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Knowledge Networking to Overcome the Digital Divide

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Abstract. As organizations become increasingly extended across global boundaries, their reliance on information and communication technologies (ICTs) to support their processes increases. The use of ICTs to activate dispersed knowledge within complex webs of human networks can enable the gap between the information rich and information poor to be overcome. This paper develops a new concept called knowledge networking and investigates how this process enables the digital divide to be overcome. Following a phenomenological analysis of knowledge networking using a selection of vignettes, this paper provides a conceptual model describing the ways in which knowledge networking enables the digital divide to be overcome.

Keywords: Knowledge networking, knowledge activation, digital divide, information and communication technologies, talent pools.

1 Introduction

Traditional notions of knowledge management do not always address the ways in which knowledge is shared and used across organizational and national boundaries. It appears that the rise of distributed processes among people and organizations in different parts of the world are providing new challenges for decision makers (Qureshi et al., 2006). The notion that organizations have become extended across geographical boundaries has meant that decision making processes are dependent upon information and communication technology (ICT) to offer an environment that provides reliable and timely task-related information sharing and support for rapid decision-making (Zigurs and Qureshi, 2001; Baker, 2002). While organizational processes are becoming increasingly dispersed, notions of knowledge management continue to focus on the generation, representation, storage, transfer, transformation, application, embedding, and protecting of organizational knowledge (Schultze and Leidner, 2002; Hedlund, 1994; Alavi and Leidner, 2001). In organizations today, knowledge management practices and technologies are being implemented and incorporated on the commonly held assumption that it will help bring about improved effectiveness, efficiency, and competitiveness. The underlying assumption is that knowledge management processes are always beneficial and that there are no negative consequences.

These notions of knowledge management fall short of enabling knowledge to be found and used. Duffy (2001) asserts that KM tools having the capability to mine complex and rich knowledge (both explicit and tacit knowledge) should be able to support KM activities within organizations as well as between geographically dispersed communities. But unfortunately, in reality Duffy's (2001) assertion falls short. Reasons for doing so have to do with but are not limited

to the existence of multiple nomenclatures for the same term (Qureshi et al., 2006). Issues relating to widespread adoption of a KM tool or technology (Venkatesh et al., 2003) by knowledge workers are another consideration that plagues the KM field. An effective KM process or strategy should bring about shared understanding of both explicit as well as tacit knowledge. But a study by Cramton (2001) of collaboration among geographically dispersed people highlighted five types of problems for the failure of mutual knowledge (knowledge that people share and know that they share). The first problem is the failure to communicate and retain contextual information. Second, is the issue of unevenly distributed information. Third, is difficulty in understanding and sharing the salience of information. Fourth, are differences in speed of access to information and last but not the least, difficulty in interpreting the meaning of silence.

Keen and Tan (2006) define knowledge mobilization as the necessary extension of knowledge management. Qureshi and Keen (2005) highlight knowledge activation as a key component of such mobilization. Knowledge networking is the core set of processes that achieves this activation and mobilization. This definition will be used in the chapter to describe this ubiquitous but ill-understood concept. By contrast, knowledge management tends to focus on the supply side of the equation: infrastructure plus information. These are needed for large-scale mobilization but need to be explicitly deigned with that goal in mind. Hanna (2006), a leader in many World Bank ICT initiatives for development highlights inattention to the nature of effective use by communities as a continued weakness in their planning and design. To bring about development there is a need to have access to information and expertise. ICT can enable development processes to be achieved (Qureshi, 2005).

In order to develop an understanding of how knowledge networking takes place, an activation perspective is necessary in that it enables knowledge to be brought into action. Knowledge networking creates information and its exchange among talent pools. Qureshi and Keen (2005) suggest that knowledge activation is the "conversion of knowledge to action." This is central to the networking of knowledge between disparate groups and individuals. The main idea behind knowledge activation is the process of discovering people with pertinent knowledge and utilizing it effectively through their keenness to provide, access, and share it when the need arises.

This chapter draws upon the Qureshi and Keen (2005) study which has implications for knowledge networking as the notion of knowledge activation through knowledge identities in a networked environment. Knowledge activation thus enables improved knowledge networking among geographically dispersed communities and attempts to reduce the gap between the information- and expertise-rich communities and those that are and poor in these resources. In this chapter the concept of knowledge networking is developed and through the analysis of a selection of vignettes, it offers evidence as to how knowledge networking is enabling the digital divide to be overcome. This analysis uses the data reported in Qureshi et al. (2007) and offers a conceptual model through which further studies into knowledge networking can be informed.

2 Knowledge Networking

There is a sense that inter-organizational learning is needed for the transfer of knowledge. Churchman's (1971) concept of inquiring systems implies that in order for actions of an organization to result in the creation of knowledge, learning needs to take place with other organizations

and even countries. Courtney et al. (1998) mention that through sharing associations, cognitive systems, and memories, organizational learning can take place. This notion signifies a heavy reliance on people and groups as enabling actors for knowledge transfer. In this, the need to network knowledge is important. A common trend in conducting business today has been in forming inter-organizational networks and a shift has occurred more toward the exchange of knowledge rather than tangible goods. In the process of such knowledge exchange there is a need for shared understanding between parties in the transaction. Swan et al. (2000) mention that Heath's (1994) "zones of meaning" can be seen to exist among corporate communities. These zones of meaning can be considered as mental models that organizations share amongst one another. In addition to this, the authors point out that there is also a need to consider differences in the network structure in terms of cultural knowledge between the different zones of meaning.

As much as knowledge creation is important, so is the issue of networking knowledge across organizational boundaries. A study by Boschma and Wal (2007) investigated a cluster of firms in the foot-ware district in the south of Italy, and showed that having strong ties to both local as well as non-local organizations is important for obtaining the necessary knowledge – both managerial as well as technical knowledge – to improve firm performance. The study's findings are interesting in that it disproves the traditional notion that an organization being simply geographically co-located within the same district as other firms will enable it to benefit from knowledge externalities. Boschma and Wal's (2007) study emphasizes the importance of building networks to facilitate knowledge transfer and highlights the importance of building non-local ties to improve overall business firm performance.

