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The internet and social capital: conceptualising openness for
development in remote and rural areas in least developed
economies

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ABSTRACT

This paper offers a conceptual analysis of what we describe as two aspects of openness: *extended feed-back* and *absorptive capacity*. These concepts are discussed in the context of their applicability for extending debate about ICT4D and identifying some evaluation indicators. *Extended feed-back* is defined as the capacity of national agencies, responsible for development, to learn and share learning about the practices, ideas and information demands of people accessing internet technologies for which they are responsible. This allows for a greater spill-over of knowledge across the national innovation system (NIS). *Absorptive capacity* is defined as the capacity of users to access and share information and to communicate with national institutions and structures about their use and interpretation of ICT based information. Essentially the concepts refer to social action through horizontal and vertical social networks. Using these two concepts we seek to theorise about how ICT can potentially enhance social capital and development in Mozambique and Nepal.

Our proposition is that the capacity of ICT networks to promote social capital depends on whether there is extended feed-back at the institutional level; and whether there is the potential for broader information absorption at *both* local and central levels. The paper concludes by identifying some potential indicators for monitoring and evaluating the impact of ICT using these concepts at the centralised agency level and social networks in rural areas.

The internet and social capital: conceptualising openness for development in remote and rural areas in least developed economies

Introduction

There is evidence of considerable variation in the way ICT is becoming socially embedded in different countries (Warschauer, 2003 and Wilson, 2004). The development, application and diffusion of these ‘enabling’ technologies are important features in contemporary national innovation systems (NIS) because they carry the capacity for a flow of information within and between institutions and social structures that comprise the system (Lundvall, 1992). Considering the role of ICT from an NIS perspective is important for policy because once defined the system provides a framework through which governments can seek to evaluate and influence the innovation process (Metcalf, 1995).

A national innovation system refers to the set of institutions and their interactions that contribute to the production, diffusion and use of new, and economically useful, knowledge (Freeman, 1987 and Nelson, 1993). Most of the NIS literature has focused on systems in industrially developed economies (OECD, 1997) but a key question for developing economies is whether ICT offers enabling opportunities for development among remote and rural communities as well as in urban contexts. The problem of marginalisation is compounded in countries where there are weak flows of information between local communities, policy makers, and agencies responsible for transferring information, knowledge and skills.

Applying ICT for development is fundamentally a social process whereby electronic technologies are differentially institutionalised and applied in particular social settings, with very diverse effects. Structures, institutions, politics and policies provide the focus for analysis and key individuals are the drivers of structural change (see for example Wilson, 2004). Warschauer (2003) argues that the problem of the digital divide is not technological but an issue of how to mobilise resources to enable ICT to contribute to making social structures more democratic, equitable and socially inclusive.

The starting point for a progressive consideration of ICT in any institution should not be the digital divide and how to overcome it but rather the broad social structures and functions of the institutions and how ICT might be used to help make them more democratic, equitable, and socially inclusive. (Warschauer, 2003, p.209)

An interesting and so far promising perspective on the development of inclusive structures has been developed by Smith *et al.* (2008). The crux of their argument is that the benefits of ICT for development can best be realised when the technology is introduced, adapted, utilised or disseminated through ‘open processes’ (Smith *et al.*, 11). Openness, they argue, can spur development but there is a need to build this capacity in a way that overcomes information and knowledge disadvantages for people in remote communities while at the same time delivering capacity to access and *use* new information (Heeks, 2008).

In this paper, drawing on our work in Sub Saharan Africa and Nepal, we conceptualise two aspects of openness: *extended feed-back* and *absorptive capacity*. In Mozambique regional

Reflection Groups connected via ICT networks were established to generate a flow of ideas within rural communities (horizontally) and (vertically) between rural communities and government agencies responsible for directing policy investments in science and innovation (Turpin and Martinez, 2006). They were intended to generate a flow of knowledge and information on key development topics (such as biotechnology for agricultural development) from policy makers for discussion in local areas (MESCT, 2003). This communication model, in principle, allowed for what we call *extended feed-back*. A limiting factor in the Mozambique case, however, was the minimal capacity *absorptive capacity*, at both central and rural locations to share in the learning process. Similarly, there was only limited capacity at the local level to utilise and more importantly disseminate innovative ideas or practices. In short, there were inherent openness limitations, both centrally and locally.

