BRINGING THE OUTSIDE WORLD TO THE REMOTE MOUNTAIONS: THE NEPAL WIRELESS NETWORKING PROJECT

Teaching Case

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Abstract

This teaching case presents the story of the Nepal Wireless Networking Project (NWNP) and its effort to connect villages in remote areas of Nepal to the outside world. Despite lack of access to proper equipment, the fact that it was illegal to install wireless network, lack of technical competence and the difficult terrain in the Himalayan mountains, Mahabir Pun, the initiator of NWNP, succeeded in bringing Internet access to these villages which led to improvement in education, health services and income-generating activities. The case describes the development of NWNP from inception to today, the stakeholders involved, services provided, current challenges and ideas for future improvements. It illustrates the importance of the champion, the process to get stakeholders commitments, the importance of contextual understanding, and the challenges of scaling up from pilot projects to wider implementations in the context of developing countries.

Keywords: ICT4D, developing countries, champions, stakeholders, mountain communities
Prologue

Mahabir Pun leaned back, knitted his eyebrows, and smiled wanly at the visitor sitting across the table piled high with all manners of papers. The diminutive dynamo thought awhile before answering the visitor’s question which was “How did you singlehandedly bring the Internet to this isolated remote mountain region of Nepal? What drove you to do this? Why of all places Nangi?” He was proud of what he has achieved which was no less than bringing in the outside world to the remote mountain villages in the shadow of the towering peaks of the Himalayas.

It has been an uphill climb, and a struggle for a decade against overwhelming odds, much like scaling the majestic peaks that surrounded him. From a small classroom in a small village called Nangi, with one band-aided computer from donated parts, the Nepal Wireless Networking Project (NWNP) as it is now known has spread to 150 villages. Through the network, villagers could now keep in regular touch with their relatives working in the Middle East; the sick could reach doctors from large national hospitals located in Kathmandu, the capital; school children could read text books and even get lessons on the computer; the youth could organize social events and announce these events electronically; traders could buy and sell their goats or vegetables to people living in other villages (some sold paper products even to Australian buyers); and an enterprising group could manage their innovative yak-cow cross-breeding project without trekking up 3000 meters to the ranch itself.

It was impressive, Mahabir admitted. It was not just his feeling, nor the praise he got from others, including academics such as today’s visitor. In 2007, he received the Magsaysay Award, Asia’s equivalent of the Nobel Prize. Yet, he was not sure how to answer his visitor’s query. He had not planned the whole thing, nor any major part of it. To use the old cliché, it was one project at a time. That was why he was thinking carefully on his response. He wanted the visitor’s help for his next project – bringing e-Learning to the villages under NWNP through a multicasting network.

His finally looked up, smiled at the visitor, and said, “it all started when I just wanted to check my e-mail”. Then he began to tell the NWNP story. At the same time, it was also Mahabir’s story.

Background of Nepal Wireless Networking Project (NWNP)

The landlocked country of Nepal lies on the southern slopes of the Himalayas sandwiched between two giants, India and China. Its total area of 147,797 sq. km. is split into the Tarai in the south (17% of the total land), the central mountain region (64%), and the Himalayan region (19%) in the north. Administratively, Nepal is comprised of 5 development regions, 14 zones and 75 districts. The Village Development Committees (VDC) are below the district level, and are further divided into wards, which are the lowest administrative unit. Essentially though, Nepal’s 3914 VDCs form the basic unit of the developmental work. Nepal’s 28 million inhabitants live mostly in rural and remote areas with urban population comprising only 25%. About 31% of the population lives below the poverty line. While the literacy rate in Nepali, the national language, is an impressive 82%, only about 18% are literate in English. Ownership of computer in Nepal is still 2.80 per hundred, and telephone lines is 3.5 per hundred (ENRD 2009). The poorest and least developed part of the country is the mountain region, which has the lowest human development index (HDI) scores (UNDP 2004). The disparity between regions has contributed to conflicts among different communities and political institutions. The result has been a steady eroding of the social capital that existed within communities (the binding elements of trust) and has severely disrupted indigenous forms of social networks and institutions (the bridging elements). The NWNP is situated in this region with Nangi village at its center.