Cultural differences play an important part in knowledge networking. There are four institutional types with varying degrees of cultural knowledge embodiment as outlined by Boisot (1998). They are Bureaucracies, Markets, Clans, and Fiefs. According to the properties of each of these institutional types, Boisot (1998) highlights that the high degree of cultural knowledge sharing within clans and fiefs assists in exchanging knowledge between zones of meaning. Thus, it enables a corporation to "develop an organizational capacity that reaches beyond its corporate boundary" (Boisot, 1998). Swan et al. (2000) performed a case study on an inter-organizational network that was a mix of the clan and fief structures. Zones of meaning were not consciously developed but rather they cropped up as a product of discourse and repeated exchanges among the network participants leading to an understanding of shared context. The shared context gave way to activities to produce specific knowledge deliverables and so reinforcing the zones of meaning and enhancing network processes. The study performed by Swan et al. (2000) allows the possibility of viewing a corporate community as a knowledge network but it does not specify the enabling factors to extract both tacit and explicit knowledge from the network participants.

Schultze and Leidner (2002) investigated both the positive and negative consequences of knowledge management by extracting published research on this topic in six different IS journals within a span of 10 years and categorizing them into diverse theoretical lens or discourses such as normative, interpretive, critical, and dialogic. The findings from the study show that each of the four theoretical perspectives focuses on different aspects of knowledge management. Specifically, the normative discourse appears well suited to studying technology solutions to knowledge management problems. On the other hand, the interpretive discourse looks to understand the implementation and the organizational implications of knowledge management initiatives and technologies. The critical discourse views knowledge with respect to

highlighting the social inequities underlying organizational stratifications. And last but not least, the dialogic discourse lends itself well to the examination of the contradictions in managing knowledge.

While a core process in the knowledge management field involves the creation of knowledge, the concept of knowledge networking enables the knowledge creation cycles to be activated. According to Nonaka and Konno (1998) new knowledge is created through the interaction between explicit (knowledge that can be expressed in words and numbers and shared in the form of data) and tacit (knowledge that is highly personal and hard to formalize, making it difficult to share with others) knowledge. Nonaka and Konno (1998) explain that there is a spiraling process that takes place as tacit and explicit knowledge interact, which gives rise to four knowledge conversion phases within an organization. The first phase is that of *Socialization*, which involves the sharing of tacit knowledge between individuals through joint activities such as simply being together, spending time and living in the same environment. The second phase is that of *Externalization*, which involves expressing tacit knowledge and its translations into comprehensible forms that can be understood by others. The next phase is that of *Combination*, which involves the conversion of explicit knowledge into more complex sets of explicit knowledge. In this phase, the core issues are communication and diffusion processes and the systemization of knowledge. The final phase is that of *Internalization*, where the internalization of newly created knowledge is the conversion of explicit knowledge into the organization's tacit knowledge. It is important to emphasize that the four phases mentioned above have a cyclical/spiral relationship and that they allow us to understand the "actualization of knowledge within social institutions" (Nonaka and Konno, 1998).

3 Overcoming the Digital Divide

The concept of the digital divide has been particularly pervasive in recent years because there is a sense that there is a gap between people who have access to ICTs and those who do not. There are various definitions to depict this divide. Servon (2002) points out that the Digital Divide is not simply a problem of access and that access is just one of the issues involved. Equally important aspects are those of IT literacy and content. The ability to use IT for a range of purposes and the knowledge of how and why IT can be used as a key resource is important in bridging the Digital Divide. In the same vein, content that meets the needs and demands of disenfranchised groups and content that is created by these groups are important considerations in narrowing the digital gap. Norris (2001) also describes the concept of the digital divide as a multidimensional phenomenon comprising of three distinct aspects. The *global divide* refers to the divergence of Internet access between industrialized and developing societies. The *social divide* concerns the gap between information rich and poor in each nation. And finally within the online community, the *democratic divide* signifies the difference between those who do, and do not, use the panoply of digital resources to engage, mobilize, and participate in public life. It appears that these global, social, and democratic gaps affect development. Traditional development literature suggests that there is a direct link between literacy, tertiary education enrollment, availability of personal computers and the digital divide (OECD, 2001).

However, a recent global study of the digital divide has illustrated that the gap is rapidly decreasing. The Sciadas reports (2003) studied the Digital Divide using three indicators, infodensity, info-use, and infostate. Infodensity refers to the portion of a country's overall capital and labor stocks, which are ICT capital and ICT labor stocks and indicative of productive capacity and is operationalized in the study through the measurements of available infrastructure/networks and ICT skills. Info-use refers to the consumption flows of ICTs and is operationalized through ICT uptake (uptake corresponds to ICT goods) and ICT intensity of use (intensity of use corresponds to ICT services). The third and final indicator is infostate, which is the aggregate of infodensity and info-use and is considered to be the degree of a country's "ICT-ization".

The report defines the Digital Divide as the relative difference in infostates among countries. The study utilized existing data on 192 countries for the measurements of networks (covering 99% of the population of the planet), 153 countries in skills and therefore Infodensity (covering 98% of the population), and 143 countries in Info-use and 139 in overall Infostate (covering more than 95% of the global population). Results from the extensive statistical analysis performed reveal that, as much as Infodensity and Info-use accounted almost equally for the existence of the Digital Divide, they also accounted almost equally for its closing. The numbers showed that on average, between 1996 and 2001, Infodensity increased approximately by 74% and Info-use by 87%. Additionally it was observed that ICT networks and uptake accounted for most of the growth and that mobile networks and the Internet were attributed to most of the gains.

