The Role of Communication Practices in the Strengthening of Counter Networks: Case Experiences From the Health Care Sector of Mozambique

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ABSTRACT

In this article we provide a theoretically informed empirical analysis of the introduction and use of information and communication technology (ICT) within the primary health care (PHC) sector of Mozambique. The theoretical lens for this analysis is developed from Manuel Castells’ (1996, 1997, 2001) ideas on the network society and counter domination. These ideas help us to conceptualize the communicative action required to strengthen the PHC sector as a “counter network,” which has the normative aim to strengthen the health information system (HIS) as a key strategy to improve health care delivery. Taking an informational perspective, the role of communication is highlighted as playing an important constitutive basis in the strengthening of this network. These conceptual ideas are applied to the empirical analysis of an ongoing project (the Health Information Systems Programme or HISP), and to analyze some key constraints and strategies for strengthening these networks. This study makes key contributions to both the theoretical and practical domains of HIS in developing countries. © 2005 Wiley Periodicals, Inc.

Keywords: counter networks; communication practices; primary health care; health information systems

1. INTRODUCTION

After the Alma Ata conference in 1978 (sponsored by the World Health Organization/UNICEF) many countries in the developing world adopted the primary health care (PHC) approach as a strategy to extend health services—curative, preventive, and promotional—to the most peripheral areas in the country (Lippeveld, Sauerborn, & Bodart, 2000). The implementation of this strategy was through the district health model advocated by the WHO as it was seen to be the most effective way to provide both community and patient-specific
services that are both specific and local (Amonoo-Lartson, Ebrahim, Lovel, & Ranken, 1984; Newell, 1989). An important aspect of the district-based model was to develop health information systems (HISs) that could support local analysis and use of information for decision making and management (Braa & Hedberg, 2002). This approach to information systems (IS) provided a point of departure from the traditional centralized systems which supported retrospective analysis being conducted primarily by officials in the central ministry. In the district model, the challenge is to analyze and use the information immediately and at the same level where data is collected (Opit, 1987).

Since the landmark Alma Ata declaration, in their attempts to implement the vision of equity and access of health services “for all by 2000,” many developing country governments have been making attempts to establish HIS as a basis to enhance the effectiveness of health services delivery (Lippeveld et al., 2000). However, research over the years has emphasized that these attempts have not yielded optimum results in practice because of a variety of reasons. These include structural issues arising from the intrinsically centralized and fragmented character of health services (Braa & Hedberg, 2002), the existence of multiple and fragmented information systems (Chilundo & Aanestad, 2003) the absence of strategies to sustain the systems after the exit of the donor money and experts (Kimaro & Nhampossa, 2004), and human resources related, both with respect to the inadequate quantity and quality of people available to deal effectively with information systems in general, and computer-based information systems in particular (Heeks, 2002; Sahay, 2001).

In their analysis of “why health care information systems succeed or fail,” Heeks, Mundy, and Salazar (1999) argue that success or failure depends on the gap between where we are now and where the HIS is expected to take us to (Heeks et al., 1999). They describe this gap as the difference between “current realities” and the “design conceptions of the health care information system.” While they discuss these differences in the context of health care systems in the Western world, this “design-reality” gap is potentially far more pronounced when we consider the PHC sector in the developing world. This sector is extremely deprived of resources, characterized by poor physical, communication, and human infrastructures, poor HIS; at the same time, it is engaged in combating health problems of staggering magnitudes. For example, Mozambique, which is ranked as one of the poorest countries in the world and has just about 600 doctors in the country to attend to a population of nearly 18 million people, needs to deal with the serious problem of infant mortality (about 200 per 1000 of children in less than 5 years).1 Trying to introduce computer-based HIS in the light of this existing infrastructure, human resources conditions, historical legacy of fragmentation, and burden of diseases, is an extremely complex challenge and reflects huge design-reality gaps.

The existence of these constraints and challenges rather than presenting the argument that HIS will never work in such deprived contexts, we argue, only helps to reinforce the need for more sustained effort to be invested to establish effective HIS. As Castells (1996) has so forcefully argued, sectors or societies that have been historically excluded face the risk of continued and systematic marginalization if they do not become part of the “network society.” Castells invokes the metaphor of a network to emphasize the central role that ICT and information will play in shaping social transformations in contemporary society.

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1While most of the poor countries (with GDP per capita of less than USD 1000) have figures ranging from 100-300 deaths, rich countries with GDP figures over USD 20,000 have figures between 2-10. Cuba is an outlier with a mortality rate of about 9 despite a GDP of about USD 1800 (see for example http://www.whc.kl.se accessed on October 24, 2003).
Transformations are enabled as people and organizations are able to access more relevant and current information using the informational networks, and apply this knowledge to make the delivery of the health services they offer more effective and information-based.

The basic principle which Castells argues for—of using the power of ICTs to become more information- and knowledge-focused—is extremely relevant for the PHC sector. For example, improving the information connectivity between remote villages and the national authorities can help to make the local health problems more visible, and provide the basis for greater advocacy to attract more focused resources such as money, drugs, and doctors. Another example of the role which information can play concerns the problem of maternal mortality, which arises often because pregnant mothers cannot reach a health clinic in time and die of bleeding or infections. If information about the geographical spread of pregnant women and also of existing clinics can be provided more effectively, via a map for instance, the authorities can take steps, i.e., to improve transportation or further outreach support, to try and deal with the problem of poor access, and with it to some extent, deal with the maternal mortality problem. As the developing world battles with various life-threatening diseases, it becomes increasingly important for them to get access to the latest research, information, and treatments. Access to the Internet can potentially be an effective tool to access such resources and help to make the local medical people become active members in global communities that are seeking to address similar problems.

