



You're Blogging My Wiki:

Can electronic communication tools improve information sharing, professional development, and access to professional child and youth mental health services?

Author(s)	Peter Levesque, BSocSc, MA, PhD (candidate)
Category	Knowledge Exchange Specialist
Institution	Provincial Centre of Excellence for Child and Youth Mental Health, Knowledge Exchange Centre
Mailing Address	Children's Hospital of Eastern Ontario 401 Smyth Road Ottawa, Ontario K1H 8L1
Contact	T: (613) 737-7600 ext. 3332 F: (613) 738-4210 E: plevesque@cheo.on.ca
Key Words	blog, weblog, wiki, podcast, knowledge sharing, knowledge exchange, child, youth, mental health, Ontario
Key Messages	<ul style="list-style-type: none"><input type="checkbox"/> Blogs, wikis, and podcastings are new electronic tools that may be of utility to child and youth mental health service delivery.<input type="checkbox"/> They are currently in use by other health sectors with successful knowledge exchange results emerging.<input type="checkbox"/> They are currently used in delivery of Mental Health services and information in the UK and Australia.<input type="checkbox"/> Ontario appears to have sufficient hardware but insufficient incentive, training, or facilitators to enable widespread use in child and youth mental health service delivery.<input type="checkbox"/> Experiments should be conducted in Ontario to produce evidence to either support or reject the implementation of these tools.
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You're Blogging My Wiki

For many individuals that are currently using some of the latest information and communication technologies, the title of this paper will not sound too strange. For others, it may sound like just another piece of techno-babble. Blogs, wikis, podcasting, and vodcasting are all relatively new - the oldest term, wiki, originating in 1995 (Wikipedia, 2005e) - but potentially important tools in assisting decision-making that can be applied to many fields, including child and youth mental health.

This paper has three objectives. The first is to introduce people in the child and youth mental health community to several important concepts and communication technologies. The second is to open discussion about the use of data, information, and knowledge to support decision-making. The third is to discuss the need to build and implement appropriate, sustainable infrastructure and incentives to support decision-making that is based on the "best" available data, information, and knowledge, obtained in the most efficient way.

One cautionary note must be stated at the beginning. The tools presented here are viewed as complementary technologies that are of potential value in an increasingly sophisticated society. They should not be viewed as replacements for many of the existing and emerging non-electronic based methods of getting needed information to all stakeholders. They do not replace existing incentives and infrastructure but may serve as supports, as well as filling gaps, in the current context.

It is perhaps most convenient to start by discussing some of the technology. Feel free to use your imagination and to draw from examples in your own practice or personal life. It is helpful to remember that technology is not something out there. Rather, many of the basic things in our daily lives are technologies. Think of a book as a technology. A fork is a technology. A pencil is a technology. They are all quite simple on the surface. They have been refined through many years of use, of trial and error, and finally, they almost disappear into the background. Blogs, wikis, and podcasts may someday be just like the cutlery in our kitchen drawers – things that we use on a daily basis without really thinking about them.

What is a Blog?

A blog is a contraction of web-log. Rebecca Blood describes blogs as "a coffee-house conversation in text, with references as required." Blogs refer to both the software applications that facilitate "entering, modifying, and displaying posts (normally in reverse chronological order) as well as the totality of content constituted by these posts." (Wikipedia, 2005d)

A post is the word for a single entry. One way to think of a post is like a postcard that you send to a friend or a letter that you mail to a colleague. A blog may be described as a broadly shared electronic journal or diary, on topics which interest someone (the author and possibly others). The direct benefit for the blogger (one who blogs) of sharing ideas, experiences, and plans with others, is found in the comments,

suggestions, and links to resources that they often receive from readers. These additions can help build or refine the posting. Benefits are also found in the “capturing” of data, information, and knowledge that may otherwise disappear and no longer be available for use.

BusinessWeek Magazine states that the number of blogs is exploding, going from 100,000 in March 2003 to over 8.7 million in April 2005 (Technorati Inc., 2005). The rate of this explosion is >40,000 new blogs per day (Baker S. & Grean, H., 2005). Baker and Grean name blogs as “simply the most explosive outbreak in the information world since the Internet itself” – a phenomenon that will simply change the way that business, of all types, is done.

