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**Analysis of Information and Communication Technology
Intervention in Rural Areas in Developing Countries from
a Social Capital Perspective: Evidence from Peru.**

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Abstract

Using grounded theory method for analysis for a holistic multiple-case study design in the Peruvian rural Andes, this interpretive research explores the way information and communication technology intervention might be translated into increasing social capital. Since researching on the interaction between technology and social settings is a major challenge, the concept of social capital, comprised of norms, trust and networks, provides a useful platform for this kind of analysis.

INTRODUCTION

The potential benefits of using information and communication technology networks as key factors creating and accessing wealth, power, and knowledge has attracted the attention of both academicians and practitioners. Walsham (2001) ponders the relevance of information technology since it “can be regarded as a political actant in the production and reproduction of knowledge, truth and power” (op. cit., p. 59) and affirms that “no society can afford to ignore these technologies at this time in history” (op. cit., p. 203).

However, to demonstrate an unequivocal relationship between information and communication technology access and human progress poses a big challenge; underlying and intricate cultural elements interacting with each other must be considered before the innovation is superimposed. Consequently, it is necessary to take into consideration some social concepts to present compelling findings based on the observed phenomenon.

During the last few years, the research agenda on information systems has been called to redirect its focus and go beyond the traditional concerns on management of data and information (Walsham, 1995a, 2001; Walsham & Sahay, 1999). The social study of information and communication technology has emerged (Avgerou, Ciborra, & Land, 2004), whereby information technology should be studied in a broader approach, evaluating its implications within the institutional framework through an analysis of technological systems, social processes and their interactions (Orlikowski & Barley, 2001). Accordingly, this study intends to analyse the information and communication technology potential in building and/or reinforcing social networks in one of the poorest regions in Peru, where a project aimed to provide access to information technology is underway.

The proposed integrative perspective, bringing together the information and technology intervention and social capital notion, provides a constructive framework this research. A profound understanding of what using information and communication technology is at a social level in rural settings in a developing country, an under researched topic in the information systems literature, will be disclosed. Likewise, by conducting the research using a case study methodology for theory-building (Glaser & Strauss, 1967; Yin, 2003), the contribution to practice with those involved in similar project will be immediately evident.

RESEARCH OBJECTIVE

This research is designed to investigate the real mechanisms by which social capital can be enhanced, if that is the case, using information and communication technology in rural areas in developing countries. The immense question “Are we making a better

world with information technology?” (Walsham, 2001, p. 251), converted into “How can we make a better world with information and communication technologies?” by the call for papers of the MIS Quarterly special issue on Information Systems in Developing Countries (MISQ, 2004), must be addressed in a proper way and instantiated with true-life evidence.

Even though the evidence linking access to information / communication technology and development is increasing, it is largely anecdotal (Bhatnagar, 2003). Technological infrastructure is not enough; to achieve a successful technological deployment is not just a matter of access to computers, but contents must be appropriate to particular situations (Heeks, 2002) and meaningful for local people (Bhatnagar, 2003). Thus, people with the essential skills for interpreting these contents and to be ready for adopting and adapting the provided technology are required (J.-W. Lee, 2001). However, individuals’ abilities are of little use if they are not participating in a more or less large community; so, social structures are needed in order to exploit the technological potential (Avgerou, 1998). If we admit social capital building as a means of network strengthening (Sherry, Salvador, & Ilahiane, 2003), it becomes the crucial determinant of the capacity of societies to utilise information and communication technology (Cornford, 2003).