While Castells’ emphasizes the logic of how these networks operate, he says much less about how these networks can be constructed in practice (Barry, 2001), especially when they relate to marginalized settings like the PHC sector being discussed in this paper (Braa, Monteiro, & Sahay, 2004). Castells approach has been criticized as technologically deterministic in that it assumes that ICTs can be quite unproblematically used to plug into the network society (Kallinikos, 2003). Kallinikos has argued for viewing networks as socially embedded and anchored to historically existing institutional ties. We build upon the earlier work of Mosse and Sahay (2003) to use the notion of “counter network” to emphasize the action and effort that needs to go into incorporating marginalized sections of society like the PHC sector into the logic of information flows that characterize the network society. In an attempt to deal with the social embeddedness that Kallinikos argues for, we focus on the ongoing communication practices within the PHC sector, and the tensions it raises with respect to the demands of the new HIS being introduced. We use the term “counter network” not in an ontological sense as a noun to describe what the PHC sector is, but rather as a verb to identify the action that needs to go into the construction of such a counter network. This approach is in line with Braa, Monteiro, and Sahay’s argument (2004) of analyzing efforts to build health informational linkages across and within countries through the notion of “networks of action.” The action they identify relates to enabling the flows within the network of people, funding, software, and training material. Facilitating such flows contributes to the sharing of experiences and creating a community of people addressing similar issues in different contexts. In this article, we argue that communication is fundamental to the facilitation of such flows. With this in mind, our research aims can be stated as follows:

- To theoretically elaborate on the concept of a counter network and how it can serve as a useful analytical tool to study the design and implementation of IS in general and HIS in particular.
- Describe an ongoing action research effort to construct such a counter network within the PHC sector in Mozambique.
• Identify the current gaps and challenges to construct this counter network, with a focus on the social processes around ongoing communication practices within the PHC sector and the tensions they create with efforts to introduce computer based HIS.

We address these questions through an in-depth analysis of ongoing attempts to implement HIS in a health district in Mozambique. These attempts are part of a broader action research effort under the framework of the Health Information System Programme (HISP) initiated in 1998 by researchers at the University of Oslo in collaboration with the Ministry of Health and University of Eduardo Mondlane in Mozambique. The analysis of the existing communication practices of the staff surrounding the flows of health information across the various levels of the health administration hierarchy provides us with interesting insights into both the challenges and opportunities of strengthening the counter networks.

The rest of the article is organized as follows. In the next section, the notion of a “counter network” is theoretically developed and how it applies to the understanding of HIS in the context of developing countries. In section 3, we outline our empirical approach, followed by a description of the case study in section 4. Section 5 contains the analysis of the case study drawing upon the concept of a counter network, and the role of communication practices in strengthening it. Finally, in section 6, we present some discussions and concluding remarks.

2. THE PUBLIC HEALTH CARE SECTOR, COUNTER NETWORKS, AND COMMUNICATION

In this section, we first describe why the PHC sector represents adverse conditions that run counter to the needs for introducing computer based HIS. Second, we outline our approach to trying to address these counter conditions. Third, we discuss the fundamental role that communication plays in these efforts to create “counter networks.”

2.1 The Public Health Care Sector in Developing Countries

The PHC sector in developing countries represents a complex and historically marginalized context where the conditions for introducing new computer-based HIS initiatives is very adverse. These adverse conditions, among other things, arise from inadequate resources, overworked health care workers, policies of international agencies, and the structure of the health administration. We briefly discuss some of these issues.

2.1.1 Inadequate Resources. While the district is designated as the hub for the planning and delivery of PHC services with a large responsibility, geographic and health-wise, adequate resources are not provided. For example, in India, each PHC clinic which caters to an average population of about 40,000 is provided with a total quarterly budget of medicines of only about $750. In Mozambique, district offices do not have adequate folders to file their monthly reports (Mosse & Sahay, 2003), and the Cuban system is faced with a chronic shortage of paper (Sæbo & Titlestad, 2004). Similarly, Lippeveld et al. (2000) describe the lack of bicycles as contributing to the reluctance of health care workers in Tanzania to be relocated to other areas, adversely influencing the HIS implementation. Problems of limited resources and budgets are often magnified by the policies of international agencies that provide funds for limited periods and to specialized programs, contributing to the creation of a trail of unsustainable pilot project (Heeks & Bark, 1999).
2.1.2 Overworked Health Care Workers. In addition to the problem of hopelessly inadequate budgets and resources, health care workers are typically overworked and having to serve multiple masters (different aid agencies, managers of various vertical programs, and the district, state, and national authorities). For example, in India health care workers need to travel long distances to visit the community in infrequently available public transport, often in adverse weather conditions of rain and heat with temperatures even going up to 50°C. While needing to meet the pressing health care demands of the community, health care workers have to fill multiple forms and reports to meet the data needs of the health hierarchy. These data needs tend to constantly change and increase as new programs are instituted and computerization efforts make more time demands of the health car workers. Overburdened health care workers are rarely complimented by the authorities, and on the contrary, are typically the targets of reprimand and blame for delays and errors in the data reporting routines.

2.1.3 Structure of the Health Administration. Making it further difficult to introduce change in the PHC sector is the strongly hierarchical, fragmented, and bureaucratic system of health department functioning that runs counter to the desired principles of decentralization. For example, Sæbo and Titlestad (2004) report from Cuba:

The health system is officially decentralized, and each level is in fact administered by the local government. But the information use is not as decentralized as the structure implies. It was experienced that most statisticians at policlinic and municipal level have little or no knowledge of what is “good” or “bad” data, or what is useful or useless. The programs used are made at the national level, and this follows the Soviet tradition of a strong centrally oriented administration (p. 6).