This trend was more evident in the have-not countries than in the countries with higher Infostates. The core finding of the Sciadas study gives empirical evidence of the gradual progression of countries in closing the Digital Divide. Figure 1 below shows how individual factors contribute to the closing of the Digital Divide. The 192 countries in the study were categorized into five groups (A–E) and compared with a hypothetical country (Hypothetica) which recorded the average values for each of the indicators. It is clear from the chart that, much of the upward movement is accounted for by the use of the Internet, followed by mobile phones and Internet networks. The same factors that account the most for the Digital Divide are also the ones that move more in the direction of alleviating it. Another interesting finding – that contradicts so

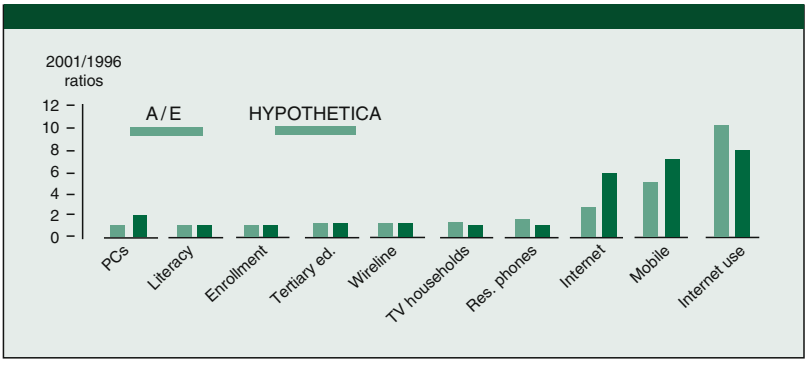

Fig. 1: Factors Contributing to the Closing the Digital Divide (Source: Sciadas Report, 2003)

many of conjectures in earlier Digital Divide studies – is that number of PCs and literacy do not play any significant role in contributing to the closing of the divide.

This suggests that there is a more powerful force affecting the ways in which the information highway is being used to bridge the development divide. Qureshi (2005) in an interpretive study of multiple cases investigated the relationships that might be in play as we talk about IT and its impact on development. Qureshi (2005) points out that positive cycles of development come about when the effects from ICT implementations with the help of better tools and techniques will result in increased human development as well as improved macro-economic growth. It is seen that this also results in increased per capital income which then creates a ripple effect for improved social and economic development. Warschauer (2003) provides a rather different focus on the interplay between ICTs and the development divide by examining the ways in which varying access to technology contributes to social and economic inclusion. This focus on social inclusion shifts the discussion of the Digital Divide from gaps to be overcome by providing equipment to social development challenges to be addressed through the effective integration of technology into communities, institutions, and societies. Warschauer (2003) thus emphasizes that what is most important is not so much the physical availability of computers and the Internet but rather people's ability to make use of technologies to engage in meaningful social practices.

It appears that the key challenge faced by knowledge networking processes is not so much the digital divide but the social divide. International development agencies have come to recognize and show concern of a social divide – digital divide within societies. The Internet has become increasingly central to life, work, and play by providing job opportunities, strengthening community networks and facilitating educational advancement. This suggests that the exclusion of certain groups and areas such as poorer neighborhoods, working-class households, or rural communities are more important than ever. According to Norris (2001), the social divide has a number of components. Norris (2001) identifies household income, occupation, education, gender, and generational differences to be the key factors in play when talking about the social divide in Internet access. She mentions that the heart of the problem of the social divide in Internet access "lies in broader patterns of socioeconomic stratification that influence the distribution of household consumer durables and participation in other common forms of ICTs, as well as in the digital world." Norris (2001) also goes onto say that it is not necessarily true that all dimensions of the social divide will automatically close as Internet access becomes more ubiquitous. Norris provides evidence from countries such as Sweden & the Netherlands where widespread new technologies exist but the gaps by education, income, and occupation still remain substantial.

A key component of the social divide is the development and access to social capital. Literature in the area of social capital has investigated the effects that it has on various segments of business activities and in the overall economy of communities. Some of the popular and widely used definitions in use today have been adapted from Bourdieu (1983) who refers to social capital as "the sum of the resources, actual or virtual, that accrue to an individual or a group of people by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition." Working off Bourdieu's definition of social capital, Coleman (1988) provides his perspective to the term by stating that "Social capital is defined by its function. It is not a single entity, but a variety of different entities, with two elements in common: they all consist in some aspect of social structures, and they facilitate certain actions of

actors within the structure." Lin (2001) provides a definition for social capital which states that "social capital is the investment in social relations with expected returns in the marketplace."

It is evident from these different definitions that social capital refers to the characteristic of social interactions and networks that can provide value added resources to a society. Impacts of social capital can be broadly classified as (1) Getting information (Granovetter and Mark, 1973); (2) Transfer of knowledge, innovation, and diffusion of technology or practices (Ahuja, 2000; Brown and Duguid, 1991); (3) Combining complementary knowledge and helping solve problems (Greve and Salaff, 2001; Von Hippel, 1988); and (4) Brokerage (Burt, 2005).

In the context of world development, increasing importance of social capital is being recognized as a key component affecting the increase in incomes. Acknowledgement of its importance has also come from the Organization for Economic Co-operation & Development (OECD) and the World Bank: "Trust [social capital] has a role in facilitating productivity…when embodied in the organizational culture of firms…and may lead to larger and more effective production units…as well as enhanced co-operation within firms. Social capital can facilitate regional systems of innovation…helps people to find jobs" (OECD, 2001). Serageldin and Grootaert (2000) mention that, at any given time, every country has appropriate levels of social capital. And that over time the total composition of social capital should increase through accumulation. Steinmueller (2004) mentions that computer-mediated-communication and information and communications technologies may help communities of practice to have enhanced capabilities of global sourcing of knowledge and problem-solving activities resulting in greater social capital. Steinmuller goes on to say that the social networks of communities of practice, help extend knowledge markets. In addition he states that changes in communities of practice impacted by ICTs may have implications for growth, competitiveness, and employment. The paper by Steinmueller (2004) lays out a number of potential policy suggestions of how communities of practice may improve economic growth for regions. Gaved and Anderson (2006) in a similar study looked at the role of local ICT initiatives on networked communities in several countries in the European Union (EU). One of the key recommendations that come out from their study is the issue that the local ICT initiatives need to "go up the citizens' value chain" i.e., the chosen technology needs to address a community purpose in order for citizens within that community to utilize it. It is evident from the social capital literature that ICTs have a role to play in enhancing and promoting social capital within communities.