Inception of the NWNP

In 1996, Mahabir was working as a schoolteacher at Himanchal Higher Secondary School in Nangi. He had completed his primary education in a village school. Teachers in the school were mainly unqualified retired soldiers who were untrained and had a very basic knowledge. In remote schools such as this, it was also difficult to obtain papers, pencils, and textbooks. Each student had a wooden board blackened with charcoal, and a soft marble stone from a nearby cliff to write with. Mahabir remembered when he got his first paper and pencil – he was in the seventh grade. Textbooks came even later, in his eighth grade. His father, who was a retired army person, had dreamt of his son going on to higher education. Realizing it
was an impossible dream, he did what numerous others before him had done: he moved the Pun family to a city near the southern plain of Nepal.

There, Mahabir completed his high school education, and worked as a teacher for about 12 years. In 1989, he received a scholarship to the University of Nebraska at Kearney, from where he graduated in 1992 with a degree in Science Education. He returned to teach at Himanchal Higher Secondary School at Nangi (see Figure 1). It was an eye-opening experience. The gulf separating the comforts of the richest country in the world and one of the poorest was vast. Yet, Mahabir had ideas about how, at least at the local level, his countrymen could climb out of poverty. At first, the villagers were skeptical about his ideas on development. They thought he would return to the US after a while. Proving them wrong, he became involved in educating school children and community people from 1993 to 1996. At the same time, he also started working on rural development programs. His efforts gradually won over the support of community groups, mothers’ groups, youth groups, retired army personnel, school management committees, and district development committees.

Nangi though is isolated. It is so remote that it took a 5-hour hike to the nearest road to catch a bus for the 4 hour ride to the nearest big town of Pokhara which was better connected to the world. Being a tourist destination, it had Internet connection, albeit slow. Pokhara was another 6-hour bus-ride to the Nepalese capital Kathmandu.

Mahabir felt trapped in this remote and isolated village. He knew about Internet and so he started making the arduous trip to Pokhara just to check his e-mail and to browse websites. He began to read more and more about the potentiality of information technology in bringing socioeconomic development. He realized that wireless Internet connection is one way to connect the mountain villages to outside world. In 1996, with the help of a US professor, he created a website for Nangi village, and briefly described the village school. The presence of a remote village on the Internet attracted some foreign volunteers to come and teach in the school. Others who came to know about Nangi school donated books, teaching materials, and money. Mahabir also installed two small hydro-generators with the help of community people in the village to provide electricity to the school.

In 1997, some students from Australia donated four used computers. Mahabir used them to teach basic computer applications at his school. Later, the school received more donated computers from international volunteers. He now began to dream about connecting the village to the outside world through the Internet.

It was a pipe dream then. Nangi had no telephone lines, no electricity beyond what the hydro-generators provided, and a few computers. To make matters worse, Nepal was then in the midst of a decade-long Maoist insurgency. It was very difficult to set up wireless Internet in the mountain regions because import of wireless equipment was banned. In fact, it was illegal to install anything wireless. Mahabir was not discouraged. Undeterred, he went ahead and assembled a wireless network flouting regulations. As he liked to say “It’s better to be crazy than to die.”

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<table>
<thead>
<tr>
<th>The district</th>
<th>Nangi Village</th>
<th>Wooden Box Computer</th>
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Figure 1. Pictures from NWNP
Exploration of Idea to install Wireless Internet Station

In 1998, a telephone line was installed in the village, raising Mahabir’s hopes. However, the quality of the telephone connection was not good. He started thinking about different technical solutions. A satellite connection was one possible solution, but this was not affordable. Still dreaming of bringing Internet services to remote communities, he once again returned to the US, this time to complete his Master’s Degree in Educational Administration.

