



Digital bridges need concrete foundations: lessons from the Health InterNetwork India

Shyama Kuruvilla, Joan Dzenowagis, Andrew Pleasant, Ranjan Dwivedi,
Nirmala Murthy, Reuben Samuel and Michael Scholtz

BMJ 2004;328;1193-1196
doi:10.1136/bmj.328.7449.1193

Updated information and services can be found at:
<http://bmj.com/cgi/content/full/328/7449/1193>

These include:

Data supplement

"Full acknowledgement"
<http://bmj.com/cgi/content/full/328/7449/1193/DC1>

References

This article cites 3 articles, 1 of which can be accessed free at:
<http://bmj.com/cgi/content/full/328/7449/1193#BIBL>

Rapid responses

2 rapid responses have been posted to this article, which you can access for free at:
<http://bmj.com/cgi/content/full/328/7449/1193#responses>

**Email alerting
service**

You can respond to this article at:
<http://bmj.com/cgi/eletter-submit/328/7449/1193>

Receive free email alerts when new articles cite this article - sign up in the box at the top left of the article

Topic collections

Articles on similar topics can be found in the following collections

[Other Medical Informatics](#) (324 articles)

Notes

To order reprints follow the "Request Permissions" link in the navigation box

To subscribe to *BMJ* go to:
<http://resources.bmj.com/bmj/subscribers>

I thank Barbara Aronson at the World Health Organisation for her help.

Competing interests: SVK was a BMJ Clegg Scholar.

- 1 Pakenham-Walsh N, Priestley C, Smith R. Meeting the information needs of health workers in developing countries. *BMJ* 1997;314:90.
- 2 World Health Organization. Forty new countries given low cost access to health journals [press release]. 17 Jan 2003. www.who.int/mediacentre/releases/2003/pr3/en/print.html (accessed 26 Apr 2004).
- 3 Aronson B. Improving online access to medical information in low-income countries. *N Engl J Med* 2004;350:966-8.
- 4 Godlee F, Horton R, Smith R. Global information flow. *BMJ* 1999;321:776-7.

- 5 World Health Organization. WHO and top publishers announce breakthrough on developing countries' access to leading biomedical journals [press release]. 9 Jul 2001. www.who.int/inf-pr-2001/en/pr2001-32.html (accessed 26 Apr 2004).
- 6 Health InterNetwork. Special PubMed for HINARI [press release]. www.healthinternetwork.org/index.php (accessed 26 Apr 2004).
- 7 Pakenham-Walsh N, Priestley C. Towards equity in global health knowledge. *Q J Med* 2002;95:469-73.
- 8 BMJ Journals. Countries with free access. www.bmjournals.com/subscriptions/countries.shtml (accessed 26 Apr 2004).
- 9 AGORA. www.aginternetwork.org/en/ (accessed 26 Apr 2004).
- 10 Food and Agriculture Organization. Online scientific information on food and agriculture for poorest countries [press release]. 14 Oct 2003. www.fao.org/english/newsroom/news/2003/23019-en.html (accessed 26 Apr 2004).

Digital bridges need concrete foundations: lessons from the Health InterNetwork India

Shyama Kuruvilla, Joan Dzenowagis, Andrew Pleasant, Ranjan Dwivedi, Nirmala Murthy, Reuben Samuel, Michael Scholtz

The World Health Organization's Health InterNetwork pilot project has shown that national and international partnerships can use information and communication technologies to strengthen the public health system and bridge the digital divide in health

Information and communication technologies (ICT) are often promoted as bridges to better governance, economies, and health,¹⁻³ but examples of how these bridges can be successfully built are rare.² In this context, the United Nations' secretary general, Kofi Annan, launched in 2000 the Health InterNetwork in the Millennium Action Plan "as a concrete demonstration of how we can build bridges over digital divides."⁴ The initiative proposed to install computers and internet connectivity at thousands of hospitals and health centres in developing countries. The private sector pledged to provide the millions of dollars needed, but the "dot com" bubble burst and the funding never materialised.

