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Provider performance and information and communication technologies

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Preface

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Provider Performance and Information and Communication Technologies

There has been much discussion of the role that recent advances in information and communication technologies (ICTs) can play in improving health provider performance, though as yet there seems to be little reliable, independently verified evidence to support the claims of those who initially viewed the new ICTs as offering "a revolution in global healthcare management" (Séror 2001, p. 1). In particular, limited systematic attention has been given to the application of ICTs by private providers in developing countries, with most of the international agencies concerned with these issues tending to focus on large-scale public sector innovations (e.g., Chetley 2006; WHO 2006).

One established requirement for the successful implementation of innovations in the private sector is a receptive "technological system" (Stewart 1977), where required inputs are readily available and delivered outputs satisfy existing demands. One reason why some specific developments in ICT have had such a major impact is that they addressed long-felt and well-understood needs. To take an obvious example, small businesses, including those in the health sector, have probably always recognized the value of being able to communicate reliably and in a timely fashion with both suppliers and customers. The arrival of the mobile telephone addressed this specific issue to an extent previously unimaginable, allowing instant communication even in some of the most remote and least developed areas. It has similarly been long understood that maintaining current information on stocks, customers, activities, and cash flows was enormously valuable in making good management decisions. Again, the development of relatively inexpensive, easy-to-use personal computers simply made it possible for such activities to be undertaken much more efficiently and reliably within existing management environments. ICT capital equipment purchases could be justified in terms of improved performance of existing tasks. Once acquired, its inherent flexibility encouraged more innovative applications.

Such low-key, relatively uncomplicated applications have probably spread rapidly within the health sector as elsewhere, but most go unreported and unremarked (Kaplan 2006). They tend to emerge into public awareness only if they are taken up by the specialist media, donor agencies, or curious academics. Two such examples originate from South Africa. On Cue, a company established by a TB specialist, uses a simple computerized telephone system to send text messages reminding patients to take medication at predetermined times.[1] The Cell-Life

[1] See www.bridges.org/publications/11.

project (Khan 2004) is supported by the mobile telephone company Vodacom. It involves the use of mobile telephones by a team of locally recruited counselors to monitor the treatment and health status of around 800 HIV patients. Health care staff at an HIV/AIDS clinic can access this information via a central database and intervene if problems arise. Similarly, paramedics and community volunteers attached to the Bombay Leprosy Project have been provided with mobile phones and pagers to link patients with clinic doctors, for example, to reach rapid decisions on emergency treatment.[2]

On a larger scale, the Health Information and Service call center provided to mobile telephone subscribers by GrameenPhone in Bangladesh (GrameenPhone 2006) is said to be widely used by informal health providers when they have doubts about a diagnosis or treatment. Voxiva, a communications company that has pioneered the use of information systems based around mobile telephones, has established a number of regional health networks. The Health Watch disease surveillance project in Tamil Nadu[3] was set up following the tsunami disaster in 2004, and a system whereby rural healthcare providers use mobile telephones to provide routine assessment data on high-risk pregnancies to centrally based senior staff[4] is operating in the Ucayali region of Peru.

Reliable information on the use of computer-based management systems by health providers in developing countries is even scarcer than that on mobile telephone applications. However, the importance of a receptive environment is well illustrated by recent reviews of two broadly comparable innovatory exercises in Ghana and Mexico by the World Resources Institute (WRI). The retail pharmacy chain CareShop was established by a for-profit subsidiary of the Ghana Social Marketing Foundation (GSMF) in 2002 (Segrè and Tran 2008). It is a franchise of licensed retailers of over-the-counter drugs, operating under GSMF guidelines that are intended to improve the quality, accessibility, and affordability of essential medicines. When a donation of 100 new computers was received, they were allocated over time to franchisees on the basis of their performance. However, the great majority were never used, and at the time of the WRI review they were typically either not in working order or not connected to an electricity supply. Their owners were theoretically interested in using the computers to record sales data but had been deterred by practical difficulties or cost implications. They apparently valued the computers highly but only as symbols that they could put on display to indicate the success of their business.