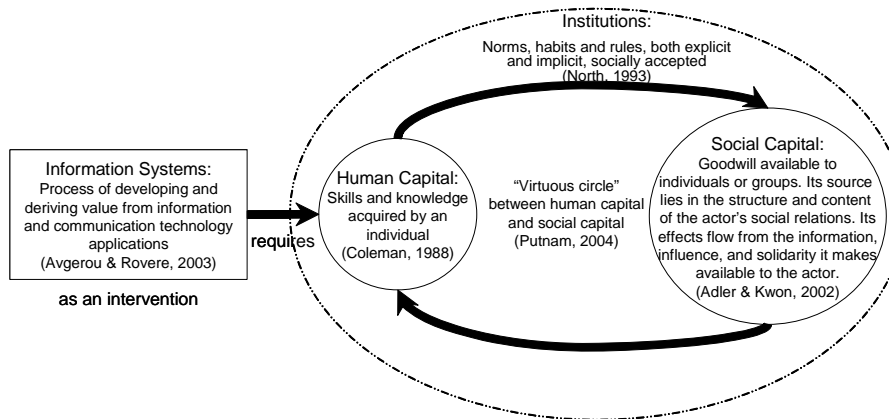
In order to achieve specificity in this research, I examine the consequences of information and communication technology provision in the Cajamarca region in Peru. The analysis of the technological intervention through the lens of social capital theory, which entails the rules of reciprocity and trust inherent to collective networks, can prove valuable to attain a better understanding of the outcome. Therefore, I put forward the general research question in the following terms: *How does information and communication technology enable the effective interaction within villages and between inhabitants of different rural villages to make the most of social capital in a developing country?*

To find an appropriate answer to such a complex question, it must be broken up into manageable specific research questions. The first step is to uncover the villagers’ appraisal of information and communication technology: *What are the motivations and incentives, from a social capital perspective, to adopt or reject the information and communication technology intervention in a rural village?* The second step addresses the dynamics of building social capabilities through information and communication technology supply and explores this process: *How does the information and communication technology intervention aid formation and realisation of social capital among rural villagers?*

PRELIMINARY THEORETICAL FRAMEWORK

In Figure 1, I present my initial theoretical framework. It includes the conceptual elements that guide this research and assisted me during the data collection procedure.

Figure 1: Preliminary theoretical framework



In this research, information systems is defined as the process of developing and deriving value from information and communication technology applications (Avgerou & Rovere, 2003) and will be closely represented as a technological intervention. I analyse this process through an examination of the interaction between technological innovation and social condition (Avgerou et al., 2004). An information system should consist of not just the technology (hardware, software, data, networks) and/or the social setting (people, business processes, politics, economics, psychology, culture) but also the rich phenomena that emerge from the interactions between the two (A. Lee, 1999).

A social constructivism approach supports the thesis that technology's impact is ultimately a matter of interpretation by human actors according to their social circumstances (Madon, 2003). The effective use of information and communication technology depends on the recipients' abilities with this particular tool (Wade, 2004). Simply providing access will be of little help if the alleged beneficiaries are not able to make sense of the now available information and cannot exploit it according to their own views: "Even if free computers and free Internet access are available, they are useless to individuals who are illiterate or lack the know-how" (J.-W. Lee, 2001, p. 128).

Therefore, the information and communication technology introduction requires fertile conditions. These conditions are represented by the notion of absorptive capacity, the ability to identify, incorporate and utilise new information, based on previous knowledge (Cohen & Levinthal, 1990), or what Foray names "knowledge as a capacity to learn" (2004, p. 236). The notion of absorptive capacity is embedded and underlies the concept of human capital, defined as "the skills and knowledge acquired by an individual" (Coleman, 1988, p. 100).

Avgerou (1998) and Main (2001) affirm it is necessary to develop the appropriate organisational and social structures capable of exploiting the information technology potential. Therefore, the underlying dynamics of the interweave between social and technological artefacts should be scrutinised (Cornford, 2003) and the concept of social capital (Bourdieu, 1983) provides the basis for this analysis. Overall, it refers to the characteristics of "social organisation, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions" through their linked rules of reciprocity (Putnam, 1993, 2004; Putnam, Leonardi, & Nonetti, 1993). While Coleman (1988) proposes that social capital fosters individuals' human capital, Putnam (2004) declares the existence of a virtuous circle between both human and social capital.

For the purpose of this research, I subscribe to the following definition: "Social capital is the goodwill available to individuals or groups. Its source lies in the structure and content of the actor's social relations. Its effects flow from the information, influence,

and solidarity it makes available to the actor” (Adler & Kwon, 2002, p. 23). This twofold statement is suitable for this study. First, it entails both internal (the structure of relations among actors within a group) and external (the relations an actor maintains with other actors) ties. Second, it allows to be attributed to both individual and communal actors.