Knowledge networking brings about development by enabling people to connect using digital media. In order to develop an understanding of how knowledge networking takes place, an activation perspective is necessary in that it enables knowledge to be brought into action. Knowledge networking creates information and its exchange among talent pools. Qureshi and Keen (2005) suggest that knowledge activation is the "conversion of knowledge to action." This is central to the networking of knowledge between disparate groups and individuals. The main idea behind knowledge activation is the process of discovering people with pertinent knowledge and utilizing it effectively through their keenness to provide, access, and share it when the need arises. This requires collaboration among people in different parts of the world. The Qureshi and Keen (2005) study has important implications for knowledge networking as the notion of knowledge activation through knowledge identities in a networked environment will enable individual's knowledge to be brought into the collaborative arena. Knowledge activation thus enables improved knowledge networking among geographically dispersed communities and attempts to

reduce the gap between the information- and expertise-rich communities and those that are poor in these resources. These processes are not only distributed, they are collaborative and are activated through a demand for action.

In addition, Queau (2002) argues that a new culture is emerging of 'information literacy' through online interactions comprised of visual representations and mental images that can potentially increase the disparities between people who are part of this culture in industrialized countries and those who are not, as well as within societies themselves. This has implications for the level of civic engagement and level of participation in knowledge networking (Norris, 2001; Giddens, 2003). And so there is a dire need to come up with ways that would help reduce the knowledge disparities among communities within and among developing and developed countries. International development agencies recognize that in order to bridge this divide between the information rich and information poor, knowledge networking needs to take place. Keen (2007) states that knowledge networking strategy is "one of accelerated development through pragmatic opportunism: its priority is to network two distinct groups: those looking for talent and aiming to source capabilities or products and services that their organizations need and those with talent looking for opportunities to find new spaces to apply their skills, build up their businesses and enrich their communities." In Sect. 4 a methodology is developed to enable the key components of knowledge networking to be identified as they enable the digital divide to be overcome.

4 Methodology

In order to investigate knowledge networking, this chapter follows a phenomenological approach. This enables us to extract the key elements of knowledge networking from interactions carried out using electronic collaboration. This process involves the collection of vignettes and blogs from the Internet. This data represents the creation of shared understanding through inter-subjectivity. According to Weick, inter-subjectivity has two defining characteristics (1) it emerges from the interchange and synthesis of meanings among two or more communicating people and (2) the subject gets transformed during interaction such that a joint or merged subjectivity develops (Weick, 2001). The creation of the life world through processes of inter-subjectivity enable us to identify and explain certain behaviors, norms, and traditions that develop in the distributed work environments we investigate. When the social construction of reality governed by inter-subjectivity is controlled by language, according to Searle (1995), language is seen to be a tool of accessing each other's life-world.

The selection of vignettes and blogs for this study was based on the following categorizations (1) impact on development, (2) conceptually relevant, (3) empirically predictive, and (4) having empirical coherence. In order to illustrate the effects of knowledge networking, vignettes were taken from articles and reports published on the World Wide Web and in books and articles. They reflect peoples' experiences in very different sets of knowledge networking and development spirals. Popular search engines such as Google and Yahoo were utilized. Keywords used included, "knowledge networking," "knowledge activation," "impact of cell phones," "poverty reduction," "knowledge networking for development," "Internet cafes," "digital divide,"

"developing countries," "African villages," and other terms relevant to the geography, demographics, and occupations of the target topic areas.

While the same criteria applied to blog selection. Relevant topics were selected from projects listed on the WSIS stock taking database to reflect knowledge networking aspects. These results are analyzed using a selection of transcripts that reflect comments, or vignettes from people interacting on the selected blogs. For each blog, the comments were then grouped into the basis of their comments as they related to the exchange of information, expertise and ideas. The vignettes and blogs are anecdotal and not part of any systematic survey or large-scale sampling. They do represent contours of a phenomenon that is increasingly ubiquitous but ill-understood.

5 Results and Analysis

Qureshi (2005) suggests that development activities are able to benefit from ICT implementations through (1) better access to information and expertise, (2) increased competitiveness and access to new markets including global markets, (3) administrative efficiencies from low transaction costs, (4) increase in labor productivity through learning, and (5) direct reduction in poverty. The analysis presented in this paper extends these factors to more explicitly address the payoffs from communication and conversation captured in the vignettes. These are the ICT effects on development.

Sustained economic growth helps break the shackles of poverty by first increasing average household incomes and second increasing income from individual and business tax revenues, which may lead to the provision of better services for the poor Qureshi (2005). When households below the poverty line share in the average rise in national income, the extent of extreme income poverty (that is, the share of people surviving on $1 a day) is directly reduced (UNDP, 2003). Such an upward spiral can also stimulate additional growth through factors such as foreign direct investments in factors of production. These are the positive effects on the cyclical process through which development can take place.

The following subsections illustrate the process of bringing distributed knowledge into action. This takes place through use of ICT to access information and expertise which brings about additional opportunities for development.

6 Knowledge Activation

Knowledge Activation is the enactment of an individual's expertise by bringing it into social interaction with other people (Qureshi and Keen, 2005). There is a sense that while the causes of the digital divide is not limited to access to technology, the real cause of this gap has to do with the concept of social inclusion or exclusion (Warschauer, 2003; Castells, 2000). According to Warschauer (2003), social inclusion refers to the extent that individuals, families and communities are able to fully participate in society and control their own destinies. Social inclusion is enabled by the existence of demand for knowledge that can be activated through knowledge

networking. Communities on the Internet enable social inclusion to be achieved and sustained through the creation of social capital.

