

TELEMEDICINE IN THE UPPER AMAZON: INTERPLAY WITH LOCAL HEALTH CARE PRACTICES¹

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Abstract

This article is based on the introduction of a telemedicine system in the jungles of northeastern Peru. The system was designed by a European consortium led by a Spanish polytechnic in cooperation with two universities in Lima and the Peruvian Ministry of Health. The purpose of the system was to improve health conditions by extending science-based medicine into a region with well-established traditional healing practices. The central analytical focus of this article is on the interplay between the public health care system, which used the telemedicine system, and local health care practices. The manner in which scientific medicine was delivered through information technology and public health care services is analyzed in terms of the health personnel's activity, the local population's conceptions of health, and the trajectories followed by patients seeking recovery. The author participated in the design of the second evaluation of the telemedicine system and acted as a participant observer in the regional hospital and peripheral clinics. In addition to interviewing health care staff from the study area, the author

also met with traditional healers, and patients in the districts whether or not they were involved in the telemedicine project. New institutional theory provided the analytical framework for the interpretation of the observed behavior of the public health care staff, traditional healers, and potential patients. Empirically, this study describes the informal aspects of the functioning of the telemedicine system, and its partial mismatch with the definitions of health and illness employed by local communities and healers.

An argument is made that people's construction of their health, which is embedded in their normal patterns of action, should be identified, and then considered in the design, implementation, and evaluation of future telemedicine projects. This article problematizes an approach to telemedicine-based health development that is weakly accountable to local social contexts and their diversity.

Keywords: Telemedicine, developing countries, new institutionalism, ethnomethodology, accountability, Amazon, healing practices, knowledge transfer

Introduction

Knowledge is like light. Weightless and intangible, it can easily travel the world, enlightening the lives of people everywhere. Yet billions of people still live in the darkness of poverty—unnecessarily.... Poor countries—and poor people—differ from rich ones not only because they have less capital, but because they have less knowledge.... This World Development Report proposes that we look at the problems of development in a new way—from the perspective of knowledge (World Bank 1999, p. 1).

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Figure 1. Earth at Night. (Credit: Data courtesy of Marc Imhoff of NASA GSFC and Christopher Elvidge of NOAA NGDC. Image by Craig Mayhew and Robert Simmon, NASA GSFC.) This picture was used in a presentation given at an ICT for Development conference, held at the project-leader polytechnic in 2003.

In the image of the Earth presented in Figure 1, the illuminated areas are the more economically developed regions of the world, those allegedly enlightened by Reason. The image can be interpreted as a metaphor for those who possess knowledge and those who do not. This conception is not a new one, but in recent years it has become interwoven with the notion of the digital divide. Arguably, the metaphorical meaning of light in the picture has prevailed: knowledge enlightens, therefore those who have no light have no knowledge.

Information and communication technologies (ICTs) have been extremely influential in directing attention to knowledge as a key factor in development. For several years now, information systems have increasingly been implemented in developing countries in order to promote education, improve public services, and stimulate economic growth (Mansell and Wehn 1998). With regard to health care, I refer to telemedicine as the implementation and use of ICTs to carry out or support health care activities remotely. Through telemedicine systems, medical science is argued to be able to spread and reach people that tend to be marginalized from improvements in biomedicine (Sosa-Iudicissa 1995) and from the promises of scientific knowledge and development in general.

ICT-based development efforts are usually based on an alliance between ICT-supported science, international organizations (such as the United Nations and the World Bank), and national and regional governments. This development approach typically relies on a linear and universal conception of knowledge–information–transmission–development (UNDP 2001). Development initiatives draw up their agendas accordingly. The development project studied here is affected by these assumptions and oriented by similar expectations.

The empirical part of the research reported in this article concerned the Upper Amazon (northeastern Peru). It centered on a town, its hospital, and the communities of a region where a telemedicine service had brought together international agencies, medical and engineering universities, health personnel, and people living in the jungle. By focusing on the interplay between ICT-supported scientific medicine and local healing practices, the aim of the research was to understand what happens in a territory where a telemedicine system has been implemented. The main research question addressed was: How do telemedicine and local healing practices influence each other? The answer, it was hoped, would yield a better understanding of the processes of health care institutionalization through telemedicine. In general, this paper

Table 1. General Presentation of RISS Development Project Partners

Key Partners	Description of Involvement
A Spanish polytechnic	Designed and evaluated the telemedicine system
A Spanish nongovernmental organization	Implemented the system and was in charge of executive tasks
Two Peruvian universities	One specialized and contributing in medical issues, the other in engineering and telecommunications
Peruvian Health Care Ministry	Gave permission to implement the RISS system in the existing organization and facilities
Upper Amazon health care system	Health personnel were directly involved in the use of the RISS system
Patients and population	Proposed beneficiaries of the RISS project
Spanish, European, and Peruvian public institutions	The main funding agencies
Infodev (international consortium sponsored by the World Bank)	A RISS project sponsor

helps to identify approaches to rethink the balance between the global attitude underpinning ICTs for development initiatives, and local adaptations to target developing contexts.

The paper is organized as follows: after an initial description of the telemedicine project and its goals, the theoretical and methodological aspects of the research approach are described. The following empirical section begins with an introduction to the links between telemedicine and the public health care system, and then relates them to local healing practices. The paper concludes with the interpretations constructed from the data, drawing upon concepts of institution and accountability.

Red Ibero-Suramericana de Salud

The purpose of the Red Ibero-Suramericana de Salud (Iberian-Southern American Health Network) project is to design, implement, evaluate, and formalize a model of low-cost telemedicine systems to improve health care in rural areas of developing countries. I will refer to the RISS project to address the initiative as a whole, and to the RISS system if the reference is to the telemedicine system. The names used in the paper are fictitious; I alone am responsible for the interpretations provided.

Table 1 introduces the principal RISS partners forming the organizational network of this action-research project (only the actors directly relevant to the analysis of the Upper Amazon region are considered in this article).

The RISS system was implemented within the existing public health care organization, and reflected the hierarchical struc-

ture of this organization. It consisted of one hospital, *health centers* (6 of them were interconnected), and nearly 80 outlying clinics—called *health posts*—scattered throughout this area of the Amazon (37 of them were electronically connected). Overall, the system was implemented in 44 facilities.

The Peruvian Upper Amazon basin is a poor rural area characterized by isolated villages dispersed across an area of 18,500 square kilometers and populated by more than 67,000 inhabitants. The main population groups of the area are *mestizos* (mixed-blood people of Spanish and Indian ancestry) and indigenous natives, most of whom live in areas difficult to access. River craft are the principal means of communication between communities and health centers. Although there are boats that travel along the two main rivers, most of them only serve the villages close to the coasts. For communities without easy access to the largest harbors, journeys are made by small canoes. There is a high incidence of diseases in the region, the most common being malaria, hepatitis, respiratory infections, dengue, HIV/AIDS, diarrhea, and enteric diseases. The local population relies on a variety of health care practices to cope with illnesses.

The telemedicine system operates chiefly via radio connections (on high frequency and very high frequency spectra), which enables the transmission of two-way voice and digital data. Hence, each health establishment is equipped with a two-way radio, a computer to carry out office duties and access e-mail service, and a printer. Where electricity is not available, power is provided by solar panels and rechargeable batteries. At the time of this research, the available bandwidth was quite limited, and trials were ongoing for newer technological solutions, such as Wi-Fi connections.

Work routines in the public health care organization shape the activities of health care personnel. It has to be noted that the RISS telemedicine system is mostly used by health personnel; consequently, electronic communications are required to comply with existing routines and the organizational structure. For example, health posts report to health centers, which in turn report to the hospital. Personnel working in health posts are expected to communicate mainly with their colleagues at other health posts in the same area and also with their health center, which in turn interacts with the hospital. For the RISS organizers, designing the network based on the public health system's hierarchical structure arguably had the advantage that personnel were already accustomed to the established routines and procedures.

In the medium term, the Peruvian Health Ministry's aim, with the support of the RISS project (as declared by a public administrator during an interview), was to create direct and effective relations between patients living in rural areas and physicians through communication networks. This aim reflects a linear conception of knowledge-information-transmission-development, which also underpins the following designated uses of the RISS system:

- accessing medical knowledge remotely
- enabling remote consultation with specialists
- providing distance education
- sending activity reports

Apart from reporting, the envisaged uses of the telemedicine system pertain to the linear relation between knowledge and development that normally underpins ICT applications for development. More concretely, medical knowledge is supposed to be transmitted and shared as information. The study emphasizes the assumption, underlying the RISS system, that the primary role of knowledge is to promote development, and the commodifiable conception of knowledge. Furthermore, the focus of such ICT projects is on existing formal organizations, which are expected to support the ICT deployment.