Nevertheless the aforementioned advantage of social capital definition, I still need a framework for analysis of its specific aspects. Nahapiet and Ghoshal (1998) identify three dimensions of social capital reinforcing each other: structural, cognitive, and relational embeddedness. Adler and Kwon (2002) affirm social capital takes place in the individuals’ social relations, “in which favours and gifts are exchanged” (op. cit., p. 18) and put forward its three sources: opportunity, ability, and motivation. Ultimately, Cummings, Heeks, and Huysman (2003) recapitulate and propose social capital’s three domains: structural opportunity, cognitive ability, and relation-based motivation. These three components should prove useful for the scrutiny of social capital in the presence of the technological intervention.

Finally, relationships among individuals and the construction of communities are performed within established frameworks socially accepted and instantiated by norms, habits, and rules both explicit and implicit (North, 1990); in other terms, institutions. “Our opportunities and prospects depend crucially on what institutions exist and how they function”, declares Sen (1999, p. 142). Analysing the consequences of any information and communication technology intervention ought to include a portrayal of the particular context because “without an institutional lens, information technology research might focus more narrowly on technological designs, economic imperatives, or psychological impacts, thus missing important social, cultural, and political aspects” (Orlikowski & Barley, 2001, p. 154).

I must emphasise that the theoretical framework shown above is a “sensitising device” (Klein & Myers, 1999). It helped me to avoid getting overloaded with data, but it may be revised and modified according to the actual facts observed during the analysis stage of this research and should not be regarded as a rigid set of premises (Miles & Huberman, 1994; Walsham, 1995b). I wish to remain open to new concepts, those emerging from the data and not included in the predefined categories (Urquhart, 2001).

RURAL-URBAN INFORMATION SYSTEM PROJECT

The subject of analysis for this research is the Rural-Urban Information System Project (Sistema de Información Rural-Urbano - SIRU, the original Spanish name). It began with the conception of Infodes Project by Intermediate Technology Development Group - ITDG, a British non-governmental organisation. Infodes Project proposed providing information by means of the integration of rural knowledge with new information and communication technology in order to increase the productive capacity and improve local governance in the countryside.

The project was implemented over two and a half years until 2001, when librarian services through local information centres in six villages were provided (Guillén Marroquín, 2004). Because the local information centres lacked Internet and even telephone services at that time, ITDG deployed two additional projects: a broadcasting station for the region (Villafuerte Quiroga, 2003) and a rural telephony pilot project (Guillén Marroquín, 2004). The latter was totally financed by the Fund for Investment in Telecommunications, a branch of the national telecommunication regulatory agency.

SIRU Project entails the implementation of a system of information. It seeks to “provide timely and useful information to local farmers, businessmen, and government agencies in order to build up capabilities for local development” (my translation, Pereyra Romo, 2002, p. 5) through the contents diffusion and interactive

communication among rural information centres. For attaining this purpose, 'infocentros' were implemented in eight towns, which are linked to each other by satellite communications and have access through the Internet to the Coordination Information Centre in Cajamarca City, the chief city of the region. Subsequent to the telecommunication infrastructure deployment, Internet access, phone calls and messaging, computer training courses, and local broadcasting programmes, among others services were made available at the 'infocentros'.

RESEARCH DESIGN

From the very beginning I must define the belief system that guides this study. My ontological assumption is that social reality is locally and specifically constructed (Guba & Lincoln, 1994) "by humans through their action and interaction" (Orlikowski & Baroudi, 1991, p. 14). My epistemological assumption is that "findings are literally created as the investigation proceeds" (Guba & Lincoln, 1994, p. 111) and that "understanding social reality requires understanding how practices and meanings are formed and informed by the language and tacit norms shared by humans working towards some share goal" (Orlikowski & Baroudi, 1991, p. 14). Therefore, given the essence of the research problem at hand, an interpretive perspective was brought into play as the foundation of this study.

The appropriate methodology to scrutinise "a contemporary phenomenon within its real-life context" is case study (Yin, 2003, p. 13). Its major advantage is that it allows capturing the whole and significant characteristics of actual events providing a deep and broad view of the particular phenomenon (Creswell, 1998) in a previously little-studied area (Benbasat, Goldstein, & Mead, 1987) leading to its subsequent interpretation (Miles & Huberman, 1994). To investigate the process under scrutiny, I adopt a holistic multiple-case study approach, where SIRU Project over six towns is the unit of analysis.

