

# ICT, SOCIAL CAPITAL AND DEVELOPMENT: THE CASE OF A MOUNTAIN REGION IN NEPAL

by

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## ABSTRACT

*While the role of Information and Communication Technology (ICT) in fostering socio-economic development is generally accepted, the process through which this may happen remain unclear. In this paper, we take a social capital perspective and propose that ICT helps to create or strengthen social capital of communities which in turn leads to development. To illustrate our proposition, we conducted a qualitative case study in the Myagdi district in the mountain region of Nepal. We studied the Nepal Wireless Networking Project (NWNP) and examined its role in building social capital, and the consequences of extended social capital on socio-economic development process. Our findings indicate that the project is enabling the villagers to create, maintain, and extend their bonding, bridging, and linking social capital. Subsequently, this social capital assists them in developing and improving their education, healthcare, communication, and generating economic activities. We also identified several challenges such as, over dependency on single actor, high illiteracy rate, poor physical infrastructure, language, and lack of participation that may impede the social capital building process.*

**KEYWORDS:** ICT4D, Social Capital, Socio-Economic Development, Mountain Region, Nepal.

## 1. INTRODUCTION

It is broadly agreed that Information and Communication Technology (ICT)<sup>1</sup> can play an important role in the development of developing countries in general and remote communities in particular (Aitkin, 2009; Akhtar & Gregson, 2001; Chapman & Slaymaker, 2002; Heeks & Kanashiro, 2009; Nair & Prasad, 2002; UNDP, 2001). The reduced cost of installing ICT infrastructure has increased the possibility of technology diffusion in these areas. For example, the ERTIC project in the mountain region of Peru demonstrated that ICT projects can be instrumental in overcoming remoteness and social exclusion problems (Heeks & Kanashiro, 2009). Other projects such as InfoDes, can be helpful in creating social capital in addition to human capital in remote communities (Andrade & Urquhart, 2009).

The social capital perspective, focusing on resources embedded in social networks for mutual benefit of parties within the networks (Putnam, 2000) has occasionally been used as a way to explore the effects of ICT intervention in communities (Urquhart, et al., 2008). Therefore, social capital perspective is a promising lens to explore the relationship between ICT4D projects and socio-economic development process. Yet, this relationship is not clear (Yang, et al., 2009). Every interaction between socio-technical actors has wide ranging and unpredictable outcomes on the structure of the social capital, and consequently, on development process at various levels.

There are studies that independently measured the impact of ICT on social capital or the impact of social capital on ICT using individual or collective level of analysis (Ellison, et al., 2007; Frank, et al., 2004; Shah, et al., 2001; Simpson, 2005). However, these studies are mostly based on quantitative techniques which are helpful in identifying causal relationships, but are relatively weak in rich analysis necessary to build theories explaining complicated phenomena, such as the interaction between ICT and social capital.(Yang, et al., 2009). A qualitative approach is more suitable to understand the influence of local context, and socio-technical interaction process. This is particularly relevant in studies of ICT in development. Social capital in developing countries, for example in mountain regions of Nepal, may be significantly different in form and substance from that in developed countries. The reasons for this differences are prevailing caste structures, nepotism, multiple languages and difficult geographical setting (Bista, 1991). Consequently, the pattern of interactions between ICT and

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<sup>1</sup> Information and communication technology (ICT) is defined in many ways, such as TV, Radio, Mobile Phones, Internet and other digitally stored information(Duncombe, 2006). For the clarity of the research objective, ICT in this paper refers to the wireless Internet services.

social capital and its consequences can be different in developing countries (Yang, et al., 2009).

In this paper, we address this issue. Our specific research question was: *How does ICT create and extend social capital and how does social capital in turn foster socio-economic development?* To examine our research question, we conducted a case study in the Myagdi district in the mountain region of Nepal and explored the role of a specific ICT intervention called the Nepal Wireless Networking Project (NWNP). We found that despite challenges and some negative consequences, the initiative positively influenced development through social capital.

The rest of the paper is organized as follows. Section 2 presents the theoretical foundation of social capital, and related works on ICT and social capital. Section 3 describes the research background, context, and methodology. Section 4 presents and discusses the findings, specifically the role of NWNP in social capital building process; Section 5 illustrates the positive consequences of extended social capital in socio-economic development process. Section 6 highlights challenges that impede social capital building process in the mountain regions. Finally, Section 7 concludes the paper with a discussion of its achievements and future research directions.

