

# Unit 5

## Knowledge Networks

### Introduction

The concept of a knowledge network is relatively new. It refers to a network whose mandate is to generate and disseminate knowledge, usually based on research that is both problem-based and theory-based. This unit will describe two kinds of knowledge networks – informal and formal. Some special features of knowledge networks for health are presented. Tools and strategies for assessing knowledge networks are included.

The 2001 Human Development Report published by the United Nations Development Programme (UNDP 2001) puts forward the proposition that we have entered "the network age". This age is the product of an interaction between two major phenomena: globalization and rapidly advancing technology. In fact, the report's cover optimistically states:

"Technology networks are transforming the traditional map of development, expanding people's horizons and creating the potential to realize in a decade progress that required generations in the past".

Various kinds of networks have been described, for example: task networks, advocacy networks, development networks, and so on. This unit will focus on "knowledge networks", within the context of health research for development. Readers of this unit are reminded that within a companion module on Advocacy & Leadership, one of the units (Unit 3) deals with "advocacy coalitions" (or networks); the unit includes a section on "research and learning coalitions".

### Practical and Learning Objectives

1. To be introduced to the concept of knowledge networks, distinguishing between informal and formal networks.
2. To learn about the special features of a knowledge network for health.
3. Using the tools, readings and case studies, to assist readers to increase the effectiveness of health research networks in which they are involved.

## Formal and Informal Networks

Almost any collaborative activity involving the sharing of information between human beings can be considered a knowledge network. Such networks can arise spontaneously and almost instantaneously in response to a particular short-term need, or be created for long-term uses through a process of planned development using rule-based formality and heavy-duty infrastructure. Some knowledge networks can involve millions of people, while others can be very small: a family can be considered a knowledge network, for example.

With the introduction of technology that stores information and knowledge, that seeks out and associates elements of information in a structured way, on the basis of systems that can be distributed across the globe, knowledge networks can exist even without direct human participation. Tim Berners-Lee, who invented the world wide web in 1991, also invented the concept of “The Semantic Web” (Berners-Lee et al 2001). This is the vision of an Internet where enough information is coded into the software and metadata guiding information and communications technology to permit the web to operate as a knowledge network.

For the purposes of this module, we will focus on the concepts behind applied knowledge networks of immediate use to health researchers. Some of these networks will be informal, and others formal, so it is worth exploring this distinction.

We are all familiar with informal networks, although that is not what we would necessarily call them. Take a look at the scenarios presented in Boxes 1 and 2.

### *Box 1: Networking Country Doctor and Doctor to the Country (Scenario 1)*

*(Source: Chris Zielinski, Director, Information Waystations and Staging Posts Network)*

Dr. H is the Director of Health Services in a small developing country. Because there are few qualified staff at the Department of Health, or in the country as a whole, he does everything. The day before I visited him, for example, he had dashed off to a village one day's drive away to try to save someone from kidney failure (uraemia). He had stayed up all night at the person's bedside as any house-doctor would, then had to give him up and returned up the rugged road to the capital in the wee hours of the morning.

### *Box 1: Continued*

As he sat at the table in the office with me at 11 a.m., our conversation was constantly interrupted by telephone calls (he had three phones at his desk), which he sometimes fielded two at a time. One call informed him that there had been three cases of meningococcal meningitis at a local school. He put the phone down and booked a call to the WHO Regional Office. We carried on our conversation. The phone rang, WHO on the line. Dr. H orders 10 000 doses of meningitis vaccine (from the top of his head, he specifies the type of vaccine, the dosage, the container, the flight on which it is to arrive).

Within 10 minutes of hearing of three cases in schools, he has planned and prepared for the immunization of the entire school population around the capital. Another call to arrange the pick-up of the vaccine at the border, one to brief the head of the local auxiliary staff, and things were taken care of. He seemed like a house doctor to his country, prescribing for it when it got ill.

The day after the vaccine arrangements were made, there was a call from the Minister's Office. The President wanted to be briefed on this meningitis business. Dr. H got up and went to tell him all about it, the model of an excellent modern doctor and public health official - and knowledge networker.

In this scenario, the networking tool is the telephone, and the knowledge is in the doctor's head. The knowledge he applies is partly what he learned in medical school, partly the fruit of experience in public health, and partly knowing who knows what he does not know. He has the authority to make decisions and to give orders. This network is distinctly centralized around him, and it works. It is informal, because nobody has written down any membership rules, and indeed the members can change as staff occupy different positions or as the particular disease being tackled changes. No one has determined that this particular network will be used again in this particular way.

Let's look at the second scenario:

### **Box 2: A Social Network (Scenario 2)**

(Source: "Social network analysis", IBM Institute for Knowledge-Based Organizations, [http://www-1.ibm.com/services/files/ibv\\_sna.pdf](http://www-1.ibm.com/services/files/ibv_sna.pdf))

"So the call came in late on Thursday afternoon and right away, I wished I hadn't answered the phone. We had received a last-second opportunity to bid on a sizable piece of work that the partner on the other end of the line really wanted to pursue. Unfortunately, I had little experience in the subject matter but happened to be the one with availability at the time. I had no clue how to even begin looking for relevant methodologies or case examples, so my first move was to tap into my network to find some relevant info and leads to other people or databases. And in fact, I relied pretty heavily on this group of people over the next couple of days. For example, Seth was great for pointing me to other people and relevant information, Paul provided ideas on the technical content of the project while Jeff really helped in showing me how to frame the client's issues in ways that we could sell. He also helped navigate and get buy-in from the client, given his knowledge of their operations and politics. And somehow in this process, we managed to pull it off ... I mean the whole game is just being the person that can get the client what they need with the company's resources behind you. This almost always seems to mean knowing who knows what and figuring out a way to bring their knowledge to bear on your client's issue. Knowing who to turn to for what is ultimately the key to doing what you need to do quickly so you can go home to your family."