The challenge of improving the flow of timely, relevant, and reliable health information remained, however. The World Health Organization (WHO), along with other United Nations agencies, technical experts, non-governmental organisations, and national governments, developed a strategy to implement and evaluate a series of pilot projects to better understand and meet those needs, as a basis for expansion.⁵

An early Health InterNetwork pilot project—to improve access to scientific publications for researchers in developing countries—grew quickly as agencies and publishers formed the Health InterNetwork Access to Research Initiative (HINARI). Coordinated by WHO and the BMJ Publishing Group, HINARI now provides public and non-profit health institutions in 113 countries with free or low cost access to over 2300 biomedical journals from more than 40 of the world's major publishers.^{6,7}

A second pilot project, Health InterNetwork India (HIN India), aimed to show the value of integrating ICT into public health practice. This article describes the Health InterNetwork approach and focuses on lessons from the HIN India pilot project.

The "digital divide"

The term digital divide often refers to unequal access to the internet in and between countries (table 1).⁸⁻¹⁰ But the divide also refers to inequities in ownership and use of technology, content, and telecommunications infrastructure.^{2,3,11}

The Health InterNetwork initiative focuses on four main components: connectivity (facilitating information access and use through ICT); content (providing timely, relevant, and high quality information); capacity building (developing skills in ICT management and use); and policy (lowering the barriers to ICT integration into public health practice).

Background to HIN India

India was selected for a Health InterNetwork pilot project because of its public health programmes as well as the availability of resources and skills needed to test the process of establishing, using, and scaling up ICT in a complex environment.

A wide range of agencies provides health services in India. Primary and secondary health care—available through a network of government health facilities (table 2)—is free or highly subsidised. Tertiary health care is provided through government medical college hospitals and specialised institutions. A rapidly growing private sector exists alongside traditional systems of medicine and major public health programmes organised by international agencies.¹²

Health InterNetwork, World Health Organization, 1211 Geneva, Switzerland
Shyama Kuruvilla
scientist

Joan Dzenowagis
project manager

Brown University, Providence, RI 02912, USA

Andrew Pleasant
visiting lecturer

Health InterNetwork India, World Health Organization, New Delhi 110011, India
Ranjan Dwivedi
project manager

Foundation for Research in Health Systems, Ahmedabad 380015, India
Nirmala Murthy
president

World Health Organization Liaison for Orissa, Orissa 751009, India

Reuben Samuel
WHO/UN development programme health and ICT coordinator

World Health Organization, Geneva
Michael Scholtz
special representative of the director general

Correspondence to: J Dzenowagis, World Health Organization, EIP/HIN, 20 Avenue Appia, 1211 Geneva 27, Switzerland
dzenowagisj@who.int



A full acknowledgment is at bmj.com

BMJ 2004;328:1193-6

Table 1 Estimated internet access worldwide, 2002

Region	Number of internet users (millions) ^a	Total population ¹⁰	Estimated internet access (%)
World	605.6	Over 6 billion	10
North America	182.7	316 million	58
Europe*	190.9	727 million	26
Latin America	33.3	520 million	7
Asia/Pacific region	187.2	3.7 billion	5
Africa	6.3	795 million	<1

*Including the Commonwealth of Independent States.

Table 2 Indian government health service facilities¹²

Type of facility	Population served per facility	Total No of facilities
Government subcentre	10 000	150 000
Primary health centre	30 000 to 50 000	23 000
Community health centre	100 000	2750
District hospital	1 500 000 to 2 000 000	600

Objectives of HIN India

The main objective of the 18 month HIN India pilot was to document and analyse the process and impact of using ICT to improve the flow of reliable, timely, and relevant information to support policy making, health services provision, and research. Another objective was to work with local organisations to assure relevance and sustainability. Some 40 partners were coordinated through the office of WHO's representative to India. They included national and state government departments, local United Nations agency offices, non-governmental organisations, research institutions, health service facilities, universities, and the private sector (see www.hin.org.in for further details).⁵

HIN India pilot sites included primary health centres and community health centres in the states of Karnataka and Orissa. The selection of these states was based on the contrast in health and socioeconomic status (table 3),¹³⁻¹⁵ national government priorities, and presence of project champions.

The pilot also supported two national priority public health programmes—tuberculosis control and tobacco control—by including related research institutions in Bombay, Chennai, Bangalore, and Delhi.⁵ As the Ministry of Health requested that the project strengthen ICT capacity at medical colleges to ensure longer term benefits, selected medical colleges in Orissa and Karnataka participated in the pilot project.