Following these observations we are investigating these conceptual ideas further through the implementation and uptake of tele-centers in Nepal. There have been contradictory outcomes regarding the impact of tele-centers in rural economies (Rajalekshmi, 2008, Soriano, 2007). Our proposition is that the capacity of tele-centers to bridge the gap between centralised/institutionalised knowledge and information and rural development and depends on an effective flow of information, on the one hand horizontally between social groups in rural areas and between institutions in the national innovation system, and on the other hand vertically between social groups and those institutions.

Our paper explores some of the dynamics underlying these factors and puts forward some potential indicators for monitoring progress through ICT for development. The first part of the paper discusses the role of ICT for development in the context of a national innovation system. The second part of the paper, drawing on recent experiences from Sub-Saharan Africa and Nepal, develops the argument that extended feed-back and absorptive capacity are essential features for enhancing development through ICT. Achieving this outcome, however, requires careful planning and implementation. Central to this is the need for appropriate methods and indicators for monitoring and evaluation. The purpose of the paper is to further develop the concept of openness drawing on these two national experiences and offer some potential indicators for monitoring and evaluating openness: at the centralised agency level; and at the level of ICT network users.

ICT in the context of a national innovation system.

A well functioning national innovation systems essentially requires mechanisms to promote the flow of knowledge and structures that promote learning (Patel and Pavitt, 1994;). While substantial work has been undertaken to develop indicators for innovation inputs and outputs (OECD, 1997) robust measures for the distribution of knowledge and flows of knowledge have proved elusive:

... there is a lack of data and information regarding this type of innovative activity. Conventional indicators (such as R&D expenditures, patents, production and trade in high-technology products) are significantly more robust but are able to draw only a rough picture of knowledge flows in the innovative process (OECD, 1997:42).

Moreover, there is a need to identify both positive and negative consequences from the process. A national innovation system generates economic capital but through

globalisation it also generates social capital by conveying ideas and culture (Fukuyama, 1999). Thus for rural communities integration with the NIS and consequently globalisation, there is the potential to undermine long standing norms and traditions, So as Fukuyama has warned, the issue for many societies is whether they are net losers or gainers from the process.

...that is, whether globalization breaks down traditional cultural communities without leaving anything positive in its wake, or rather, is an external shock that breaks apart dysfunctional traditions and social groups and becomes the entering wedge for modernity (Fukuyama, 1999).

Connecting rural societies to the NIS, can at best lead to positive changes in the nature of social capital, new norms and traditions and systems of production. At worst it can lead to a loss of social capital, leaving little in the way of 'new solidarities' to bind communities together as part of a national innovation system .

ICT investment in general and increased use of the internet is argued to have had a major impact over the last fifteen years on global economic development. For example, the internet by reducing costs and improving market efficiency, has changed market structures and affected the mark-up margins of firms thereby influencing relation between costs and output prices. The diffusion of the internet as a cost saving technology is introduced in a model with network effects and dynamic market structures. (Meijers, 2005). Many analyses support the view that ICT does contribute to economic growth. However, this is not necessarily the case in developing countries. Nor is it necessarily the case for rural communities.

In 2001 Castells drew attention to the unequal pattern of development emerging through the 'information revolution' and since Castells assessment in 2001 many developing countries have fallen further behind in terms of building knowledge based economies. According to the World Bank's Knowledge Economy Index most of the world's least developed countries (LDCs) have since 1995 slipped further behind the rest of the world in their capacity for 'knowledge to be used effectively for economic development' (World Bank, Knowledge for Development, 2009). Moreover, in spite of the global growth in ICT two countries discussed in this paper (Mozambique and Nepal) continue to lag well behind the rest of the world in terms of access to and use of ICT as well as knowledge development.¹

As Wilson (2004) points out, what complicates things for governments in the south is that the 'divide' is as great *within* their societies as it is between them and the north. Policies for overcoming the 'exclusionary' nature of IT diffusion are thus urgently required for the sake of these countries' long-term social and economic sustainability. Institutional change is required to improve the capacity of rural networks to link them systematically, through ICT, to the core institutions in a national innovation system.

A well functioning national innovation system assumes a set of institutions *and* their symbiotic interactions in the production, diffusion and application of new knowledge, ideas for production and services (OECD,1997). While ICT has shown potential for some

¹ The World Bank's K4D program measures ICT according to: telephones per 1000 people; computers per 1000 people; and internet users per 10,000 people.

interaction between rural and urban institutional structures (Brower, 2010) the conditions for achieving this are limited because rural social networks are only weakly linked to the major institutions in their NIS and their relationships are far from symbiotic.

