vil-

lages collected funds to build it and manage it. Technically this tower is maintained by local people, unless in complex trouble.

National policy and opportunities

After the deregulation of wireless frequencies for ISM Band, the wireless Internet market expanded rapidly. Despite this, many business people are not encouraged with this policy. Still there are many other associated policies that have not been clearly addressed yet; for example, legalisation of the VoIP route and services is still in discussion. VoIP mobile services have great business opportunities.

Nepal Wireless has been fully using the benefits and opportunities of the existing ICT policy. Though this policy is not enough to encourage the public to implement ICT services in rural areas, there are lots of restrictions to be lifted and issues to be improved. The most important thing is that government services are not available online. The few that are available are not well-operated and there is no programme of encouragement for the end-



users. NWP and its associated local organisation have already shown the feasibility of an infrastructure-sharing principle which has lots of potential for development in Nepal.

According to the Director of the National Information Technology Center (NITC) Mr Subhurna Shakaya, many government officers and departments does not seem to be very aware of the national data centres and e-governance applications that have already been built with technical and funding support from the Asian Development Bank (ADB) and the Korean International Cooperation Agency (KOICA) and connected with the fibre network with all Ministries. Also there has been a direct connection established between the Nepal Internet Exchange Point (NpiX). But the question is how many local government portals are installed here and how many people are accessing them?

The survey found that most of the DDCs and VDCs were not aware of this and were not utilising this infrastructure. According to one engineer working inside the Data centre, it does not have enough services and application to provide services to all the DDCs or VDCs. According to him, the government is not serious about this project and is always waiting for foreign support.

This means that the government of Nepal has still not recognised ICT as a prioritised field. This has caused many barriers which are in pending in policy level issues; business inside the ICT sector is not rising as expected.

Recommendation and conclusion

Access to ICT services and benefits for the developing countries is very important but also a big challenge from a different perspective. Poverty, lack of digital literacy, infrastructure, and stable political situation are becoming the main barriers. But going through the many successes and failures, it has been found that more than poverty and digital literacy, necessity is the biggest opportunity for adopting ICT in rural areas. From the study it has been clearly found that the rural community has widely adopted Internet technology in the form of interactive communication tools. Even though it has much

potential, the rural community has not recognised its power and has maximised the benefits from its uses. VDCs have actively supported the establishment and building of tele-centres and limited these to computer training centre or communication centre. Along with communication, ICT can be integrated into every part of daily life within the existing infrastructure and skill level. There are a few steps and a framework that need to be followed by government and its stakeholders. These are:

1. The government itself must become a user of ICT.
2. An infrastructure-sharing policy must be established at national level.
3. Standardisation of skills is very important for maintenance of quality work.
4. Promotion of the organisation as an end-user of ICT in rural areas is very urgent: schools, public health posts, and VDCs must integrate their daily work in ICT services.
5. Local content is lacking; it must be encouraged and systemised.
6. Local resources (funding, skilled workers) are sufficient but need to be managed well.

References

1. Bhavni A *et al.*, (2008) The role of mobile phones in sustainable poverty reduction. ICT Policy Division, Global Information and Communications Department (GICT). Available at http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/The_Role_of_Mobile_Phones_in_Sustainable_Rural_Poverty_Reduction_June_2008.pdf [accessed 16 February 2011]
2. Caspary G and O'Connor D (2003) Providing Low-cost Information Technology Access to Rural Communities in Developing Countries: What Works? What Pays? OECD Development Centre Working Papers, No. 229. Paris: OECD.
3. NTA (2010) Management Information System. Nepal Telecommunication Authority. Available at http://www.nta.gov.np/articleimages/file/NTA_MIS_42.pdf [accessed 15 April 2010].
4. Onta P (2001) FM Radio and the New Urban Public in Nepal. Sari Reader 2001: The Public Domain. Available at <http://www.sarai.net/publications/readers/01-the-public-domain/076-079fmnepal.pdf> [accessed 15 April 2011].
5. UN – ESCAP and ADB Institute (2005), Building e-Community Centres for Rural Development:

- Report of the Regional Workshop Bali, Indonesia, 8 – 14 December 2004. Available at <http://www.unescap.org/idd/pubs/Building-e-Community-Centres-Report.pdf> [accessed on 18 March 2011]
- Number Caspary G and O'Connor D (2003) Providing Low-cost Information Technology Access to Rural Communities in Developing Countries: What Works? What Pays? OECD Development Centre Working Papers, No. 229. Paris: OECD.
6. NTA (2010) Management Information System. Nepal Telecommunication Authority. Available at http://www.nta.gov.np/articleimages/file/NTA_MIS_42.pdf [accessed 15 April 2010].
 7. Onta P (2001) FM Radio and the New Urban Public in Nepal. Sari Reader 2001: The Public Domain. Available at <http://www.sarai.net/publications/readers/01-the-public-domain/076-079fmnepal.pdf> [accessed 15 April 2011].
 8. UN – ESCAP and ADB Institute (2005), Building e-Community Centres for Rural Development: Report of the Regional Workshop Bali, Indonesia, 8 – 14 December 2004. Available at <http://www.unescap.org/idd/pubs/Building-e-Community-Centres-Report.pdf> [accessed on 18 March 2011].