Achievements and lessons from HIN India

Connectivity

HIN India introduced ICT into seven primary health centres and three community health centres and

upgraded computers, internet connection, and networks in four research institutes and two medical colleges. It also tested applications such as e-fax (faxing direct from computers), e-consultations, geographic information systems, and handheld computers in these settings.

HIN India showed that computers and internet connectivity meet real needs even in remote settings. Assessments and local expertise determined the ICT components for the sites. A basic package consisted of a desktop computer, printer, scanner, electrical and telephone connections, and subscription to an internet service provider at an average cost of \$2750 (£1533; €2275) per site. Six months were allocated to establish connectivity, but at some sites the process took over a year. This was because of difficulties in securing reliable electricity and telephone services, complex bureaucratic processes, and competing demands on over-taxed infrastructure.

ICT tools that were tested after connectivity had been established showed some immediate benefits. Every day during the summer, for example, staff at primary health centres used to deliver a daily heatstroke report to the district health office. Given the few buses and lengthy travel time, reporting took most of the day. With e-fax, reporting is instantaneous—provided that electricity is available and telephone lines are functioning.

Content

HIN India tackled the challenge of identifying and publishing health information to meet the wide range of local needs. One goal was to institute a process for publishing national, peer reviewed journals. As a pilot, HIN India and the Tuberculosis Association of India published online full text versions (all volumes since 1990) of the *Indian Journal of Tuberculosis*. To improve the capacity of medical colleges, the Rajiv Gandhi University of Health Sciences, as a local champion, led a consortium of Indian medical college libraries in Karnataka—25 in the first phase—to share online subscriptions to 250 biomedical journals. The National Medical Library and medical colleges in Karnataka both established interlibrary loan systems for print and electronic resources. The Indian Council for Medical Research coordinated the development of a prototype National Health Information Collaboration web portal for publishing locally relevant content.

The HIN India experience showed that access to relevant content is an important incentive to using ICT. Better access to existing content, however, does not necessarily meet local needs¹⁶: long technical reports are not the most effective way to communicate with policy makers; the well documented disparities of the “10/90 gap” in health research (less than 10% of the funding is directed at 90% of the world's health problems) mean that much of the global pool of knowledge is not necessarily relevant; and the use of local languages is essential for community health workers.⁵

As India is not part of the HINARI scheme, improving access to international scientific publications was also a challenge for HIN India as one full text journal article costs \$12 to obtain online or entails a wait of months to be delivered by surface mail.^{5 6} Sharing resources and costs through consortiums and

Table 3 Key comparisons between Karnataka, Orissa, and India

Selected indicators	Karnataka	Orissa	India
Population (millions) ¹³	52.3	36.0	1002.1
Urban population (% of total) ¹⁴	34	14	27
Life expectancy at birth (years) ¹⁵	63.6	54.8	59.4
Mortality (%) in under 5s ¹⁴	69.8	104.4	94.9
Population served per government doctor ¹⁵	13 536	64 178	Not available
Literacy rate (%) ¹³	67.04	63.61	65.38
Per capita net domestic product 1999-2000 (rupees) ¹⁴	16 343*	9162*	17 039*

*Currency conversions (May 2004) are ₹204, \$367, and €303 for Karnataka; £115, \$206, and €170 for Orissa; and £213, \$382, and €316 for India.



The new and the old are both in use in India



an interlibrary loan system proved a viable strategy to improve such access in medical colleges.

Capacity building

HIN India set up contracts with local firms to provide training in basic computer and internet skills for over 300 staff and students at pilot sites. This supported local business and facilitated continuing interaction between public health staff and trainers. Faculty members, staff, and students at Orissa medical colleges formed Health InterNetwork clubs to meet operating costs and to provide management, training, and maintenance on a “fee for access” basis. The clubs promoted a strong sense of local involvement and furthered learning among users.⁵ HIN India and local consultants developed and implemented a suite of tools for programme monitoring and ICT needs assessment at pilot sites, creating new and productive relationships among HIN India partners.