Transcript 1 illustrates the existence of social capital among the members of this village. The concept that the Internet can promote social capital has been shown to bring about more extensive social networks of support within and outside the geographic areas in which the participants reside (Warschauer, 2003).

Transcript 1: Seeking Travel Advice

> *dear fellows, i'm kind in need for information about life in nigeria in particular kano especially for lebanese living there or moving there on work purpose i need to know as much as u can on political situation, security, medical situation, insects and malaria, water, food, places to go to and anything u can do to support me.*

With the existence of high social capital, demand for knowledge can be activated spontaneously by people in the knowledge network. People in the community in Transcript 2 feel free to say and do as they wish; participants share and access information they need instantaneously and appear to have greater control of their lives. In her study of civic engagement on the Internet, Norris (2001) suggests that digital politics serves to engage the engaged.

Transcript 2: Bank Warning

> *I would like to tell u all that everyone has an account in saradar bank under 5000$ or under 5000000 l.l.... they r going to take 15000 l.l. or 10$ everymonth without knowledge...so please pay attention and let everybody know this message ....coz if u r not putting money in ur account...it will disappear....*

This is a "Virtual Village" in Lebanon ripe with discussions on politics (the cedar revolution), health, facts and personal discussions. Participants of this virtual village are members of the general public who access information and expertise on a range of subjects instantaneously.

Transcript 3 illustrates the different opportunities these virtual gatherings bring about. This has the potential for new opportunities to achieve growth in per capita incomes – as opportunities such as the one illustrated in transcript 3 come to fruition.

Transcript 3: Potential Employment Opportunities

> *I'm working on a project that could make job vacancies for about 25 mechanical engineers, here in lebanon, and anything with that result couldn't be nicer to do, anyway, among the info i need is the salaries of mechanical engineers, according to their experience in here, ….This project might be moved to INDIA, so wish me, and us all luck !!!! D.P*

Within this positive spiral of Internet use, this community portrays a clear sense of mutual support. This form of knowledge activation enables knowledge networking to become more pervasive and drive social and human development processes. Once initiated, this positive spiral enables income opportunities to be generated and thus economic development.

7 Information Literacy

A view from the human development world provides insight into how people experience ICTs and whether there is a negative spiral that is affecting their lives. A selection of transcripts from a number of blogs connected to Blog Africa give a sense of this human experience with ICTs in

Africa. Transcript 4 illustrates the stark reality of what is faced by an aid worker trying to educate orphans in Sudan.

Transcript 4: Part of Email from an Aid Worker in Darfur

The answers from the children living in Fata Borno were for me – very powerful. I asked them "if you had a million dinars what would you do with it?" they all said "buy food" – an uncomplicated, unselfish, very basic need. I asked "what do they think is the solution(s) to the problems in Darfur" – they said "collect and take away all of the guns" - precise, unpolitical, and astute. And, I asked them, "If I could deliver to the world a message from you – what would it be?" they said "that there is a camp in Fata Borno – we are here, do not forget us ..."

Many writers propose theories of how literacy can bridge the digital divides and have research to support this claimed link (Norris, 2001; Servon, 2002; Warschauer, 2003). However, when people are not free from poverty and do not have the opportunity to get out of it, implementation of ICTs may worsen the plight of the most disenfranchised. Information literacy appears to be developing but in the majority of the blogs viewed, the language and tone was not very conducive to the development of a community. The blogger in Transcript 5 is clearly frustrated by this development.

Transcript 5: Explosion of "Net Fanatics"

The explosion of local .Net fanatics continues but have you noticed the trend at dotnet.org.za of new bloggers not introducing themselves and instead just jumping headfirst into their first blog entry? Whats next? Elbows on the table? ;-) Welcome to the ZA blogging scene in any case :-D

Warschauer (2003) suggests that the value of information literacy stems not just from the use of a computer and the Internet but also from a broader information society, its ethics and norms.

8 Knowledge Networking of Talent Pools

The vignettes presented this far suggest that the key factors affecting the success of knowledge networking is the use of low cost technologies for conversation and communication. These technologies enable talent pools of comprising of experts, entrepreneurs, farmers and business people to be accessed and activated through communication. In particular, mobile phones enable these talent pools to be activated towards joint effect. The following Vignette 6 illustrates the activation of talent pools through knowledge networking.

Vignette 6: Benefits of Mobile Phones in Developing Countries

Some of the biggest benefits of cell phone use are going to the world's very poorest people, who cannot even afford to buy their own phone handset. A lively rental market is flourishing across the developing world. For instance, Grameen Phone now boasts more than 100,000 "phone ladies", who buy a handset (often with the help of a loan from a micro-finance institution such as Grameen Bank) and then rent out airtime. These women are forming an increasingly influential army of micro-entrepreneurs, a new focus of business activity in their villages. And they are providing potentially global connectivity to some of the world's least connected people. There are other benefits, and potential benefits, that may not be fully captured by GDP statistics. There is the psychological benefit of being able to talk to relatives living far away, for example. And there is enormous potential for mobile telephones to transform the efficiency of healthcare provision in poor countries. In Kenya and Tanzania, the African Medical and Research Foundation (AMREF) is using phones to allow patients in remote areas to be diagnosed by specialist doctors far away in AMREF's headquarters. Another

project has built a management structure based on mobile phones to enable doctors in AIDS clinics to monitor patients far away to ensure they are taking their drugs (Source: **"**Access to mobile phones is rocketing, along with its impact on poverty", International Development Magazine. http://www.developments.org.uk/data/issue31/loose-talk.htm)

This shows talent pools at work. In many small villages, the inestimable phone ladies are well-known and are entrepreneurs with the micro-finance loans as venture capital. The lesson here that is mobile technology has changed the economics and risks of innovation. A cell phone is immediately usable, with no need for training, does not involve complex installation and operation, nor purchases of software and peripherals. This contrasts with the risks and complexity of PCs and even PDAs: the frequency with which they are unused or underused, obsolescence, and high initial purchase price can be readily observed. A second lesson is that it is communication and conversation that have driven the entire consumer market: from AOL's chat rooms to SMS and now to VOIP. The economics of communication has also changed to reflect this networking of talent pools as is illustrated in Vignette 7.