Research Approach

My research focus was mainly on the social aspects of the implementation of the RISS system. The purpose was to highlight what happened on the ground as a result of this development effort. Based on an ethnographic study, and complemented by other qualitative research methods, this paper attempts to problematize the widespread approach adopted in development projects: the conception of knowledge as a commodity, and the associated expectation of linear organizational change through its transmission as information.

Theoretical Framework

There are various theoretical perspectives available to make sense of the case studied here. Actor-network theory can be used to bring out what is inscribed in an information system intended to promote development (Heeks 2004; Walsham and Sahay 1999). Narrative analysis (Czarniawska 1997) can aid explanations of how people make sense of what happens, and what they do about health. Symbolic interactionism would show how symbols and myths orient people's perceptions and attitudes toward ICTs and their expectations of development. Besides these theoretical perspectives, the kind of empirical setting analyzed lends itself to an anthropological analysis as well. Medical anthropology provides lenses with which to identify different conceptions of health and sickness (Good 1994), and development anthropology focuses on the changes that result from international cooperation projects (Cernea 1996).

The focus on rationalities implied by information systems is an important line of research in this field. Avgerou (2000) examines the mismatch between the scientific and economic logic rooted in Western rationality that is inscribed in information systems, and the local rationalities that these ICT-based development efforts encounter in target contexts. Her approach emphasizes the ethnocentrism of the scientific-based reasoning embedded in information systems for development, and how managerial rationality is affected by local rationalities (Avgerou 2002). Elsewhere, Avgerou (2003) has analyzed information systems as hybrid networks, paying special attention to the ideas and institutionalized practices that they imply and support. She questions the implied primacy of technocracy in ICT-based development whereby target contexts are conceived as being conducive or not conducive for ICTs. The fact that these projects tend to fail suggests that they do not engender a techno-rational and linear process of organizational change, which is expected to produce development. Of interest in this regard are the three kinds of rationality, identified by Heeks et al. (1999) for evaluating the feasibility of health care information systems: technical, managerial, and medical. Each rationality assumes an objective engagement with the subject matter. From a technical perspective, artifacts are objective and neutral, and do not carry political or cultural values. Managerial rationality mainly concerns stakeholders' interests and money (both of which are considered to be objective and rational). Medical rationality focuses on the medical information transmitted through the system, which from this standpoint is seen as objective and rational.

It is necessary to question what an information system takes for granted and, in this case, to examine the local implications

of the change that a telemedicine system seeks to achieve. Good (1994) writes that illness is understandable through interpretation, and beliefs are what shape the experience of sickness. From this phenomenological perspective, he argues that sickness is not limited to the body as an object but is a part of the self, which is heavily conditioned by the social environment. Good follows Foucault (1975) in arguing that medicine is made up of practices that create the objects with which it deals. Ciminelli (2002) notes that Western medicine is informed by the triad of data collection–illness cause retrieval–treatment. However, the distinction between health and illness may vary in different places and historical periods. Medicine, therefore, constructs what is expected to be normal and accountable. Manca (2003) writes about Chiapas, Mexico, where it is commonplace to relate a sickness to socially relevant happenings rather than to physiological causes. Hence, treatment consists in mending community networks, reinterpreting what has happened, relieving tensions and balancing social relations.

Although all of these theories have offered meaningful insights for this study, the theoretical framework used here is new institutional theory, which concentrates on what actors conceive to be normal, and on the material and symbolic constraints on activity. In the following subsections, I describe the key features of the theory that I draw upon, and also provide the justification for my choice.

The New Institutional Perspective

In development issues, institution building is a widely used approach that seeks to promote and sustain organizations (DEVS Foundation 1990; United Nations 1982). Institution building is the key that relates organizational change directly to development because it expects the latter to happen through the production of goal-oriented organizational changes. New institutionalism is a theoretical perspective that relies on a less reductionist conception of organizing processes. Specifically, context is not conceived as the background for organized action, and rational choice is not taken for granted. This standpoint can shed new light on knowledge practices in situated contexts, which rationalistic approaches fail to recognize, thereby contributing to the understanding of ICT-based development efforts.

According to Galaskiewicz (1991, p. 294),

institution-building refers to “those conscious efforts to direct societal change and to search for more effective social controls which are grounded in rationality.” Actors participate in the creation of

these new systems voluntarily, and efforts are aware of and even guided by scientific thought.

New institutional theory pays special attention to the environment—usually termed the *organizational field*—in which organizations are situated, and the influences that orient and perpetuate their collective actions. This approach yields a theoretically informed perspective on organizations as particular socio-historical constructions. New institutional theory conceives of institutions as social models embedded in people’s patterns of action; in other words, institutions are organized and established courses of action.

Institution represents a social order or pattern that has attained a certain state or property; *institutionalization* denotes the process of such attainment. By *order* or *pattern*, I refer, as is conventional, to standardized interaction sequences. An institution is then a social pattern that reveals a particular reproduction process...Institutions are those social patterns that, when chronically reproduced, owe their survival to relatively self-activating social processes (Jepperson 1991, p. 145).

Therefore, institutions are not necessarily organizations. Examples of institutions provided by Powell and DiMaggio (1991) are marriage, gender differences, hand shaking, vacations, army, and voting.

As Jepperson states, new institutionalism, in response to sociological approaches based on actors, “has tended to ‘defocalize’ actors...purposefully, because undue focus on actors has seemed to impair the production of sociology” (1991, pp. 158-159). This point is relevant to the research reported here, as it is focused on courses of action (or practices) such as reporting, controlling, or herbal healing, each of which involved a number of actors with different roles and status. By avoiding (bounded) rational choice and individualistic approaches, institutional analysis was able to highlight specific contextual determinants and consigned actors as individual to the background.

Organizational field denotes the frame of reference of organizations engaged in a specific activity, their interactions constituting a recognized area of activity. With this view, the organizational field is the unit of analysis that combines organizational and social levels in the study of social changes. Powell and DiMaggio (1991, p. 65) add that “the structure of an organizational field cannot be determined *a priori* but must be defined on the basis of empirical investigation.” This is important here because not considering local healing practices in the organizational field of the telemedicine project would

hamper understanding of both the telemedicine system and its functioning.

Although new institutionalism has concerned itself with both the macro and micro levels, the former has been the dominant focus of research. Nevertheless, this study follows the latter line of analysis: “ethnomethodology and phenomenology together provide the new institutionalism with a micro-sociology of considerable power” (Powell and DiMaggio 1991, p. 21).

Ethnomethodology and Accountability

In this paper, I use—rather than comment on or contribute to—ethnomethodology; therefore, I introduce its main concepts by drawing upon key scholars from this genre of research.

Ethnomethodological studies analyze everyday activities as members’ methods for making those same activities visibly-rational-and-reportable-for-all-practical-purposes, i.e., “accountable,” as organizations of commonplace everyday activities” (Garfinkel 1967, p. vii).

This statement pinpoints the central empirical issue dealt with by this research. Ethnomethodology proposes that normality is a continuous social construction. This consideration will be borne in mind when I report and interpret data from the field study.

[Ethnomethodology] refers to the methods we have available to us to make sense of our immediate social surroundings and thus take action (and offer an account for such action) in league with our companions. As a research field, the term refers to the study of how members of an identified cultural or social group manage to make meaningful the varied worlds of their experience. The methods of interest to ethnomethodologists are those commonplace and more or less taken-for-granted routines by which working definitions of social situations are collectively produced (Coulon 1995, p. v).

Anticipating situated action, Garfinkel uses the term *accountability* to highlight the sense of normality that informs people’s courses of action and provides possible justifications should they be necessary.

Recognizable sense, or fact, or methodic character, or impersonality, or objectivity of accounts are not

independent of the socially organized occasions of their use. Their rational features *consist* of what members do with, what they “make of” the accounts in the socially organized actual occasions for their use. Members’ accounts are reflexively and essentially tied for their rational features to the socially organized occasions of their use for they are *features* of the socially organized occasions of their use (Garfinkel 1967, pp. 3-4).