## **2. THEORETICAL FOUNDATION**

### **2.1 SOCIAL CAPITAL**

The genus of the concept of social capital can be traced back to the late eighteenth and early nineteenth centuries (Portes, 1998). The idea that involvement and participation in groups can have positive consequences for individuals and communities and as a solution to social instability and self-destruction was raised by scholars such as Tocqueville, Durkheim, Weber, Locke and Marx. The term “social capital” itself was first coined by Hanifan in 1916 (Hyusman & Wulf, 2006). He proposed that it was helpful in building goodwill, fellowship, sympathy, and social interaction among individuals and groups within a social unit. The concept of social capital, therefore, was more focused on positive consequences of sociability while ignoring the less attractive features (Portes, 1998).

Studies of social capital can be categorized into two broad streams based on the level of analysis (Portes, 1998). The first stream, individual social capital studies, focused on individual (human capital) or small groups as unit of analysis (Bourdieu, 1986; Coleman, 1988). It examined benefits accruing to individuals from their relationships with others. The

second stream, collective social capital studies, extended the concept to a community or national level, considering social capital as both individuals' social networks and their moral attitudes, or social norms, which contribute to common good of a community or even a nation (Putnam, 2000; Yang, et al., 2009). Social capital was further categorized into six dimensions; groups and networks, trust and solidarity, collective action and cooperation, information and communication, social cohesion and inclusion, and empowerment and political action (Bank, 2006).

Social capital also has negative consequences, an aspect that has received less attention in the literature. As stated by Portes: "The research literature on social capital strongly emphasizes its positive consequences. Indeed it is our sociological bias to see good things emerging out of sociability; bad things are more commonly associated with behavior of homo economics (economic human). However, same mechanisms appropriable by individuals and groups as social capital can have other, less desirable consequences" (Portes, 1998, pp 15). Negative consequences are related to several issues, such as restrictions imposed on actors who do not belong to network, lacking perception of environmental changes outside the network, negative social dynamics within the network and downward spiraling norms, dependency on central actors and their loyalty towards the network, restrictions on autonomy and individuality resulting from demands for conformity, irrational economic behavior due to the feeling of solidarity towards partners in the network, and irrational economic behavior due to personal aversion (Field, 2003; Hyusman & Wulf, 2004).

## **2.2 FORMS OF SOCIAL CAPITAL**

Social capital has different forms: *bonding*, *bridging*, and *linking* (Healy & Cote, 2001; Putnam, 2000; Woolcook, 2001). As summarized in Table 1, bonding social capital refers to relation amongst homogenous groups such as family members, close friends, ethnic fraternal organizations such as religion based groups. Bridging social capital refers to relation among distant friends, associates and colleagues, as well as institutions such as civil rights movements, and ecumenical religious organizations. Linking social capital refers to relations between individuals and groups in different social strata in a hierarchy where power, social status and wealth are accessed by different groups (Healy & Cote, 2001). The concept of linking social capital is extended to include capacity to leverage resources, ideas and information from formal institutions beyond the community (Woolcook, 2001).

Bonding and bridging social capital have resonance with the ideas of "strong ties" and "weak ties" respectively (Granovetter, 1973). Bonding social capital is good for maintaining existing

relations. However, strong bonding social capital may sometime have adverse impact and serve to exclude and create a context for the growth of reactionary ideology. Bridging social capital is crucial for extending social networks, and it could be an important resource in facilitating mobility. ICT in this context may provide an opportunity to create bridging and linking social capital while at the same time, may help in maintaining existing bonding social capital.

### **2.3 ICT AND SOCIAL CAPITAL**

Despite abundance of research in social capital in fields such as sociology, political science, economics and organization science, the attention from IS scholars has been minimal (Hyusman & Wulf, 2004). This is unfortunate because the interdisciplinary nature of IS research and growth in networks within and between organizations makes research into the relationship between ICT and social capital even more important. Social capital in relation to ICT can be framed at the individual level as connecting and enabling social capital (Yang, et al., 2009), and studies can examine the impacts of ICT on individual's social networks and the possible benefits generated by such networks. At the collective level, research can focus on identifying the role of ICT in social capital building in communities. The study reported in this paper can be categorized as at the collective level and explores how ICT facilitate remote communities to build their social capital.