This hierarchical and centralized structure makes it problematic to introduce a HIS which requires decentralized approaches that enable the participation of health care workers in the design and use of the system (Braa & Hedberg, 2002).

2.1.4 Role of International Funding Agencies. Another adversary to the PHC sector arises often from the policies of international funding agencies who despite their stated policies to integrate health care services, continue to fund particular vertical health programs, contributing to fragmentation rather than integration of health services. For example, Chilundo and Aanestad (2003) describe the greater funding given to the tuberculosis (TB) program as compared to the malaria program in Mozambique contributes to inequities in resource allocations, training budgets, and the degree of standardization of the forms and registers used. Despite more people dying of malaria than TB in Mozambique, the staff dealing with TB has more resources and better training and thus can technically provide both better services and HIS. Another aspect of contradiction arises from the policies of international agencies to fund large complex projects such as the Electronic Patient Record and Telemedicine, at the expense of supporting relevant programs related to PHC goals. For example, in India, the World Bank funded attempts at developing a complex name-based system (covering about 75 million population), when the support could arguably have been more usefully directed, e.g., to improving the working conditions of health care workers.

The above-stated constraints, and many others, impede the PHC sector to achieve its aims of decentralization and a focus on preventative care. The PHC sector is expected to both serve the preventive health care needs of the community in the geographic areas which it serves, and also the reporting needs of the health administration structure by collecting data
on various aspects of preventive health care, processing it, analyzing it, and then sending it up in prescribed formats through various levels of the administrative structure. Ideally, these two goals should support each other, i.e., the HIS should enable more effective planning and delivery of health care services. However, in practice the various problems discussed above prevent these goals from being effectively met. It is within this “counter context,” we discuss how the construction of more effective networks can be attempted.

2.2 A Proposed Approach to the Construction of Counter Networks

Taking our perspective on networks as the action that needs to be developed to construct counter networks, we conceptualize the action at two key levels of the conceptual and operational.

At a conceptual level, the notion of counter network helps to emphasize the sustained and long-term effort that is required to develop such networks. The counter network notion helps to emphasize the very contrary assumptions around the role of ICTs made in contemporary conceptualizations of the “network society” (Castells, 1996) or the “networked organization” (Nohria & Eccles, 1992), or even the “global village.” While the concept of the network is useful to emphasize the interconnectedness of the subsystems in organization and society, they tend to subscribe to the logic of globalization and market forces where the underlying assumption is that given the power of ICTs, everyone can become a member of the new, networked configurations. Such a technologically deterministic assumption, it is argued, does not adequately consider sectors or domains (for example, the PHC sector of a developing country), which for reasons of geography, history, politics, and economics, may not have the technological and human capacity to join these networks (Mosse & Sahay, 2003). The notion of counter networks then helps to emphasize the very different contexts, and the need for very different and radical strategies to strengthen them. The strategies are not about how to get the latest technologies and plug them in, but to develop sustained and intensive action over time across the multiple levels of the health sector (Braa et al., 2004). While the counter aspect of the network helps to emphasize the need for action that goes beyond simply providing technological fixes, the network part underscores the need to consider the interconnectedness and multiple levels of action.

At an operational level, the concern is on what tactical and practical strategies are required to develop and strengthen these counter networks starting with the normative assumption that it is important that this is done to deal with the potential threats of the PHC sector getting further marginalized (Castells, 1996). Contemporary globalization processes are creating increased and new forms of interdependencies and complexities and with it also opportunities, at a scale not previously experienced. The strategies around networks, Castells (1996) argues, are to develop informational linkages, based on the twin axes of networking and technology. Such networks are comprised of interconnected nodes with no center, exemplified in global financial networks, production and consumption organized around the network enterprise, and the global criminal economy. At an operational level, Castells (2001) describes the power of such networks as follows:

Because networks are extremely efficient organisations, they eliminate through competition, alternative structures, so their logic expands. Because they operate in a globally interconnected environment, they diffuse unevenly, throughout the planet, blurring institutional and cultural boundaries, and focussing exclusively on their instrumental performance. Networks are the carriers of globalization. (p. 5)
Castells argues that what distinguishes contemporary networks from what existed in the past is the extent of use of ICTs, which provides flexibility and increased functionality into operations in ways not possible before. He writes:

They (earlier networked enterprises) failed in their coordination functions; they could not master large resources, and marshal them in one particular direction. Centred, hierarchical organizations were much more efficient at mobilizing resources and executing the order. New information technologies changed all this. Suddenly networks could at the same time coordinate decision-making and decentralize execution of shared tasks. They could issue orders, and receive feedback in real time. They could be multi-directional and interactive. (Castells, 2001, p. 5)

In a recent paper, Braa, Monteiro, and Sahay (2004) argue that the effectiveness of HIS can be improved by focusing action on enabling the flows of people, ideas, funding, software, and training material within and across the various nodes of the network. Such flows not only help to enhance network efficiencies such as the decentralization, or not, of tasks (Kallinikos, 2003), but also help to develop the potential for learning and sharing of experiences. Facilitating the achievement of such potential is fundamental because the PHC sector is not primarily driven by the logic of profits or time saving and cutbacks, but by a broader social logic of improving the social and existential condition of common people. Networks enable the potential to share values, experience, knowledge, funding, and technologies between the various nodes of the network. Elden and Chisholm (1993) describe this potential, “Using networks of different organizations or work units that can struggle together to learn from each other to develop designs that meet specific requirements of local conditions has emerged as an alternative to establishing experimental units.” (p. 293)