In this second scenario, a more collaborative approach is applied. The network tool is the telephone again – and, no doubt (although this is not specified explicitly) some legwork in walking from office to office, and e-mail as well. The required knowledge is scattered through a number of people, and the process of adding people to the effort is based on referral: someone knows someone else who knows what is needed. Rather than relying on authority, the coordinator of the initiative essentially expects that people will devote their time through mutual self-interest to secure a specific contract. Again, it is an *ad hoc* network, and different people are likely to be involved for different subject matter.

These informal knowledge networks are case-driven: something has happened, or needs to happen, and so the network arises to deal with a particular case. Other informal networks are situation-driven. For example, those who work in an academic environment belong to the "invisible college", sharing research results and information among each other. By virtue of their situation as microbiologists or mathematicians, they communicate with other microbiologists or mathematicians to exchange knowledge. It may be argued that this informal knowledge network requires at least the membership qualification of a degree, but on reflection it is clear that this is not a formal requirement. There are many cases where persons who do not in fact hold a formal qualification participate in the knowledge exchange of the invisible college.

More broadly, we can group such informal networks under the term, “communities of practice”. Communities of practice can be defined as informal groups of professionals who have a real need to know what each other knows. Such communities of practice consist of self-selected volunteers who in some way share a common practice – in the invisible colleges, one community would include the mathematicians, for example. The community of practice functions by coordinating the sharing of knowledge, in a structure comprising informal groups within or across organizations, and it lasts as long as its members feel it is to their benefit to participate.

Thus, informal networks are generally loosely structured, taking on whatever shape responds best to the need. They can rely on a range of media – voice, telephone, e-mail, letters, faxes – as appropriate. People can be added to the network at will, either by demand or by referral, or by self-selection in some informal networks. The need to know is the driving force, and the desire to achieve a specific result is the binding agent.

Note that, just because they are informal, this does not mean that they cannot provide an important result. But both the country doctor and the staff in the business office might wish that there was something more reliable in place. What happens when the country doctor himself falls ill? What if Paul or Seth were away? The very flexibility and *ad hoc* nature of an informal network is both its best strength and its greatest weakness.

Both of these are informal networks. In general, informal networks have the following characteristics:

- **No fixed membership.** Members either select themselves or are selected by another member.
- **No explicit rules or qualifications required for belonging.** Although it is usually very clear why each participant is considered a member.
- **Any duration.** They can be very short-term, and they can be very long-term. You can even join some knowledge networks on birth and leave them when you die.
- **Medium.** They can use many media simultaneously, as appropriate, and are rarely bound to any one medium.

In contrast, formal knowledge networks always have a formal membership procedure, whether qualification- or rule-based, with an approval mechanism (which can be automated). They are almost never very short term or fully lifelong; in general, however, they are long-term. An operational definition of a knowledge network appears in the box below, taken from a study by Clark (see Recommended Readings).

### ***Box 3: Features of a Formal Knowledge Network***

*(Source: Clark, H.C. 1998. Formal Knowledge Networks: A Study of Canadian Experiences. Winnipeg, Canada: International Institute for Sustainable Development.)*

Clark lists the following “ideal characteristics” of formal knowledge networks:

- The main purpose is to create and disseminate knowledge for use beyond the membership of the network.
- The structure and operation are designed to maximize the rate of knowledge creation.
- Provides recognizable direct benefits to participants.
- A formal organization with a well-defined management structure.
- Participation is by invitation, based on criteria of merit or peer review.
- There is a well-developed communications strategy; and
- The network results in a reduction of boundaries between sectors, such as universities and industry.

Formal networks have arisen in response to the recognition that a collaborative approach is extremely useful in a range of specific situations. Their structure tends to rely on a single medium, and this is reinforced by formal requirements for membership.

Examples of formal knowledge networks include:

#### **Networks linked by common interest**

- **Professional associations** with members who apply and pay to join. Typically these have a central organization with affinity groups that provide information and opportunities for meeting and inter-relating.
- **Project teams** established to achieve a specific task, with employees assigned by management to participate in achieving project milestones and goals. This would be a formal group within or across organizations.
- **Issue/advocacy networks** established for public education and to exert policy influence. Such networks are typically populated by self-selected volunteers with a common interest who participate in a central organization, with formal membership or partnership requirements. The network serves the purpose of coordinating programs, managing messages and the like.

#### **Networks linked by methodology:**

- **Internet** (e.g., networks based on using e-mail or the Web)
- **Meetings** (e.g., networks operating on the basis of a regular meeting cycle)
- **Offline** (e.g., networks communicating by post, telephone, exchanging newsletters, CD-ROMs, videos)

Different formal titles are used to name formal networks, but it is often difficult to distinguish between these. A few ideas about the connotations of these titles are given below, although exceptions can be found for almost all of these terms:

### **Networks of individuals**

- **Association.** This usually describes a network based on qualifications (Miners' Association, Journalists Association) or common purpose (Association against Crime, Citizen's Rights Association). Members choose to "associate" themselves with each other because they stand for the same thing. An association may confer titles or award qualifications, own office space, hold meetings, etc.
- **Society.** A society is very similar to an association, although it may have a narrower scope (The Shakespeare Society). A clear sub-category is the learned society, which looks after the interests of an academic specialization, holds meetings and publishes a journal. The very act of joining a society may itself be a qualification or title.
- **Club.** A club is generally smaller than either an association or society (but not always – the Royal Automobile Club) in both size and scope. Clubs tend not to award awards or qualifications.

### **Networks of organizations**

- **Alliance.** Alliances are perceived as being loose groupings of organizations. There is generally no formal merger of organizations implied, with each member carrying on exactly as before. A rather approximate and broad common vision and aim generally suffice.
- **Collaboration.** Collaborations generally imply a more formal commitment for members to work together to achieve a specific objective or series of planned objectives.
- **Coalition.** A coalition usually sets out to achieve a specific aim, which may be short term, and which is usually related to a legal, regulatory or governmental framework.
- **Confederation.** Used for countries, trades unions and other organizations choosing to work very closely (up to and including merging) and to speak with one voice.