On his return in 2001, Mahabir’s dream received a jolt. He was stunned by the yawning gap between the Information and Communication Technology he was used to at Nebraska and the stone age level that he now had at Nangi. Instead of brooding over “his fate”, he had an inspiration and on an impulse, sent a message to the British Broadcasting Corporation (BBC), asking for ideas to connect such remote villages to the outside world through the Internet. BBC broadcast it on their famed and popular World Service and published it on their website. The response was overwhelming. The e-mail was read by many foreign students and volunteers who were eager to contribute to the mountain village through voluntary services. Within days, offers of help began to arrive. It started as a trickle; a used PC here, a server there. Soon volunteers began to show up at Nangi mostly to teach English, mathematics, and science subjects to school children. It was 1996 all over again.

Mahabir then started extending his network through e-mails with international volunteers; in particular, graduate students from western countries helped to bring computer equipment, set up the network, and taught basic computer skills to the villagers. Gradually, people in the community were taught by volunteer students to assemble donated computer parts in wooden boxes. By now, Mahabir began to realize that his dream was intact, but he alone could not do the job: he needed several other individuals and organizations. He started to look around for like-minded actors.

Pilot Test of NWNP

In 2001, with the help of a technical team, Mahabir established a non-governmental organization (NGO) called E-Networks Research and Development (ENRD, 2011). The purpose of this NGO was to conduct ICT research and development in remote areas. The NGO provided initial technical support to install wireless stations in Nangi. In 2002, Mahabir, along with people in the community (see Figure 2), the NGO, international volunteers and a technical team from an Internet service provider (WORLDLINK), conducted a pilot test. They tried to connect the Mohare relay station, which isolated near Nangi with the Pokhara base station, where the server was located. They used antennae and dishes (see Figure 3), donated by international volunteers, which were placed in tall trees. All the equipment was carried and installed by the villagers themselves. Through trial and error, they succeeded in setting up a wireless connection between the base station at Pokhara and the one at Mohare located near Nangi. Soon after, they extended the network to Nangi itself and a few other villages using basic wireless technologies.

In 2003, Mahabir formally established the Nepal Wireless Networking Project (NWNP) with the stated aim of providing Internet services in the mountain regions (see Table 1). The technology used during this period was desktop and laptop computers, Internet telephony equipment and high-resolution network cameras. This equipment was used to operate distance teaching and telemedicine services. In addition, NWNP acquired resources to build the network infrastructure, which included wireless devices, a network...
server and associated software, and power generation equipment at the relay stations. NWNP was gaining in popularity in Nepal and other parts of the world. Individuals and businesses, such as the Himalayan Bank and Solutions Consultant from Nepal, started donating computers and equipment. International donors from the USA, Canada, the Netherlands, Germany, Singapore, Australia, and Japan joined in. Tourists and volunteers coming to Nepal also brought unused computer parts such as motherboards, memory cards, hard disks, and video and sound cards. These parts were then assembled in the mountain villages inside wooden computer casings made by the villagers (see Figure 1). Local committees, such as the Mustang District Development Committee and Himanchal Higher Secondary School, provided administrative and financial support to run and maintain the wireless project in the districts of the region.

![Mahabir Pun with Dish antennas](image1.jpg) ![Relay Station](image2.jpg)

**Figure 3. Antennas and relay station**

### Extension of NWNP Services in the Mountain Districts

During 2005 and 2006, NWNP further extended its network into other districts and expanded the coverage of the Internet services (see Figure 4). They replaced old network devices with new and more robust equipment. International organizations such as the International Telecommunication Union (ITU) and World Bank granted funding through the Poverty Alleviation Funds of the Government of Nepal. Funding was supplemented by a grant from the International Center for Applied Studies in Information Technology (ICASIT) at the George Mason University School of Public Policy, USA, to print handbooks, for training, and publicity. NWNP also collected funds from village development committees and schools for user training, network administration, and to provide salaries to its support staff.

![NWNP in 2003](image3.jpg) ![Antenna on trees](image4.jpg) ![NWNP in 2011](image5.jpg)

**Figure 4. Trajectory of NWNP from 2003 to 2011**

In 2006, the political situation in Nepal reached a turning point when Maoist rebels signed a peace deal with the Government. With the political situation now more favorable, NWNP organized a seminar in
Kathmandu with government ministers, political leaders, government bureaucrats, and Internet service providers to discuss existing regulatory and legal issues. Mahabir lobbied the government to put the remote communities on the priority list of IT policy in 2010. Consequently, the Government de-licensed the 2.4 GHz and 5.8 GHz bands. In addition, it allocated some funds to all village development committees to introduce computer and Internet-based education in schools.