Having decided the methodology, I had to define the method for data collection and data analysis. Grounded theory method (Glaser & Strauss, 1967) is extremely useful for under researched areas; moreover, its inductive thinking approach assists in the discovery of underlying patterns existing in real-life events. The analytical effort during the codification procedure, the ever-present chain of evidence along the investigation, and its ability to relate the findings to other theories prove method's rigour (Urquhart, 2001).

Data collection

Subsequent to having negotiated the access with SIRU Project officers, I prepared the instruments for the fieldwork, mainly the in-depth interviews. The open-ended questions were informed around the themes presented in the preliminary theoretical framework, but not composed in a direct form that could "preconceive the emergence of data" (Glaser, 1992, p. 25).

Originally, I planned to visit the towns of Chanta Alta, Combayo, Huanico, La Encañada, Llacanora, and Puruay Alto, since they were towns where the project was initially launched. Nevertheless, during the course of the fieldwork between July and November 2005, I decided to include the towns of Chilete and San Marcos, following the information received from my first interviewees, and Cajabamba, because it was supposed to be another town served by the project. I always kept in mind the tenet of flexibility (Trauth, 1997) when conducting my fieldwork; I chased the data wherever they were. In order to refine the data collection plan, mainly the relevance of the in-depth interview questions (Yin, 2003), I performed a pilot case study in Puruay Alto.

In total, I conducted 38 one-hour in-depth interviews in Spanish with participants from three groups of stakeholders: infocentros managers (8), intended beneficiaries from the infocentros (22), and SIRU Project officers (8). All the interviews were audio taped

and transcribed afterwards. In general, I conducted the first interview in each town the second or third day after my arrival, once I got some degree of acquaintance with the local environment. During the interviews, I went from the general topics to the more specific ones as a way to gain rapport with my participants. Nevertheless, I admit in not a few cases the tape-recorder precluded the participants to express spontaneously; in those situations, I gained richer insights from informal conversations rather than from planned meetings.

I also produced more than 200 pages of field notes from my observations. They became an excellent complement of the interviews and provided the unspoken information to complete the picture. Besides, I took more than 110 photographs depicting the distinctive characteristics of each town. In addition, I collected published information and documentary material and looked for information and communication technology media content.

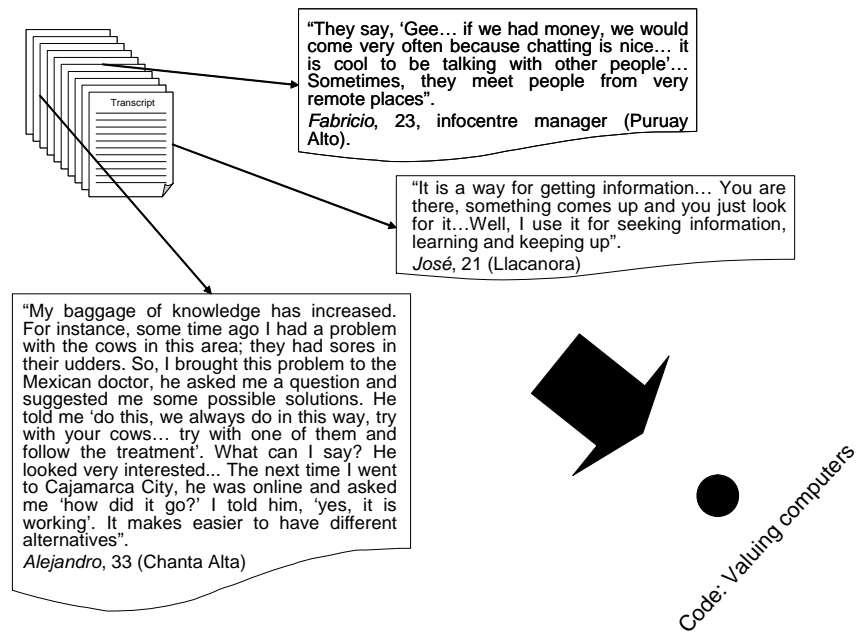
My approach was to collect background data about persons, processes, and settings; detailed descriptions of a range of participants' beliefs and actions; information revealing what is beneath the obvious data; multiple perspectives to understand the contexts of the study and inform my ideas (Charmaz, 2006). I did a major effort in collecting rich, substantial, and relevant data that can guide me to a study of quality.