Fundamental to the processes of sharing of experiences across the network are the social processes that shape and are shaped by communication. The PHC sector is composed of various groups of people who have to interact with each other in the process of providing health care, carrying out various administrative tasks such as the reporting of routine data, and for social interchange. In this article, we focus on the communication practices that surround the construction and transmission of the monthly routine HIS across the different levels of the health administration hierarchy. Our analytical focus is on the tensions that the existing communication practices create with the demands of the efforts to introduce computer-based HIS, and how these can be dealt with. Reconciling or easing these tensions through sustained and sensitive implementation efforts, we argue can help the PHC sector to better achieve the potential that ICTs provide in creating effective counter networks.

2.3 The Role of Communication Practices in the Construction of Counter Networks

An underlying assumption in our arguments is that for the PHC sector to achieve its stated goals, ICTs can play an effective enabling role. However, the strategies for implementing these technologies have to take into serious consideration the adversarial situation that exists. We concur with Castells’ argument that a key element in the development of such counter networks is the communication strategies adopted. For example, Castells (1997) attributes the success of the Mexican Zapatista movement primarily to their communication strategy, describing it as the “first informational guerrilla movement.” Castells argues, “The Zapatistas ability to communicate with the world, and with Mexican society, and to capture the imagination of people and of intellectuals, propelled a local, weak insurgent group to the forefront of world politics” (p. 79).
The masks used by the rebels, in the photographs that were projected to the world media, also helped to develop global visibility for the movement. The charismatic role of Marcos, the leader of the movement, and the symbolic and also substantive meanings of the messages expressed through the Internet helped to develop a worldwide network of solidarity groups that helped to counter the repressive intentions of the Mexican government.

Joshi (1991), in the context of development and India, writes about the important role of communication in reducing inequalities in the efforts to create an integrated society. He points to the potential that ICTs provide in helping to build national cultural identity, and enhance social benefits while taking a historical perspective. Joshi emphasizes the new possibilities that arise from the utilization of new ICTs can help to empower the disadvantaged and redress some of the uncaring trajectories that some developing countries are taking. Like Castells, arguing for the need to take advantage of the potential of new ICTs, Joshi (1991) writes:

In the same strain we can say that the choice before us in India is not between having or not having modern communication. It is between unplanned technology transfer from the affluent to the poor countries and innovative adaptation of modern communication to the conditions . . . of society in India. (p. 122)

Like the authors above, we also argue for the fundamental role of an effective communication strategy in developing ICT-based counter networks around PHC in Mozambique. We use the notion of communication practices to analyze communication strategies. Communication practices refer to the manner in which health information is handled, including its collection, analysis, and transmission, between and across different levels of health administration. Communication practices are conceptualized as being mutually constituting and constituted by health information flows, implying that they shape and are shaped by health information flows, which refers to the flow of health data from the community to the district, to the province, and to national levels of the health administrative hierarchy in Mozambique. The focus on communication practices allows us to understand some of the complexities in the introduction of new ICTs because the existing context is characterized by existing practices, some of which may run counter to the demands of the computer-based systems. The challenge is to understand existing practices, and examine ways to adapt ICTs accordingly, and expand the domain of communicative strategies to enrich the constitutive basis of the counter network. With this perspective in mind, in the next section the research approach is defined which is followed by the case study.

3. RESEARCH APPROACH

The reported research is within the umbrella of the Health Information Systems Programme (HISP). The HISP approach to network building is “bottom-up” and relatively altruistic (not-for-profit). The Health Information Systems Programme seeks to strengthen processes around the design, implementation, and sustainability of HIS with a focus on the local level of the district, and building the capacity of health care workers to use information more effectively, and supported by ICTs. This focus of HISP on ICT-supported HIS development in marginalized regions of the world, which by default are by-passed by the free-market inspired processes of globalization, and through an international “donor economy,” which are channeling large funds into specialized health projects. The Health Information Systems
Programme has located computers at the district levels, and provided training to district personnel in charge of HIS in local data analysis and use of information to support health care. The HISP team comprises a multidisciplinary team of specialists from the fields of informatics, information systems science, public health, development studies, and the social sciences. The HISP effort is within the framework of action research, with the aim to bring about social change in the health care sector.

In this line, the Mozambique health care sector can be conceptualized as a network that has nodes at the levels of the health clinics, the district (DDS), the province (DPS), and the Ministry of Health (MoH). The various nodes of this network are linked with each other and also to international agencies through the flows of funds, expertise, material (like drugs), and health statistics (See Figure 1). Communication practices provide the constitutive basis of this network, both shaping these various flows and being shaped by them. These communication practices are shaped by both the structural conditions (of infrastructure and roads, for example) and the everyday work practices of the health staff. These influence the kind of data that is sent, when, how, its quality and use. Understanding these interactions between communication practices and HIS was the focus of the empirical work.

In Mozambique, HISP started in 1998 with the implementation of HIS in three pilot districts located in different provinces that also serve as training sites for medical students. The action research effort in these districts was on training, building a relationship with health care workers, facilitating data entry into the database, and providing the technical support to the HIS team members. In addition to these activities, the HISP team was involved
at the provincial and national levels in the design and implementation of HIS and others activities including the translation of the software and manuals from English to Portuguese, installing the database at various levels of the HIS, design of training programs for the health staff. A year after starting, the HIS team had been commissioned by the provincial authorities to expand the initiative from the district to the whole of the three provinces. Within this framework, the Xai-Xai health district within the province of Gaza, became one of the research sites.