## **Knowledge Networks for Health**

Knowledge networks have different requirements depending on the subject matter they cover, and on their participants or members. Such requirements are a part of the ontology (or complete description) of the knowledge network.

For example, a knowledge network focusing on literature might find it entirely proper to include opinion, speculation, unverifiable claims and comments in many areas. At the same time, this network might insist on meticulous accuracy in identifying author names, book titles and publication dates. The ontology of such a literature knowledge network would specify exactly where to apply which kinds of precision. Of course, such an ontology is rarely if ever written down in such domains as literature and the humanities in general.

In the sciences, and specifically health, this is different. Clearly, the health system has specific information and knowledge management needs resulting from its essential characteristics. In a knowledge network, these will include the needs for i) information of assured quality; ii) an evidence-based approach; iii) security, authentication and authorization governing knowledge in the system; iv) consideration of ethical issues; v) standards for data and metadata; and vi) communication and information flows between diverse national and global information systems. We will briefly consider each of these below.

## ***Quality of Information***

When considering the quality of information in knowledge networks dealing with health, particularly electronic ones, the question is frequently asked, “Why bother at all? We don’t care about the quality in other media either”. If traditional media did not require quality standards, why should the new media? Among the reasons offered by Gunther Eysenbach (2001) on why this is not a convincing argument in the field of consumer health are the following:

1. The Internet has characteristics that demand attention to quality issues:
  - Lack of quality control (editorial boards) compared with traditional media.
  - You can distribute information for free, if you keep production costs down. This encourages cutting costs and not sticking to the highest publishing standards.
  - Dubious and alternative medicine products currently predominate on the web.
  - Information is often provided out of context; it does not have to be false to be harmful.
  - Enormous reach, with the potential to affect the health of large populations.
  - Interactivity leads to greater involvement by users and thus perhaps a greater impact.
  - Users retrieve information when they need it and are more likely to apply it immediately.
  
2. The Internet is not a static medium such as a patient leaflet, a newspaper, or a book, where once a person has obtained misinformation there is little health professionals can do to complement or rectify this information. On a decentralized, electronic medium, intelligent systems can automatically give additional information about the information from other sources to the consumer, or help in guiding consumers to the best-available evidence.

These reasons are also applicable to health research information. As well as risks, of course, there are many new opportunities offered to improve quality. Just because we have neglected quality considerations in the past, does not mean we should continue to do so now. For example, in the traditional media, when a published paper contains errors, a corrigendum may be published in subsequent issues. It is a familiar finding that later researchers may read and cite the original paper without



even being aware that there was a corrigendum. In the Internet Age, there is scope to do something about this by making use of linking and "metadata".

## ***Need for an Evidence-based Approach***

Contemporary medical research is based on the concept of "evidence" – reference to quality-assured papers that provide reliable authority for future research. These act like steps in a ladder both for the researcher and for those who analyze and evaluate the researcher's work subsequently. The more relevant evidence that is provided by a knowledge network, the more valuable the network.

This is an area that is being revolutionized by technology and the shift in publishers' business models. The ability for researchers, particularly those from developing countries, to find relevant evidence quickly, easily and affordably has increased dramatically in recent years. Such programs as the Health InterNetwork Access to Research Initiative (HINARI) and INASP's Programme for the Enhancement of Research Information (PERI), now offer free or low-cost access to thousands of top journals to researchers in developing country institutions. These will be described further later. (See also Unit 1 of the Knowledge Management module.)

Equally, the technology of searching for information has undergone a radical improvement. Old keyword-based systems rely strongly on the searching (not researching!) abilities of the user or librarian, and skills in applying Boolean techniques (AND, OR, NOT). They also depend on authors using keywords when they write up their research, and will generally miss papers that use synonyms.

The new context-based, conceptual search software is able to take natural language queries and extract highly relevant results from materials using a range of terminologies. This is particularly important in health knowledge networks. Based on such conceptual software, a new field called biosemantics has arisen to enable researchers to use the published literature as a tool on which to test hypotheses directly. For example, you might want to test the hypothesis that a certain medicine is better than another one in treating children in hot climates. Using bio-semantic procedures, you could simply enter the hypothesis, select the evidence literature to search (all of MEDLINE for the past 20 years, for example), and extract the papers that support or contradict the hypothesis. This is clearly a whole new level of knowledge management.

## ***Security, Authentication and Authorization***

In knowledge networks, especially those utilizing the Internet, it is difficult to be sure of an individual's identity. You can never be sure that the person sending you a paper from [e17biff@worldnet.com](mailto:e17biff@worldnet.com) is John Smith. Worse, when the paper arrives, can you be sure it has not been altered by someone along the way? Websites are prone to "hacking", or malicious alteration by third parties. "Dr. Smith" may be giving you advice, but what kind of doctor is he? Can you trust him? Your knowledge network may include an archive of papers written by your members: how can you be sure

that a new submission, or proposed change to an existing paper, is really by a member?

While such questions arise in the non-electronic world as well, they are greatly aggravated on the Internet. It is important to be able to warranty the authenticity and integrity of all content. Just consider the effect of someone maliciously changing any of the dosages or other numbers in research literature.

Hence in electronic health knowledge networks, scrupulous attention needs to be paid to systems guaranteeing security of knowledge, authentication of individuals (Are you who you say you are?), and setting levels of authorization to carry out various actions in the network (Who has the right to deposit papers? Who has the right to change what content?).

## ***Ethics***

Knowledge networks embody acts of sharing knowledge. Some of this knowledge is personal to individuals, even though it is shared. Everyone has some concept of privacy, although this differs very considerably from country to country and from culture to culture. In the field of medicine, there is more uniformity in the picture, even though (often as a result of technological developments) this keeps changing and evolving rapidly.

For example, epidemiological data may be grouped together in such a way that those viewing the data cannot detect anything about individuals. Such considerations are often assured legally by data protection acts and other regulatory instruments.