Data analysis

When applying the grounded theory technique, I adhered to the precept of constant comparison through permanent asking the neutral questions: What is this data a study of? What category does this incident indicate? and What is actually happening in the data? (Glaser, 1978, 1992; Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1990). Reading beyond the lines, listening beyond the words, and seeing beyond the pictures is an intellectual exercise conducive to the discovery of underlying patterns in the data.

Grounded theory analysis is a rigorous method of coding textual data that implies a conceptualisation progression. For the initial coding, I broke "the data analytically" (Strauss, 1987; Strauss & Corbin, 1990), simply ran "the data open" (Glaser, 1978, 1992), and saw "actions in each segment of data" (Charmaz, 2006). Instead of implementing a rigid strategy for coding by either word-by-word or paragraph-by-paragraph, I adopted the criterion to identify codes when I got complete ideas or concepts within the data. When naming the codes, using NVivo[®] software, I privileged in vivo words over sociological constructs (Glaser, 1992), to be held firmly attached to what the data are saying.

Figure 2: Example of the coding procedure



My line of attack was to analyse the transcripts on a case-by-case approach to be mentally immersed in each town while examining the data. The coding effort for the first case was the most painful; it demanded approximately eight hours a day during six-day workweek for nine weeks. Conversely, coding the next cases was very much quicker after the initial codes were discovered from the first case; anyway, having already identified codes did not prevent me to create new ones as they emerge from the data. I always kept in mind not to develop too many substantive codes that can dilute the core categories analysis (Glaser, 1992). Figure 2 presents an example of code emergence from textual data.

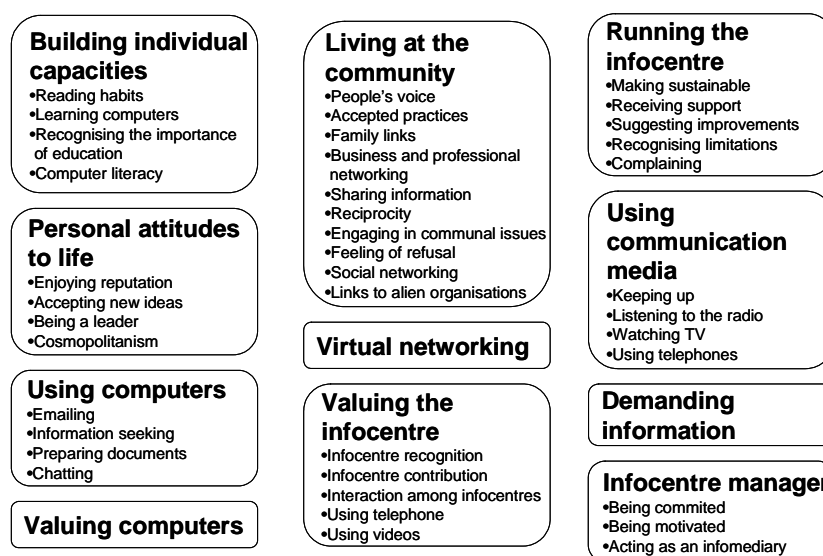
Once the initial code was completed, something that I can only affirm when this research is finished and definitely the already identified codes are not the last ones, I had to move to a higher abstract level to discover the sub-categories and the subsequent categories, the conceptual elements that will lead me to the theory (Charmaz, 2006; Glaser, 1992). In my first attempt in pursuing the sub-categories I did axial coding informed by the coding paradigm (Strauss, 1987; Strauss & Corbin, 1990). Soon after, I verified this strategy was not the right one for my research, because the already identified codes did not fit well into the predefined classes of the coding paradigm (conditions, interaction among the actors, strategies and tactics, and consequences).