ICT for Rural Development

International development programs directed toward least developed countries have often underemphasized the unique role that indigenous knowledge can play in introducing, adapting and exploiting new technologies. One of the most interesting aspects of Wilson's analysis is his documentation of the local nature of the IT revolution and the importance of specific individuals and cultures of knowledge in steering the national response. Wilson puts forward a Strategic Restructuring (SRS) perspective to explain how the information revolution has produced different outcomes in different societies. In contrast to a more technology determinist perspective that tends to assume supply and access to more phones or computers will reduce inequality he portrays the information revolution as being institutionally as well as technologically driven.

Chapman and Slaymaker (2002) focused on strategic application of emerging ICT to address the challenges faced by rural areas in developing countries, particularly new solutions provided by ICT to rural development problems. Their analysis suggests that ICT has the potential to address unequal distribution of technical knowledge and overcome information barriers to rural development. The study found that many development agencies underestimate the flexibility of current technologies to accommodate specific developing country problems and failed to effectively mainstream strategies to harness the potentials of ICT for rural development

Hudson (2006) tried to analyse the potential of ICT in rural areas to foster a wave of regional development. This study examined strategies and techniques for affordable access to internet and to share the information. Her rather optimistic findings suggested new developments in telecommunication had the potential to set a new standard for the life of rural people in areas such as education and health and suggested further research on how ICT investment in could return improved social outcomes among low-income people in rural areas (Hudson, 2006). However, these issue are rarely discussed in the context of a national innovation system. Yet, importantly, there is inherent potential for ICT to integrate rural traditions, knowledge and life styles into such a system providing the mechanisms for delivery and access asufficiently open to accommodate quite different forms of social capital. In short they need to be delivered in a way that offer 'bridging' social capital (Anheier and Kendall, 2002).²

These perspectives are consistent with the idea of openness (Open ICT4D) as formulated by Smith *et al.* (2008), where openness is conceptualised as a way of 'organising social activities. In particular the concept is concerned with the way 'access', 'participation' and

² Bridging social capital has been defined as shared traditions and norms and ways of operating through a layer of 'thin trust' that extends to networks of individuals and organizations otherwise removed by distance or traditions. This is in contrast contrast to 'bonding' social capital that as localized and generally shared among the same or adjacent communities,. Bonding social capital has he potential to increase the difference between groups, whereas bridging social capital has the tendency to integrate groups into a broader system (see Anheier and Kendall 2002).

'collaboration' are organised. Critical questions for analysis and assessment that follow include 'who produces the good; who owns the good; and, who can access and use the good? This brings into sharper focus the network of social relations that exist (and persist) at each end of the flow of knowledge through ICT rather than the technology that carries the message or the content of the message itself. Thus, the social organisation and institutional arrangements in place among senders and among receivers as well as between senders and receivers are important determinants of Open ICT4D.

ICT Openness and Development: *extended feed-back* and *absorptive capacity*

Extended feed-back

In order to explore these social processes in more depth we have put forward the concepts of *extended feed-back* and absorptive capacity. Our proposition is that in using ICT for development extended feed-back is necessary in order to enable learning to occur at an institutional level among national agencies concerned with national development strategies. This need is particularly acute in rural areas. For example, experiences in promoting grass roots innovation have shown that many agricultural problems are solved not just from public investments in R&D through public research institutions but through interaction they have with practitioners on the periphery (Lakhani et al., 2007). Jain (2003) has documented the way that grass roots innovations can be developed in marginalised areas of India creating what he calls a 'digital provide', rather than a digital divide'. To illustrate his point he refers to the *Honey Bee Network* that has provided an institutional structure for linking existing technologies to village based production processes. He contrasts this approach with the dominant policy response that seeks to reduce the digital divide simply by expanding ICT infrastructure (Jain 2003). In short this suggests an approach to bring rural social networks more centrally into a national system of innovation.