It is, therefore, evident that institutions—conceived as social models embedded in normal patterns of action—and accountability are closely bound up with each other. Courses of action consist of the ethnomethods that people use to orient their activity and make sense of their social environment. Accountability refers to the collective and implicit sense of normality constructed by people’s activity. Zucker helps to clarify how new institutionalism and accountability combine to furnish insights into the social construction of organizations.

[Institutionalization] is the process by which individual actors transmit what is socially defined as real, and at the same time, at any point in the process the meaning of an act can be defined as more or less a taken-for-granted part of this social reality (Zucker 1991, p. 85).

The concept of institution at the microlevel will be used throughout this paper. This conceptualization enables health practices to be interrelated within the organizational field constructed by the RISS telemedicine project. The paper’s empirical focus will be on accommodation of the telemedicine system in the Upper Amazon, where diverse institutionalized health care practices existed, relying on different sources of accountability. The central concern will, therefore, be to show how health care is practiced in context, to demonstrate the intersection between local healing practices and telemedicine-enhanced health system organizational routines. The scientific health care institutionalization enacted by the telemedicine system will be examined in light of this interplay, construed in terms of the health operators and patients’ practices and coexisting multiple accountabilities (Suchman 1993, 2002).

Methodological Approach

Given the theoretical framework just described, the research methods used to study the RISS system were selected to collect data on the following aspects: the use of the telemedicine system in its context; how the telemedicine system

affected the population's perception of public health care; and the difficulties faced by the project due to existing social relations and beliefs. These general topics were empirically narrowed down to the telemedicine system's daily use, the actors' usual courses of action, and how the actors accounted for what they did, directly and indirectly, with respect to their health seeking behaviors.

My participation in the project began in January 2003, when I attended a conference on ICTs and development organized by the RISS project. Thereafter I joined the evaluation team which was commencing the discussion on the second statistical evaluation scheduled to take place some months later. Formally and substantially, I was in this group as an independent researcher who would bring in ideas from a qualitative research perspective, and collect data. The main communication channels among the participants, who work for different organizations and in different continents, were the mailing lists; I was joining them. Through my year and a half of participation in the group, I offered suggestions on the design of the evaluation by proposing new dimensions to consider and discussing which indicators to use. At the same time, I conducted a study of RISS project documents, such as reports, academic publications, intra- and interorganizational communications.

The field work in Peru started 10 months later and lasted from November 2003 to January 2004. I collected data (the analytical results of which were shared and discussed with RISS organizers and other evaluators) as a participant observer at the two partner universities in Lima, and in the Upper Amazon. I joined the RISS project nearly 6 years after its initiation and 3 years after the system had been activated; the experimental period had been completed and the system had entered the daily routines of the public health institution. This situation allowed me to analyze the use of the RISS system in a "normal" context, rather than in an experimental one. In the Upper Amazon, I was initially based at the main hospital of the area, from where I went to health facilities and communities. My stays in the latter lasted between 1 to 7 days. Besides interviewing health care staff from most of the area, I spoke with patients and traditional healers in districts served by 8 of the 44 clinics participating in the telemedicine project, plus 2 that were not involved. The main research methodology was ethnography, which included "virtual" participant observation in online groups before and after the field work in Peru. In order to clarify my interpretations, and to produce formal data, my ethnography was enriched by

- Semi-structured interviews with individuals: It was evident that responses and comments were often too positive to reflect the actual situation, so these interviews

served to find out more about the expectations vis-à-vis the practicalities of the system.

- Semi-structured interviews with groups (health teams, users, families and neighbors): These responses were more convincing, probably because all the participants had to state their positions in the presence of people that they had and would have to deal with.
- Focus groups (with physicians, nurses, information system workers, health organizers, local people): They were very effective in disclosing different standpoints on what had happened, and in explaining and justifying actions.
- Shadowing: I followed health personnel as they did their work for short periods (no longer than 1 day at a time). This furnished information on some of the subtleties underlying the complex relations between health personnel and patients.²

During the entire data collection process, I was aware of the reflexive issues arising from my roles and my perspectives on what I was studying. This prior understanding helped to clarify my point of view on the main focus points of data collection, which were

- the interweaving between telemedicine and the health care system
- the difference between telemedicine's expected and actual uses
- the reasons for the "drift" of the system
- how telemedicine had changed the public health care system from the perspective of the population
- how healing practices affected patients' behaviors and recovery-seeking trajectories

Notably, my perspective changed during the research process. My initial intention was to take part in the action-research project and contribute to it by proposing ideas of normative relevance. Later, owing to the complexity of the situation that I encountered and my consequent doubts, I shifted to a more independent and descriptive stance. I thought that any normative effort would have to be based on deeper understanding of the empirical context.

²I was based in Macondo, the fictitious name of the town where the central hospital of the project is located. From there I visited health centers and posts: Mola, Carretera, Shucush (first for 3 days and then for a week), Muchinis, Cruz de la Virgen (one week), Miroagua (several brief visits), and Zatope. A complete list of interviews, questions, and focus groups is given in the appendices.

The Telemedicine System in its Context of Implementation

Three sets of relations constituted the framework of the research: the telemedicine system, the health care system, and local healing practices.

It became apparent during the data collection process that these sets of relations did not coincide with the three types of healing practices customary in the area of the Peruvian jungle studied: herbal, scientific medical, and spiritual–magical.

These healing practices are crucial for understanding the interplay between the telemedicine project and its context of implementation. The label “local healing practices” applies to both herbal and spiritual–magical healing practices, whereas telemedicine and health care systems jointly denote the local presence and practice of scientific medicine.

Telemedicine and health care systems were closely inter-related, because the telemedicine system provided support for the public health care system’s activity, while the health care system—and the scientific medicine embedded in it—legitimized telemedicine. Later in this section, telemedicine and public health care will be situated in relation to local healing practices. Although not explored here, the alliance between scientific medicine and telemedicine also legitimated the international partnership promoting the project.

As anticipated in the theoretical section, the organizational field (the frame of reference for a specific activity) cannot be defined *a priori*. During the process of this research, it emerged that the organizational field constructed by telemedicine comprised herbal, scientific, and spiritual–magical practices.

Telemedicine and the Public Health Care System

This section first outlines how the telemedicine system was typically used by describing how the system supported the public health care system in epidemiological vigilance, activity reporting, control, coordination, and delivery tracking. It then explains how the public health care system and scientific medicine legitimated the telemedicine system. The subsequent main section will focus on the points of discord between the public health care system, in which the telemedicine system was embedded, and local healing practices.

The Telemedicine System Supports the Public Health Care System

In the morning, there were always physicians and public health officers in the telecommunications room of the hospital. They dealt with events of the previous night, asked for information from remote health centers, and requested confirmation that items sent by boat had been received. The telemedicine system was mainly used to provide logistical support for the public health care system’s activities. More specifically, the main practices that the system affected were epidemiological vigilance, reporting, coordination, monitoring, and tracking.

Epidemiological Vigilance

During the focus group on this topic, the manager of the hospital epidemiology department described a day when a blood sample arrived from an isolated community. Analysis by the biology laboratory found that the patient was suffering from toserine. To avert an epidemic, the administrator went to the communications office to tell the health center that had sent the sample to take the necessary precautions while the hospital organized an intervention.

She asked specific questions about the patient’s village in order to make the intervention more precise and effective. She, then, tried to find the Elite group[†] closest to the village by calling other health centers and posts via radio. The purpose was to get the group on site to provide first aid and collect more information for the hospital about what was required to avert the epidemic.

[†]Small and well-equipped health teams that move through the jungle to provide health care in remote places.

Epidemiological vigilance is the organization of information channels concerning health situations in a specific area, and with special regard to infectious diseases. It is most useful in preventing or counteracting epidemics in areas where the public health care system is weak. The introduction of the telemedicine system had not only reduced the time required to inform health establishments, it had also greatly improved activity coordination. Previously, as a physician put it during the focus group meeting on the topic, “epidemiological vigilance existed only on paper.”³

³During the same focus group session, the physician added that she still had to analyze samples being sent by boat. Providing health centers and posts with microscopes would make the process less dependent on physical transport and therefore more efficient.