Therefore, I adopted the focused coding approach proposed by Charmaz (2006), where the sub-categories arise from the most significant earlier codes, the initial ones, to explain the process under study. Since theoretical sensitivity is a must in grounded theory method, I always make comparisons, ask constantly, build on ideas, and look for fresh possibilities (Charmaz, 2006; Glaser, 1978) to refine my emergent sub-categories through the scaling-up course of action. Writing analytical memos alongside the codification procedure proved to be tremendously beneficial. Memos are theorising write-ups of ideas as they come up and provide a space to develop ideas and to clarify and direct subsequent coding (Charmaz, 2006). I prepared one analytical memo for each transcript and am preparing one for each emerged code; they assist me to gain theoretical sensitivity (Glaser, 1978, 1992) while I am in the path of the discovery.

PRELIMINARY FINDINGS

So far, I obtained 50 codes; at some point, I got over 90. In the way, according to the tenet of constant comparison, some codes were elevated as sub-categories; others were downgraded, while others were merged. Figure 3 presents the emerged codes; they are not, however, the last and definitive codes for this research.

Figure 3: Emergent codes and sub-categories (the latter are in bold)



Over again, the already assigned names identifying the codes might change during the analysis in progress. Notice that whenever was possible, I used gerunds for labelling the codes in order to convey the sense of action taking place in the phenomenon under study (Charmaz, 2006). It helps me in maintaining the focus on the process and giving it analytical treatment.

PRINCIPLES FOR CONDUCTING THIS RESEARCH

Since this is an interpretive holistic multiple case study, I adhere both to the principles for data collection prescribed by Yin (2003) and to the principles for interpretive field studies recommended by Klein and Myers (1999). Accordingly, I present a brief discussion of how each principle is met in this research.

Principles for data collection

- Use multiple sources of evidence. I conducted in-depth interviews, made field notes, and produced photographs. In addition, I gathered published information related to the towns as well as both information and communication technology and media contents referred to the infocentros.
- Create a case study database. I organised electronic records of texts, audio, and image files; NVivo software proves to be very useful not only for data analysis but also for recording the files. I also prepared an archive of pamphlets, booklets, maps, and reports.
- Maintain a chain of evidence. Grounded theory method makes possible the cross-reference between methodological procedures and resulting evidence; every emerged code can be traced back to the data.

Principles for an interpretive field study

- Hermeneutic circle. The holistic multiple case study approach provides elements to understand both the parts (participants, towns, and I as a researcher) and the whole (the consequences of SIRU Project across the towns).

- Contextualisation. Obtaining information about the towns, living there, and sharing everyday life with villagers provided me a rich understanding of the background where my study is taking place. Afterwards, the codification procedure on a case-by-case basis helped me to analyse the events being focused on the unique conditions of each town.
- Interaction between the researcher and the participants. As I was conscious that my contact with the participants could make them aware of the consequences of the information and communication technology intervention, I also recognise they have influenced my preconceptions.
- Abstraction and generalisation. The inductive thinking of grounded theory method, through the coding procedure and analytical memos writing, is leading me to theoretical insights of the problem at hand from the very concrete data to a higher level of conceptualisation.
- Dialogical reasoning. I explained my philosophical approach and tried to put aside my previous knowledge, experience, and already reviewed literature during the codification procedure. Certainly, this is not an easy task.
- Multiple interpretations. By questioning different participants and observing the same incident from different angles as well as looking for an explanation from any potential contradiction I tried to corroborate the obtained information.
- Suspicion. I recognised different groups of stakeholders beforehand; when I approached them I tried to discover their prejudgements or interested opinions, if any, and to perceive how they might consent themselves providing deceptive claims.

CONTRIBUTION OF THIS RESEARCH

Since Avgerou and Walsham (2000) and Walsham (2001) called for researching in developing countries, burgeoning literature has been produced. However, it has been focused at organisational level only, while the notion of social capital was mostly not taken into account. The interplay between social capital and information technology has been recently researched on Huysman and Wulf's (2004) pioneer volume. Its contents, however, refers for the most part to developed societies. This research aims to complement the aforementioned approaches analysing the consequences of the technological intervention in a developing country from a social capital perspective.

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