From a development perspective there are two important elements of openness: first is the capacity for agencies communicating with communities on the periphery to learn from the information flow as well as to deliver information. The second is to interact with and share their learning with, and learn collectively with, agencies responsible for different development strategy components. Such agencies are likely to include those responsible for agriculture, health, education, financial institutions and rural development. In both cases this is an issue of bridging *social capital* through expanded networks and potentially the flow of economic capital. As Bourdieu, 1986: 8) has noted:

[S]ocial capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition – or in other words, to membership in a group ... The volume of the social capital ... depends on the size of the network of connections he (sic) can effectively mobilize and of the volume of the capital (economic, cultural or symbolic).

Bourdieu in 1986 probably underestimated the role of virtual networks in forming institutionalised relationships. The pervasive nature of the internet to perform this role leads us to extend his notion of social capital into this domain. Consequently the value of networks created through the internet become just as important as the information

conveyed. The extended networks, at least potentially, can serve to bridge social capital vertically between discrete groups in the innovation system (Narayan and Pritchett, 1999).

More recently, Lundvall has argued that social capital is a critical precondition for the development of a learning society, and consequently, innovation and growth (Lundvall, 2002, 99-101). As we argue later in this paper, open ICT has the potential to enhance social relationships, bridge regionally based social capital and national innovation system structures and consequently serve as a spur for development. Extended feed-back and absorptive capacity in the delivery of and access to ICT are important components of this enabling process.

Absorptive capacity

Among rural communities there are social limits as to who can access the internet and when. There are very practical limiting factors such as distance from the nearest telecenter or computer access point. There are limits to the amount of time that is available during periods of pressing work commitments. There are educational and literacy limits, prevailing gender, class or caste inequalities or simply lack of familiarity with the sorts of information that might be accessed or used. In short, there are limitations to the extent that information can be *absorped* into a network. Cohen and Levinthal (1990), established the idea of absorptive capacity as the ability to integrate externally developed technology or ideas. Some researchers have linked the concept to the prospect of open innovation (Arora et al., 2001; see also Wim et al, 2007. These authors used the concept with respect to firms' capacity to assimilate and replicate new knowledge. We apply it here to describe the capacity of social networks and institutions to access, absorb, share and make use of new knowledge. Conceptualising absorptive capacity in this way leads to a focus on the structures in place and the social limitations to the sharing of information. Moreover, it draws attention to the enabling or limiting structures concerning the ways locally based ideas, questions and propositions be shared, discussed and conveyed to the agencies responsible for delivering information.

An example of absorptive capacity is the case of the Honey Bee Network that has established 'information kiosks' in villages around the cooperative sugar factory in Warana, a poor region in the comparatively rich state of Maharashtra. ICT was brought to the area by the Warana 'Wired Village project', to 70 villages around Warana. This was achieved by establishing a series of 70 'Village Kiosks' each with a PC and printer connected to the sugar factory providing business, farming and educational information as well as receiving and making payments (Jain, 2003). The initiative has since expanded enabling village based farmers to connect to the internet independently to access a broader range of information about their harvesting and fertilizer costs. Jain argues that while many such successful initiatives contributing to a digital provide the more successful cases are those where information is shared horizontally among information 'user groups. Similarly, Smith et al have drawn attention to the so called 'green road' to sharing scientific information that:

...encourages researchers and academics to make digital pre-print or post-print copies of their research work or publication available in open access repositories or archives (Smith et al, 24).

In essence this approach facilitates absorptive capacity through the wider network of information users. In the following section we offer examples from our work in Mozambique to illustrate how these concepts (extended feed-back and absorptive capacity) might be applied to reveal strengths or weakness in the way open ICT might enhance development outcomes. Information flows and bridging social capital can thus be delivered across a national innovation system both vertically, between agencies and communities, and horizontally, between agencies and within communities (Dolfsma and Dannreuther 2003).

Linking the rural poor to central information networks

ICT for open science policy in Mozambique

Mozambique has had one of the lowest rates of per capita GDP, the most precarious school enrolment rate, and one of the lowest life expectancy levels in Southern Africa. Social and economic indices combine to present enormous challenges for the country. At the close of the twentieth century, there was no strategy for S&T development or an agency with specific authority for developing a coordinated plan for promoting a national innovation system. At that time science, technology and innovation in Mozambique was best characterised as a range of loosely coupled institutions and government agencies rather than a ‘system’. Various Ministries supported research institutes but there was limited coordination between ministries in terms of overall priority setting and long-term planning. The institutions were also weakly connected to production sectors and overall strategies for socio-economic development. Further, while government budgets support the general infrastructure for these institutions, project funding was primarily driven by the availability of international funding. Consequently, planning and development utilising science and technology was neither comprehensively coordinated nor structurally linked to other R&D-performing institutions.