Reporting and Control. The RISS telemedicine system was used for reporting and monitoring within the public health care system. Health posts periodically sent in reports on their activities, inventory needs, and health conditions of the population and of specific patients. The officers and doctors in the hospital devoted a great deal of time to checking and confirming data.

Excerpt from Radio Exchange on Reporting and Monitoring

Varadero (a health center): This is a malaria case.

Macondo (hospital): Go on.

Varadero: Male, 42 years old, 54 kilograms, headaches.

Macondo: Wait a moment, I'm out of paper. [pause] Go on, headaches...

Varadero: That's it.

Macondo: What's his name?

Varadero: [name and surname]

Macondo: When did he arrive?

Varadero: At 11:30 a.m. [it's nearly 1:00 p.m.].

Macondo: How many doses has he received?

Varadero: Three.

Macondo: Next one.

Varadero: Male, 31 years old, 60 kilograms. Fever, some body pain, headache. Since he began the treatment he's only suffered headaches.

Macondo: Go on.

Varadero: He arrived 6 days ago at 11 p.m.

Macondo: Next.

Varadero: She arrived 10 days ago, you already have her in your files. She is still taking Paracetamol, she has some fever. She is continuing antimalaria treatment with three doses a day.

Macondo: Reduce the treatment to two doses daily, as the protocol says.

Varadero: Patient [name and surname], 30 years old, 58 kilograms, male.

Macondo: Say it again.

Varadero: 30 years old, 58 kilograms, male; 4 doses of ¾. The patient used other [herbal] medicines.

Macondo: Go ahead.

Varadero: He was the last one.

Macondo: Over and out ["QAP": Expression used to conclude a radio conversation while communication is still possible if necessary].

This passage shows that reporting and monitoring were not clearly distinguishable; both were present in the conversation quoted.

Notably, the health personnel preferred to use voice communication, even when filling out a spreadsheet and sending it by e-mail would have been more efficient. The e-mail system was not highly regarded by the RISS system's users, as shown in the following excerpts.

Excerpts from Interviews with Hospital Employees

Employee from the epidemiology office: "E-mail is not really appreciated because you never know if an e-mail has arrived or has been read, you don't know if they will reply, nor when, and if they don't, why not."

On e-mail usage, a communication officer: "To us e-mail is secondary, the voice is the most important thing, to listen to the others."

The closer relations made possible by the telemedicine system brought both control and mutual encouragement and support to workers in remote areas. Even when not directly asked, most of the personnel interviewed perceived that they were subject to closer monitoring due to the information system. The phone and radio were often used to check on the state of all tasks. The following excerpt on activity reporting shows how the information system was used to control activities.

Excerpts from Radio Exchanges: Control

Macondo: Nueva Vida, Nueva Vida, Nueva Vida, Nueva Vida.

Nueva Vida [a health center]: Go ahead.

Macondo: Your report is still missing.

Nueva Vida: I'm finishing it, we have a lot of patients.

Macondo: We need your report to aggregate the data to send to Lima. Close the health center and finish it!

Nueva Vida: Affirmative, you'll have it tomorrow.

Macondo: QAP.

Before the introduction of electronic communication channels, all messages had to travel along rivers, and this took a long time. The information could be lost or it might not have been sent, it was difficult to request reports and their absence was always justifiable. The electronic communication network had not increased the quantity of information officially required, but it had reduced the excuses for not sending or receiving information. Coordination within the health care system was thus improved, and a closer shared understanding about what had to be done was produced.

Coordination. Due to my access to the telemedicine system, and legitimate role in peripheral functions of the public health care system, I was able to reconstruct the trajectory of a district-level directive prohibiting health personnel from leaving their workplaces during the Christmas holidays because of flooding in the area.

Trajectory of a Directive Within the Local Public Health Care System

December 5th: The district health care administration issued the directive.

December 6th: The directive was transmitted during the morning and arrived at the hospital, where it was transcribed and printed as "hoja de tramite" [bureaucratic paper]. It was then forwarded to the hospital administration office. The director was not available at the time, so the document was left in the secretariat.

Some hours later I was there for other tasks when the secretary gave me the paper signed by the director and asked me to take it to the communications office. One of the two communications officers started calling health centers over the radio. As it was late afternoon, he could only contact two of the six of them.

December 7th: Throughout the morning, the same officer

bore in mind the centers he had been unable to contact and when he recognized their voices on the radio (which was always on) he gave them the information. That evening one center still had not been notified.

Each health center had to transmit the directive to their health posts; this would happen in a similar way.

December 10th: I was at a health post and heard a nurse receiving the information (I asked for confirmation that this was the first time that they had heard about this directive). Other posts may have received the message later.

Information was supposed to circulate in real time, but in practice could take up to 5 days or more to arrive from the upper level of the hierarchy to health care practitioners working in isolated facilities. However, information circulated much faster than it did before the introduction of the system, and it was especially important in cases where it was necessary to transport seriously ill patients to better-equipped health centers or to the hospital. The journeys could take several hours, or even days, and the system was of great help in organizing, for example, intermediate stops at clinics along the way where the patient's condition could be checked.

Organizing Intermediate Stops for Patients

While at the communication office of the hospital I could hear some of the communications taking place on the communication network. This is an excerpt from my field notes about an interchange between two health workers of different peripheral clinics: "A patient is leaving this clinic. He is on the way to Macondo hospital. He should be there [at the other speaker's clinic] this afternoon. Please wait for him at the harbor and prepare some sedatives for his infection."

This simple example underlines the usefulness of the communication network in making patient transportation safer and faster in this difficult environment.

Tracking

Excerpts from Radio Exchanges: Tracking

Radio: Hello.

Macondo: Go ahead.

Radio: Macondo?

Macondo: Yes, who's there?

Radio: Puerto America.

Macondo: Go ahead.

Puerto America: Did the blood sample arrive?

Macondo: Yes, it did. What's the name?

Puerto America: [name and surname]

Macondo: I'm going to check for results. QAP.
[He goes to the biology laboratory with the patient's name written on a small piece of paper. He comes back to the radio 20 minutes later.]

Macondo: Puerto America?

Puerto America: Yes.

Macondo: Negative.

Puerto America: All right, thanks.

Exerpt from Field Notes

A public health officer informs a physician at a center about how much gasoline has been sent so that he can make sure it has not been stolen.

The previous excerpts show that coordination and delivery tracking were tied together and fulfilled the need to monitor activities. Monitoring was felt to be of prime importance in a volatile context where actors were doubtful about whether other actors had fulfilled their duties.

The previous data report on all of the main uses of the RISS system, and illustrate how various aspects of remote organizing were practiced. Enhanced distant coordination and routine informal talks strengthened a shared sense of belonging to the health care system. Noticeably, formal knowledge sharing was lacking.

Scientific Medicine Legitimizes the Telemedicine System

Having shown how telemedicine supported scientific medicine, I now describe how scientific medicine legitimated telemedicine. Specifically, the possibility of sharing abstract medical knowledge through an information system legiti-

mized the expected use of the system for consultations and distance education.

As noted earlier, scientific medicine is based on the triad of data collection–illness cause retrieval–treatment. This triad had not changed with the introduction of the information system. Data collection on patients' conditions was not affected by the system, but the information system could potentially improve diagnosis by enabling remote consultations (which were quite rare). The system indirectly supported treatment because it improved the allocation of resources such as medicines, monitoring the activities of the peripheral centers, and patient transportation. The RISS system was beginning to be used for distance education. Some radio conferences had been set up by the regional hospital, and course material was sent by e-mail from a partner university to health personnel working in the area. However, it was difficult to evaluate the impact of the distance education on practice, because it was not possible to determine the origin of the medical knowledge that I saw being practiced. My impression was that this aspect of knowledge sharing did not significantly affect health care activities, because infrequent references were made to the content of these radio conferences or e-mail courses. An example of the difficulty encountered by formalized knowledge in shaping everyday life in the area is provided here.

Scientific Medicine Evidence in Context

I was shadowing a health worker visiting the houses of a district. His task was health education and elimination of stagnant water to prevent the reproduction of dangerous mosquitoes. In a dark, wooden house, the walls of which were covered with posters and religious images, it was impossible for a family to see the actual mosquito larvae that the health worker had found in the water in a pot. The health worker was trying to show the larvae, using a pipette and a torch, as an example of the family's mistakes in managing water. The purpose of the demonstration was to raise awareness of the risks of stagnant water.