Research shows that ICT facilitate the building of social capital through increasing flows of information (Adam & Urquhart, 2009). A number of anecdotes indicate that ICT can lead to creation and maintenance of bridging, bonding and linking social capital (DCITA, 2005). This is corroborated by findings from studies that examined the impact of online social networking sites (SNS) on formation and maintenance of social capital (Ellison, et al., 2007). Focusing on both the maintenance of existing social ties and the formation of new connections, they identified a positive relationship between certain kinds of SNS use and the maintenance and creation of social capital. Such studies illustrated the impact of ICT on social capital and vice versa (Frank, et al., 2004; Shah, et al., 2005; Simpson, 2005). Other studies show that ICT promote interactions among community participants that helped to generate and maintain the trust, acceptance, and alignment necessary for successful cooperation (Syrjänen & Kuutti, 2004). A case study on Iranian NGOs found that computer based centers facilitate the building of e-community and extend existing community networking through improved transparency and participation (Rohde, 2004). Our study builds on this stream of research to understand the role of ICT in creating, maintaining, and extending of social capital

in remote communities of a mountainous region in a developing country. Specifically, we studied an ICT initiative, the Nepal Wireless Networking Project (NWNP) in the Myagdi district in Nepal.

**Table 1.** Forms of Social Capital

Forms of Social Capital	Description
Bonding Social Capital	Denotes ties between people in homogenous groups and similar contexts such as immediate family, close friends and neighbors and ethnic fraternal organizations.
Bridging Social Capital	Denotes ties among distant friends and, associates, as well as between institutions such as religious organizations, and civil rights movements.
Linking Social Capital	Denotes ties among unlike people in dissimilar situations, such as those who are entirely outside the community and in different social strata in a hierarchy of power social status and wealth.

### 3. RESEARCH BACKGROUND, CONTEXT AND METHODOLOGY

#### 3.1 NEPAL

Nepal is a landlocked country situated in South Asia, on the southern slopes of the Himalayan mountain range, and lies between two giants India and China (Figure 1). The total area of Nepal is 147,797 sq km. The country is comprised of three main geographical regions, the Tarai (17% of the total) in the south, the central mountain region (64%), and the Himalayan region (19%) in the North. As shown in Figure 1, Nepal is divided into 5 development regions, 14 zones and 75 districts. The village development committee (VDC) is the administrative unit below district. There are around 3914 VDCs all over the Nepal. The lowest administrative division is the ward. There are around 9 wards on average per VDC. The total population of Nepal is around 27 million, about 75% of whom live in rural and remote areas mainly in mountain regions.

A large proportion of the population lives below the poverty line. The literacy rate in Nepali, the national language, is 82% and in English is approximately 18%. Computer ownership per 100 inhabitants is 2.80, and telephone lines per 100 inhabitants are 3.5 (ENRD, 1997). Human

development report 2004 shows that the mountain region has the lowest human development index (HDI) score amongst the three regions and is also the poorest (UNDP, 2004). The social, political, and economic disparities among regions flared up conflicts among different communities and political institutions. Consequently, it eroded the social capital that existed within communities (the binding elements of trust), and severely disrupted indigenous forms of social networks and institutions (the bridging of the elements). Clearly, the mountain region is the most underdeveloped. It was here that the project we studied, NWNP was initiated. It is situated in the Myagdi district of Nepal which is located at an altitude of 2700 meters above sea level as depicted in Figure 2.



**Figure 1.** Map of Nepal

Source: [www.planetware.com](http://www.planetware.com)

### 3.2 NEPAL WIRELESS NETWORKING PROJECT (NWNP)

The Nepal Wireless Networking Project (NWNP) was started in 1997 by educationist and social activist Mahabir Pun (team leader of the project). After completing his Masters degree from US, Pun returned to teach at a village high school located in Nangi in Myagdi district. At that time, villagers had to make two-day trips to the nearest town (Pokhara) to check their e-mail from friends abroad. In 1997, through personal correspondence, Pun succeeded in acquiring four used computers from Australia and began teaching computer classes at the Nangi high school using them. Later, the school received some more donated computers; however, there were no telephone or internet connection in the village.

In 2001, Pun wrote an email to the British Broadcasting Corporation (BBC) asking for ideas to connect this remote village to the outside world through internet. When the BBC published

his email, the response was overwhelming. Within a year, volunteers from Europe and the United States began to help him in setting up a wireless connection between Nangi and other neighboring villages such as Tikot, using TV dish antennas mounted in trees. Gradually, the success story of NWNP spread across the World Wide Web, and his social network started extending across to other parts of the world. Volunteers from several countries started donating computers, parts, Wi-Fi equipments, and perhaps most importantly, their skills to these mountain villages.