**International Collaboration of NWNP**

In 2009, NWNP was registered with the Ministry of Industry’s Office of Company Registrar as a not-for-profit company. During that year, NWNP implemented projects supported by Asia Pacific Telecommunication (APT). These projects connected 14 villages through wireless technology. At that time, services to other villages could not be extended due to financial and technical limitations. To raise funds for a further extension of project services, Mahabir initiated a ‘One Dollar per Month’ campaign. The idea was to collect one dollar per month from Nepalese citizens and the diaspora to implement the wireless project. Table 1 presents a timeline of NWNP from its inception to the current state.

<table>
<thead>
<tr>
<th>Time</th>
<th>Events</th>
<th>Other Key Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>Mahabir Pun received scholarship and left for US for undergraduate study</td>
<td>University of Nebraska at Kearny</td>
</tr>
<tr>
<td>1992-1996</td>
<td>Mahabir returned to Nepal and started teaching and social work</td>
<td>Community people, school teachers</td>
</tr>
<tr>
<td>1996</td>
<td>First website of Nangi village and Himanchal school set up</td>
<td>Volunteer professor from US</td>
</tr>
<tr>
<td>1997</td>
<td>Himanchal school received 4 used computers</td>
<td>Visiting volunteer Australian students</td>
</tr>
<tr>
<td>1998</td>
<td>Nangi village got a telephone line</td>
<td>Nepal telecom</td>
</tr>
<tr>
<td>1999</td>
<td>Mahabir left for US for graduate study</td>
<td>University of Nebraska at Kearny</td>
</tr>
<tr>
<td>2001</td>
<td>Mahabir finished master’s degree and returned to Nepal. Wrote an e-mail to BBC</td>
<td>BBC</td>
</tr>
<tr>
<td>2001</td>
<td>E-Network Research and Development (ENRD) established</td>
<td>Some technical experts from Nepal</td>
</tr>
<tr>
<td>2002</td>
<td>Pilot test of the Nepal Wireless Networking Project (NWNP) conducted between Pokhara and Nangi.</td>
<td>ENRD, ISP, Volunteer students</td>
</tr>
<tr>
<td>2003</td>
<td>NWNP services fully operationalized between Nangi and Tikot villages</td>
<td>School teachers, community people, ENRD</td>
</tr>
<tr>
<td>2005-2006</td>
<td>NWNP extended to other villages</td>
<td>World Bank, ITU, ICASIT</td>
</tr>
<tr>
<td>2006</td>
<td>NWNP lobbied the government and achieved reduction in license fee and allocation of budget to village development committees for computer education</td>
<td>Government ministers, political leaders, ISPs</td>
</tr>
<tr>
<td>2007</td>
<td>NWNP collaborated with OLE, Nepal Mahabir won Ramon Magsaysay Award</td>
<td>OLE, Ministry of education</td>
</tr>
<tr>
<td>2008</td>
<td>NWNP initiated telemedicine project</td>
<td>Om Hospital, Kathmandu Model Hospital, Health workers, Doctors</td>
</tr>
</tbody>
</table>
Gradually, NWNP extended its collaboration with various international organizations to extend its wireless Internet services. For instance, Japan International ICT Association (JIIA) of Tokyo provided technical support to select appropriate technology by sending their experts to Nepal. Similarly, International Telecom Union Association of Japan (ITUA-J) helped to develop links with Japanese partners and supporters, and provided technical support and guidance. In addition, the Japanese telecom operator, KDDI Corporation, donated 85 laptop computers to the wireless project. They also provided their expertise to install telemedicine services in the remote villages. NWNP is also working on environmental monitoring projects with the Asian Institute of Technology (AIT), Thailand. The project involves working with the Kaski Association of the Blind to introduce computers and Internet services for visually impaired people.