Vignette 7: Increased Communication in Africa

Since the base station in Funyula started up in 2005, three entrepreneurs have started public phone booths using landline-style handsets with mobile technology. At one booth, Yuanina Juma pulled a crumpled letter from her bag and punched in her husband's number. He is away working in the capital, Nairobi. "When are you coming back?" she asked, as her one-year-old son held on to her skirt. "You have to send me money, because I am broke." At another booth beside a bus shelter, Angelina Odhuor called her son-in-law, who works in a hospital in the Rift Valley region. "My daughter needs school fees," she told him. "Can you help us?" Queueing behind her, Evelyn Anyango waited to call her uncle in Uganda: "I am calling him to come because there is a funeral. My little sister died of malaria." In a culture where people travel long distances to find work, the mobile has become the most useful and ubiquitous piece of technology since the bicycle. Just as bicycles are used in rural Africa to transport bananas or paying passengers, the mobile is changing lives in ways unimagined in the developed world. It links distant families and allows the poor to communicate. (Source: Guardian special report on Africa. http://www.guardian.co.uk/hearafrica05/story/0,15756,1569470,00.html)

Mobile payments are likely to become a massive international industry as more and more workers leave countries such as the Philippines, Indonesia, and many parts of Africa and Latin America to work in Singapore, the U.S., Dubai and elsewhere. Currently, the fees charged by currency exchange services and firms such as Western Union are high, though falling rapidly. This has meant increased work opportunities for remote businessmen as is illustrated in Vignette 8.

Vignette 8: African Businessmen Happy with Improved Work Efficiency

The new technology has had a bigger impact on shopkeepers and tradesmen, who use it to keep in touch with suppliers and customers. "Before we got a signal here, I was doing five or six jobs a week" said electrician Isaac Kamande. "Now I'm doing 20 or 30 jobs a week. Before, people had to call the landline, which was not all that reliable. On rainy days, it goes off. Maybe there would be an emergency, but customers couldn't reach me - they had to send somebody with a message." (Source: Guardian special report on Africa. http://www.guardian.co.uk/hearafrica05/story/0,15756,1569470,00.html)

Vignette 8 depicts another talent pool at work. Much of the literature on ICT and economic development speaks as if all the poor are lifeless and lazy and that they need education before they can be brought into the knowledge economy. So many of the vignettes above signal the opposite: it is not an oxymoron to speak of poor entrepreneurs.

However, should ICT implementations not be appropriate to local needs, digital divides increase, and the reverse can occur and perpetuate a downward spiral. For example, lack of access to information or expertise brought about by the lack of access to information kiosks or inappropriate support for community networking, reduces the ability of a farmer or merchant to sell goods at the most favorable price, thus reducing income generated by their efforts. Given the costs of Internet access compared to income, only a small segment of the population have access to the Internet. Warschauer (2003) notes that the Internet can lead to a narrowing of social contact as there is no assurance that people will use it for either social interaction or information.

Similarly the implementation of information systems that intend to provide better access to government services and information can bring about administrative inefficiencies by locking out citizens that have no means or ability to use the information system. In the new global electronic economy, fund managers, banks, corporations as well as millions of individual investors can transfer vast amounts of capital from one side of the world to another at the click of a mouse. As they do so, they can destabilize what might seem like rock solid economies (Giddens, 2003).

Those who are negatively affected by the information system are considered Victims in this research and may comprise people, organizations and even entire regions or countries. The ending of textile import quota by the WTO in 2005 has seen massive growth for China and India, retailers and global supply chain service providers have used ICT to streamline their entire logistics and consumers have benefited from a 40% drop in the cost of clothing. Vietnam, Honduras and other countries in which textile manufacturing was one of the largest sources of employment have seen as much as 40% of their factories close in under a year.

Only talent pools can compensate for such disruptions and only knowledge networking can fuel their innovation. From that perspective, there is much encouraging news from the vignettes and many other such examples. The talent is there. And the interest in knowledge networking infrastructures is accelerating. Africa now has 5 million Internet subscribers with Internet cafés springing up in many urban areas (Steinberg, 2003).

9 Knowledge Networking for Development

In working towards bridging the digital divide, development may take place through social and economic aspects needed within a country. Qureshi (2005) provides a socio-economic model of development. This model of development identifies social development by delineating the key areas in which its activities are most common: government, healthcare, the environment, and education. The social perspective enables development to be investigated as a product of human activity systems. The socio-economic model of development also incorporates economic development through financing in the form of loans, aid and/or trade agreements, the use of knowledge and expertise for innovation and the sourcing of raw materials, goods and services needed for production. These in turn may create an impact on public policy, education, and healthcare.

In order to for knowledge networking to enable development to take place, the knowledge needs to be activated. Activation of knowledge involves bringing knowledge into action. The knowledge activation framework proposed by Qureshi and Keen (2005) suggests that the demand for knowledge within a network is driven by knowledge "identities" that determine the willingness

of people to communicate and share. They have many incentives to share their accountable knowledge, which is part of their responsibility and position. They are less likely to share their discretionary and autonomous knowledge, which is personal and in many instances carefully guarded. Knowledge networking processes are initiated through processes of collaboration (existence of shared spaces and support for the activation of accountable knowledge, reciprocity and relationship for activation of discretionary knowledge, and trust and personalization for activation of autonomous knowledge). The following Vignette 9 illustrates how this process takes place.