In Mozambique, the institutions and policy process of the NIS are heavily concentrated in Maputo. Thus, research and technology planning, the application of research outcomes and the diffusion of technologies and knowledge were limited by weakly developed links to local practices, traditions and knowledge systems in rural areas as well as weak links between government agencies responsible for various elements of development..

The ministry responsible for science and technology policy recognised that S&T policy and practice required connections across a wide range of sectors and between researchers and the rural poor. Essentially this meant developing a coordinated approach to the ‘capture’ of new knowledge and skills and linking knowledge development to production practices.

In 2001 the government implemented a networked S&T information process that led to the production of a draft plan and strategy for the country’s first national S&T policy (MESCT, 2003). A strategy underpinning the approach was to encourage the involvement of a wide cross-section of society and institutions. The process comprised of four elements:

1. generating broad and inclusive policy debates;
2. identifying gaps in the system, the status of S&T in the curriculum and the role of technology in production sectors;

3. drawing together traditional and scientific knowledge systems in order to build a comprehensive knowledge base that has meaning for all Mozambicans;
4. establishing structures for providing continuous policy advice and feed-back on the system.

The process involved four steps. The first initiative was to establish provincial ‘reflection groups’ in each of the country’s twelve provinces. The task of these groups was to stimulate debate at provincial levels on key areas of science and technology from the point of view of contemporary local need, potential supply, and potential social implications. These debates were defined to include areas such as maintaining food security, access to safe drinking water, options for alternative energy, health and healing, managing natural disasters, and the delivery of safe and affordable housing.

The provincial reflection groups were each led by small group of ‘provincial leaders’. Their major task was to ensure that a wide range of community perspectives from city, village and across different sectors contribute to on-going discussion and debate about the role of science and technology in their day-to-day lives. The debates were intended to provide a platform on which future S&T initiatives could be built (Turpin and Martinez, 2006).

Thematic reflection groups’ discussions were intended to lead debates in key areas and to stimulate further discussion in the provinces. These groups involved a different set of people from the provincial groups and were usually specialists in a particular field. The role of the thematic reflection groups was to provide specialised and informed advice on the potential development across a range of selected key scientific areas such as energy, housing, health and medicine, and food production. In essence they were an attempt to generate horizontal communication linkages and a structure to stimulate what we have called Extended absorptive capacity??. The two sets of reflection groups through national debates provided a mechanism for informed dialogue across knowledge systems. An ICT system provided the technological mechanism for achieving this.

A networked national innovation system for open debate

Drawing on international development aid a networked and web-based communication system was set in place to support this transmission of ideas. The reflection groups via the communication system integrated ideas and comments and contributed to debates concerning national policy options in key areas. Through the network reflection groups could gain access to significant data and to government ideas for new initiatives as well as communicating the ideas and responses of local communities in the regions.

In the Mozambique case the policy process appears to have intentionally sought to integrate the ideas and expectations from different knowledge systems through the use of an open ICT network. The intent appears to have been to enhance absorptive capacity for new ideas for production or delivery of services (see Mouton, 2007). For example in the health and medicine area both traditional healers and medical practitioners were engaged in the policy debates. In so doing, ideas about both forms of knowledge were transmitted. The important issue was not the superiority of one form of knowledge over the other. Rather, it was about the open process through which the value of each could be transmitted and debated.

An open ICT process was used to integrate local knowledge systems with the more formalised science based structures in the country. The objective was to develop cross-cutting initiatives to link different and largely segmented knowledge systems and consequently allow for more open feed-back. In the Mozambique approach all agencies concerned with the production, transfer and transmission of knowledge were assumed to be part of the innovation system. Although government remained central to the process, it sought to bridge productive interaction between knowledge systems rather than building science institutions or simply managing the links between them. There is potential for absorption of ideas through local and national policy debates and international science within the local knowledge system encouraged through ICT networked reflection groups. There is also the potential for extended feed-back through cross cutting debates between government agencies.