However, the route taken by a patient's records, starting from information that is explicitly (and necessarily) linked to the individual, to "anonymized" summary epidemiological data can be an ethical issue. How did the person who removed references to individuals do it? Can the person reverse the process at will, or has the procedure been designed so that the individual links could not be recovered, even if someone wanted very badly to do so?

This example illustrates how technology helps on one hand, and introduces new ethical concerns on the other. Participants in a medical/health knowledge network need to be highly alert to ethical concerns.

The first principle of medical ethics, according to the ancient Greek physician and teacher Hippocrates, was that physicians should "do no harm". The Hippocratic Oath stipulates that patient confidentiality must be respected, that physicians should not perform procedures for which they are not qualified, and that physicians should lead "exemplary lives". Over the years, the Oath was greatly expanded thanks to experience and necessity (Devlin 2001). The fullest expression of medical ethics is now found in the Declaration of Helsinki<sup>1</sup> (originally proclaimed in 1964, and much revised since then).

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<sup>1</sup> *Declaration of Helsinki. Ethical Principles for Medical Research Involving Human Subjects.* Adopted by the 18th World Medical Association General Assembly, Helsinki, Finland, 1964

Codes of ethical conduct have evolved from decades of analysis, debate, and international concurrence from research scientists, clinical practitioners, policy makers, and academics. Three widely accepted ethical principles should guide the protocols for any study involving humans (National Commission for the Protection of Human Subjects of Research 1978). Research participants should expect:

- **Respect.** People who volunteer for research should be treated as autonomous agents – people who have self-rule. People who have diminished self-rule due to age, marital status, mental or physical impairment, lack of education, incarceration, or financial instability are entitled to additional precautions.
- **Beneficence.** Participants should also be protected from harm, with extensive efforts in procedures and study protocols to secure their well-being. In the context of research on humans, “beneficence” is a strict obligation to maximize possible benefits and to minimize possible harm to participants. Beneficence places the responsibility of the well-being of the participant – physically, mentally, and socially – directly on the researcher conducting the study, and reinforces the ancient maxim of medical ethics: first, do no harm. Protecting the human research participant is more important than the pursuit of new knowledge. It takes precedence over the personal or professional gain of the researchers.
- **Justice.** Who will benefit from the research and who will bear its burdens? Scientists are called upon to design studies that distribute equally the risks and benefits that participation in the research would bring. Justice mandates that recruitment and selection of research participants be done in an equitable manner, and that research not be done on disadvantaged or vulnerable people in order to benefit the privileged. The concept of justice also applies to the publishing of study results. Investigators are ethically obligated to present their findings accurately and fully – including results that may argue against the study’s hypothesis – in order to protect both the study participants and people who volunteer for future research on the same topic, as well as the general public whose access to products or services may be affected by the outcome of the research (Kommission für Forschungs Partnerschaften mit Entwicklungslandern nd).

## ***Data Standards and Metadata***

The Internet is increasingly becoming a treasure house of information of relevance and interest to health researchers. Apart from peer-reviewed journals offered through such schemes as HINARI and PERI (as mentioned earlier), there is a flourishing activity involving the development of archives, where researchers in all disciplines deposit either pre-print versions of their research papers, in some cases including the final printed versions as well. There are now over 7,000 scientific and

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and as amended by the 52nd World Medical Association General Assembly, Edinburgh, Scotland, 2000. <http://www.wma.net/e/policy/17c.pdf>.

technical preprint sites. Many are based on standards developed by the Open Archive Initiative (OAI) to search and retrieve documents in distributed archives and at its own site (<http://www.openarchives.org>) The ambition of the OAI movement is to create a “a global library that facilitates searching, data retrieval, cross-linking, as well as stable long-term archiving”.

With such schemes and the development of extremely powerful conceptual search software, the long-standing dream of researchers quickly being able to find anything that is relevant to their work, and of having their work found as well, wherever they are, and irrespective of the competing “noise”, is now technically feasible.

In order to achieve all the potential benefits of sharing knowledge on the Internet, thus, it is essential to adopt such standards as OAI, and to include the associated metadata (descriptors of data such as author’s name, title, etc.). These are key enablers of knowledge networks for health. These are the stepping stones to creating the Semantic Web mentioned earlier.

## ***Communication and Information Flow between Diverse National and Global Information Systems***

However focused they may be, knowledge networks do not exist in a vacuum. This is particularly true in the health sector. Organizations such as the WHO carry out clearinghouse functions such as the development of norms and standards and the convening of expert bodies. This accumulated knowledge is vital in guiding and underpinning national efforts in public health and health research, and needs to be accommodated in knowledge networks.

Equally, local knowledge needs to find a space in the regional and international arenas, as evidence on which to formulate broader conclusions. These flows of information between knowledge networks should operate between countries, within regions, and from region to region.

Knowledge networks should always be designed to respond to the immediate needs of their participants, but also with an eye for the “bigger picture”.

## **Evaluating Networks**

The Recommended Readings section describes several studies that assess knowledge networks in an industrialized country, in this case Canada (Clark 1998, Stein et al 2001). Additionally, in the Tools and Resources section, readers will find a listing of features of well performing networks, derived from a UNDP-commissioned study of “task networks”.

Examples of evaluations of research networks operating in low- and middle-income countries are more difficult to find. Two examples are summarized here.

Dr. Anne Pertet is a health social scientist from Nairobi, who works with SOMA-Net, an Africa-based health social science research network. In a thoughtful essay, "Networking: the facts behind regional research collaboration", she discusses some specific challenges of regional networks in "the South" (Pertet 2001). Three challenges are identified:

- communication: including both technological deficits, and poorly developed "information cultures";
- sustainability: in particular, the challenge of sustaining a network that has been initiated by a single funder;
- collaboration: describing strategies such as the creation of "chapters", North-South partnerships, and South-South partnerships.