This excerpt shows the empirical relevance of local ethno-methods and daily construction of patterns of action in specific contexts. The empirical evidence provided by the health operator was not visible in that family's actual material environment, and not significant in their cultural space. Even if the family had seen those one-millimeter-long, whitish mosquito larvae, they would not have accepted that they were the cause of possible diseases and the eventual deaths of relatives and neighbors. More likely they would have continued to attribute disease and death to sorcerers. This is not to imply that such an alignment of senses, objects (water,

pipette, larvae, and light), and thought shaped by scientific medicine would have been impossible, but this example demonstrates that the spread of scientific medicine is not just a matter of formal education or information transmission. It must deal with the contexts in which people live, and the social environments they constitute because it is there that scientific medicine is expected to be accepted and meaningful in shaping activity.

Although in various situations scientific medicine seemed not to have a sufficient grasp of people's behavior, it was still used to legitimate what telemedicine does and can do, as exemplified by the following excerpt.

Excerpt from an Interview with the Shucush Physician

Question: What changed after the introduction of the telemedicine system?

Answer: It allowed us to send information about patients, which is especially important in serious cases. So we can make more scientific decisions. It helps in transmitting health information, in coordinating our work with the hospital, and in supervising health posts. Moreover, we can access scientific information and keep in contact with people living far away.

Excerpt from My Field Notes

For over a week that I spent there, the only person to use the laptop computer was the technician I came with. Radio was sometimes used: to organize our stay there, to ask for medicine to be sent by boat, and to inform the hospital that malaria cases were slightly increasing.

Once a nurse spent more than a hour dictating via radio data she had collected and hand-compiled in a table. The data were about the health center's activity, the same kind of data I had seen being written up at the hospital's communication office.

The legitimation that the telemedicine system gave to health personnel in the presence of their patients should be stressed. This emerges clearly from the following excerpt.

Excerpt from Field Notes Taken at a Health Center

While at Miroagua (a health post close to the hospital), a physician was examining a patient with high fever. He asked the woman who came with him, "Has he taken any herbal medicines?"

Visibly uncomfortable, she replied, "Yes."

The physician named two plants and she replied, "Yes, a bit of them."

Physician: "When?"

Woman: "The day before yesterday."

Physician: "Plants harm you! I'm calling the hospital, do you believe what the hospital says?"

[Silence]

He called a nurse and went on the radio to inform the hospital about the situation. At the hospital a physician was called. He asked about the patient's clinical situation. The local physician gave information on symptoms, body temperature, blood pressure, and added that the patient probably had malaria. The hospital physician asked, "You have a microscope there, right?"

"No."

"Then take him to the hospital."

While I remained outside, the woman entered the room where the patient had been put. The physician entered and said, "I've been told we must take him to the hospital." Then he added, "You see? Those plants are dangerous. [silence] But don't worry, everything will be all right."

The last two excerpts reflect a clear difference between the expected and declared uses of the telemedicine system and with the actual ones. The first exemplifies a rationale for telemedicine as supporting core medical activity whereas its use is primarily logistical. The second shows the increased legitimation enjoyed by health staff (both physicians and nurses) because the system was used instrumentally in their relations with patients and the population. Indeed, in the radio conversation, the reason given as to why the patient was being sent to hospital was a lack of clinical data to transmit (no microscope), whereas the reason given to the patient was that medicinal plants had been used.

These excerpts illustrate the social relevance of telemedicine, and how this system was spreading knowledge, but not as formal information. Specifically, the telemedicine system's presence was widely legitimated because it was expected to deliver scientific medicine and improve rational decision making in health matters. The last excerpt shows how the physician's choice and action—consistent with scientific medicine—became legitimated for patients through their association with telemedicine.

Mismatch of Uses and Local Healing Practices

In its daily use, the telemedicine system underwent adaptation due to the encounter with local contexts. The empirical data show a difference between the information system's claimed and actual use. According to common expectations, the purposes of the telemedicine system were remote consulting, distance learning, and sending epidemiological and activity reports (this is partly factual). Participant observation revealed that it was used to provide logistical support for medical activities, to coordinate and track transportation along rivers (of documents, blood samples, patients, gasoline, medicines), and to send reports.

The official use of the system was rational, focused on medicine, and supposedly reliant on a formalized and efficient organization. The actual use reflected some of the concrete problems encountered by everyday medical activities in the area. At this stage of my ethnography (before I established closer contact with the local population), the main reasons for this mismatch seemed to be the following:

- Inadequate resources: Practitioners were forced to improvise solutions to problems.
- Mismatched resources: A lack of laboratory instruments to produce clinical data onsite could not be remedied by a communication channel.
- Weak infrastructures: Communication channels were important for improving the use of infrastructures.
- Resistance to control: Lower level personnel did not always welcome a system that subjected them to closer control.
- Lack of trust: Everything was double-checked because actors did not believe that others had fulfilled their tasks.
- Insecurity: The difficult environment constantly interfered with activities and made people doubtful.

It is already known and widely accepted that developing country contexts pose difficulties such as those enumerated above. But are structural and logistical problems enough to explain why the system's use was different from expected? Why did patients often arrive late at health facilities? What occurrences beyond the information system were not perceptible through the information system itself? Appropriate answers could be found not by examining the health care system alone, but only by adopting a broader approach that encompassed how patients, population, and the system were

mutually affected. The mismatch between declared and observed system usages suggested that there was more to be found about how the social context affected the practice of telemedicine in that part of the Amazon region.

The following subsection describes the accommodation of the public health care system—embedding telemedicine—to local healing practices. Special attention is paid to interpretations of illnesses, which proved relevant in explaining self-accountable medical practices as boundaries of the electronically enhanced public health care system.

Herbal Medicine

It was initially difficult to determine what patients did before they went to a health establishment. I was identified with the public health care system. Thus, I was told and shown things that patients assumed were understood by the public health care system's healing practice. It took a while for me to suspect and to confirm that plants were the first, and often the preferred, cure. Direct questions like "Do you use medicinal plants?" elicited negative responses. When I had learned something about the use of plants, I changed my questions. For example, "Do you take honey and lemon for a cough?" elicited responses such as "Yes, sometimes, but I prefer mint." This implied that some shared knowledge with patients produced more relevant answers. Although I did not develop detailed knowledge about the use of herbs in healing, I learned enough to ask some questions about the patients' behaviors and to discuss health matters with them.

Excerpt from an Interview

After a woman said that she had given herbs to her son:

Question: Are herbs better than medicine?

Answer: They are more effective, but if they don't work, we go to the health center.

Question: Do you always try herbs before going to a public health service?

Answer: Yes, we do that.

Question: Can you treat any disease?

Answer: With herbs and medicines you recover, but you mustn't mix them. You take herbs, and if necessary you switch to pharmacy medicine.

Question: Do you say this to the physician?

Answer: No, because he gets angry.

A man declared during a group interview, “Medicines from the pharmacy are drugs, chemical medicine is like a drug. It works as a sedative but it doesn’t completely heal you. Plants and their roots, on the other hand, cure you.”

When a member of a community fell ill, her or his family and neighbors participated in the healing process. Herbs, diets, and home remedies were suggested and prepared by relatives. For example, refreshing liquids were drunk for fevers; bananas and lemons were eaten for diarrhea. Plants were cultivated in back gardens or picked in the jungle, under the guidance of the more experienced members of the community. Although in serious cases herbal treatments could be suggested by locally legitimated experts, the knowledge deployed in those healing actions was distributed. No single individual controlled such knowledge, which had been acquired across generations and/or from neighbors. Each specific treatment arose from local common sense about a specific illness. Furthermore, a notion of hot/cold equilibrium seemed to be the reason why neither the healthy nor the sick liked to boil water (although it was strongly recommended): water was to refresh, boiled water (which tastes different) lost its refreshing effect. To cleanse the body there were treatments based on diets and/or strong disinfectant plants (*ojé*, *uñas de gato*, which was also used for cancer), or plants that provoked vomiting. Of relevance here is that the justification for the herb used was always based on the need to balance hot and cold, and/or to cleanse the body. The reasons for taking a cure were coherent with this shared source of accountability that suggested the means (a fast and/or an herb) and addressed the ends (rebalancing body temperature).

Herbs were handy both physically and culturally, meaning that their use was normal and supported in those social environments, and legitimated in the local construction of reality. Nevertheless, the use of herbs was concealed from those who were not expected to share this common understanding.