Since 2003, this project has been in full-fledged operation. Despite difficult circumstances, such as lack of government support, lack of funding, lack of technical knowledge, and an unstable political system (Nepal was in fact involved in a civil war between the government and the Maoists when the project started), the project succeeded in providing internet service. It uses minimal wireless technology, home-made antennas, and relay stations that had to be hidden in trees. Pun was recognized for his initiative when he received the prestigious Magsaysay Award in 2007. Currently, the NWNP has built networks in around forty villages in Myagdi and other districts, and is partially supported financially by the World Bank and Nepal Telecommunication Authority.

### **3.3 RESEARCH SITE**

The research study was conducted in Nangi and Tikot villages in the Myagdi district, located in western Nepal on the southern flank of the Annapurna and Dhaulagiri ranges of the Himalayas. (Figure 2) We chose Nangi because it was the first Himalayan rural village of Nepal where NWNP provided internet connection. The central office of NWNP Project is the Nangi telecenter which is run by Himanchal Higher Secondary School and it coordinates the whole wireless network which covers the different villages of Myagdi, Parbat and Kaski districts. The center has now started extending its services to several other rural and remote villages of Nepal.

The total population of Nangi and Tikot villages is around 2,000. Villagers from these remote regions have to go to urban areas to procure employment, education, and healthcare services. Tikot is not accessible by road. While Nangi is better connected, it still takes about four hours by jeep or one day's walking to the nearest town of Beni. From Beni, it takes another seven-hour bus ride to reach the capital city of Kathmandu. These two villages are inhabited predominantly by Magar ethnic communities including other minority castes and social groups (Pun, 2006). Most of the villages in mountain regions are scattered in small clusters with average populations of less than one thousand. Before the intervention of ICT through

NWNP, and because of the geo-political exclusion, their social network was limited to strong ties or bonding social capital within their own homogeneous group. Most of the decisions were taken by the communities themselves in the presence of VDC chairpersons.

The inhabitants in these villages still practice shamanistic rituals and shamans are respected as traditional doctors and healers. Medical clinics have only recently been set up. Most of the villagers are farmers growing mainly potatoes and other agricultural products. Young men from these villages prefer to join military service either in India or UK, mainly because a high level of education is not a requirement for enrolling. The main source of revenue for the villagers is not surprisingly remittances of salary from military service, and whatever is earned from selling agricultural and dairy products.



Source: Google map

Source: Picture taken during field visit

Figure 2. Geographical landscape of Nangi village

### 3.4 DATA COLLECTION

We collected the research data through interviews, notes taking, observations, archival records, physical artifacts, and documents. To obtain primary data, 40 respondents were interviewed from the two communities of Nangi and Tikot. Using the snowball technique, we selected the interviewees from different village development committees (VDCs), IT vendors, policy makers, private investors, and donor agencies. The interviews were mainly semi-structured, lasted between 15 and 55 minutes, and were tape-recorded. To obtain the collective views, we conducted focus group interviews of school children, teachers, and local users and non-users. We also observed ICT usage at schools, telecenters, and village telemedicine clinics. In addition, we gathered supplementary data from different relevant Internet sites, through informal discussions, email exchange, social networking sites, and

different websites of ICT4D projects. We also conducted a workshop on ICT4D in Kathmandu which was attended by various actors involved in NWNP including Mahabir Pun.

### 3.5 DATA ANALYSIS

All the interviews were transcribed. We then used nVivo tool to summarize, code and categorize the data in accordance with the social capital perspectives. To check the reliability and validity of interviews and interpretation, we held regular discussions with other researchers and practitioners throughout the project. One of the researchers was from a remote community of Nepal, and his knowledge and experience as an insider helped with understanding the reality of the research context.

To insure rigor, we evaluated the research process using the set of principles provided by (Klein & Myers, 1999). For example, we used the Hermeneutic circle to map the codes to the theoretical concepts, such as bonding, bridging, and linking social capitals. Next, we followed an iterative analysis process to connect codes with categories and sub-categories of social capital. It is important to emphasize that we used the theoretical concepts to get a richer understanding of the process as a sensitizing device rather than testing or falsifying hypotheses. The social capital perspective thus served as *a priori* guideline for collecting and analyzing data (Walsham, 1995).