The HIN India project showed that local champions at all levels—from a nurse at a primary health centre who worked to excel at computer skills and was willing to teach other staff, to university faculty and government administrators who promoted the project—can make a big difference in the adoption of ICT. Identifying and supporting such champions is vital for improving awareness and adoption at sites and for gaining support at higher administrative and policy levels.

One path to improving capacity to integrate ICT in health begins with training in basic computer skills and then developing specific skills in the use of ICT for public health. Introducing ICT into public health settings without effective planning can increase inequities and inefficiencies.

Policy

HIN India faced many barriers to integrating ICT into public health practice, including cultural and political factors such as a lack of coordination in ICT development activities, poor incentives for cooperation, and entrenched bureaucratic procedures at all levels. In Orissa, HIN India brought together local, national, and international stakeholders to make the best use of limited resources by coordinating ICT strategies. The Danish International Development Agency, for example, reallocated its resources to provide training for health workers instead of duplicating other agencies' efforts to supply computer hardware.⁵

The Health InterNetwork is founded on the principle of equitable access to information and tries to ensure that new technologies do not exacerbate socio-cultural divides. HIN India found that over 50% of private sector doctors had access to the internet, compared with less than 20% of government doctors. Researchers and administrators reported the highest access (75%). In all settings, professionals of higher rank are predominantly male.⁵ HIN India showed that it is possible to narrow these gaps—for example, by planning for computer installations in women's residences at medical colleges and ensuring that staff at primary health centres received computers and training. When possible, open access software was used, and efforts were made to ensure that the content is in the public domain.

Discussion

Strong incentives exist in the market and in society for adopting the newest technology or approach. Using the latest technology to quickly attract interest, participants, and support can be effective, but organisations and governments must understand and plan for the long term. Careful assessment of the programme and the involvement of local partners can achieve an effective balance between short term incentives to adopt ICT and the long term goal of using ICT to strengthen public health practice.

Health InterNetwork India was initially conceived as being led by partners in India, with WHO India serving a coordinating role. However, the demands for efficiency in a short term pilot project, combined with the considerable demands on local institutions, made a leadership role by an agency such as WHO almost inevitable. Finding the balance to assure local ownership, control, and sustainability is an ongoing responsibility, as is reconciling the different perspectives, agendas, and approaches to integrating ICT in health settings. The HIN India pilot has shown that those challenges can be overcome through committed partnerships and established mechanisms that facilitate evaluation and coordination.

“Without computers and the internet, we are fighting 21st century health problems with 19th century tools”
Tuberculosis field officer, Orissa, India

Summary points

The World Health Organization's Health InterNetwork India pilot project implemented and analysed processes for establishing and using information and communication technologies (ICT) in India's health system

The project shows that national and international partnerships can help to do this effectively when connectivity, content, capacity building, and policy components are included

Computers and internet connectivity can be provided and meet real needs, even in remote settings

Identifying and supporting champions is vital for the successful adoption of ICT

Careful assessment and the involvement of local partners can help achieve a balance between short term incentives to adopt ICT and the long term goal of using ICT to strengthen public health practice

Conclusion

The HIN India pilot has shown that ICT can be adopted and used effectively in local and national public health settings. Further work is needed to evaluate the longer term impact and to establish best practice. An important requirement for bridging the digital divide is to ensure that connectivity, content, capacity building, and policy meet real needs. ICT will not have a major impact without concerted and coordinated efforts to invest in basic infrastructure, develop human resources, provide relevant content, and implement supportive policies. Innovative partnerships such as the Health InterNetwork can be a catalyst for building concrete foundations for digital bridges in health.

HIN India consists of many international and national partners, with over 40 partners in India alone (see bmj.com for a full acknowledgment). The editors of this theme issue, the reviewer, Alejandro Jadad, and Thomson Prentice from WHO provided useful suggestions for revision. AD provided the photograph of new technology in use in a primary health centre in Chhatarbar, Orissa, and of the traditional ledger still in use.

Contributorship: RD was responsible for implementing the HIN India pilot project, and JD oversaw it. SK coordinated with international and national partners; AP was the external evaluator; NM coordinated the needs assessments and project monitoring at local sites; and RS coordinated the project implementation as well as interagency and government collaborations for the project in Orissa. MS underwrote all the project's activities. All authors contributed substantially to the analytical base for this article and approved the final content. SK, JD, and AP drafted this article and incorporated input from the other contributors. SK, JD, and AP are guarantors for the article.