[2] See www.edc.org/GLG/gkd/Sep_2001/0032.html.
[3] See www.voxiva.net/tamil.asp.
[4] See www.voxiva.com/nacer.asp.

On the other hand, the Mexican pharmacy franchise Mi Farmacita Nacional was said to have fully integrated computerized patient records and inventory control into its management processes (Coronado, Krettecos, and Lu 2007). Though Mi Farmacita is a fully for-profit company, it has adopted a social entrepreneurship model similar to that of CareShop, aiming to provide essential drugs and health services to low-income populations. Each franchisee is responsible for hiring a relatively inexperienced though qualified doctor. Each time these doctors diagnose and write a prescription, details are entered into a centralized computer system via a terminal located in the facility, generating the data required for monitoring professional performance. The computer is also used for inventory management, allowing franchisees to monitor their stocks and place orders. The associated sales database can be accessed across the franchise chain, and franchisees are encouraged to compare product sales and prices to promote competition.

First Care[5] is a health care initiative by Rural Technology and Business Incubator (RTBI), a society set up by the Indian Institute of Technology to promote technology-based business ventures in rural areas. It aims to create a network of trained and accredited primary care providers by working with "rural medical practitioners," informal private providers who typically operate as solo practices in rural communities. They form the largest cadre of private health providers in rural India and are by far the most popular source of care for the rural poor. First Care regards ICT as absolutely central to its project. First Care plans to link clinics with Internet- and mobile-telephone-enabled kiosks that will provide access both to distance leaning materials and to physicians and hospitals that are willing to offer advice, laboratory testing, and referral support. First Care also intends to introduce personal-computer- and mobile-phone-based record keeping systems that will allow quantity and quality monitoring of services. At present, just one pilot activity is under way with a small group of rural medical practitioners in a rural area of Tamil Nadu.

An alternative approach to rural health care in India, deliberately bypassing informal providers, is being piloted by Drishtee,[6] a for-profit franchise organization that aims to use ICT to promote entrepreneurship in rural areas. They have established a network of around 1,000 kiosks across six states, with each kiosk having a catchment population of around 1,200 households. They were initially focused on providing access to a range of key information sources—for example, government records and commodity prices—and assisting applications for licenses, certificates, and benefits. They have also set up a range of training courses,

[5] See www.rtbi.in/home1.html.
[6] See www.drishtee.com.

particularly in computer literacy and spoken English. In 2006, working with Microsoft India (Microsoft 2007), they set up kiosk cooperatives in a small number of villages in the Madhubani district, one of the poorest in Bihar state, to provide video-conferencing facilities that allow diagnosis and prescription by doctors in an NGO health center in the capital, Patna. This involves the use of a recently developed remote diagnostics unit that captures blood pressure, heart and lung sounds, oxygen saturation, temperature, and pulse rate. The health center maintains computerized patient records for those using the kiosk and has links to a referral hospital that can undertake laboratory tests and provide a referral service. The kiosks can also be used to arrange purchase of prescribed drugs from an accredited pharmacy.

A third variant on this theme is currently being piloted in Pakistan. Sehat First, a joint venture between d.o.t.z. Technologies (a social enterprise) and the Acumen Fund (a nonprofit venture capital fund), has set up ICT-based health centers in five locations in Bin Qasim Town in the southeastern part of Karachi. The first started to receive patients in April 2008,[7] and the ambition is to establish 500 centers across Pakistan by 2012. Again, the model is based on franchised health centers which in this case incorporate a multipurpose tele-center, pharmacy, and general store, with the aim of ensuring financial viability. They are targeted at areas with very limited formal health services and aim to provide basic care, pharmaceutics, and a similar tele-consultancy service to that envisaged by Drishtee. Support for these services is provided by partnership agreements with Aga Khan Medical Services and Unilever Pakistan.

As the above examples show, the general franchise model can take a variety of forms. One key dimension of this flexibility is the degree to which they are centrally directed and regulated. ICTs have greatly extended the possibilities for both centralization and decentralization. The availability of reliable communications and a stand-alone computer in each facility has the potential to increase the ability of local managers to be self-reliant—for example, maintaining their own supplier, customer, and inventory databases, and keeping track of their own sales and finances. On the other hand, the same equipment can allow a central authority to undertake detailed monitoring of their activities. An extreme example of the latter, though in a retail chain rather than a franchise operation, is provided by an independent evaluation study covering the period 1998–1999 of what was then the largest and most widely dispersed chain of private urban clinics in South Africa (Palmer et al. 2003).