Since these earlier initiatives the Mozambique system has moved on and a number of national networks established (Mouton, 2007) Only time will tell just how effective these early information strategies were in promoting development. The interesting aspect of the story, from our perspective is that the approach builds on the idea that social capital embedded in community networks and knowledge based institutions can be bridged through the open development of ICT. In order for information to be openly distributed and negotiated through ICT for development there is a need to generate the potential for extended spill-over and enhanced absorptive capacity. In this context the two concepts offer a means for analysing and theorising about OpenICT4D. We return to this issue in the concluding section of this paper.

Tele-centers for Open ICT Networks in Nepal

The concept of the *telecenter* has delivered ICT into some rural and remote areas where it was previously unavailable (Harris et al., 2003, Corea 2007). Telecenters are public places with computers, internet and auxiliary services with human interaction in rural places. They offer an innovative approach for extending access to ICT enabled services in rural areas in developing economies. In some countries they are called rural information centers (Chapagain, 2006), multimedia centers (Jalali, 2006), ‘telecottages’ or ‘information shops’, (Harris, 2002). They can be a public place like post office, school, health post, or any physical place that provides affordable access to the internet for variety of reasons. Roman (2004) describes telecenters as local information and communication resource centers established for bringing benefits of new technologies to the rural poor. Rural Telecenters have informed and benefitted rural poor through affordable access to ICT enabled services (Chapagain, 2006).

The introduction of a telecenter into a typical rural community in a developing country represents a substantial innovation for that community. For many rural dwellers, a community telecenter will be their first encounter with a computer. (Harris, 2002, p. 74)

Telecenters were established for different purposes in different countries. Some telecenters are aimed for e-governance services and to serve ultra-poor in rural areas in India (Rajalekshmi, 2007) and to deliver internet access to rural areas in Mongolia (Goransson, 2005). In the Philippines they were introduced to develop and test communication and information system to support rural communities. In Malaysia, they were introduced as a community resource for internet and ICT to achieve sustainable human development in

remote area and to create opportunities and reduce poverty by connecting rural communities in Laos (Harris 2002). In Colombia they were introduced to create local information systems that offer vital business support for rural agro-enterprises; and for diffusion of innovations (Roman 2004).

According to a Chinese study the social and economic factors which facilitated access to and use of information centers in rural China could not be sustained because they adopted the top down approach. It was perceived that it helped local farmers in gaining access to information and knowledge but failed to incorporate development needs (Soriano, 2007). A case study of DWESA project in South Africa argued that financial sustainability is not a sufficient condition for the success of a telecenter. Other different types of sustainability issues like social and cultural sustainability, technological sustainability, and institutional sustainability are important for telecenters in rural area. The study concluded that ICT telecenters are useful for rural development- aimed to promote e-commerce in tourism (Pade et al 2006). Alami and Pal (2005) dealt with rural telecenter evaluation methodologies with evaluation tables containing question, key indicators, approach and summary. The research contained appendices with various existing telecenter models, measurement indices and a questionnaire. Roman (2004) used diffusion theory to provide the conceptual theory for research and practice. 'perceived attributes of Innovation', 'communication aspect of diffusion process' and 'consequences of innovation adoption' three important aspects of diffusion were focused to conclude that the first requisite of telecenter research is understanding their multilayered nature.

Jalali (2006) analyzed the impact of telecenters in Iranian villages specifically on youth and women looking at social and economic impacts. The study concluded that there is a positive social impact in terms of education and information, acceptability, culture and health factor. But the study could not explain the complex social issues of community behavioural parameters and innovations associated with the diffusion of technology. In an Indian case-study Rajalekshmi (2007) found that personal trust between the people and the intermediary is important, but for making e-government services successful, it was institutional trust in government that was critical. All cases are in one way or other concerned with social networks and the flow and use of information across them. This raises many questions about whether telecenters can establish information networks within and between rural communities and other development agencies responsible for delivering key development services.

The Case of Telecenters in Nepal

Formal IT policy in Nepal only began to emerge from 2000. At that stage the main issues addressed in policy concerned infrastructure, research and development, human resources, e-governance. The notion of inclusivity was discussed but the concepts and mechanisms for addressing it or indicators for assessment were only poorly understood. From 2002 key policy objective was to connect Nepal to the emerging ICT global map. The rural telecenter network' was initiated as a strategy to network rural communities to this broader network (Chapagain, 2006).