Funding: The Bill and Melinda Gates Foundation, the United National Foundation, and the United Nations Fund for International Projects provided and organised project funding.

Competing interests: None declared.

- 1 www.dotforce.org (Digital Opportunities Task Force).
- 2 Wade RH. Bridging the digital divide: new route to development or dependency. *Global Governance* 2002;8:443-66.
- 3 International Telecommunication Union. *World telecommunications development report*. Geneva: ITU, 2002.
- 4 United Nations. We the peoples: the role of the United Nations in the 21st century. Millennium report of the secretary-general of the United Nations. 2000. www.un.org/millennium/sg/report (accessed 28 Apr 2004)
- 5 Health InterNetwork. The Health InterNetwork India Pilot Project. 2003. (www.hin.org.in)
- 6 Aronson B. WHO's access to research initiative (HINARI). *Health Info Libr J* 2002;19:164-5.
- 7 Smith R. Closing the digital divide. *BMJ* 2003;326:238.
- 8 United Nations Conference on Trade and Development (UNCTAD). Millennium Indicators Database, 2004. http://unstats.un.org/unsd/mi/mi_goals.asp (accessed 28 Apr 2004).
- 9 NUA. How many online? NUA surveys website. 2002. www.nua.ie/surveys/how_many_online (accessed 28 Apr 2004).
- 10 United Nations Population Division. World population prospects: the 2002 revision. United Nations Population Division website. 2002. <http://esa.un.org/unpp> (accessed 28 Apr 2004).
- 11 Lessig L. *The future of ideas: the faith of the commons and a connected world*. New York: Random House, 2001.
- 12 Gourie-Devi M, Satishchandra P, Gururaj G. Epilepsy control program in India: a district model. *Epilepsia* 2003;44:58-62.
- 13 National Family Health Survey. National Family Health Survey-2 fact sheet—states. 2000. www.nfhsindia.org/data/india/statfind.pdf (accessed 28 Apr 2004).
- 14 Registrar General and Census Commissioner, India. Census of India 2001. www.censusindia.net
- 15 United Nations Development Programme India. Inter-state health statistics. 2001. www.undp.org.in/report/IDF98/idfihlth.htm pdf (accessed 28 Apr 2004).
- 16 Piotrow PT, Kincaid DL, Rimon IIJG, Rinehart W. *Health communication, lessons from family planning and reproductive health*. Westport, CT: Praeger, 1997.

One hundred years ago

When is a banana ripe?

It is not infrequently asserted that as a nation we are not sufficiently appreciative of the value of fruit as a food, and that in consequence our ordinary diets are often defective in this respect. Some years back the grounds for this charge were greater than at the present time, for there can be no doubt that there has been a marked increase in the consumption of fruit by all classes. In proof of this we need only point to the now immense and still increasing use of the banana. Not long ago it was only occasionally seen on the tables of the well-to-do, but now it is universally sold on the humblest barrows and stalls, and forms a not inconsiderable item in the diet of the poor. In spite of vast additional quantities of the fruit having been imported during the last three years from places as far off as the West Indies and Costa Rica, the supply in no way meets the demand. Added to its pleasant qualities to many as a fruit, it is credited, and no doubt correctly, with nutritional properties of a high order. Considering this, and the proportions to which the use of the fruit has

attained, it is a matter of no small importance to settle not only when bananas are in the best condition for consumption, but also as to when they have passed the stage at which they are fit for human food. In their native countries they are seldom eaten before the skin is discoloured and the pulp of so soft a consistence that it can be scooped out with a spoon. Under the artificial conditions they are placed in these climes they undergo somewhat rapid changes, and the times at which they are best suited for consumption may be short and difficult to predict with any degree of precision. Authorities, however, claim that they are habitually eaten here before they have reached their most suitable stage. Before they are thoroughly matured, moreover, they are apt to be insipid in flavour, and to cause dyspepsia and other forms of intestinal disturbance. They should not be eaten before the skin is blackened in places, or when there is any reluctance in the skin to separate from the pulp.

(*BMJ* 1904;ii:1271)