The clinics offered ambulatory care to patients who either paid a flat fee or were members of an affiliated insurance scheme. The aim was to provide an attractive and trustworthy service, including on-site availability of doctors, laboratory tests, X-ray, ultrasound,

[7] See www.sehatfirst.com/#/objectives/4527966722.

and drugs, at a price that would allow access to a wide range of urban workers, not only those in well-paid employment. The average cost per visit was around 42 rand (US$7). It would appear that the ICT system was a key factor in holding down costs and hence allowing the company to adopt this pricing policy. Each clinic was linked to the head office of the company over a computer network that handled both clinical and management information. On entry, a patient would initially be seen by a health care worker who entered personal details and symptoms into the computer network. This could access a database of more than 2,000 algorithms for diagnosis and treatment derived from the Cochran Collaboration Reviews. The reliability of this database was central to the overall operation, given that computer-based diagnosis is not a trivial undertaking (Peters et al. 2006). Three outcomes were then possible. The health worker might use the information system to arrive at a diagnosis and recommended treatment; pass the patient on to a clinic nurse; or tell the patient that the clinic was not able to assist him or her. A similar procedure would take place for patients referred to the nurse, except that in these cases an onward referral would be to a clinic doctor.

Health care workers, nurses, and doctors were all expected to follow recommended treatment protocols, and decisions to act otherwise would be systematically recorded and reviewed by clinic and central managers. Any drugs provided from the clinic dispensary would be similarly compared with those implied by the recommended protocol and all deviations identified. The system thus allowed not only for routine clinical audits but detailed daily reports on revenues and costs relating to each patient visit. Overall, controlling access to clinic doctors, use of expert systems, and strict adherence to protocols enabled staff costs to be less than half and drug costs around one-quarter those at comparable private general practices. The independent evaluation reported favorably on both the cost and quality of services provided.

Some might argue that the clinic chain exhibited two common characteristics of private sector engagement in service provision: “Cherry-picking” areas where treatment was relatively straightforward and profitable, leaving the public sector to deal with the rest (Pollack 2001); and de-skilling staff by requiring them to follow the dictates of expert systems (Hanlon et al. 2005). These complaints are familiar from discussions of European health care systems, as are the counter-arguments: Private provision in selected areas can “reduce the overall burden” on the public sector, allowing a focus on areas of greatest need; and services should be run in the best interests of patients, not providers. This is not the place to address these long-running debates. The key observation for the present discussion is the crucial enabling role played by the computer system in the implementation of the adopted business model and in the fine-tuning of that model in pursuit of profitability. The example suggests that ICT may sharpen the debate on

public versus private provision by increasing the range of strategies open to private companies seeking to establish profitable investments in the health sector.

The model described above is crucially dependent on the use of accurate diagnostic software. Development of such software is a far from being a trivial undertaking (Peters et al. 2006). It has become a rapidly expanding area of specialization for software companies, and there are a considerable number of competing products in this market. One of the more interesting, because the intention is to distribute copies free of charge in developing countries, is NxOpinion. This was developed by the nonprofit Robertson Research Institute[8] in collaboration with Microsoft Research. It is a real-time diagnostic tool intended to assist the diagnosis of around five hundred illnesses and forms part of an integrated software package that also supports electronic health records and performance monitoring. Thus far, it has been piloted by missionary hospitals in the Dominican Republic and by a medical NGO, Doctors on Call for Service,[9] in the Democratic Republic of Congo. In 2008, the Elaj Group, which provides medical services in Egypt, Qatar, Saudi Arabia, and United Arab Emirates, signed a memorandum of understanding to distribute and promote the software, initially within its own centers and then to providers in Libya, Morocco, and Tunisia.