Various health disciplines are taking notice and using blogs in a variety of ways. For their research in the field of experimental surgery and regenerative medicine, Sauer and colleagues describe how blogs are used to achieve “continuous communication” within the research team and as substitute manuals for daily laboratory work. Using a password-protected blog (<http://www.typepad.com>), they make the blog available only to team members (an important consideration when sharing private and sensitive clinical information). The team then has access to chronological entries of administrative issues, such as dates and deadlines, and project-specific information and documents. Comments are posted and further documents and links are added. Information is structured according to self-selected categories and by date. Additional connections via the Web (links) to scientific papers are given, access to on-line dictionaries and databases are provided, and the contact details of the group are also provided.

In the context of mental health, blogs appear to have become a regular part of communication in the United Kingdom. Mental Nurse, (<http://www.mentalnurse.org.uk/>), as with many blogs, is a personal initiative to inform and improve access to data, experience, information, and knowledge in the field of Mental Health Nursing. It uses Word Press software (<http://wordpress.org/>) to describe the life of a mental health nurse and provides links to professional resources, other blogs written by clients, staff, and others with a relationship to the Mental Health system. One sign of the author’s entrepreneurial spirit is the use of advertising to offset the cost of running and hosting the site.

At an organisational level, the National Institute of Mental Health in England (<http://kc.nimhe.org.uk/>) has launched a “knowledge community”. In this community each member can create an individualised blog to share their own experience, research, case studies, problems, anecdotes, and knowledge as well as provide links to other people – individually and in groups, organisations, professional resources, and current events and news.

Blogs can be syndicated (think of a television network with links to many individual stations). Readers may subscribe to a series of blogs containing subject matter that interests them. This is accomplished using a RSS feed (Rich Site Summary), which is coding generated by the blog software that is automatically sent out whenever a new page is posted to a blog. This code is picked up by a feed reader, which notifies the subscriber that there has been a change in a page that interests this individual. This high level of personalization and interactivity is one of the reasons that blogs are being referred to as part of the “Web, Version 2.0” (Fuchs).

What is a Wiki?

Wiki Wiki is the Hawaiian word for “quick” or “informal”. Although the Pacific Islands do not normally conjure up images that are fast-paced (with the notable exception of surfing) the word wiki is indeed of Hawaiian origin. The concept of the wiki has existed for over a decade (Wikipedia, 2005e). It is only in the last couple of years however, that wikis have become prominent. A wiki is a web application that allows users to add content, as on an Internet forum, but also allows anyone to edit the content – taking collaboration, or co-labouring to another level. The defining characteristic of wiki technology is the ease with which pages are created and changed or updated (Wikipedia, 2005e).

One of the most prominent wikis is the aptly named Wikipedia (<http://wikipedia.org>) which, as of July 2005, had 620,000 articles complemented by tens of thousands of articles in French, Swedish, Polish, Spanish, German, Japanese, Dutch, Portuguese, and Italian. Wikipedia is an example of the concept that information seems to share many properties of a liquid – it flows, it fills the container it is poured into, and it easily leaks out from any opening in that container. It is publicly shared and is renewable. Some may argue that it may also become polluted, turned into a commodity for sale, and fought over for control.

Anyone “interfacing” with a wiki can be a consumer of information as well as a producer. It is a method of harnessing collective intelligence and of moving data and information into knowledge and wisdom. By engaging people at the point where they are (their threshold of interest), there is a reduction in the cost of time and energy needed to come to a common understanding of the “best” way to approach an issue or problem. This process is a method of knowledge exchange and mobilisation.

With the simplicity of editing a text document (Word, WordPerfect), non-technical users can add and edit information with ease similar to sending an email. This information is posted but is then subject to a review process that is open. Information that is incorrect or questionable is removed or subject to debate. Each page of content is ultimately “owned” by an individual who has responsibility for its quality and the maintenance of this quality. The log-in names of the contributors to each page are maintained in a reference database. Each version of the page is also maintained. Ideas may change and evolve, but the versions are never lost and authorship is easily determined.

An example of using wikis in health includes a group of radiologists in Japan. Through the use of freely available open source software (<http://en.pukiwiki.org>), they created a site to share Computed Tomography (CT) and high speed Magnetic Resonance Imaging (MRI) images with each other. (Open source software is produced by individuals and groups and is made available for free on the Web. Individuals with programming abilities contribute their time and skill to improve the software.)