A strong case is made for arrangements for communication and collaboration across several networks in a given region. Donors are challenged to coordinate their efforts to avoid inter-network rivalry and competition for funds, and to create forums where networks can come together for mutual benefit.

As another example, a detailed evaluative study of networks was commissioned by the International Development Research Centre (IDRC) (see Bernard 1996 in the Recommended Readings). The study was stimulated by the following statement:

“Since its inception, focusing on research networks has been a distinctive IDRC feature. Many of our most notable successes have derived from such networks. We need now to move in this direction with even greater determination.” (IDRC Executive Committee of the Board, June 1995)

The study, conducted in 1995, focused on research networks that had been supported, directly or indirectly, by IDRC. Data were gathered in several ways: interviews with more than 50 network coordinators, IDRC staff and individuals from other agencies; file reviews of IDRC networks; a literature review; and commissioned papers on specific topics.

The report includes several sections: definitions and purposes (of research networks), structures and functions, conditions of success and causes of failure, risks and balances, and realizing the benefits. Readers are encouraged to study the report in more detail. Listed below are some of the "lessons" summarized in the foreword:

- Networks are more than simply an arrangement to link discrete units, or facilitate associated databases. They are, in fact, "social exchange arrangements".
- It is important to realize that there are different types of networks. Examples are: task oriented networks, capacity building networks, operational networks, research networks, and so on.
- The most distinctive "comparative advantage" of networks is their flexibility, particularly in serving as "transitional arrangements". They are not, however, a substitute for institutional development or specific research program implementation.

- Networks have the potential to weaken the capacity of participating institutions, if energies devoted to institutional priorities and to network priorities are unbalanced.
- Networks must be adapted to the realities of their contexts. In this respect, there are some distinctive differences between international and local networks. The strengths of international networks include: promoting ideas, providing technical support, coordinating policies and disseminating products. Local networks are more conducive to capacity development and project collaboration.

The author concludes that ultimately it is the "users" of a network, those responsible for "carrying out the innovation and reinventing it as it proceeds through use", who should decide whether a network should continue.

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## Recommended Readings

1. UNDP (United Nations Development Programme). 2001. *Human Development Report 2001. Making New Technologies Work for Human Development*. New York – Oxford: Oxford University Press.

*Since 1990, the United Nations Development Program (UNDP) has published an annual Human Development Report. As in each of these reports, the focus is on people – and the factors that help or hinder them in making choices. This report begins with a 30-year review of human development, then goes on to describe how technology can be a tool for (and not simply a reward of) development. Stating that technology has produced "the network age", the report includes a review of the risks of technological change, the need for appropriate national strategies, and the role of global initiatives to support national efforts. Information and communication technologies are featured throughout the report.*

2. Clark, H.C. 1998. *Formal Knowledge Networks: A Study of Canadian Experiences*. Winnipeg, Canada: International Institute for Sustainable Development.

*This book summarizes a study of Canada's formal knowledge networks and attempts to capture this experience gleaned over a period of fifteen years. Professor Clark, a well-known Canadian academic (former president of Dalhousie University) conducted interviews with officials working within four CIDA-funded "Centres of Excellence", and 12 Networks of Centres of Excellence, as well as other networks.*

*Of particular interest are the conclusions about how formal knowledge networks in an industrialized country (in this case Canada) can contribute to sustainable development, not only in Canada but also globally.*

3. Stein, J.G., Stren, R., Fitzgibbon, J., MacLean, M. 2001. *Networks of Knowledge: Collaborative Innovation in International Learning*. Toronto, Canada: University of Toronto Press.

*This is the report of a study by researchers at the University of Toronto, exploring the question, "What contribution do Canadian universities make to development, both within Canada and globally?" Five networks were studied in some depth, representing a broad cross-section of knowledge areas. Based on this analysis, the authors put forward the view that knowledge-based research networks make three kinds of contribution to processes of knowledge production: they generate new knowledge; they generate "operational" knowledge; and they disseminate global knowledge locally. The book includes a thoughtful essay (by Richard Stren) on "Knowledge Networks and New Approaches to Development", including a section on "the blurring of 'North' and 'South'".*

4. Hilderbrand, M.E., Grindle, M.S. 1994. *Building Sustainable Capacity: Challenges for the Public Sector*. New York, U.S.A.: United Nations Development Program. Report No. INT/92/676.



*This is a report of a major study of public sector capacity building, which was conducted in six countries: Bolivia, Central African Republic(CAR), Ghana, Morocco, Sri Lanka and Tanzania. In each country, a detailed analysis of "task networks" was done. Three of these (Bolivia, CAR and Tanzania) were health related. In addition to describing a useful overall model for capacity building, the report analyzes the characteristics of networks that facilitate performance. This component is used as a basis for Tool 1.*

5. Bernard, A.K. 1996. *IDRC Networks: An Ethnographic Perspective*. Ottawa, Canada: Evaluation Unit, International Development Research Centre. Available at: <http://www.idrc.ca>

*Commissioned by the IDRC Board, this report summarizes a qualitative study of IDRC-supported research networks. Information sources include participant interviews, file reviews of IDRC network projects, and a literature review. The report also includes summaries of eight commissioned papers on specific aspects of networking. The focus is on interactive research and capacity development networks, as distinct from networks primarily concerned with information exchange. An overall conclusion is that successful networks are "learning organizations".*

6. Creech, H. 2001. *Strategic Intentions: Principles for Sustainable Development Knowledge Networks*. Winnipeg, Canada: International Institute for Sustainable Development. Available at: [http://www.iisd.org/pdf/2001/networks\\_strategic\\_intentions.pdf](http://www.iisd.org/pdf/2001/networks_strategic_intentions.pdf)

*In this study, Heather Creech reviews the values of models of collaboration for the sharing of information and expertise, as a means of changing public and private sector actions to be more supportive of sustainable development. She identifies a gap in the limited understanding about how to conceptualize, develop and follow through on the strategic intentions of a network. In her view, this gap can be bridged by focusing on the engagement of decision makers who are to be the targets and recipients of the work of the network. "There is a need to be more strategic in the choice of partners and in the management of the way they work together in order to keep on-mission and on-message to decision makers. There is a need to reduce the transactional costs of collaborative work that often delay the attainment of the network's intentions. And finally, there is a need to find new ways to monitor network efficiency and effectiveness."*