ICT and the health knowledge economy

The above discussion has focused on the deliberate use of ICT by health care providers to improve access, efficiency, or quality of services. However, these technologies have also very much changed the information environment within which providers operate. Bloom, Standing, and Lloyd (2008) suggest that health care is now best regarded as part of an emerging "knowledge economy" in which people are moving from being essentially passive recipients of care to active participants in their treatment. One key driver of this change has been an explosive growth in the volume of health-related information flows. Many who would previously have relied on the judgments of local health providers, possibly supplemented by advice from family and friends or vaguely remembered newspaper articles or stories broadcast by local radio or television stations, now have access to, and in some cases are directly targeted by, a vast array of competing sources of information. Over the past 20 years, an explosive growth in the number of radio and television channels, print publications, and mobile-telephone- and Internet-based services has resulted in a step-change in the range of material available and the speed with which access is possible. Health care providers who have previous found it relatively easy

[8] See www.robertsontechnologies.net/.
[9] See www.docs.org/.

to dismiss the doubts of those self-diagnosing from a medical dictionary or self-treatment guide are now confronted by patients who may have instant access to thousands of apparently authoritative information sources that appear to address their specific health concerns.

This revolution has been associated with the emergence of a great variety of content providers with very different aims and incentives. In addition to a diverse range of qualified and unqualified health workers, these include public health information agencies, producers and sellers of health-related goods and services, advertising and public relations agencies, international and national NGOs, advocacy groups, and media companies seeking audiences. Some of these will offer valuable information and guidance. Others may dissuade seriously ill individuals from seeking appropriate treatment or encourage the worst fears of the worried well in order to sell them a guaranteed cure. The overwhelming majority will be subject to no external quality control procedures and have almost complete freedom to claim qualifications they do not possess, make wildly exaggerated or simply false statements as to the efficacy of treatments they recommend, invent evidence to support such statements, and even conceal their true identities or allegiances.

This rapidly changing health knowledge economy provides both opportunities and challenges. One widely accepted distinguishing characteristic of health markets is the imbalance of power between possessors of expertise and those hoping to benefit from it—the problem of information asymmetry. The new technologies can in principle redress this balance. A poor woman in a Bangladesh village can use a mobile telephone to access the GrameenPhone Healthline (GrameenPhone 2006) and ask a qualified doctor if the drugs being prescribed by a local provider will make her condition better or worse. A member of an Internet-based AIDS patient group can compare experiences with thousands of sympathetic fellow sufferers, some with professional expertise, and gain the confidence required to challenge substandard treatment. On the other hand, the capacity to communicate information faster, more often, in more attractive formats, and in a much more targeted fashion offers enormous opportunities for those who wish to exploit the technologies for maximum commercial or political advantage, irrespective of the cost to specific individuals or the population at large. Medical “quacks, charlatans, mountebanks, cranks and hucksters” (Wahlberg 2007) have been an integral part of the history of health care, probably since its inception. They have often proved both highly adaptable to changed environments and highly innovative in their use of new technologies. It is not surprising that they have enthusiastically grasped the opportunities offered by developments in ICT.

The new technologies thus raise complex challenges in terms of equity of access to health information, the quality of that information, and the trust that users can place in information providers. Mechanisms are needed that can both promote beneficial applications—for example, improving the ability for service users to make better informed choices—and limit the opportunities for misuse. They imply a need for new ways of thinking, both about the nature of regulation and the extended range of actors and modes of accessing health information and services to which that regulation should be applied. In the OECD countries, this will probably involve further development of existing institutional arrangements such as professional codes of conduct and formal regulatory regimes, which evolved partly to mediate the relationship between providers and users of expertise to mitigate the potential adverse consequences of information asymmetry. However, these are weakly developed in many developing and middle-income countries, where the combination of increasing marketization and largely unmediated access to information and services has created opportunities for harmful behavior as well as potential gains. To highlight one obvious example, health workers, drug sellers, and pharmaceuticals suppliers often have powerful incentives to encourage a costly style of medical care, involving over-medicalization of self-limiting conditions and unnecessary health expenditure. Combining those incentives with a capacity to conduct extensive media-based advertising campaigns alongside highly targeted information flows to specific provider and patient groups, or even specific individuals using computer databases, the Internet, and mobile telephones could greatly exacerbate an already extremely worrying situation.