This group shares patient data, upload pages of medical images, and other information for education, research, and teaching. In this instance, Nakata and colleagues describe how they allowed only registered users (to protect confidential information) to access the wiki using basic authentication of their web-server and other means. Nakata claims the use of the wiki is helpful in efficiently managing diagnostic

image data. Attributes of the wiki they developed include the ability to grow and the ability to access it from many locations.

One issue, which has not been fully resolved, is the ethics of sharing clinical data electronically. The example provided above did not discuss this in detail but their awareness of the issue appears to be integrated into their decision to only allow registered users to have access to the data.

What is a Podcast?

Podcasting is not a new way to fish. One way to describe podcasting is like having your own, very personalised radio station. A station where you choose exactly what you want to listen to, but also to which you can contribute your own voice. Podcasting is a way of publishing sound files to the Internet and of “catching” those files from sources you subscribe to. Podcasting is a combination of part of the word broadcasting and part of the name of the popular audio player from Apple Computer, the iPod (Meng, 2005). Meng describes podcasting as “the process of capturing an audio event, song, speech, or mix of sounds and then posting that digital sound object to a Web site or blog. Vodcasting, with vod meaning “video-on-demand” is almost identical except that the content is video.

Starting in 2003, a number of blogs started to publish audio content (Wikipedia, 2005c). The use of multiple forms of communication is especially important when one considers the different ways of knowing and expressing – reading text, listening to audio, watching video, writing, etc.

The Australian Broadcasting Corporation’s youth radio station, “Triple J” (<http://www.abc.net.au/triplej/>), is using podcasts as a method of enabling youth to listen to information pieces through their choice of medium (on their portable devices) and at a time they choose. Recent episodes include Pharmacist Gail Bell’s investigation of Australia’s depression epidemic. She wonders why over a million Australians now take antidepressant drugs.

Other podcasts available include why it’s hard to stop harmful addictions. That podcast includes stories of people who kicked their drug habits and how they managed their lives post habit. It was part of a promotion of “Positive Stories” by the Australian National Council on Drugs (<http://www.ancd.org.au>).

At this point, many of you are considering possibilities for use of blogs, wikis, or pod/vodcasting in your own contexts. On the other hand, some of you may be wondering what’s all the fuss; “I already have more than enough information as it is!” While it is true that information is abundantly available, very few of us have efficient tools to filter through the most useful information available to its full potential.

Is More Knowledge a Good Thing?

Many individuals have heard about the movement towards “evidence-based decision making”. This intellectual movement, which simply stated, argues the case for both using better quality data and information, as well as using it more often, in decision-making processes. The debate as to what constitutes good evidence continues in many sectors however, the stated intention is a movement towards the highest quality (as contextually appropriate) as often as possible.

Many individuals are currently working on building systems which help keep track of and deliver data, information, and knowledge when it is needed, in formats that can be used, and in as cost effective a way as possible. Many more are simply surviving through “decision-based evidence making” and hoping that the strength of experience and relationships helps to avoid large errors.

Data, information, and knowledge exist now in greater quantities than at any time in the past. Trends indicate that the production of knowledge will not only grow but also accelerate. Whether the number quoted is believed or not, most people have heard the mantra of “knowledge is doubling every (insert your favourite number here)”. The spectacular growth in the production and accessibility of new data, information and knowledge creates enormous challenges for government departments, public agencies, and service delivery centres, in determining what sources to trust, which data sets to rely on, and what evidence to use when developing a range of human activities.

These activities include but are not limited to: policy making, program creation, product development, process improvement, procedure definition, professional practice, clarifying perspectives within and across sectors, and people skills. This is as true in child and youth mental health as it is in community policing, automobile production, or rocket science. One could argue that of these, child and youth mental health is among the more difficult sectors because of the “density” of complex, non-controlled or controllable, human beings, with issues of safety always just on the surface.

The increased use of information and communication technologies has been one method of tackling these challenges but knowledge management, knowledge mobilisation, and knowledge exchange is much more than throwing more computers at the problem. The rise of knowledge management, knowledge transfer, knowledge exchange, and knowledge exchange seems to be rooted in the desire to move from simply “knowing” to smartly “doing”. There are currently thousands of experiments and initiatives aimed at developing better understanding of the appropriate mechanisms, incentives and infrastructure needed to support a decision-making system that consistently moves the “right” information, in the “right” format, at the “right” time, for the “right” audience. It is recognised that decision-making processes, at all levels, are often based on a complex emergence of factors including judgement, values, habits & traditions, lobbyists & pressure groups, pragmatics & contingencies, experience & expertise, as well as evidence (Davies).