Vignette 9: Mobile Phones to Help Fight Poverty in Africa

Daniel Mashva heaves his sack of cabbages and sweet potatoes into a rickety shared taxi and travels nine hours under the scorching sun to the market in Johannesburg. By the time he arrives, half his tiny harvest is rotten and the 48-year-old father of five returns to his impoverished village just a few pennies richer. That was before new cell phone technology changed his life. Mashva now dials up to a virtual trading platform on his new high-tech phone and sells his produce direct from his small thatched hut on the fringe of the vast Kruger National Park. "I check the prices for the day on my phone and when it's a good price I sell," he told reporters from his village in the remote Northeast of South Africa. "I can even try to ask for a higher price if I see there are lots of buyers." Mashva is one of around 100 farmers in Makuleke testing cell phone technology that gives small rural farmers access to national markets via the Internet, putting them on a footing with bigger players and boosting profits by at least 30 percent. (Source: Zee News http://www.zeenews.com/znnew/articles.asp?rep=2&aid=292033&sid=ZNS)

This behavior reinforces the points made by that what drives innovation in underdeveloped economies are talent pools – people such as Mr. Mashva who are able to make the connection between new tools at hand and their own growth via knowledge networks. Such use of mobile phones for the activation of dispersed knowledge to enable knowledge networking is bringing about economic development on a larger scale. Vignette 10 illustrates this impact.

Vignette 10: Mobile Phone Boom Spurs Bangladesh's Economic Growth

"The mobile phone industry in Bangladesh employs 237,900 people directly and indirectly. These are well-paid jobs with salaries many times the national average," said the study by the international consultancy firm Ovum. The study commissioned by the GSM Association (GSMA), a global industry body of 690 operators, found that the mobile services industry contributed 650 million dollars to Bangladesh's GDP annually. Analysts say the boom will continue amid falling mobile phone prices. Last year alone call charges fell by 30 percent, injecting faster growth to the industry. Over seven percent of the population now has a mobile phone, up from a mere 0.2 per cent four years ago, the study said, describing the growth as "extraordinary". Due to huge investment by operators, mobile phone coverage now has been extended to 90 percent of the country, it added. (Source: http://news.yahoo.com/s/afp/20060510/tc_afp/bangladeshtelecomstudy)

This vignette illustrates a trend in developed nations whose implications for other nations is easy to overlook: the commoditization of what was previously "high tech" but is now consumer electronics and the corresponding commoditization of many jobs that previously were "high knowledge" in the sense that they demanded advanced levels of education and were very specialized. The more that mobile phones, PDAs, PCs and Internet-based services become commodities, the greater the expansion of their use and of the jobs that surround that use. Katmandu offers good, low cost Internet service and Bangladesh has after decades of failure to grow employment added a billion dollars a year to its economy plus several hundred thousand jobs.

In developed economies, this commoditization is very much a threat, cutting margins for companies such as Sun, Dell, Sony, and HP and leading to the outsourcing of more and more jobs to locations such as Bangladesh. Exploiting technology commoditization has added half a billion dollars to its economy and taken away far more than that from these and other firms' profits. Historically, nations have tended to assume that they should move to the high end of the knowledge economy, as Taiwan and Singapore have so successfully done. Europe and Japan launched multi-billion dollar programs with such lofty titles as The Fifth Generation and Esprit, all of which generated limited value. This vignette may be summarized as "the more you commoditize high technology, the more people who can afford it and the more the jobs that creates and the larger the knowledge network."

A very common scenario is apparent in organizations: having less time available for us to grow comfortable in our own knowledge while needing to generate more knowledge. It is becoming extremely challenging and difficult, even within narrow technical professions, to stay current and updated. For example, consider today's medical profession where, despite having formal education, doctors are frequently "taught" by their patients, who have more time to review massive amounts of data related to their specific medical concern. Even more so, as we move into a knowledge-intensive economy, only rarely does any one person have sufficient knowledge to solve increasingly ambiguous and complex problems.

The following vignette is an ideal example of circumstances frequently heard when managers and executives are asked to narrate how they obtained information critical to the success of an important project. This person was successful, not solely as a result of his own knowledge, but rather as a product of being able to find and apply relevant information efficiently. And of notable importance is the role that his network played in helping him locate knowledge in a timely fashion.

Vignette 11: How Employees obtained Information Critical to the Success of an Important Project

> *"So the call came in late on Thursday afternoon and right away, I wished I hadn't answered the phone. We had received a last-second opportunity to bid on a sizable piece of work that the partner on the other end of the line really wanted to pursue. Unfortunately, I had little experience in the subject matter but happened to be the one with availability at the time. I had no clue how to even begin looking for relevant methodologies or case examples, so my first move was to tap into my network to find some relevant info and leads to other people or databases. And in fact, I relied pretty heavily on this group of people over the next couple of days. For example, Seth was great for pointing me to other people and relevant information, Paul provided ideas on the technical content of the project while Jeff really helped in showing me how to frame the client's issues in ways that we could sell. He also helped navigate and get buy-in from the client, given his knowledge of their operations and politics. And somehow in this process, we managed to pull it off…I mean the whole game is just being the person that can get the client what they need with the company's resources behind you. This almost always seems to mean knowing who knows what and figuring out a way to bring their knowledge to bear on your client's issue. Knowing who to turn to for what is ultimately the key to doing what you need to do quickly so you can go home to your family"* (Cross et al., 2002)

It is becoming clear that we are seeing a subtle but consistent shift in how we work. This is a collaboration component that pervades knowledge networking and is a key driver for development activities. Such virtual teams have become more pervasive than ever before and enable

bridges to be build across different regions. It has now become easier to communicate than to cut oneself off from such knowledge networking as that described in this example.