As shown in Table 1, from 2009 to 2011 NWNP started making its presence felt both nationally and internationally. The wireless project not only built up a physical infrastructure, but also a huge social network. The structure of the network was composed of many stakeholders, such as local schools, local governments, community people, hospitals, governmental and non-governmental organizations, businesses, and other international actors.

By 2011, NWNP had already built networks in around 150 villages in Myagdi and other districts. It has also gradually enrolled local, national, and international actors in the formation and extension of the wireless project and its services. Mahabir received many prestigious awards, including the Overall Social Innovations Award (2004) and, in 2007, an honorary degree as Doctor of Humane Letters (2007) from University of Nebraska, Kearny, and the Magsaysay Award (the Asian equivalent of the Nobel Prize).

**Services offered by NWNP**

NWNP is located in mountain villages of which Nangi is a typical example. The average population of these villages is between 800 and 1,000. Except for four villages, they are not accessible to motor vehicles by road. Historical reasons mean that the inhabitants of these villages are predominantly composed of people from the Magar ethnic community. However, there are other minority groups as well. Although the area has become better connected via roads that are open to motor vehicles, the geo-political configuration has confined them to traditionally formed strong ties or bonding social capital. The communities make most of their local decisions in the presence of village development community chairpersons.

Most of the young people from these villages migrated to urban places to search for employment, leaving behind retired army personnel and elderly people. Joining the British or Indian army is preferred in many mountain regions, as it does not require a high level of education. It is the prime recruiting ground of the legendary Gurkha regiments. The villagers still practice shamanistic rituals and shamans are respected as traditional doctors and healers. Medical services are still in a dire state. One young social activist ironically stated that:

“The place become a dumping site for disabled and elderly people. Educated people are not
staying in the village; they are migrating to urban places"

Before NWNP was initiated in Nangi, communication technologies were primitive if it existed at all. There were neither mobile telephones nor Internet access. On the need and usefulness for the project, Mahabir expressed his optimism:

“One of the reasons I got involved in this project is because I have seen that this has good potential to provide some very basic services to the rural community. Like health and education services...Because there is no way Nepali government is going to build hospital and bring doctors in the rural areas...as it cost so much money to do that...also you can see a lot of good schools and colleges are in the urban areas...students are getting opportunity to get quality education there but students in rural areas are not. So there is a huge education gap...therefore, I think ICT can help to bring this education gap closer. Similarly, to make this project sustainable we have to generate income, that’s why we are working in ecommerce project and Internet telephony “

NWNP provides communication (VOIP, e-mail, bulletin boards, etc.), education (distance teaching, e-learning), healthcare (telemedicine), business (e-commerce, e-tourism, local marketing, remittance) and employment opportunities in the mountain region (See Figure 5). The central office of NWNP is the Nangi telecenter, which is run by Himanchal Higher Secondary School. This telecenter coordinates the whole wireless network, which covers the different villages of the Myagdi, Parbat, Mustang, and Baglung districts. Specific services offered by NWNP are described below.

<table>
<thead>
<tr>
<th>Telemedicine</th>
<th>Community Information</th>
<th>Communication</th>
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<tbody>
<tr>
<td><img src="image1.jpg" alt="Telemedicine" /></td>
<td><img src="image2.jpg" alt="Community Information" /></td>
<td><img src="image3.jpg" alt="Communication" /></td>
</tr>
</tbody>
</table>

**Figure 5. NWNP Services in the mountain regions**

**Educational services**

Nangi, like all villages in Nepal, had primary schools, but the quality of teachers and the educational material were low, resulting in a high percentage of dropouts already at the primary level. Teachers were (and still are) often retired military personnel without proper pedagogical training. Books, if they do exist, were often outdated, and lacked the material that students needed. There were no educational institutions above primary schools forcing whole families to move to urban areas in search of appropriate educational opportunities.

NWNP’s services were consequently to provide the infrastructure and equipment needed for Internet access at schools (see Figure 6). The infrastructure also provided Internet access to the villagers in the afternoon and early morning, who could then use computers and online services.