The answer to the question “Is more knowledge a good thing?” appears to be in part addressed by looking at what we mean by decision-making and distinguishing between levels of decision-making and the different models of knowledge utilisation.

Data, Information, and Knowledge

The dominant perspective of most Knowledge Exchange practitioners is that the difference between data, information, and knowledge (and on to wisdom) is based on complexity and relationships to action. Data is commonly understood to be raw numbers, unprocessed narrative, and collections of figures. Data becomes information through a value-adding process of interpretation, meaning giving, and analysis using tools, theories, and contexts. Information becomes knowledge in application – via actions, decisions, assessments of impacts, etc. Wisdom appears to be applied knowledge over time.

The natural corollary from this is that there are as many different types of knowledge as there are contexts and decisions to be taken. What knowledge to consider, and when to consider it, are important questions. At a simple level, these questions are the basis of the evidence-based decision making movement.

There is well known literature around decision-making and knowledge by authors including Jeremy Grimshaw, Jonathan Lomas, John Lavis, Rejean Landry, John Seely Brown, Peter Senge, Martin Eccles, and others. There is however, relatively sparse information on how data, information, and knowledge are used in the child and youth mental health system.

An important and recent work by Melanie Barwick, Katherine Boydell, and colleagues, Knowledge Transfer and Implementation of Evidence-based Practices in Children's Mental Health, provides some clear messages. (<http://www.sickkids.ca/communityhealth/custom/knowledgetransferandimplementation.pdf>)

One message is that the failure to use available science is costly and harmful and that a sustained collaborative effort is required to bring evidence-based practice to children's mental health care. Drawing from the literature they point out that the transfer of research-based information to practitioners requires attention to four critical elements: the source, the content, the method, and the audience. They also state however, that there is a need to better understand practitioner's attitudes towards evidence-based practice in order to address scepticism, distrust, and resistance. The authors assert that practitioners need better access to the research base as well as to venues in which they can share their tacit knowledge with others (including scientists and policy makers and administrators) and that an attitude of life-long learning and reflective practice needs to be developed.

With regards to the effectiveness of knowledge transfer, the main message of the study, includes an emphasis on active collaboration with all stakeholders from the beginning, a clear preference for face-to-face communication, and a bias against passive dissemination. These conclusions are supported by the work of Chen, Cowan & Jionard, Koch, and Suthers, which come to similar conclusions in other work environments. What is particularly interesting however, are the mixed messages about learning, available tools, utilisation of existing resources, and the relationship between practitioners and the research experts.

Although executive directors and clinical staff indicated that over 65% thought it was likely their colleagues would turn to the Internet as a resource and that there was a high perceived adequacy and use of computers, there were frequent anecdotal reports of low computer access. The majority of clinical staff do not read about new techniques each month, nor do they have enough opportunities to keep up their skills. They also feel that they have few opportunities for personal growth.

The Barwick report contains some very good recommendations for taking action and improving the environment for evidence-based practice in child and youth mental health in Ontario; however, I suggest that there are complementary opportunities, which have not yet been addressed.

Push, Pull, Linkage, and Exchange

The work of Rejean Landry at Laval University, and his success with moving real problems from the Ministry of Health and Social Services into the university-based research agenda. He has also been successful at moving research findings into policy, programs, and planning for improving the health and quality of life of Quebecers. His work is based on the four basic principles of effective knowledge exchange: push, pull, linkage, and exchange.

Within the context of the Centre of Excellence for Child and Youth Mental Health, a provincial resource based at the Children's Hospital of Eastern Ontario in Ottawa, the concepts of push, pull, linkage and exchange are part of the operational plan of the Knowledge Exchange Centre. With a goal of facilitating and assisting in building an integrated mental health system for children, youth, and families in Ontario, the KEC is building mechanisms, products and processes that support achieving this goal.

Some examples include: Pushing out data, information, knowledge to various audiences in formats that are best received; Pulling in youth, families, policy-makers, practitioners to useful tools like the website, databases, the library; creating Linkages between disciplines, problem sets, communities, people (and more); and facilitating Exchanges between individuals and groups through discussion fora, translated documents, summaries, guidelines, etc.