Patients attended public health care facilities (if they went at all⁴) when home-made medicines proved ineffective. This always took some time, from 2 to 10 days, plus the time taken to arrive at a clinic, which might be days away.

⁴Public health care was free for those under the age of 18, for pregnant women, and in cases of “extreme poverty” (decisions on which are arbitrary). Thus, adults did not frequently go to health facilities.

The Public Health Care System: “El doctor es él que estudia la medicina por medio de la universidad”

The paragraph title is a quotation from an interview (in English, “A physician is someone who studies medicine through the university”) that aptly introduces the local population’s perspective about telemedicine and the health care system stated in the previous section. I asked inhabitants of isolated communities if they knew about radios and computers, and if they had perceived a change since their introduction. An exemplary excerpt follows.

Excerpt from an Interview with a Group of Inhabitants of Cruz de la Virgen

Question: What do you think radio and computer are useful for at the health center?

Answer: I don’t really know, to communicate and travel to Macondo.

Question: Do you know why they communicate?

Answer: No, I don’t know.

Question: Do you think the health center has changed since they have had a radio?

Answer: No, it’s the same.

Question: Do you think it is important to communicate with the hospital?

Answer: Of course!

Question: Why?

Answer: Because you can get there more quickly in case of emergency.

Question: What happened in emergencies before the radio?

Answer: We died here.

The population perceived public health care as associated with rapid recovery, which implies that communication and urgent transportation were closely interrelated.

It was quite usual for the health care personnel—not only physicians—and the local population to diverge in their understanding of health.

Excerpts from Interviews at an Outlying Health Clinic

A physician, reporting a common perception within the public health care system, stated, "They [local population] are at another stage of development.... They do not know there is a laboratory here, or even what a laboratory is. We explain everything but they do not understand."

On the other hand, a man waiting for an examination said, "Sometimes you realize the doctor doesn't understand. I've tried to explain natural remedies and you see he doesn't understand. Or he does not want to."

During the same series of interviews, a patient said that she first went to the doctor for an examination; when she felt the same problem again, she went directly to the pharmacy.

Medical science legitimated the public health institution's activities. This does not mean that all actors shared this source of accountability. With regard to telemedicine, the local population did not clearly perceive any direct influence of this artifact on health care matters. At nearly all centers, patients arrived in the late stages of disease and expected a rapid recovery. Sometimes doctors and nurses were accused of causing the deaths of patients who had arrived in a serious condition. Although the information system permitted remote consultation, the late arrival of patients induced the use of the system to arrange patient transportation to a better-equipped center in order to shift responsibility to the latter. The telemedicine system does not allow sharing of responsibility for the patient, which legally remains on the personnel in charge of the health establishment as long as a patient is there.

This paragraph integrates what was reported earlier about telemedicine and the public health care system with the Amazonians' own perspective. Notably, the health system often seemed like a "black box" to local eyes. Divergent understandings and practices did not prevent some mutuality, for example, about the telemedicine system and quicker patient transportation. In addition to the need for improved transportation for medical reasons, the RISS system fulfilled the patients' expectations of rapid recovery, and the health personnel's interest in shifting responsibility and, by accompanying the patients, in temporarily leaving isolated workplaces.

Local Healers

When a treatment prescribed by the public health care system was not rapidly effective or produced side effects (which were

common owing to bad nutrition, fasts, and homemade remedies), patients, supported by their social environments, thought that they were suffering not from a physical disease (the only kind that the public health care system dealt with) but a spiritual one due to the envy or revenge of others. These illnesses were called *males* (evils) provoked by sorcerers, and they could only be cured by local healers. Although the latter often used herbs, there was a significant difference with respect to domestic cures: the healers had a strongly legitimate role in their communities. There were several kinds of healers, and many contrasting opinions about them underlined their social importance. They had a deep understanding of the communities in which they lived, and of people's beliefs and fears. They used dreams, rites, symbolic objects, and magic to affect their communities.

I cannot say whether the local healers used their influence instrumentally, and it was probably not a suitable question for understanding their role.⁵ What is important is that the local population (and some health personnel as well) believed in the local healers' ability to heal. Accordingly, the local healers exerted strong social pressure on their communities. In some villages, people whispered their fear of being made sick if they did not go to local healers. Due to the high incidence of illnesses in the area, and because of the health care system's weaknesses, *males* were quite common. The local population believed that sorcerers and local healers (often the same people) were able to produce and treat such diseases. This belief enabled sorcerers and healers to profoundly affect social relations within their communities and make facts and situations accountable.

A Case of Illness Interpretation

An old woman, a member of a family that had achieved some commercial success with a boat that they had built, fell sick. She did not recover with herbs and medicines and was consequently taken to a healer, who announced that her illness was due to revenge exacted by someone in her community because her family had not shared its "wealth." Because the healer cured her, his statement became true for the community, whose members had been warned against being selfish and not sharing what they had.

In regard to the importance of *ex post* interpretation vis-à-vis communities, it is interesting to note how the responsibility for serious cases was shifted. Local healers sometimes sent

⁵Moreover, looking at their activity from a utilitarian perspective would imply a rational choice approach in contrast with the theoretical framework presented previously.

patients in desperate conditions to health centers, which maintained that this was a way for healers not to be perceived as responsible for those deaths in local communities. On the other hand, the public health care practitioners did not object to terminal patients (cancer or AIDS victims, for example) from using traditional medicines.

This section has linked the coexistence of different healing practices with the healers' role of "managing" interpretations and therefore providing their communities with sources of accountability. I next describe how the local process of diagnosis clashed with the medical science process.

The Interpretation of Illness

The usual treatment trajectory followed by patients began with herbs, passed through the public health care system, and, if they did not recover rapidly, ended with local healers. What struck me was that people's accounts and behaviors were coherent with the kind of treatment that they were using at a certain moment, although they were incoherent with other kinds that they had used or would use. High body temperature could be sequentially experienced as an imbalance between hot and cold (perhaps due to some inner impurity), as a case of malaria requiring hospital treatment, or as someone else's revenge taking the form of a *mal* produced by a sorcerer.

The diagnosis process was of particular interest. In scientific medicine's pattern of action, patients express their symptoms, the necessary clinical data are produced, and then this information is associated with a disease to make sense of it. This model works where scientific medicine is hegemonic. In the Upper Amazon, most of the public health personnel complained that patients frequently attended a health facility at quite late stages of disease. Indeed, they often arrived at the public health system 2 or 3 weeks after the first symptoms. At that point, diagnosis was difficult and physicians had major problems, not least due to the lack of diagnostic instruments on site. Treatment was difficult as well because there was a limited range of medicines available and there was no medical literature on how pharmaceuticals might interact with the herbal medicines that patients might have taken earlier.

On the one side, some patients said that they did not understand what physicians told them about diseases and medicines; others claimed that they felt that they had not been understood, and usually avoided saying things that might make doctors angry, such as having taken medical plants. On the other side, doctors said that people should be better educated to understand what they said and did. As a conse-

quence, many patients avoided medical examinations and preferred to go directly to the pharmacy. From the patients' side, these short-cuts avoided a routine that could be troublesome for them. On the physicians' side, this behavior was problematic for treatment.

Coexisting perspectives on spiritual diseases and local healers were even more problematic. This situation was described by a physician.

Excerpt from an Interview with the Puertobalsa Physician [conducted in hospital]

Question: What happens if a patient comes and says that he or she has been attending a local healer?

Answer: Well, now medical science is quite advanced in diagnosis, there are many instruments to understand exactly what illness they are suffering from....They have to leave behind what they did previously [attending a healer] otherwise they continue with those beliefs, according to which a sick person is a sorcerer's victim. Now they have to understand that all illnesses can be treated, there's no illness that cannot be treated. But they claim to be victims of sorcerers, but it's not true, there are diseases that require time to recover from, like tuberculosis, which takes 9 months. We have had cases and, what happened? After 10 days they see no improvements and quit the treatment saying it's because of a sorcerer that they do not recover quickly.

Thus, health staff, and physicians in particular, rejected non-scientific healing (at least formally, because several of them did not do so on unofficial occasions).

Excerpt from a Group Interview with Cruz de la Virgen Inhabitants

Question: I've heard about *mal de gente*. What is it?