*The paper presents an overview of the "formal knowledge network", which provides a more structured and outcome-oriented approach than some other models for collaboration. In particular, it covers (i) the drivers behind the growth of interest and experimentation with networks; (ii) the different types of knowledge and their relevance for knowledge networks; (iii) the range of collaboration models available for sharing, aggregating and creating of knowledge; (iv) the formal knowledge network as a separate and distinct approach; (v) the operating principles for formal knowledge networks; and (vi) a synopsis of the basic components for formal knowledge networks.*

*Additional working papers that provide more detail on the basic components of formal knowledge networks are summarized (moving from communications to engagement strategies, management and governance of knowledge networks, helping knowledge networks work, and measuring while you manage).*

7. Nath, V. *Knowledge Networking for Sustainable Development*. Available at: <http://www.bellanet.org/gkaaims/documents/docs/exchanges-ict.html?ois=n>

*In this paper, Vikas Nath, of UNDP's Sustainable Development Networking Programme (SDNP), maintains that knowledge is and will continue to be critical to the social and economic activities that comprise the development process. "The cornerstone of this approach is global access to information and human resources, enrichment of information during different steps and an efficient mechanism for collective learning and sharing of knowledge between nations, communities and individuals through bridging of the gap between users and sources of information."*

*While conceding that information and communication technology can never be the sole answer to problems facing sustainable development, "it does bring new information resources and can open new communication channels for the marginalised communities. It offers a means for bridging the information gaps through initiating interaction and dialogue, new alliances, inter-personal networks, and cross-sectoral links between organisations. It can create mechanisms that enable the bottom-up articulation and sharing of local knowledge. The benefits include increased efficiency in allocation of resources for development work, less duplication of activities, reduced communication costs and global access to information and human resources."*

*Nath sees information as a commodity whose value increases with time and as a critical resource for people-centred sustainable development: "Information access gives people greater control over their destinies." While the simple availability of information does not result in knowledge, it is nevertheless the essential ingredient – although this needs to be proactively cultivated: "Information about how to treat a simple disease such as diarrhoea has existed for centuries, yet millions of children continue to die from it because information does not get translated into knowledge for the local communities"*

*He asserts that the crucial role of knowledge sharing in development is to bridge the gap between different communities, and between development professionals and rural people. The knowledge networking approach consists of initiating interaction and dialogue, new alliances, inter-personal networks, and cross-sectoral links between organizations so that "useful knowledge" is shared and channeled to develop "best management practices" and provide practical decision support.*

*Knowledge based networking implies that knowledge is acquired not just by creation but also by transfer of knowledge existing elsewhere. Knowledge networking creates a mechanism that enables the articulation and sharing of local knowledge with potential for further enrichment of this information as it passes through the network of users. Benefits include more efficient and targeted development intervention, less duplication of activities, low communication costs and global access to information and human resources.*

8. Bill and Melinda Gates Foundation. 2002. *Developing Successful Global Health Alliances*. Available at URL: <http://www.gatesfoundation.org>.

*Based on a review of 30 global health alliances, this paper sets out five key questions that managers and donors seeking to build successful alliances need to address:*

- *Where is the value in forming an alliance and what do the partners have to do to capture these sources of value?*
- *What is the appropriate organizational structure for the alliance?*
- *Are the “minimums” of operational planning and performance management in place?*
- *Does governance balance power with participation?*
- *Does the alliance have enough dedicated “horsepower”?*

*Exhibits 3-7 provide tools for:*

- *assessing how your alliance stacks up in terms of these five questions plus its overall goals and scope (Exhibit 3);*
- *calculating the value of an alliance (in terms of cost savings, time savings and other value) along five different dimensions (Exhibit 4);*
- *determining which organizational structural model may best suit your alliance (Exhibit 5);*
- *determining a funding model appropriate to the situation (Exhibit 6); and*
- *scoring the strategic, operational and relationship performance of your alliance.*

# Tools and Resources

## 1.0 Tool for Assessing Network Performance

*In the mid-1990s, UNDP commissioned a team from the Harvard Institute for International Development to conduct a pilot study of capacity building. The report is annotated in the Recommended Readings section. The report includes an analysis of the features of well-performing "task networks" [Table 4.3]. These features are adapted in the tool below. Some of these features could be helpful when assessing the performance of "knowledge networks".*

Task networks that perform well have the following characteristics:

- Effective capacity across multiple organizations that must collaborate to accomplish a given task.
- Policy frameworks that define goals for coordinated action.
- Specific mechanisms for frequent interaction across organizational boundaries.
- Horizontal interaction across organizations at policy, operational, and field levels.
- Vertical interaction within levels of government involved in performing a common task.
- Common training institutes or programs that bring together staff assigned to different organizations but involved in the same task.
- Clarity of organizational responsibilities.

## 2.0 Sample Network Planning Tool

There are a number of techniques used for analyzing the options available in developing a new network. These might focus on such aspects as cost (What can we afford?), target groups and audiences (Who are we trying to reach?), geographical factors (Which countries or regions do we want the network to cover?), technology (Should we link the network by Internet, CD-ROM, or traditional technologies?), communications device (Will we use a newsletter, e-mail list, travelling storytellers, etc.?).

Issues such as governance, responsibility, authority, ownership and buy-in, centralization or decentralization, network configuration (hub, star, point-to-point, all-to-all or all-through-one) all can serve as the basis for a planning framework for a new network.