The research described here was carried out within this framework in the health district of Xai-Xai over 4 months during April 2002 to February 2003. The main aim of the study was to understand the communication practices within different levels of HIS with a focus on the district, including activities surrounding the processes of collection, storage, and transmission of routine health data starting from the health facilities, for example, data related to immunization (PAV\(^2\)), infectious diseases, and the maternal and child health (SMI\(^3\)), through to the district, province, and national levels.

In this study, data were collected through participant observation, formal interviews, informal meetings with managers at all four administrative levels of management. In these meetings, some of which with seniors managers at MoH, we tried to interpretively understand how the communication practices shape the flows of health information across various levels of the HIS. The training courses and workshops conducted at the district were also beneficial to understand the problems health care staff experienced and to help them build capacity for addressing problems. In these workshops, issues regarding HIS were discussed in small groups and in larger open-forum discussions. During this study, one of the authors was based at the research site and served as a facilitator for these discussions.

In addition to various interviews, meetings and discussions with the national and province level staff, 13 personnel were interviewed at the district and health center offices. These included doctors, nurses, the different people responsible for the HIS. The focus of the interviews was to understand their communication practices, the various documents and forms used, and the structural and infrastructural constraints to the working of the HIS. At the national level, we had frequent meetings with senior managers who also participated in discussions while preparing the training material for the courses. These discussions gave insights on how the training should be conducted. This approach and interactions with both senior and local managers sought to develop an understanding of the whole aspects of HIS.

4. THE CASE STUDY

The National HIS (NHIS) of Mozambique was initiated in 1982 through technical support from the World Health Organization (WHO) that mandated the need for uniformity in the reporting systems of various subsystems such as programs of immunization, family planning, and drug distribution. The desired uniformity was expected to provide a better basis for efficient allocation of resources (material and financial), and improved planning and management of health care services delivery.

At the lowest level of the NHIS are the health centers, who in addition to providing various services (such as registering and serving antenatal cases), serve as the entry point of data in the HIS network. Data is collected about the number of people seen in the clinic within each program, and then aggregated on a weekly and monthly basis and transmitted to the next

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\(^2\)In Portuguese: Programa Alargado de Vacinação.

\(^3\)In Portuguese: Saúde Materno-Infantil.
level of the health hierarchy, which is the DDS. The personnel (normally a female or male nurse and an employee) at the health center typically performs multiple tasks, both with respect to giving care (clinics may see up to 50–100 patients a day), doing data collection, its processing and transmission, and administrative tasks such as the collection of salaries and medicines from the district. In addition to the data compiled by the health personnel, data also comes through other more informal sources such as midwives and community health agents (ACS\(^4\)), for example about the deliveries taking place at home. This leads to a multiplicity of channels of communication, and sometimes the ACS bypass the health center and take their data directly to the district. Data from these informal sources often come on scraps of paper which are destroyed after being entered (sometimes also before), thus leaving no written history of the transactions. Some old graphs, tables, and statistics are pasted on the walls, which tend to have more symbolic than functional value.

The transmission of data from the health centers to the district is not an easy task even though the distance may sometimes be only 10 to 15 kilometers. The challenges arise because of the lack of official transport, infrequently available public transport, and the multiplicity of tasks a person does which needs to be combined within a context of scarce resources. When the data is carried by an employee rather than the nurse, the DDS staff does not fully trust the data because they cannot clarify discrepancies which would be possible with a nurse. When the data reaches the DDS, it is either physically given to the staff at the NEP (Nucleus of Statistics and Planning) or slipped under the door of the office. Delays and missing data are frequent.

The DDS is the hub for the HIS; staff face extreme work pressures and scarce resources. Typically, the district has one medical doctor responsible for providing care to about 40,000 people, and often does not have access to a dedicated vehicle or reliable communication devices (like telephones). In the district studied, we were told that there may be nearly 150–200 outpatients visiting on an average daily. The NEP staff, who also are responsible for attending to the patients, receive the data from the health clinics in a single document comprised of forms from different health programs such as SMI, PA V, BES (disease statistics), and outpatient programs. The reports first come to the head of the NEP, also the head of the HIS, who distributes relevant parts of these forms to the heads of various programs who, in turn, aggregate the totals coming from the clinics, and add that with their own figures to comprise a total (for example, of SMI) for the district. The head of the NEP then combines the various reports, has them signed and symbolically approved by the Director of the DDS, after which they are ready for dispatch to the DPS.

The NEP team, who sit in one room, represent both a physical and social network within the DDS, which serves as a hub for district health care, and are linked to external networks of the DPS on one side and the community on the other. They are thus part of multiple networks, responsible for various tasks, but provided with scarce physical, medical, and administrative resources. It is within the NEP that HISP is trying to introduce the DHIS software and train the staff, currently in health data entry. Within the district, the action research was also reflected on training on information use, building computer skills and a relationship with health staff responsible for HIS in Xai-Xai. However, training efforts to date have been largely ineffective because of the multiplicity of tasks the health care staff does, which makes their working day fragmented and pressured. In addition to that, there is frequent turnover of staff lost to Maputo (the capital city) or the private sector, where they

\(^4\)Agente Comunitário de Saúde (individuals with limited training in health care serving remote and sparsely populated rural areas).
can receive higher salaries, which creates significant discontinuities in the implementation process. The field support from the HISP team during the initial stages of the implementation was also weak, and led to disappointments and fallen expectations among the NEP staff.