On the other hand, the spread of relatively low-cost information and communication technologies may also contribute to addressing such issues by providing alternative forms of knowledge mediation that can be linked to effective regulatory mechanisms. It has the potential to disseminate expert knowledge and respond to requests for specific kinds of information—for instance, through Internet-linked mobile telephony—at a cost that is at least in reach of poorer populations. (By 2007, there were 250 million mobile telephone subscribers in Africa, which was also the most rapidly expanding regional market (IPS 2008).) It can enhance the agency of local health service user groups, empowering them to create their own knowledge base and take more informed decisions, perhaps in collaboration with supportive health professionals from outside their own region. Such innovations can be small-scale and relatively inexpensive—for example, blending Internet and community radio services as in the Kothmale project in Sri Lanka (James 2005) or the Nakaseke Community Multimedia Centre in Uganda (Nakaseke 2007). New institutional arrangements in health and other social sectors are also emerging to allow the use of information technology to monitor provider behavior and make information on that behavior

public. An interesting example is provided by recent developments in China, where the introduction of Basic Medical Insurance schemes in urban areas (Tang and Meng 2004), and the parallel New Cooperative Medical Schemes (Mao 2006) in rural areas, have resulted in a computerized inpatient record system that, though primarily intended for accounting purposes, has considerable potential in terms of allowing local government to oversee the activities of notionally public sector but largely autonomous and market-orientated hospitals.

The new health knowledge economy reflects the increasing role of non-state actors in health systems, particularly where markets are playing an increasing part, and raises complex governance issues. Health system analysts often speak of public-private partnerships, but this language is inadequate to describe many of the institutional arrangements emerging at the interface between states, markets, and civil society. These often tend to be locally generated strategies responding to the need to establish or reestablish trust in providers of information, goods, or services. The "tele-center" or "tele-kiosk" concept provides an interesting example of the possibilities and potential pitfalls of such strategies. These are primarily small to medium scale, typically private sector franchise enterprises with donor, NGO, or government subsidies, that aim to act as community communications centers, combining telecommunications, Internet, e-mail, fax, photocopying, printing, and sometimes local radio as in the Kothmale and Nakaseke examples cited above (Fillip and Foote 2007). The idea has proved extremely popular with governments, international agencies,[10] social entrepreneurs,[11] and some private companies. Microsoft's Project Saksham has recently agreed to set up 5,000 rural kiosks in India and has suggested an eventual target of 200,000 using satellite-based broadband.[12]

Many of these supporting organizations have indicated that the provision of health-related services should be a key component. Run by managers dedicated to serving the community, and employing trustworthy and benevolent local institutions and individuals—e.g., hospitals, health NGOs, and local doctors—to mediate information flows, they might seem to provide at least a plausible route to bridging the digital divide in the health sector. However, this attractive scenario makes two key assumptions: first, that questions relating to health issues have but a single correct response on which all reputable mediators can agree; and second, that mediators will be both incorruptible and beyond the influence of local economic, social, and political pressures. In practice, hospital doctors, for example, might well use Internet resources to disparage remedies advocated by respected traditional healers or insist that people should

[10] See www.unescap.org/icstd/applications/cec/.
[11] See www.grameencommunications.com/upcoming.html.
[12] See www.microsoft.com/india/keynote.aspx.

not purchase drugs in markets run by local community leaders. They may take these positions based on considered clinical judgment, professional hubris, or commercial interest.

How would such disputes between potential mediators on health issues be conducted and resolved? Probably on the basis of local popular opinion and/or the degree of influence that the various parties can bring to bear on the tele-center management. Where governments or other donors are providing support, they too will clearly be in a position of influence but will typically not wish to be seen as micro-managing an institution explicitly identified as a local resource. The more successful the tele-center, the more it tended to lead debates on health issues, and the greater the level of trust conferred on it by local community members, the more incentive there would be for capture by one or other local elite groups. The key point is the familiar one that health knowledge has a high value—not only in commercial terms but also in terms of social, cultural, religious, and political currency—and valuable assets attract the attention of those who see potential advantage in their ownership. If tele-centers were to become a serious source of health information, their governance structures should merit at least as much consideration as their technical capacity.

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