With knowledge networking there is a shift to an etiquette that you can contact anyone as long as there is a legitimate knowledge networking need. People do not see this as an "intrusion" and it is routine to reference a colleague in explaining the reason for making the knowledge networking request.

10 A Knowledge Networking Model

The above analysis suggests that knowledge networking enables the digital divide to be overcome by activating geographically dispersed talent pools. These talent pools benefit from the activation and enable income to be generated by enabling new markets to be accessed and administrative efficiencies to be achieved. In order for this cycle to enable knowledge networking to be effective, information literacy needs to be continuously developed. The greater the ability of individuals to communicate and understand electronic communication, the more they can engage in activating knowledge. This cycle of knowledge networking enables the digital divide to be overcome by narrowing the gap between information rich and information poor people by bringing together these dispersed knowledge resources to bear on the knowledge. The vignettes have illustrated how knowledge networking can be successful by enabling people and businesses to access new markets, use information they would otherwise not have, achieve administrative efficiencies and enable diverse talent pools to be accessed. When knowledge networking processes are able to transcend the social divide, businesses are able to make decisions relating to the sourcing of global capabilities (Keen and Qureshi 2006). This has a direct effect on the ability of these businesses to innovate, access and hire needed talent. This increases incomes and enables further sourcing of talent from these regions as is illustrated in Fig. 2.

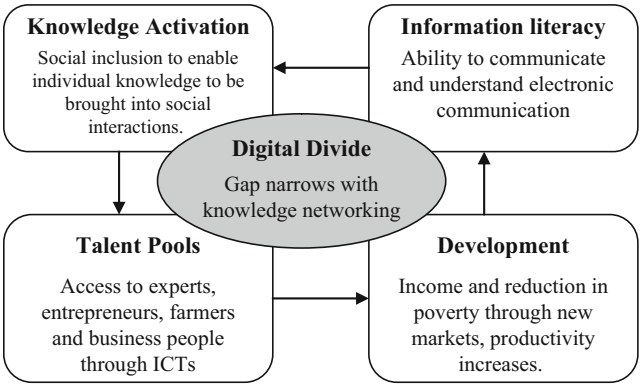

Fig. 2: Knowledge Networking Model

It appears that while the benefits of knowledge networking are many, these can be best reaped by bridging the social divides. Castells (2000) is notable in his description of globalization to be fueled by information technology in what characterizes this current technological revolution is not the centrality of knowledge and information but the application of this knowledge and information to knowledge generating and information processing devices. This forms a cumulative feedback loop between innovation and the uses of innovation. This feedback loop can enable decisions to be made that enable ICTs to be used to bring about increases in incomes and better livelihoods. The Internet can promote social capital and has been shown to bring about more extensive social networks of support within and outside the geographic areas in which the participants reside (Warschauer, 2003).

The results of this research suggest that through knowledge networking, farmers, small business entrepreneurs, students and NGOs are able to access new markets, use information that they otherwise would not have access to, access talent pools and get help with running their activities more effectively and efficiently. This form of distributed decision making has a direct effect on the ability of these people to increase their incomes. However the ability to achieve these gains through knowledge networking depends upon the social divide. The greater the social divide the more difficult it becomes to source global capabilities and participate in the industries that provide special services, assembly of low cost products, outsourcing and even creative communities. This suggests that through knowledge networking organizations are able to make decisions that enable them to source talent, goods and services from regions that provide the lowest cost burden.

11 Implications for Knowledge Networking

The discussion thus far has illustrated how knowledge networking is a process that can foster development by affecting human, social, and economic development. Through the activation of geographically dispersed knowledge, human freedoms and civil engagement, social capital and inclusion, and opportunities for sourcing expertise and innovations can be achieved. This process can lead to positive spirals that enable the digital divide to be bridged or negative spirals in which ICTs may exacerbate existing gaps in poverty, information literacy and facilitate social exclusion. This has implications for the way in which the digital divides are addressed and approaches that can be used to overcome them. These are outlined as follows:

1. Low cost communications technology, in particular, mobile phones, and payment systems enable talent pools to be activated. Information systems that address knowledge networking should address credibility, validity, accuracy, and recourse.
2. Information literacy is needed to enable people to reap the benefits of digital infrastructures. There is a demand function at work in knowledge networking whereby people with limited education, poor information literacy and in many instances isolation from the mainstream of the modern economy none the less apprehend the opportunity for themselves to make a significant improvement in their lives.
3. The collaboration component is driven by the need to access dispersed talent. This need is fueling the use of ICT for the development of virtual teamwork which spans developed and developing countries.

4. The activation of knowledge is particularly prevalent in established communities in which social capital is high. Fostering social inclusion brings about a readiness with which people share information and a sense of civic engagement. These high activation communities also generate opportunities for economic development.
5. The existence of talent pools drive networking between people and in doing so extend the reach and impact of their knowledge generation, mobilization, use, and impact. This suggests that governance mechanisms are needed to protect intellectual property and promote ethical conduct in the use of dispersed talent.
6. Information architectures are needed that foster activation of knowledge and the development of knowledge networks. In particular, semantic Web searching tools would bring knowledge in talent pools into action and mitigate the development of knowledge networks. Such architecture should address knowledge sources rather than information in databases.

The above implications point to a set of guidelines that may enable bridges to be built across the digital divide. This also suggests that further research is needed into the ways in which knowledge networking infrastructures may be developed to activate and protect dispersed talent pools.

12 Conclusions

The sourcing of knowledge and skills from developing countries has hastened the need to share dispersed knowledge. This paper has illustrated the need for knowledge networking and produced a model through which organizations in the developed world are able to source the skills they need from developing countries. Following an analysis of knowledge networking, this research has illustrated how knowledge networking can enable development to take place by bringing about positive cycles that enable the digital divide to be bridged. Knowledge networking can also reduce development by bringing about negative communication cycles. Armed with insight of knowledge networking, further research should investigate approaches for stimulating positive development cycles through knowledge networking.

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