The report from the DDS is sent to DPS through various channels, and like from the health centers to the DDS, the report flows need to be combined with other administrative and personal tasks leading to various delays. Contrary to the district where the reports are paper-based, at the DPS the reports are first entered into a computerized database. However, the program does not support all the incoming data, for example, the TB and malaria data goes into different systems developed as stand-alone programs to support the vertical services. After entering the data into the computer, printouts are distributed to people responsible for various programs like in the DDS, who then make their own manual calculations and aggregations of data. The final report with the statistics of the province is sent to the MoH in paper or electronic format (on a disk), through various channels such as a person going to Maputo or by fax. Often the fax is sent to the wrong person in the Ministry and there are significant delays in its correct receipt. In the MoH, the data when received in a disk (if working) will be entered into the national database, but quite often it is just filed away along with the manual records. The MoH is then supposed to use this data for purposes of planning, monitoring, and evaluation of health programs and reporting national-level statistics to the international agencies.

5. CASE ANALYSIS

After having discussed our first two research aims of theoretically elaborating on the concept of a counter network and describing an ongoing effort to create one in sections 2 and 4, respectively, we turn to the third question of the gaps and challenges in trying to create such a network in practice in Mozambique. We discuss these challenges arising from four key reasons: conflicts in identity, uncoordinated donor policies, structural constraints, and pressures of existing work practices. After discussing these constraints, we analyze some of the action that can be directed to make the communication practices more effective by reconciling some of the tensions that the attempts to introduce computer-based HIS gives rise to.

5.1 Conflicts in Identity

The health care system represents a complex network of activities, people, and artifacts constructing and reflecting an identity through their everyday action and communication. The identity of the health care workers can be understood with respect to two networks—community and departmental—which helps to unpack some of the tensions that arise.

5.1.1 Community. The subdistrict-level health care personnel have a very important identity in the community through the health care services they provide in very adverse circumstances. The boundaries of the interactions are not restricted to the clinics but extend into community life. For example, private vehicles are often borrowed by the health care facilities to transport patients to the district hospital, and the health care staff in their personal capacity will look up patients at home. Similarly, in the district, where there is one doctor to provide services to 40,000–60,000 population, the doctor is seen as more than a provider of
professional services but as an important person in the community and local government. For example, in another province we studied, the doctor even deputed as the governor in the latter’s absence. There is thus a sense of mutual sharing and respect between the community members and the health care staff, who enjoy a strong sense of identity.

5.1.2 Department. Formally, the health department, especially at the district and sub-district levels are poorly and under-resourced, and there is little official motivation in terms of salaries and recommendations. Despite the multiplicity of tasks and pressures, the staff performs their everyday routines such as delivering health services, producing periodic data reports, and doing their administrative tasks of collecting medicines and salaries. Identity is expressed in multiple ways, for example, how work routines are harmonized with existing conditions. Even though these conditions are adverse, they are accepted as a part of life that is hard to fight against. This acceptance also comes with the historically existing weak power the lower levels have to take actions, for example on how resources should be used. Structural constraints arising from distances and lack of transport are difficult to overcome, and delays in reports are the natural consequence. This form of acceptance in identity is also expressed in the practices around the HIS as delays and inconsistencies in the data are seen as acceptable and a part of everyday life. Filling and transmitting reports are seen as largely the requirements of the bureaucracy, where the form takes importance over the content; delays, inconsistencies, and errors in data often go unnoticed or are largely ignored. These functional delays, in some sense, are attempted to be compensated by the symbolic graphs and tables pasted on the walls, reflecting the compliance of the staff to the orders of the higher authorities who want to show that data analysis is taking place.

The health care staff, as members of multiple networks, have to deal with ongoing tensions in their everyday work. The tensions manifest as the reporting demands impinge on their pressing need to provide medical care to fellow community members who travel long distances to reach the health facility. These multiple networks sometimes reinforce each other, and the positive community identity supports and provides motivation to perform the more uninspiring departmental work of reporting.

5.2 Uncoordinated Donor Policies

The policies of international agencies and their support to vertical programs at times run counter to the desired principles of integration based on a geographical entity rather than on programs such as TB or malaria. The paradox created through these funding policies is that malaria, despite being the largest killer in Mozambique, is more poorly supported than TB (Chilundo & Aanestad, 2003). These funding policies have significant practical implications, such as their being inadequate reagents for testing for malaria, or poor stationery to collect malaria data. This inequitable distribution of resources also can potentially disrupt the sense of community and camaraderie that exists at the district and subdistrict levels of the health care system and with it the functioning of the reporting systems.

Another adverse implication of the donor policies comes from their support of large, expensive, and rather esoteric projects. For example, in Mozambique the EuroSys consultancy was contracted to develop a medium-term (5–10 years) strategic informatics policy of the health sector with a total budget of USD 55 million. However, the project has not shown tangible results as of yet. The EuroSys project has been currently stalled because the MoH staff found the program too ambitious, especially because of its policy of recruitment of staff at salaries that were much higher than of the existing staff. This would create inequities and
potentially divert funds away from more urgent needs such as opening new HIV or malaria testing clinics. The important point to emphasize here is that because of this project and the money it promised to bring in, other initiatives like the HISP were not given the formal go ahead from the Ministry for nearly 2 years. This created a deadlock situation that to date has been hard to break.