Students and teachers were offered e-mail accounts through the project, while a bulletin board for local news, local advertisements, announcements, and urgent messages were offered. A school teacher commented on the usefulness of getting access to Internet in the following way:

“There are a lot of benefits of using computers in this village. There are many places in Nepal where children have not seen computers. But in our remote village, children are able to use and feel the new technologies”.

He went on to add:
“They are able to read updated news, and some are busy playing games. To enjoy playing games on a computer is also a breakthrough achievement for them.”

The people from the villages who are working abroad used e-mail to communicate with their families back home and to extend their social networks. The principal of the school commented:

“By using e-mail, we can meet people from other villages. We can exchange our information and put news on the homepage. We can easily find out about any events. It has facilitated the resource exchange. Through the Internet, we can also connect inside and outside of our country.”

Teachers and students obtain access to educational materials on the project’s intranet, allowing them to search and share information, which is perceived helpful by the students:

“It helps us in our study. For example, to understand history, the course book is not enough. Now, we may download additional information to get to know more. It’s helping me to receive external information related to my studies”

School children and teachers seemed more motivated to study and learn, and students living in the villages are suddenly able to communicate with others:

“...in the case of students it has been drastically changed. They are using social networking services to make a lot of friends. Likewise, we have a lot of volunteers from other countries with different nationalities and cultures. We can have cultural exchanges, building friendships with them. The dimension of communication has been altered”

Mahabir soon realized that access alone was not enough to improve the educational level; what was needed was localized educational material in Nepali. He started to look for a likely partner to develop this content. Help was not too far away. Rabi Karmacharya had just returned to Nepal, leaving behind a successful career in a software development firm in US. With a master’s degree from Massachusetts Institute of Technology, Rabi had a bright future in US. Yet, he yearned to give something back to his country. He returned in 2007 and established an NGO in Kathmandu called Open Learning Exchange (OLE), Nepal. Rabi’s vision was to transform Nepal’s public education by integrating technology in the classroom and giving children the tools and platform necessary to learn and excel. OLE developed online educational content in the Nepali and English languages for students. The contents are based on the government curriculum from grade two to grade six. In addition, OLE developed e-library content that is available online for the students and villagers. Since 2008, NWNP and OLE have been in a testing phase of using the network for online-based learning. OLE made educational material for children in the rural areas of Nepal; however they were not able to distribute the material to the mountain regions. NWNP provided the infrastructure to implement educational materials in the mountain regions, whereas OLE, in return, provided teaching material to schools children. Thus, the OLE project is now an integral part of the NWNP. Rabi stated:

“Other thing technology can do is from the communication aspects, it improves the access, so now they [students in rural and remote areas] can go to school and access lot of quality education materials. Many places every year in remote areas don’t even get the textbooks, sometimes the books arrived when the academic year is over, so we are facing lot of these challenges. By introducing technology we can update and send the materials immediately, and easily access the materials”

| Yak-Cow Cross-breeding Project | Online Education | Haat Bazar |
Telemedicine

The primary health care system in these villages was provided by “village ladies” (also known as “health sisters”). They received at best a few weeks of basic health care training. The nearest doctor was several kilometers away, and hardly any specialist doctor would come to villages like Nangi.

In 2008, NWNP initiated a partnership with Om Hospital at Pokhara, Nepal Medical College and Kathmandu Model Hospital to provide telemedicine services to various remote communities. The core of the telemedicine services consists of web-conferencing equipment installed in the villages as well as in the hospitals, allowing real-time interaction between local health workers and specialist doctors through the video-conferencing services. The health workers of these villages can now communicate with medical doctors in the urban center of Pokhara and Kathmandu to obtain medical assistance. Every morning, they meet through a video-conferencing system where they discuss patients and common diseases and consequently learn from the doctors. Thus, the doctors who were reluctant to travel to those villages could serve poor communities from their own hospitals. Saroj Dhital, a doctor at Kathmandu Model Hospital, stated:

“Daily video conference can provide continue training to the health workers in the remote area. And secondly, at the time of emergency, they can bring patients before camera. Our effort is that health workers here in the village become efficient. The people in this village should trust them more, and ultimately it will benefit village people”