### 4. FINDINGS

The wireless project provided an opportunity to the remote communities in Nangi and Tikot to extend their social network. At present, villagers are using the internet for communication purposes. People from the villages who are working abroad are using e-mails to communicate with their families back home. Students and teachers are offered web mail accounts through the project, while others are using free web mail accounts such as Yahoo and Gmail. There is a bulletin board for local news, local advertisements, announcements, and urgent messages. One of the respondents, a school principal said:

*It [NWNP] has increased the dimension of communication. For non-students, the communication patterns have been somewhat changed, for example, by providing faster communication opportunities. But 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.*

Social capital extends the network and relationships amongst groups and individuals based on trust, reciprocity, and exchanges (Portes, 1998; Woolcock & Narayan, 2000). In the following sections, we describe the role of the wireless project in the creation, maintenance and extension of social capital, specifically, bonding, bridging, and linking social capital.

#### **4.1 BONDING SOCIAL CAPITAL**

As defined in Section 2.2, bonding social capital refers to connections within a homogeneous group whose members share some demographic characteristics such as family, kinship or ethnicity. The majority of the inhabitants of Nangi and Tikot villages belongs to the same ethnicity, namely Magar and thus possessed high bonding social capital to begin with. However, they were not able to interact with their relatives and friends who did not live in the immediate vicinity. With the use of the wireless network, Nangi and Tikot village people are able to maintain their bonding social capital. The villagers can now connect with their relatives through email, chat and other social networking sites. Students from high schools are using the network to write e-mails to each other and to their pen-pals abroad. In the past, the villagers used to send letters through post office that used to take months. Now they can communicate in real time no matter where they are located. A village activist explained:

*Regarding the social impact, we are not in a position to say that it has a solid role in development; however, the perspective of the village people regarding the computer and its usage is changing. They are at least using email and chat for sending and receiving message to/from their relatives in foreign countries.*

#### **4.2 BRIDGING SOCIAL CAPITAL**

As defined earlier in Section 2.2, bridging social capital refers to relationship among distant groups. The wireless project has enabled Nangi and Tikot villages to connect with forty other villages which have brought together people across diverse social divisions. The project has also facilitated the creation of the bridging level of relationships among various informal and formal institutions which have different functions and are located in different places. For instance, the NWNP is working with Open Learning Exchange (OLE) Nepal, an NGO based in the US and Kathmandu, as a partner to develop educational contents for the school children. The contents are based on the government curriculum from grade one through ten. In addition, the NWNP is in the testing phase of using the network for online-based learning. The objective is to provide further education for youngsters living in the villages. To meet the challenge of bringing specialist doctors into the mountain region, the NWNP has initiated telemedicine services in some villages of Myagdi. Every morning, the women who are

responsible for health care services in the villages consult doctors from main hospitals using videoconferencing services, to discuss patients, common diseases or to learn from doctors and health care workers from other communities.

Extended bridging capital can be helpful to generate employment opportunities in the villages. For example, NWNP has developed an eCommerce platform in collaboration with an engineering college in Pokhara, the nearest large urban center. In addition, it is planning to start a remittance service because many from these remote communities go to work abroad. Moreover, virtual ATM machine services are being piloted in Ghore Pani (a famous trekking route for tourists), which will be further distributed to other tourist areas. The initial success of NWNP helped these remote communities to create a link between VDCs and local government institutions to replicate similar projects.

#### **4.3 LINKING SOCIAL CAPITAL**

Linking social capital pertains to vertical connections to formal institutions mainly at a higher level of hierarchy (Woolcook, 2001). In the context of Nepal, this implies connections with people in powerful and influential positions, whether political or financial. The wireless project not only facilitated relationship between the Nangi and Tikot villagers and local governments, but also assisted in building relationship between these villages and central government. These relationships were also at broader scales for macro level development. Pun successfully lobbied parliament to de-license wireless technology and remove high customs levies on equipment, in order to facilitate its adoption throughout the country. NWNP is helping to develop websites of different mountain villages for e-governance program (Pun, 2009), which may help to extend the linking social capital between community people and central government.

Before the initiation of this project, these mountain villages were almost unknown to the outer world. However, with its extension to several other mountain villages and coverage through different media, such as World Wide Web, radio, magazines, and TV, large number of volunteers, consultants and researchers from all around the world are flocking to these villages. NWNP is currently working on creating a research hub between Japanese, European, Indian, and US Universities and research institutions (ENRD, 1997).

#### **5. LINKING ICT, SOCIO-ECONOMIC DEVELOPMENT AND SOCIAL CAPITAL**

In the previous section, we described how the ICT initiative, the NWNP, facilitated the community people in creating, maintaining and extending their bonding, bridging and linking social capitals. The question remains though about how social capital in turn fosters socio-

economic development. One possible link is through social capital's role in developing human capital (Coleman, 1988). It can also be an instrument to access resources embedded in the relational social structure (Bourdieu, 1986). Studies show that social capital leads to civic engagement, better healthcare, and educational improvement (Putnam, 2000). It is further argued that social capital as trust among different institutions and citizens likely leads to economic development (Woolcock & Narayan, 2000). The essence of social capital lies in its ability to secure benefits by virtue of membership in networks and other social structures (Portes, 1998).