5.3 Structural Constraints

Structural constraints arising from inadequate transportation, medical, communication, and people availability influence adversely the functioning of the PHC sector. For example, the non-availability of frequent transport contributes directly to the untimely delivery of data. The formal health organizational system also provides structural constraints through the contradictions created by their top-down and donor-driven style of functioning. In trying to obtain the funds from donors, they accept practices that may be in tension to the needs on the ground. For example, in the case of accepting large expensive projects like EuroSys, the need to improve the information-handling capability and conditions of the health care staff gets marginalized, or to augment the numbers of hard-pressed staff, who are currently seeing sometimes even 100–150 patients daily.

A key adversary to the PHC sector arises from the strong hierarchical and top-down structure that allows little scope for local initiative and decisions, even though the professed rationality of reform is that of decentralization. This top-down structure is reflected in the nature of the HIS, where the lower-level nodes collect a huge amount of data and send it to the next level up as per official orders, yet rarely do they use the data to support their everyday work. The absence of any systematic feedback mechanisms from the higher authorities to the lower levels, while reflecting this hierarchical structure, also reinforces it as the lower-level staff experience the lack of useful links of their data collection tasks with their own everyday work.

The HISP approach is try to challenge some of these deep-rooted hierarchies, by first placing the computers at the districts, and then trying to train the health workers to be capable of using the computers to do local analysis and make use of data for their local action. However, the hierarchies are strong, and even though the local people acknowledged the usefulness of the HISP software and approach, they were reluctant to use it, and continued to use the existing reporting systems which they agreed was faulty and not useful to them. This reluctance arising from the deadlocked situation of a lack of formal support from Ministry of Health managers has contributed to a very slow and painful uptake of the HISP processes in Mozambique.

5.4 Pressures of Existing Work Practices

The existing work practices of the health care staff, on the one hand, can be seen to help achieve the goals of health services delivery to the best possible extent given the existing conditions. The positive identity with respect to the community, strengthened by a sense of social cohesion between the health care staff, and their tireless work helps to overcome some of the existing constraints to their provision of health care services to the maximum extent possible. On the other hand, these work practices can be seen to negate some of the goals of an effective HIS. In a situation where health care delivery takes precedence over administrative tasks (Mosse & Sahay, 2003), not enough attention and resources are
TABLE 1. Constraints to the Development of the Counter Network Around the Mozambique PHC Sector

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conflicts in identity</td>
<td>Poorly resourced. Overworked with multiple responsibilities. A positive community focused identity. A more negative identity with respect to the formal health department.</td>
</tr>
<tr>
<td>Uncoordinated donor policies</td>
<td>Hierarchical system of working of the health department. Top down planning contrary to decentralization principles. Policy of aid agencies funding vertical programs that counter needs for integration based on community. Government support for large, expensive projects.</td>
</tr>
<tr>
<td>Structural constraints</td>
<td>Structural constraints of infrastructure impede achieving goals. Structural condition of organizational practice impede achieving of goals.</td>
</tr>
<tr>
<td>Pressures of existing work practices</td>
<td>Existing work practices positively allow the reaching of goals with respect to health care. Existing work practices negatively influence the reaching of goals around HIS. Multiple tasks assigned to health care workers.</td>
</tr>
</tbody>
</table>

put into improving the HIS. The HIS as a result is characterized by delays, inconsistencies, missing data, and a lack of analysis and feedback routines (Braa et al., 2001; Skobba, 2003). The realization that the supervision and feedback from the top is limited, also serves as a deterrent to the health care staff to put more than the minimum effort required to complete the monthly routines of reporting.

In Table 1, we summarize some of the key constraints to achieving the development of an effective counter network.

After describing the nature of constraints identified through our empirical analysis, we focus on first describing some of the existing communication practices, and second, on identifying some strategies that we in HISP are trying to develop to help develop a more effective counter network.

5.5 Existing Communication Practices

In a recent article, Mosse and Nielsen describe communication practices to be characterized by *ritual, functional, and symbolic* aspects (Mosse & Nielsen, 2004). The ritual aspects of communication can be described as being relatively unreflective actions to accomplish routine tasks, and as being nonfunctional in relation to the act itself (Carey, 1989). For example, the process of completing the monthly reports and sending it to the levels above can be seen as a relatively ritualistic communicative act. However, this interpretation of rituals is limited as it does not point to their importance in fulfilling important social functions (Westrup, 1996). So, these reports also serve important functional purposes, such as providing a basis to show that there is a rational basis taken for allocation of medicine. However, this basis can be largely symbolic, being used to legitimize actions to external constituencies (Carey, 1989), such as to funding agencies. In contrast to symbolic acts which serve as external legitimizing devices, rituals constitute and reinforce the actor’s membership internally in a community to which he or she belongs. Seen from this perspective, communication serves
also as a vehicle for confirmation as well as production and reproduction of the rules of behavior in a community. For example, Carey (1989) argues that reading a newspaper is less of a situation of learning and “more [about] attending to a mass in which nothing new is learned but in which a particular view of the world is portrayed and confirmed.” (p. 20)

Seen from this perspective, communication practices within the Mozambique health care sector varies with the levels of the hierarchy (clinics, DDS, DPS, MOH), and also with respect to providing health care services and the practices around the HIS. While at the clinic and district level, the communicative practices are largely both symbolic and functional; those around the HIS are more ritualistic. At the province level, the practices around the HIS become more functional as reports have to be aggregated and analyzed, and there is a clearer division between health care and HIS tasks. At the MoH, the HIS tasks are also both symbolic and functional, with reports being needed to be sent to the international agencies and other government agencies. At the district and subdistrict levels, there is a visible and greater emphasis given on health care activities over HIS, which contributes to the weak quality of the latter.