These daily virtual meetings enable consultative medical care where expert knowledge from doctors in national hospitals combines with the contextual knowledge of local primary healthcare workers. A health worker said:

“Telemedicine means, here we have a small clinic, where two sisters [nurses] are working. If they find any difficulty or some emergency cases then they directly connect to Kathmandu or other 4 – 5 main hospitals and consult with them”

The interaction between patients and doctors is indirect through health workers. The patient communicates with the local health worker who communicates with the doctor. Still, it has a beneficial effect. A doctor associated with this project commented:

“Particularly in the villages, people are afraid of diseases. When they see a doctor in front of the camera prescribing medicines to them, they feel psychologically confident”

Mahabir commented on the project in the following way:

“It is difficult to get specialist doctors in remote places; in this situation we are using this technology to access doctors from remote places. The people who have not seen doctors can see the doctors through this technology. These are the main focuses of our project. So wherever we are going we are connecting schools and health post stations”

The village health sisters also receive distance training and education programs through the telemedicine project. Doctors give lessons online, and the health workers present their cases to other health workers and doctors. The participants in these online sessions actively engage in discussions about topical issues and practice making diagnoses. A health worker said:
“[The] objective [of telemedicine service] was to involve and empower women, for example, health workers. Therefore, this [telemedicine] clinic was not only for treatment purpose, but it also provides training to the village women. They also trained health workers from other villages, who are women”

**Income Generation activities**

Employment opportunities are rare in remote mountainous villages such as Nangi. Exodus to urban centers is a common phenomenon. Those who remain are mostly farmers, not surprising since every family produces food and products needed for their own survival. Farmers sold their meager surplus, mainly agricultural products but also livestock such as goats and cows at local markets. Walking several kilometers to the nearest urban areas was difficult, especially with livestock in tow. There were others who needed income generating activities. Other than non-farmers, there were those who returned to the villages after failing to obtain work in the urban areas where they had migrated.

To help generate income-earning activities, NWNP started working with Gandaki Software Engineering College, Pokhara to develop an intranet e-commerce platform, known as Haat Bazar. On Haat Bazar websites, villagers could advertise local products for sale, such as cows, buffaloes, goats, chickens, vegetables, and cheese. Mahabir described Haat Bazar as follows:

“They can use it [Haat Bazar] for advertisements in the village. Thanks to the Internet, we can promote local products such as Doko, Namlo, Nepali spices, mushrooms, and cattle. Anyone who wants to sell their products may use services like Haat Bazar on the Net. They contact the Internet operator, who will put the information online for other people to see and buy that product”

NWNP then found a partner to collaborate in its web endeavor. The partner was a web portal called Thamel.com, which sells good online chiefly targeting the expatriate Nepalese who could purchase gifts to be delivered to an address in Nepal.

The company grew rapidly after their story of selling goats was published on a BBC website. The director of thamel.com, Bal Joshi, and Mahabir came together when Joshi was exploring business opportunities in mountain regions and Mahabir was looking for his e-commerce platform. In 2008, they conducted a pilot test of virtual ATM machines to operate credit card transaction services for tourist on different trekking routes. Current plans for extension includes a remittance service in remote areas, since many family members from remote communities go to work abroad.

The community of Nangi is also running a crossbreeding project between yaks and cows. The ranch is located at a remote site 800 meters above the village. The management committee can communicate via net meeting to make appropriate decisions regarding the project without making long trips. The communication services allow for planning, ordering of supplies and management of the projects. Mahabir is excited by a newly initiated remittance service:

“Remittance services are going to start soon in this village. By using this service, family and friends in foreign countries and in the big cities may transfer money easily, which is clearly beneficial for the community”

**Current challenges**

It has hardly been smooth sailing for NWNP: it also faces a number of challenges It has not been easy to get farmers involved, especially the older ones, due to a lack of understanding of the importance of learning to use computers, a lack of education, and a lack of time and effort to participate in training to increase their ICT competence. Another major challenge is the literacy rate and the lack of online context based on the Nepalese language.