In its tenth development plan (2002-2007) the government aimed to establish 1500 telecenters to serve rural areas. Community owned telecenters were established through government, donor supported initiatives and ICT based rural development programs initiated by non-government organizations. Government expected that these telecenters

would at least provide access to information, basic exposure to technology and assistance in delivering some government services. The information from the National Information Technology Center on agricultural information, health, distance learning, productive economic activities, environment protection and natural disaster mitigation was to be developed and delivered online to rural telecenters. The central government website www.hmgnepal.gov.np was created to provide all required application forms and information on government services. This website was later changed to www.nepal.gov.gov.np. Telecenters were expected to bring positive cultural changes for development, but the social process through which this might occur and the implications for a national innovation system were barely mentioned. The people in rural community were clearly demanding telecenters for their villages. But the national roll out plan of 1500 telecenters was slow. Despite the target of 1500 only 63 telecenters were established through the first four years. The program was extended after 2006 and the ICT global development alliance was launched in 2007 to establish 18 rural tele-centers by March 2008, providing connectivity in remote mountainous areas.

Community based management committees were delegated responsibility for raising finance for operational costs and 50 per cent of the internet cost from the second year. Implementation of the telecenter program has been varied. This has partly been due to poor coordination between the numerous organizations involved, such as NGOs, private companies, local communities. All had different expectations of an operational model

Experiences through the first phase of telecenter development suggest the program's weakness was an excessive focus on the technology rather than the development of locally relevant content (Rai, 2007). The project partners currently extending the ICT based services emphasize what they describe as equitable distribution of services, innovations in technology, financing mechanisms, information dissemination and capacity development. The potential information and knowledge flow, however, are generally portrayed in vertical terms, with program success measured according to connectivity and content flow. Little attention appears to have been paid to potential horizontal flows that might occur at the local level or among the central information distributing and receiving agencies. Certainly no policy discussion appears to have occurred about the implications for the national innovation system, about the capacity of local production systems to absorb new knowledge acquired through the telecenters, or about institutions in the innovation system to learn about how to bridge different knowledge systems.

Assessing the development of social capital through telecenters in Nepal

A research study is now being carried out to examine the socio-economic impact of telecenters in rural and remote areas of Nepal. Village meetings and minutes of discussions prior to the establishment of the centers suggest that there is the potential for extended feed-back through the telecenter experience and there was evidence discussion about how local communities might productively absorb new information. The implementation process and rationale for their development is well documented in government archives and this information will be used to assess the ex-ante expectations of government and communities in setting up the telecenters. Further, the experiences and social networks that have followed the implementation are currently being assessed through a series of case-study and interviews through 2010.

The study has developed a set of indicators for assessing ‘openness’ and to describe and analyse, ex-ante and ex-post, the telecenter process, the users, and their social networks, and the potential bridging of social capital between disparate groups in the innovation system (see Table 1).

Preliminary analyses suggest that only few agencies were involved in providing content to the social network (telecenter) and that community involvement was limited on the content development. Less than one quarter of currently operating telecenters engaged in community discussions through the telecenter design. Those few telecenters that did seek community feedback subsequently altered the design and operational procedures. Although the second phase of the telecenter roll drew on upon initial community feedback there was little evidence of information sharing *across* communities or sharing of community feedback *across* government agencies .

The present ex-post analysis shows there was no systematic and coordinated information flow between telecenter implementation agencies. This was often because there were as different ‘program owners’ priorities. In addition, not all telecenter program owners had their own content delivery mechanism. Of those that did, few had mechanism to sustain them in the future. Information content and dissemination mechanisms were thus quite removed from the telecenter operation and its users.

At the local level preliminary analysis has revealed a considerable amount of cross group communication, for example, between farmers group and business groups. Often a single a family member was the conduit for an extended user network. But feedback from these local network was seldom sought allowing little feed-back on government policy. network. However, the telecenter network provided good feedback to local governing institutions such as village development councils. In response, these councils tried to modify their local procedures and attempted to deliver feedback to central government agencies.

The feedback mechanism was thus not via a direct link between users and relevant agencies but rather indirectly via a telecenter network. If the program owners were non-government organizations any link to government agencies was much weaker.

The field data documentation and analyse is still far from complete but the preliminary observation from the field is that that telecenter networks have been able to consolidate and extend rural social networks with the potential (although often not necessarily fully realized) to embed them more centrally in the national innovation system. As the work progresses we hope that the methodology can be refined and applied more fully to the analysis of open ICT and the broader national consequences.