Answer: Sometimes for envy, you know? Someone sees you're making progress, you're earning more than the others and they try to make it hard for you, or stop you. Envy is quite common.

Question: How is it done?

Answer: How to say...if you have never had anything and suddenly you make progress, you start a business or whatever, the others say "How is it possible?" And everyone hates you and tries to stop you. They take something of yours and do witchcraft.

Question: What do you do in those cases?

Answer: Your family takes you to a local healer. If he cannot treat you, there is no solution...you die.

...

Question: Can physicians do something about it?

Answer: Definitely not, they can cure physical sicknesses, not these.

The last two excerpts show how the same disease was interpreted differently from different standpoints. The ensuing courses of action diverged accordingly: the health personnel called for more education to counteract local beliefs; the patients sought the right kind of cure before it was too late.

It is to be noted that *mal de gente* could be literally translated as “people’s sickness.” Actually, it is mainly related with mundane rather than religious matters. As is clear from the next excerpt, the *mal de gente* was an illness that appeared to be untreatable. It did not correspond to any scientifically categorized disease. Indeed, it was not a disease in itself, but could have been any serious sickness not yet cured, so that, no diagnosis was possible *a priori*.

Excerpt from Interview with a Physician and Nurse from Berejos
[conducted in hospital]

Question: Scientifically, what disease is *mal de gente*?

Physician [with a long experience in this region]: When they do not recover quickly, they say they have *mal de gente*.

Question: So, is *mal de gente* any serious illness?

Physician: Not necessarily, but they are illnesses that get worse by not eating and drinking enough, which is a quite usual condition.

Question: Can *mal de gente* be a long-term disease?

Physician: No, more properly it is long-treatment disease.... I think *mal de gente* is given as the explanation for any death which doesn’t have another one. Everyone believes it whenever they cannot find an easy explanation.

Question: Could more effective treatments reduce those beliefs?

Physician: Definitely.

Nurse: There are cases in which children do not recover quickly. We have to persuade their mothers that it is not an illness caused by someone else. And to convince them to take medicines as prescribed, and to continue although they do not see an immediate recovery.

What happens when there are diverse medicines and none is dominant? Answering this question by describing the patients’ usual course of action introduces the answer to the main research question. Local healing practices exerted indirect influence on the use of the telemedicine system by affecting the population’s use of the health care system. The telemedicine system was not directly affected by divergent healing practices but, by broadening and strengthening the public health care system, it made the mismatches between the health system’s organizational routines and patients’ trajectories more evident, both to the population (which was more directly exposed to scientific medicine) and to the researcher (I was particularly intrigued by the encounters among different practices in that context). In summary, patients’ trajectories within the organizational field were affected by various healing practices. Therefore, mismatching and temporary interpretations of illness prevented telemedicine from supporting scientific medicine *tout-court*.

Discussion

Is medical knowledge in the Upper Amazon like the light? Can it easily travel to those regions through telemedicine systems, as the World Bank implied?

Table 2 shows sets of relations framing the research, and local healing practices constituting the organizational field. The latter, intended as the frame of reference of organizations engaged in a specific activity, is constituted by coexisting healing practices, and used as the unit of analysis in studying changes produced by telemedicine.

Table 2 can be used to sum up the overall line of argument. The RISS telemedicine system supports the health care system, and at the same time the latter legitimates the former.

This alliance makes them increasingly coherent and accountable to scientific medicine. However, scientific medicine sometimes clashes with local healing practices. In order to explore this clash, herbal and spiritual–magical cures have been considered in the analysis of the organizational field constructed by the RISS system. These healing practices affect the use of the RISS system indirectly because they give

Table 2. Research Framework and Healing Practices of the Organizational Field Considered

Sets of Relations Framing the Research	Medical Practices in the Organizational Field
Telemedicine system	Scientific medicine
Health care system	
Local healing practices	Herbs
	Spiritual-magical cures

limited space of activity for the health care system within which the telemedicine system is implemented. This argument highlights some critical limitations in the linear and universal conception of knowledge implied by the quotation presented in the “Introduction,” and the role that ICTs play in the context of developing countries.

The data have shown a difference between the expected and actual use of the system. This difference has been interpreted as a symptom to be understood to provoke learning, rather than as an error to be corrected. The telemedicine system is improving public health care system activity in the Upper Amazon but mostly in unplanned ways, such as by supporting logistical practices and legitimating health staff in their everyday courses of action.

Practiced Forms of Knowledge

Knowledge sharing through information systems (remote consultations and distance learning, in this case) was expected by both international organizations and the initiative’s organizers. Knowledge sharing in the form of abstract information is assumed to linearly shape organized action remotely, but it did not prove to be the main function of the system in the region considered.

This case highlighted the contextual constraints on telemedicine use. First, a lack of instruments with which to produce clinical data (such as microscopes) made remote consultations difficult. There were other reasons why consultations were unusual: the risk of misunderstandings in remote diagnosis and treatment made specialized physicians reluctant to cooperate on courses of action that might give them moral co-responsibility for a mistake. Moreover, professional pride prevented them from cooperating with lower level personnel as fully as they could have done. There was another non-trivial reason why consultations were not regularly requested: personnel employed in rural areas felt a deep sense of isolation, so that accompanying a patient to another center or hospital gave them a chance to leave their remote workplaces for a while.

The health care system gained increased inner coherence because of the two-way relation (support and legitimation) between telemedicine and scientific medicine, rather than through abstract knowledge sharing. Those personnel who sought to keep in touch with “the city” and their colleagues used electronic communication quite frequently. Those who “gave up” and did not take care of their terminals, which could easily be damaged by environmental conditions, were less aligned with the telemedicine system and thus scientific medicine. It was clear that the majority of the personnel felt themselves subject to closer monitoring, and forced to be more accountable, because of the system. Moreover, to use *accountability* in its ethnomethodological meaning, the sense of professional and personal isolation suffered by health personnel working in remote communities was ameliorated because they were in closer contact with their professional community and reproduced a common sense of their activity, which shaped the way in which they dealt with local health problems. This was a crucial function performed by the RISS system, and it affected the practice of telemedicine.

Taking population into account, local healing practices acted as social regulators (i.e., accountabilities). *Males* were a source of accountability and a way to regulate people’s behaviors, which were indirectly affected by telemedicine. These conceived diseases could be used to explain child mortality, mend interfamilial tensions, and other socially relevant facts within a community. This social function could not be linearly substituted by biomedicine in the form of a telemedicine-enhanced public health care system that backed biomedicine’s endeavor to monopolize health matters.

This is of central importance for understanding the indirect relation between telemedicine and local healing practices. The public health care institution affected health ethno-methods and courses of action beyond its formal organization, so that telemedicine institutionalization was socially constructed—or otherwise—on a broader level than the organizational one. On an organizational rather than epistemological level, this implies an anti-universalistic conception of medical science because in this organizational field of multiple sources of accountability, health care was not institu-

tionalized within medical science. Herbal, scientific, and magical treatments drew on different sources of accountability and remained self-accountable; cross doubts were unusual. Each healing practice relied on its own ethnomethods, which shaped courses of healing action accepted as normal by their social contexts and justified them in case of need. Within each healing practice, other treatments were meaningless; they could be either physically effective or counterproductive. No healing practice was believed by patients to be the right one before positive effects were manifest, so that they switched between different kinds of treatments. The practice that made them recover was the one that provided the right interpretation. Thus, the understanding of disease was a process coexistent with the patient's healing course: the diagnosis (in its broader meaning of interpreting a sickness) was the product of the trajectory.

The patients' healing trajectories displayed a continuous reproduction of divergent medical knowledge in normal patterns of action, these being rooted in local sources of accountability. This explains the drift (Ciborra et al. 2000) toward a logistical use of the information system. The development-in-use of the telemedicine system reflected the interplay among medical practices: this information system had found a specific and effective role in the public health care system which at the same time was finding its space among other treatments. Thus, there was no homogeneous organizational field through which scientific medicine could spread, and where an information system could linearly improve public health care. Interplay between diverse institutionalized treatments was defining a new sense of normality for the people affected by the telemedicine project. Indeed, the telemedicine system's usage covered the range of activities allowed by the organizational field, and it developed (even in unexpected ways) inasmuch as it was coherent with local healing practices and conceptions of health. We thus have an answer to the question as to how telemedicine and local medicines affected each other: There was not a direct relation and mutual influence between them, but the presence of other healing practices gave scientific medicine only a limited space of activity. It was mostly within this defined space that the RISS telemedicine system was legitimated and used.