This analysis of the existing communication practices provides the basis to suggest at least three communication related strategies for developing more effective counter networks.

5.6 Proposed Communication Strategies

1. Being sensitive to the physical context of communication.

Introduction of ICTs and associated practices assumes that communication can take place in non co-located settings. In contexts like Mozambique, this is an unrealistic assumption. To give a small but pertinent example, the HISP training was located in a room where the computer was placed, which had been constructed through the funding of the Portuguese Co-operation (Portuguese Aid Agency). This room was about 100 meters away from the room where the NEP staff, the people to be trained, were located. The training was constantly disrupted as the NEP staff were called to attend to a patient or conduct some administrative tasks. A practical solution to this problem, which seriously affected the training, would have been to move the computer to the NEP room or to do the training in the evenings. Our attempts to do the first were not successful because of security concerns (the NEP room did not have a strong door) and the donor had restricted the movement of the computer. Some success was achieved with the second approach, though not completely because the staff used to be tired by the evening. Being sensitive to the physical context of communication would help to strengthen both the ritualistic (the sense of social cohesion and identity of the NEP staff), and the functional aspects of communication by allowing tasks to be done through face-to-face communication between the NEP staff, for example, to tell where a file is located, while the training was going on.

2. Dealing with the structural constraints that shape communication practices.

The constraints and consequences of the lack of transport and other communication infrastructure have been emphasized. In contexts like Mozambique, where even the basic telephone lines do not exist, it is unrealistic to imagine that the forms can be sent over the Internet. This implies that the physical transportation systems would need to be strengthened if the electronic HIS are to be made functional. Currently, the problem of delays is contributed to by the fact that because of the paucity of transport, the administrative tasks need to be coordinated with the transfer of data. For example, if medicines are to be collected from the province on the 5th of a month,
then the transfer of forms also is delayed to that day (instead of being sent on the required first of the month). This creates delays and problems right through the whole network. This example raises the need first, for more effective coordination between the different functions of the health facility so that the overall goals are met. Second, alternative arrangements for transportation can be found, such as through outsourcing of logistics support where a dedicated vehicle can be hired for particular days of the month to transport all the health data from the districts in a province to the provincial head office (the DPS). In addition to improving the functional aspects of flows, this can also help to reduce some of the burden from the health staff to focus on their health care tasks.

3. Changing the focus of what is being communicated.

The current focus of what is being communicated is on providing data rather than information or knowledge. The reports carry data, often irrelevant and incomplete, only for purposes of completing the ritualistic and symbolic aspects of communication—of a report being needed to be sent every month to the higher level of the hierarchy. This current focus needs to be redefined and forms should carry more useful information or knowledge, i.e., enhancing the functional aspect of communication. This implies the need to (a) collect data that is relevant for action, and (b) to combine this data with other data (such as population and map boundaries) to convert the data into health indicators, which is useful information. This exactly is the focus of the HISP approach, and the software has the functional capabilities to do so. However, this has not yet been effectively implemented because of the absence of a strong policy at the MoH to re-examine and reformulate the datasets, and to have indicators to be calculated at the lowest levels and used as a basis for functional action. Such an approach is in contrast to the existing situation where indicators are largely calculated at the level of MoH primarily to fulfill symbolic purposes. By shifting the level and purpose of the data collection efforts, if the information can be put to action, useful knowledge will be generated through active reflection on the experience of doing so. Such reflection can be usefully reinforced by enabling more horizontal communication linkages, for example between different districts where health staff can reflect and learn from their individual expenses.

A key point emphasized through the three practical strategies proposed above is the fundamental need to take into account in an integrated way the social and physical context of communication, and on redefining the focus of communication. Sensitivity to the local context emphasizes the need to consider together both the physical and electronic infrastructure. In conditions like Mozambique where the electronic networks are extremely weak, adequate steps need to be taken to strengthen the physical infrastructure like that of transportation, if we want the computer-based systems to work. By redefining the focus of what gets communicated, and by enhancing the functional value of information being transmitted, we raise the probabilities of the reports being linked with more meaningful action. The HISP processes and software can potentially serve as an effective tool to make more clearly visible the health reality of the local levels to the policy makers, and point out areas of emphasis for intervention.

Our analysis extends the work of Heeks, Mundy, and Salazar who have proposed the ITPOSMO dimensions (Information, Technology, Processes, Objectives and Values, Staffing and Skills, Management and Structures, and Other Resources) to analyze the "design-reality" gaps of Health Care Information Systems. While this analysis was based
on health systems in the Western context, we have tried to examine the gaps in a developing country context, namely that of Mozambique. We have focused our analysis on identifying the challenges of communication practices and how they contribute to the design-reality gaps. Trying to bridge these gaps, we argue, will contribute to the development of effective counter networks around the Mozambique PHC sector. Enabling such counter networks, we believe can contribute in three ways: (a) to make more effective the health reality of areas that has been historically marginalized, (b) to help support the provision of focused and relevant action to help address health problems of these regions, and (c) to create mechanisms through which more effective flows (of people, information, experiences, etc.) can take place within different nodes of the network.

6. CONCLUSIONS

In this article, we have tried to extend Castells’ ideas around counter-domination and how these can also effectively operate in network, by empirically applying it to the analysis of the challenges that historically marginalized sectors like the PHC experience in becoming members of a larger network. A key emphasis in this work was to underscore the need to plan ICT initiatives in such contexts using a very different set of assumptions around the role and practical use of technology as compared to what are made in Western contexts. An important focus in this regard is the understanding of the mutual linkages between communication practices and health information systems.

REFERENCES


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