Conclusion: Open ICT, Social Capital and Development

While there is some evidence that the diffusion of ICT in some locations is producing valuable results the overall position of least developed countries in terms of transforming to knowledge based economies remains bleak, particularly among countries where a large proportion of production is carried out in rural communities. In this paper we have attempted to explain how ICT diffusion into remote and rural areas in these countries might

better lever social and economic development. We have argued that the development of ICT for development should be considered as a central component of a national innovation system. This is because it potentially offers a means for information delivery and learning within and between the institutions and networks in urban and remote locations that comprise the system. We have argued that vertical and horizontal information flows need to be built into the process in order to generate ‘bridging’ social capital that can potentially complement a national innovation system.

The Open ICT4D proposition proposes that ICT can provide a useful tool for development. The proviso, however, is that the structural arrangements under which information is prepared and transmitted and the institutional arrangements through which the technology is accessed must be *open*: that is the information transmitted must be widely accessible and shared. One of the problems in testing this proposition is that the concept of ‘openness’ covers many variables. Some may be more important than others in different social contexts. For example, access to web-based information might well be extremely open but the information delivered might be tightly controlled with only limited input from a select group of people or agencies. Conversely, information input might be broadly canvassed and drawn from a wide variety of sources, but access to the information restricted by logistic factors or limited literacy skills. Yet, in this latter case, if local institutional networks or structures openly allow for the broader distribution of the information, is the system then open?

We have sought to extend the conceptual analysis of ICT openness by defining two sub-elements of the concept: extended feed-back and absorptive capacity. In order to operationalise these concepts we have proposed some indicators that could be used to explore these elements empirically in future research. We have argued that in order to maximize development potential in least developed economies there is a need for both extended feed-back and enhanced absorptive capacity. We have argued that both elements of openness are necessary conditions for effectively using ICT for development. Moreover, both forms are required between and within institutions concerned with the delivery of information, within and between social networks.

From this perspective it is not the technology that is critical for development, nor the information conveyed. Rather, we propose that it is how together they can offer an open system that extends networking *capacity* into social spaces previously unreachable that can drive development. Enhanced networks provide conduits to useful and relevant information, knowledge and experiences and serve to enrich social capital. We argue that it is this ‘bridging’ social capital that provides a springboard for development. As Lundvall commenting on the Danish case has put it:

Small countries have amassed a form of social capital that enables citizens to cooperate and participate actively in learning processes that promote growth and competitiveness more easily. ... it is interesting that while the learning economy is characterized by increased competition, it is also characterized by an even more close collaboration between firms and their customers and suppliers (Lundvall, 2002, 100)

In the rural and remote regions of developing countries it is not so much the collaboration between firms, customers and suppliers that is critical for learning, but collaboration between agencies, institutional structures and community networks. But the argument is the

same: we are concerned with the development of bridging social capital that can potentially be enhanced through extended social networks as part of a national innovation system.

Table 1: Variables for assessing open feed-back and open spill-over

<i>Variable Type</i>	<i>Agency networks</i>	<i>Local User Networks</i>
Indicators for ex-ante analysis		
Absorptive capacity	Number of agencies involved in providing content	Extent of community involvement in discussion.
Extended feed-back	Breadth of community involvement during telecenter design.	Articulation of community interests during design phase – breadth of community involvement
Absorptive capacity	Extent of agency sharing of meeting notes and community expectations	Extent of sharing across community of government expectations and potential for telecenter development and management
Indicators for ex-post analysis		
Absorptive capacity	Information flow between agencies: eg how many agencies, how often communicated and content communicated. Is the information flow for delivery mechanism or content of delivery?	Transmission and dissemination of information through community networks. Nature of groups communication ie family only, economic producer group, health/medical group network, education group network.
Extended feed-back	To what extent is feed-back solicited from users? Does the feed-back have impact on any areas of government policy?	Is information from users conveyed to national or regional agencies?
Absorptive capacity	How is the feed back shared ie within one agency (eg health or IT Ministry)? Or, what other agencies are informed with feed-back?	If information is conveyed to national or regional agencies, who is involved in compiling the information (ie single user, community group, other family, school or medical group, NGO?)
Extended feed-back	Is feed-back information used in developing future information content, new targets for information or new areas of information?	Do areas of information (ie agricultural product market prices) transfer to other community based areas (eg education and training for crop management).

Source: Ghimire, 2009

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