The wireless project provided a platform for villagers to use internet services, such as VoIP and social networking sites to build new networks and relationships and extend and strengthen existing ones. This increase in their social capital has possible implications in the socio-economic development process. Table 2 summarizes this link. The citations in the table refer to the sources in the literature that link these processes to development.

**Table 2.** Social Capital and Socio-Economic Development Process

<b>Social Capital</b>	<b>Socio-Economic Development Process</b>
Bonding	<ul style="list-style-type: none"> <li>- Return migration from urban to rural (Ma, 2002)</li> <li>- Resource sharing within community people(Lin, 1999)</li> <li>- Maintaining trust within community people(Putnam, 2000)</li> <li>- Increasing flow of social and financial remittances(Levitt, 1998)</li> <li>- Job searching(Lin, 1999)</li> <li>- Building human capital(Bourdieu, 1986; Coleman, 1988)</li> </ul>
Bridging	<ul style="list-style-type: none"> <li>- Better healthcare services with telemedicine</li> <li>- Sharing education material with other schools within Nepal</li> <li>- Creating economic opportunities, such as small scale industries</li> <li>- Resource sharing between distant community people(Granovetter, 1973)</li> </ul>
Linking	<ul style="list-style-type: none"> <li>- Sharing educational material with international schools</li> <li>- Accessing better healthcare services through telelink to developed countries</li> <li>- Linking local level community with national level government using eGovernance services(Woolcock &amp; Narayan, 2000)</li> <li>- Facilitating technical information flows (Barr, 2000), research collaboration with national and international institutions</li> <li>- Providing platform for ecoTourism businesses</li> </ul>

As we can see from the table, ICT provided the platform to maintain bonding social capital and created a trust between and within the members of the communities. They can share information about their cultural and other activities online. Through extended bridging social capital, village people can enjoy better education and health care facilities. The villagers also started small scale industries like Nepali paper production. The extending of bridging social capital to marketers in Australia resulted in these Nepali paper products being sold in Australia. The linking social capital with different government agencies, tourism sectors and international research institutions has the potential to bring international standard education to these remote villages, which in turns facilitate in building human capital, provide healthcare services and business, and research collaboration opportunities.

In the following sections, we discuss some specific areas to illustrate the link between ICT, and socio-economic development process from the perspective of social capital.

### **5.1 EDUCATION**

Creating and extending bridging social capital enabled school children in the area to search and share information from where other resources were available. Teachers and students are getting access to some educational materials on the intranet. During our focus group interviews some children described their use of the Internet:

*It helps us in our study because to understand the history only course book is not enough, therefore, we can download other information to know more. It's helping us in getting external and study related information.*

Because of extended social networks, school children are motivated towards learning and teachers are motivated towards teaching. The project has facilitated the building of social capital between schools. It developed local manpower, such as IT teachers, clinic health workers, and network technicians. They are not only providing training to their local people but also to other localities in that region.

### **5.2 HEALTHCARE**

NWNP has set up a telemedicine center between Nangi, Ramche, and Tikot villages. Now, the health workers of these villages can communicate with a medical doctor in the urban center of Pokhara for medical assistance. The village health workers facilitate communication between the doctor and the patient and provide the medicine prescribed by the doctor. A health worker in Nangi telemedicine center 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.*

Team leader of NWNP project described the importance of ICT in creating bridging and linking social capital, especially between remote and urban hospitals, in the following words:

*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.*

Health workers from the Nangi and Tikot villages asserted that telemedicine assists in the development of trust, an important element of social capital, among village people due to the virtual presence of doctors. A doctor associated with this project said:

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

### **5.3 ECONOMIC OPPORTUNITIES**

The extension of social networks created economic opportunities for the villagers. One example is the cross-breeding project between yak and cow initiated by villagers at Nangi. The project is located at a remote site which is 800 meters above the village. Through internet applications such as NetMeeting, members of the management committee of the project can communicate with each other when making decisions. The wireless project has also initiated income generating activities, though these are still in a test phase. One example is the virtual marketplace called Haat Bazaar where villagers can advertise their local products, such as cows, goats and chicken for sale. The team leader of NWNP project told us:

*They can use it for advertisement; now in our village because of this internet we can promote local products, such as Doko, Namlo, Nepali paper, mushrooms, and cattle. If they want to sell their product then they can use our services like Haat Bazaar on the net. They can contact the internet operator where we have installed internet services, and put up the information from there. So that other people can see on the net and buy that product.*

He also indicated that new services are being planned:

*...remittance services, which are going to be started soon in this village. Because of this [remittance] friends in the foreign country can send their money easily. This is also a benefit to the community.*

The youth in the villages are getting employment in the project. They are enhancing their knowledge and skill through the use of ICT. During our interview one of the technicians said:

*Mahabir sir taught us at the beginning, such as checking radio, operating computers. And then using by myself I learned it through experience.*

For long term sustainability, financial capital plays a vital role. The NWNP is also planning to start eBusiness services (a means of building linking social capital) such as eco-tourism, and ATM virtual machines. Team leader of the project said:

*To make this technology sustainable, we need to introduce ecommerce, so that we can get some economic sustainability.*

## **6. CHALLENGES AND NEGATIVE CONSEQUENCES**

The NWNP has enabled the villagers of Nangi and Tikot to build and strengthen their social network; however, there are a number of challenges that needs to be addressed. These challenges can create obstacles in social capital formation process; consequently, the benefits of ICT4D projects in the remote communities may not be realized. The Director of Nepal Telecom Authority described these challenges as follows:

*Rural means no affordability, lower literacy rate, everything is not good, below average, and poverty incidence is high in rural areas. So all this factors, moreover, the supporting infrastructure such as, electricity, road network, and other supporting infrastructure are not developed in the rural areas.*

Below, we briefly elaborate on these challenges.

### **6.1. ILLITERACY, LANGUAGE, AND LACK OF PARTICIPATION**

Our study shows that the main challenges in social capital formation are language and lack of participation from elder generation. For example, the majority of the villagers are using ICT services for communicating with their relatives or friends. While it may be helpful to maintain the bonding social capital, they need to extend their social network for macro level socio-economic development (Granovetter, 1973; Woolcock & Narayan, 2000; Woolcock, 2001). As mentioned earlier, only 18% of the educated population in Nepal is literate in English and the figure is much lower in the mountain region. As a consequence, the majority of the people in Nangi and Tikot villages are less familiar with English-oriented ICT services. However NWNP has initiated several networking projects focusing on developing online context based on the Nepalese language.

The participation of the community people is also important for creating social capital. The participation of farmers (the majority of people living in these villages) is still a challenge due to their lack of education, high illiteracy rate, and lack of time to participate in training to increase their ICT competence. The VDC chairman of Nangi village, who learned to use computers and the Internet, explains:

*In this village, around 50% are retired personnel from the UK's or India's armies. I told them this is an Internet age; we used to send letters using the post office but now, because of the Internet and telecommunication, we can send information to different places easily. Therefore, I asked village elders to come and take computer education, but still, they are not able to understand it.*

## **6.2 POOR INFRASTRUCTURE**

Power shortage and poor existing infrastructure are general challenges for the mountain regions. The country is currently facing twelve hours of power cut. Solar power is expensive and season dependent, for instance, it is useless during the rainy season. Poor infrastructure may impede the smooth flow of information and communication that may erode social capital in the long run. For example, lack of sophisticated devices has hampered the quality of telemedicine services in Nangi and Tikot villages. Team leader of NWNP told us that to generate local content and promote it to outside market broader Internet bandwidth is needed which is not available in mountain regions:

*The only constraint to make VoIP telephone call 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, Yahoo Voice Chatting in the morning or evening because during that time Internet bandwidth is available.*

The poor physical infrastructure in these villages also hindered health workers in using their full capability in the telemedicine project. One of our respondents told us:

*When I went to Kathmandu Model hospital last time for training, there I could use lot of lab facilities, but it is not available here. Because it requires lot of equipment, therefore, I am not able to use my learning in full.*

## **6.3 POLITICAL INSTABILITY**

Nepal's social capital is depleting due to political instability and lack of government intervention policies (UNDP, 2004). Ten years of Maoist insurgency, massacre of the former King's family, and a succession of fragile governments are some of the reasons for this. Decades of political instability in Nepal has hampered the overall socio-economic growth. There is a lack of government support for community based ICT4D projects such as NWNP. During our interview one villager from Tikot complained:

*District education office is not helping us directly, but education ministry provide them around 40-50 thousand for the internet provision to the schools. They sometimes offer us a program to provide equal amount of money from the community and from the district education office... but that small amount is not enough to contribute to the big change.*

#### 6.4 DEPENDENCY ON CENTRAL ACTOR

Mahabir Pun initiated the project from his uncle's house. The project was illegal at that time, and had to be located in mountain areas dominated by the Maoists. Pun's importance cannot be overestimated, and based on what he has done with the NWNP he is currently well-respected at all levels in Nepalese society. This gives him access to all offices, including ministries in the capital, Kathmandu. Thus, his network is of critical importance. However, this is also a double-edged sword. As Portes (1998) pointed out, over dependency on a central actor can be a negative consequences of social capital. The project would not exist without him, but it will also fail if he can no longer manage it. Therefore, the project may face the challenge in making the transition from its initial phase where the champion is of critical importance, to a more mature phase where it is less dependent on one (or few) contributor(s). In the case of Tikot village, the one man dependency effects technical support as well. One of the teaching staff in Tikot School told us:

*If the computers get out of order, then there is no one to give support. We have just one Tek (technician), he is also not perfect. He does according to the instructions given by Mahabir on phone. Otherwise, if the problem gets bigger than he [Mahabir] needs to come.*

Another teacher expressed his worries thus:

*It was not possible without him; still I didn't find any other person who came here to work like Mahabir. For example, there are many people who came from foreign countries to observe the project, but there were no one who says that I will work with Mahabir. Therefore, until Mahabir is here, it will function properly, however in his absence, we need another person like him for the sustainability of this project. Therefore, in his absence this project may not function properly, I am bit worried about it.*

Although NWNP has the support of community members, they are still over dependent on team leader for funding, planning, and action. A villager from Nangi expressed his concerns thus:

*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.*

#### 7. DISCUSSION

Before proceeding on to a discussion on the research and practical implications of our findings, we point out the limitations of the study. Our data was collected from two remote mountain villages in Nepal and is thus highly context dependent. That limits the extent to

which our findings are generalizable. The time frame of the study also raises the possibility that we may not have captured the effects at the “right” time. Such projects may require a longer period to have a more sustained influence. The researched communities were composed of homogeneous groups; result could have been different in other multi ethnic communities. Difficult geographical location, and low literacy rates were other obstacles in collecting data. Our findings should thus be interpreted in the light of these limitations.

Overall, NWNP has created a positive wave in Nangi and Tikot villages. The expansion of the network from what initially covered just two villages to currently more than forty is in itself an indication of success. Despite some challenges and negative consequences, the project has been sustainable and is an important example of a relatively successful ICT4D project in remote areas in a country such as Nepal which is rarely (if ever) discussed in the literature. Supportive government policies, infrastructure development, and public-private partnerships may support the replication of the NWNP experience across other mountain villages in Nepal, which in turn may inspire similar initiatives in other developing countries.

Theoretically, our research interest was exploring the link between an ICT intervention in a developing country and socio-economic development. We proposed that ICT helps in developing and extending social capital which in turn lead to development. At least in the context of a remote mountainous region, we found support for our proposition. The wireless project led to strengthening of bonding, bridging and linking social capital. It opened up prospects in education, healthcare, communication, and ecommerce despite barriers such as, high illiteracy rate, poor infrastructure, language barrier and lack of participation.

It is tempting to suggest practical implications based on our findings. The obvious one is that ICT initiatives should focus on facilitating bindings within communities (to enhance bonding social capital), between communities (to extend bridging social capital) and with higher levels (to create linking social capital). At the same time, it is vital to not be overly dependent on a central actor or on a small group. Paradoxically, projects such as NWNP succeed in remote regions precisely because of the activist roles of central actors like Pun.

Yet questions remain. The social capital perspective does not tell us how the capital building process happens. Who are the central actors? How do they go about building the social networks? Further research is needed. One possible theoretical lens to examine these issues is Actor-Network Theory which can help explain who the main actors are and how members are enrolled in the networks. However, that raises even more questions. Why do the actors act the way they do? What motivates or drives them? Theories such as Stakeholders or Genres of communication can be useful to examine these issues. These are avenues for future research.

Ultimately though, we may have to accept the very plausible outcome that research may only be able to partially answer the question of how exactly an ICT intervention can lead to development. As one of our respondents in Nangi village said:

*“The Internet cannot help us with plowing, sowing, and harvesting. But by using the Internet, we can engage in a lot of other educational and financial development, I believe.”*

The encouraging part was that he was enthusiastic!

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