A major challenge is the lack of skilled manpower to maintain and develop the project further. Local youth are trained to become technicians who can solve very basic technical problems, but there is a need for certified engineers. One technician argued:

“We are not using the computers for complex tasks, therefore, we don’t have any problems. But
we will face difficulties if we start using them for more complex tasks... If the computers are out of order, there is no one to fix them. We have just one technician and he is not perfect. He works according to the instructions given by Mahabir Pun by phone. Otherwise, if the problem is bigger, then Mahabir needs to come"

Based on what he has done with the NWNP, Mahabir Pun is well respected at all levels in Nepalese society. This gives him access to the corridors of power, including the ministries in Kathmandu. At the same time, he is also maintaining and managing the whole network, by buying, installing and maintaining the equipment such as servers, which are still located in his private house. A villager commented on Mahabir’s role:

“Mahabir has done this entire thing. He is the one who brings computer and Internet in this village. All the credit goes to him. As long as Mahabir is with us, there is no fear. However, in his absence we are little doubtful”

Another villager had a different perspective:

“In other villages, people from foreign countries and government agencies invest in development project, but in our village there is no spokesperson who can speak on our behalf. There are some clever people here, but they don’t want to stay in this village”

Power shortages, combined with poor infrastructure, hinder the quality of telemedicine services in the villages. With power shortage in most parts of Nepal, and unreliable power supply due to the mountainous terrain, NWNP is dependent on solar power systems. Such systems are expensive and not always reliable during the rainy seasons. Mahabir observed:

“The only constraint to make voice over IP telephone calls to the villages from abroad using the extension number is that they don’t have enough Internet bandwidth from the ISP. People are using Skype and Yahoo! Voice Chat in the morning or evening, when acceptable Internet bandwidth is available”

Small-scale businesses to generate income are initiated and are still in the testing phase. According to the director of the Nepal Telecommunication Authority, the private sector is uninterested in remote locations:

“The major challenge for the private sector is the lack of a business model in remote places. In the liberal economic system, a business model is very important, we have so far not been able to design the correct sustainable business model”

Due to insufficient roads and lack of infrastructure it is difficult for farmers to transport local products to nearby cities. Moreover, the lack of infrastructure also hampers the tourist industry, since it is difficult and time-consuming to transports tourists into the mountain areas. Thus, more tourism and better use of natural resources is inhibited by the lack of roads. Tourism is also hindered by the difficult political situation, where ten years of Maoist insurgency, the massacre of the king’s family, and a fragile government, have yielded an unstable political situation and lack of government support. The political situation challenges NWNP in several ways. For example, despite the allocation of money to facilitate the development of telecom infrastructure in remote areas, the funds have not been used, due to the political instability and delayed bureaucratic processes. A head teacher offered an example of the practical difficulties due to the difficult political situation:

“We sent our computer teacher to Kathmandu for one month of training in hardware. Due to the Nepal Banda [strike] and other political movements, he received just 15 days of training instead of one month”

Epilogue

“That is NWNP in a nutshell”, said Mahabir with his ever present smile, “that is how it happened”. The visitor looked up. He has been listening with rapt attention for two hours as Mahabir described the project that his host was clearly proud of. He also sensed a hint of concern in Mahabir’s voice. “You have done well, Mahabir. NWNP is spreading and the villages are now part of the greater world. Is there anything you are worried about?”
Mahabir looked out of the windows at the snow-capped peaks shimmering in the far horizon. “We have now reached 150 villages and we want to reach more. Can we do it? We have done well in many villages, but there have been others where things have not gone well. You know these villages may look the same, but they are not so. Not all are from one community, some seem to want the things we offer, others not that much. Some of the groups in some villages – you know the mother’s society, the youth society – are more enthusiastic than in other villages. I can’t be everywhere.” He spread his hands.

Then he said, “I want to do so much more. I want our planned multicasting system to work, where the main idea is to provide Math, English, and Science education to students in the remote villages through online and real-time communication. Qualified teachers from the urban schools can lecture online for students in the mountain areas who don’t have such teachers. At the same time, they can ask questions through online chatting or audio systems, through the interactive and real-time learning management system.” He smiled his wan smile and asked, “How can you help us do this”?

References