Open Issues for Institutionalization

By way of summary, the self-accountability of coexisting healing practices emerged as a central issue for the institutionalization of telemedicine-supported health care. From the public health care system's standpoint, this issue is usually reduced to a problem of mutual understanding due mainly to a lack of education and the diversity of the languages spoken.

Participant observation showed that a disease was experienced as different depending on different medicines. From a rationalistic telemedicine conception, other treatments were obstacles to system effectiveness. On the local inhabitants' side—when they relied on nonscientific treatments—the public health care system did not deal properly with what they were suffering from, which might have been due to community tensions.

The dichotomy ready/reluctant to accept telemedicine implies a narrow perspective on target populations, and excludes aspects that have proved relevant. This approach is closely connected with the commodified conception of medical knowledge that telemedicine is expected to provide. The new institutionalist perspective problematizes this commodified conception by highlighting how practiced knowledge can differ from abstract knowledge as it engages in interplay with local accountabilities.

In order to draw some practical implications from this case and to furnish suggestions for similar telemedicine projects in developing countries, it is necessary to distinguish between the descriptive and normative levels. On the former level, enlargement of the empirical basis would engender the theoretical change needed, insofar as theories are not accountable to the variety of organizational fields with which health development efforts must cope. In my opinion, this change to the descriptive level requires an open attitude toward social contexts, which may be radically different from expected. Therefore, reflexive work must be combined with the promotion of local participation, which cannot be limited to explicit claims.

When development was conceived as industrialization, it was pursued by exporting machinery and building factories. Then, studies on development discussed the idea of technology transfer and such ideas still continue. In recent years, a similar approach has been developed under the label of *knowledge transfer*. When presenting parts of my research at meetings of various kinds, I understood the concerns of scholars and practitioners in this field that critical attitudes may paralyze activity because they are weak in providing normative recommendations. This is a concern that I shared even before I adopted a more independent stance. Nonetheless, I believe that some of the paradoxes that development projects encounter can be sources of learning. This article, too, can form part of a reflexive process starting from a specific evaluation that may be of some relevance to both the academic debate and development efforts. I can suggest the following: Enlarging the empirical basis on the descriptive level may provoke theoretical approaches that help us in rethinking implicit assumptions about development contexts.

However, prudence does not permit me to go further than these general recommendations. On the normative level, I merely add that the goal-oriented social changes usually termed *development* should be provoked and/or supported when they emerge, rather than be promoted. In other words, telemedicine—and the knowledge it implies—should be translated into local healing practices rather than being transferred.

Conclusion

New institutionalism may be of great help at the descriptive level because it provides the tools and perspective with which to supersede a dichotomous perspective (such as e-readiness) that reduces local specificity to the perspective of the development effort's promoters. Organizational learning could help to reorient the design and implementation of information systems in developing countries. Organizational learning is a theoretical alternative to technical and rationalistic approaches to organizational change, and it could suggest some new ideas. The relevant aspect of organizational learning here is that knowing is situated (which rejects universal conceptions of knowledge): learning takes place in different contexts, and it produces different knowledge. Rather than merely being the transmission of knowledge, learning "happens" through participation in practices. Accordingly, telemedicine's development in context should be considered in terms of (mis)alignments of artifacts and practices creating and destroying shared contexts through processes that rational choice and cognitive approaches leave aside. Cultivating these processes through tentative alignments can make development efforts more accountable to local contexts.

Looking at the RISS project from this theoretical viewpoint underlines that the telemedicine system had been embedded within the existing health care system, and that in some way it had affected the health personnel's practices. The telemedicine system became a source of accountability for them, but patients and the population continued to engage in other practices and knowledge as well. Promoting organizational learning would require situating medical knowledge and telemedicine on the boundaries among different practices and sources of accountability and then "cultivating" organizational change. Health care would be a practice to be enacted rather than a problem to be solved; thus, the health care system's healing ability would be an emergent property.

Broadly, with regard to information systems and development, knowledge is hardly reducible to information provided through ICTs, which do not channel knowledge as well as they they do information. Information systems in develop-

ment contexts must take account of local ethnomethods, courses of action, and accountabilities, which can be seen as microtranslations of local institutions. In conclusion, it is important that the organizers of development initiatives design and carry out their efforts taking local knowledge into account, even when the knowledge is implicit in local practices rather than being formally expressed. This may encourage the use of ethnography as a research practice, and—generally—the direct experience of local contexts in order to produce mutual accountabilities rather than implying a common rationality.

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Gianluca Miscione is currently an associate professor at the Department of Informatics of University of Oslo. He holds a Ph.D. in Information Systems and Organization from the Sociology Department of the University of Trento (Italy). His research activity is focused on the interplay between information and communication technologies and social change. It is situated between science and technology studies and development studies, and characterized by a particular interest in understanding what happens at the intersection of the global and the local. Since completing his Master's dissertation on the social boundaries of the Internet, he has been exploring what happens on the edge of the so-called "knowledge society," with the aim of crossing the separation between mainstream research and development studies including developing contexts in research *tout court*. His main research interests are development, innovation, and information and communication technologies; ethnography and qualitative methods; trust and social capital; and knowledge representation.

Presently based in India, Dr. Miscione is active within the Health Information Systems Project (H.I.S.P.).

Appendix A

Interviews and Focus Groups During the Field Research

Individual Interviews

In Lima

General RISS-Peru administrator
RISS-Peru medical aspects director
RISS-Peru technical aspects director
RISS-Peru supervisor
Distant education coordinator
Technicians
A public health care ministry administrator

At Macondo Hospital

A biologist of environmental health office
A physician specializing in tropical fevers
Malaria department manager
Biology laboratory manager
Information services employee

In Health Centers and Posts

Berejos physician
Carretera nurse
Carretera supervisor
Cruz de la Virgen obstetrician
Miroagua physician
Miroagua ear, nose and throat specialist
Mola nurse
Muchinis physician
Puertobalsa physician
Puertobalsa nurse
Shucush obstetrician
Shucush child care responsible
Shucush physician
Zatope nurse

Outside the Public Health Care System

Eight patients
Three local healers
Local authorities in Shucush

Group Interviews

RISS – Peru engineering group (Lima)
Epidemiology officers (Macondo)
Cruz de la Virgen health personnel
Seven interviews to groups of patients and population (more than sixty people in total)

Two Focus Groups Were Organized in the Hospital

Topics

“Epidemiological vigilance and the RISS telemedicine system”
“Public health care system and local population”

Appendix B

Interviews and Questions

Questions to Health Care Staff

- What are your main activities?
- How did they change after the introduction of the telemedicine system?
- Could you tell me about an event that created problems?
- Who do you keep in touch with through the telemedicine system?
- What are pros and cons of the system?
- Do you have problems in communicating? Why? Possible solutions?

- Did you receive enough training to use the system?
- What do you think about remote consultations?
- How does the population perceive the telemedicine system? How do they use the health care system?
- What are relations with traditional medicine?

Questions to Patients

- Why are you here (if at a health facility)?
- How often do you come here? If so, why?
- Do physicians speak clearly?
- Do you talk freely about how you feel?
- Do you use medicinal herbs?
- Do you come here for all kind of illnesses or only for some of them?
- Do you know about patients who has not been healed by the public health care system? (If they name local healers) Do you think they can heal people? Have you gone to local healers?
- Do you know about radios and computer in health establishments?
- Do you think they are useful? For what?

Questions to Inhabitants of the Communities

- What are the main reasons why you use the public health care system?
- How long does it take between your first symptoms and when you go to a health facility?
- What do you do during this time?
- Do you know about cases in which the health care system has been unable to heal a patient?
- What would you do if a child of yours had a fever?
- Have health care personnel suggested you take medicinal plants?
- Do healers send people to health facilities?
- Do you know about radios and computer in health establishments?
- Do you think they are useful? For what?

Topics of Interest for the Open-Ended Interviews with Local Healers

- What are the most frequent diseases for which people seek treatment?
- What do they do?
- How do healers heal?
- Actual anecdotes.
- How did the healers learn?
- What, from their perspective, are *males*?
- How do they deal with *males*?
- Do they send patients to the health establishment? Do they go there?
- How are their relationships with health care staff?
- How are they paid?

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