The following chart sets out one approach that was used in developing a new network by one of the programs at the World Health Organization (WHO). Essentially the analysis is output-driven, seeking to answer the question, "What do

we want the network to achieve?” A second question is, “Who is going to use it and how?” From an analysis of the objectives and user profile, the appropriate tools were identified which could be used to create the network between those users who are to be reached to achieve a specific objective. In this case, the focus was on electronic tools, but the framework could equally be used with traditional tools. Finally, responsibilities are assigned.

Drawing up such a table is an instructive process, and it can be done in cycles – the first pass often brings out any lack of clarity in setting out objectives or identifying users. Participants will bring out issues about the tools suggested, which may often require re-thinking. And finally, when the responsibilities are assigned, it may prove impractical for various reasons – for example, a lack of capacity (time, funding, staff) in the responsible person or entity, or a political unwillingness or inability to exercise the assigned responsibility.

<b>Objective/Function</b>	<b>Priority Clients - User Profile</b>	<b>Relevant Electronic Tool</b>	<b>Responsibility</b>
1. To facilitate the exchange of dialogue and ideas between people involved in planning and implementation of program interventions at national and global level.	Individuals who have good experience in all or selected aspects of the program, and are concerned with or directly involved in programming and implementation issues; they may be located at national or international level. These need to be identified clearly.	Forum discussions; Closed e-mail discussion groups.	WHO Selected expert moderators
2. To disseminate information about best practice in implementing and scaling up interventions.	Individuals with diverse levels of education, practical experience and management; are affiliated to community-based organizations, institutions or government departments (located at the central and district levels in a country); may also be affiliated to international organizations: are	Website presenting practical information, reference library, links to other sources, etc; CD-ROM including selection of information on best practice; e-mail newsletter sent regularly to subscribers.	WHO IT management group Experts in the field.

3. To assist individuals, youth groups, governments and community-based organizations at national level with problem-solving related to implementation of interventions	organizations; are involved in some way in planning and implementing interventions.	Interactive exchange service on website (e.g. message board).	WHO Partner organizations Experts in the field IT management group
4. To harmonize between the interests of donor agencies and the needs of implementers on the allocation of resources and scaling up of interventions	Staff affiliated to donor agencies, international organizations, government institutions, the private sector and non-government organizations involved in lobbying for resources and identifying needs for implementation.	Special section on website addressed to donors; e-mail newsletter.	WHO IT management group.
5. To influence policy and decision makers in adopting and supporting effective policies and interventions	Senior staff affiliated to government institutions and non-government organizations at country level and who are involved in the decision and policy making process in programming.	e-mail newsletter; Special section on website; Forum discussions.	WHO Partner organizations; Selected expert moderators; IT management group.

# Case Studies

## Case Study 1: Lessons from a Latin American Network

*(This case study is a summary of a more detailed description of this network, which can be found in Almeida, C. 2001. Networking and coalition building: Lessons from a Latin American Network. COHRED Learning Brief 2001.11, Geneva, Switzerland: Council on Health Research for Development )*

The Network for Health Systems and Services Research in the Southern Cone of Latin America was created in 1994. Its original purpose was to coordinate the existing health research expertise for evaluating health sector reform activities in the sub-region. This network was assessed in 1999 and 2000, using several surveys and seminars.

Some of the main conclusions were:

- The Network has played a fundamental role in promoting and funding research in the area of health systems and services research (HSSR).
- The Network has established a "democratic, participatory forum where diverse actors discuss the agreement to formulate a common agenda for research and for developing health policies".
- National and regional seminars have been an important element in the exchange of ideas, promotion of reflection and debate, and the development of action plans.

Several "lessons learned" were identified in the evaluation, including the following:

- Networks can play a lead role in facilitating public discussion on key issues.
- Since most network members are national institutions, the action plan of a regional network must be closely aligned with national plans and priorities.
- The Network has played a key role in strategic coordination of activities at the two levels: national and regional. For example, it has created a database of studies, events and discussions in the HSSR field with information from both levels.

The "Southern Cone" network is closely affiliated with the Alliance for Policy and Systems Research, and through this affiliation, its work has become known internationally.

## Case Study 2: South African National Health Knowledge Network (SA HealthNet)

(Source: Louw, J.A., Seebregts, C.J., Makgob, M.W. 2002. *Using a Knowledge Network as an Instrument to Underpin and Stimulate Innovation in the Health System: With Reference to the South African National Health Knowledge Network (SA HealthNet)*)

### Overview

The South African Medical Research Council (MRC) designed a model for inter-institutional knowledge management in the health system and has applied it to establish, in collaboration with partners, a National Health Knowledge Network (now called SA HealthNet).

Within the framework of two overarching goals of building a healthy nation through research and furthering the information society, the MRC and its partners started creating a novel National Health Knowledge Network in 1999. This system will facilitate and enable interaction and iterative information flow among players in the health system — researchers, health services, industry, health policy makers and communities — against the backdrop of a virtual organizational approach. Such action is essential to drive innovation processes for finding solutions for the southern African region's health problems. It is also in line with the Essential National Health Research (ENHR) approach and the World Health Organisation's initiatives to network scientists for collaboration in solving complex health problems.<sup>1</sup> Apart from a catalyst role in terms of innovation, the National Health Knowledge Network will also provide government, the policy making environment and communities with a unique decision support instrument.

### Background

In general, information systems in the South African health context are disparate and not integrated. Although there is an abundance of websites, no single entry point existed at the time of initiating this project to provide access to quality-controlled health information resources, or to allow for reciprocal sharing of information. Clearly evident is the need to establish a virtual knowledge network that will provide for specific applications to support and stimulate innovation through efficient knowledge management — and serve as a decision support instrument for government and the health services sector. Such a network will have to complement the initiatives undertaken under the umbrella of the National Health Information System of South Africa.

An underlying principle of such a knowledge network is that it provides a trusted single entry-point resource for quality-controlled and evidence-based information. In this regard it is necessary to establish a mechanism (such as peer-review panels) to vet information sources that would become modules of the knowledge network, as well as those which might be pointed to via hyperlinks.

### The prototype

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<sup>1</sup> World Health Organization, Advisory Committee on Health Research. *A Research Policy Agenda for Science and Technology to support global health development*. Geneva: WHO 1998.



The South African National Health Knowledge Network (*SA HealthNet*) aims to provide:

- A unique information system, which provides the necessary virtual environment for improved interaction among players in the health system and allows the reciprocal flow of both codified and tacit knowledge to drive innovation in this system.
- A trusted “one-stop shop” for accessing quality-assessed and evidence-based information sources for policy and decision making at the national government, provincial and community level.
- A system providing advanced security to store confidential research data and allow accessibility at different layers of aggregation of these to relevant end-users.
- A system which will complement the National Health Information System of South Africa (NHISSA) and will enable substantial savings in the health services sector through the assimilation of evidence-based knowledge.
- A comprehensive set of data resources with metadata on these.

At the prototype site (<http://www.healthnet.org.za>), the key elements of the knowledge network include:

- information management
- website design
- information repositories
- searching mechanisms
- Internet application development
- security and access control
- links and metadata
- network services.

The knowledge network allows access to online publications, in this regard fulfilling the role of the new generation of electronic libraries. The knowledge network will also have a portal role by pointing to relevant web resources. Although the knowledge network should use the latest appropriate IT, it should also, as mentioned previously, cater for communities that are poor in terms of telecommunication infrastructure.

A significant challenge for the knowledge network is to develop an architecture that supports powerful searching capability and, at the same time, provides access to information in a fast and generally accessible way. Often these two goals are incompatible and alternatives need to be provided that optimize one or the other. Another key element of the architectural design is the logical integration and structuring of information and matching with appropriate target audiences via appropriate network and access control mechanisms.

This model has the potential to be rolled out as a working concept into Africa as a whole and also other regions in the world, bearing in mind the telecommunication infrastructure which obviously needs to be available.

## Case Study 3: Health InterNetwork

In April 2000, UN Secretary General Kofi Annan introduced what he called the “Health Information InterNetwork” at the UN Millennium Summit. Subsequently, in his Millennium Report “We the Peoples”, he outlined the concept of public-private partnerships, and proposed a number of initiatives that would embody this in different sectors. In the health sector, he envisaged a capacity building project “to provide Internet connectivity and appropriate content to 10,000 health centres throughout the developing world”. WHO, as the specialized organization responsible for health in the United Nations Common System of organizations, took responsibility for this project.

Under the revised name Health InterNetwork (HIN), and headed by Dr. Michael Scholtz, Special Representative to WHO’s Director-General, the project began fund-raising and finding partners. Initially, much of the early running was done by a foundation established by the US online health company Web MD. However, a change in ownership and priorities led to the effective withdrawal of Web MD from the project. Some initial funding came from the Gates Foundation and the UN Foundation, which has been used to initiate pilot projects in a number of countries.

HIN’s early focus and goals were decidedly on basic technological capacity building:

- To “build an Internet infrastructure for health and communication between the world’s poorest nations and the industrialized nations.”
- To create 10,000 new “web nodes” in developing world hospitals, clinics, and public health facilities.
- To use the Internet to “establish a surveillance and data transmission system” to feed information to WHO and others.

As the conceptual thinking developed, however, it became clear that appropriate content had to be available as well. The declared goals of HIN are now:

- **Content:** to provide appropriate content based on country needs.
- **Connectivity:** to establish or upgrade thousands of Internet-connected sites in public and not-for-profit institutions in developing countries.
- **Capacity building:** to build the skills needed to put information into action: information access and use in daily work, basic computer and Internet skills, and hands-on training to use specialized public health information, literature and tools.

The content side soon blossomed under a program called the HIN Access to Research Initiative, or HINARI. This was created based on a number of earlier efforts. One of them was a WHO survey of biomedical researchers in developing countries carried out in December 1999. More than 900 respondents identified two key needs: “first, access to research in the important and usually expensive medical journals published in the North; secondly, assistance in having their own research published.”<sup>2</sup>

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<sup>2</sup> Paper delivered by Maurice Long, Special Consultant to the British Medical Journal Publishing Group, to the meeting of the International Publishers Association in Accra Ghana in February 2002, on HINARI: Health InterNetwork Access to Research Initiative

HINARI began activities began in February 2001. Assisted by the good fortune of a previously scheduled meeting at UNESCO that month, and a follow-up in New York the next, the WHO team put the idea of providing low-cost access to biomedical literature for developing country researchers to senior executives representing the leading commercial publishers of biomedical journals.

In July 2001, WHO was able to announce<sup>3</sup> that “six of the world’s leading medical publishers (Blackwell Science, Elsevier Science, Harcourt International, John Wiley, Springer Verlag, and Wolters Kluwer) had joined forces in a venture to enable more than 100 of the poorest countries in the world to access scientific information free of charge through the Internet.” The number of initial publishers shrank to five with the acquisition of Harcourt by Elsevier, but this did not diminish the number of titles included in HINARI. In June 2002, it was announced that a further 17 publishers had joined and that “by the end of this year [2002], WHO hopes to include all the world’s biomedical journals in the program.”

Operationally, HINARI is structured as a partnership between WHO (lead agency), the *British Medical Journal* Group, Yale University Libraries, publishers and the Open Society Initiatives for core OSI countries in Central and Eastern Europe and former Soviet Union. Funding is minimal, as publishers provide access from their own resources. Yale University helped in the design of a simple portal accessible by users hampered by low bandwidth. Yale also donated its own Library’s user authentication software to HINARI.

It is worth noting that there is no contract between the WHO and the publishers covering HINARI, which is therefore not owned by anyone. “It is nothing more than a coming together of some of the key publishers in biomedicine, facilitated by the World Health Organization... There is no formal Management Board, and there is definitely no bureaucracy. ”<sup>4</sup>

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<sup>3</sup> WHO Press Release dated 9 July 2001: <http://www.who.int/inf-pr-2001/en/pr2001-32.html>

<sup>4</sup> Long, M. *op cit*.