As indicated, face-to-face interaction provides the highest level of receptivity however it is expensive, needs to happen regularly, and has potentially negative effects on the capacity of personnel already in the system, in that it further removes individuals from their primary functions. While face-to-face, (one form of synchronous [at the same time and/or place] communication), is absolutely necessary and should be further developed, facilitated, and encouraged, shortages of resources will not be solved any time soon.

An optimal balance of face-to-face learning needs to be supported by multi-media, distance learning and other forms of asynchronous (at a different time and/or place) communication. Given that there are adequate numbers of computers available in the system (95% of executive directors and clinical staff report having a computer in their personal workspace) and that the level of personal computer ownership and

Internet access in Ontario homes is among the highest in Canada (Statistics Canada), it can be argued that Internet utilisation for child and youth mental health service provider development has been underdeveloped.

In a preliminary scan of Ontario child and youth mental health service organisations, conducted by the author and Denise Lacroix, it was determined that passive dissemination of data and information was the norm. Despite some clear excellence of both format and content, child and youth mental health agencies in Ontario have, in many instances, under-exploited the opportunities available to them to use the new communication methods provided by blogs, wikis, and pod/vodcasts. The possibility of pulling subscribers to their websites, of linking them to each other rather than simply to facts and figures, and the opportunities for exchange, discussion, and constant communication was not prominent and appears to be resisted strongly by some. The scan did not identify experiments actively test whether the “scepticism, distrust, and resistance” detailed by the Barwick study can be addressed by introducing asynchronous communication infrastructure to engage the various parties involved with the child and youth mental health system (service providers, service administrators, parents and care-givers, children and youth, policy makers, and population health researchers).

Can it be argued that incentives (whether financial support, training, or ground-level “hand-holding”) must be given for a culture of life-long learning to develop? Can it also be argued that sufficient infrastructure must be provided so that the incentives lead to behaviour which derives full value from the data, information, knowledge, (and wisdom) needed for evidence-based practice to be realized in the Ontario child and youth mental health system. If so, then part of this infrastructure is the development of multiple methods of communication, in multiple formats, with facilitators and mediators. Those most actively involved in the system, should be able to move from knowing the details (What?) to knowing what the details mean (So what?) to taking the most effective action possible (Now what?). Barwick’s correct emphasis on Berwick’s seven rules of dissemination (find sound innovations, find and support innovators, invest in early adopters, make early adopter activity observable, trust and enable reinvention, create slack for change, and lead by example) is important. There must also be recognition that Actors in each part of the system will see the same issues differently and that the system being created, must permit self-optimising behaviour and informed choice from the Actor’s perspective. One element of this is the adoption and implementation of highly personalised and customisable opportunities for sharing and learning such as discussed.

Has the first question been answered?

Can electronic communication tools improve information sharing, professional development, and access to professional child and youth mental health services?

The answer is maybe. There is insufficient evidence to provide a definitive positive or negative response. Practices are emerging in Australia and the United Kingdom that may be of some utility in Canada and Ontario. However, without well-developed and implemented attempts to determine if this is an opportunity to leverage existing resources in Ontario, the answer will remain maybe.

Child and youth mental health is an issue that is only beginning to emerge from the shadows of stigma, ignorance, and shame. Like technology, child and youth mental health is not something out there. It affects all people, both directly and indirectly, whether through an illness, a relative dealing with depression, or the lost productivity in schools and workplaces. It is one of the few diseases in which the victim is often blamed for getting sick. As such, it is imperative that those directly involved in building the system to provide service, information, and support, consider all the possible options. New communication technologies, as discussed, should be part of the evidence-based decision-making entering into this building process. That evidence has not yet been gathered.

References

Adamides, E.D. & Karacapilidis (2004). Information technology support for the knowledge and social processes of innovation management. *Technovation* (in press), 1-10.

Agarwal, D.A., Sachs, S.R. & Johnston, W.E. (1998). The reality of collaboratories. *Computer Physics Communications* 110, 134-141.

Avouris, N., Dimitracopioulou, A. & Komis, V. (2003). On analysis of collaborative problem solving: an object-oriented approach. *Computers in Human Behaviour* 19, 147-167.

Aydogan, N. & Lyon, T.P. (2004). Spatial proximity and complementarities in the trading of tacit knowledge. *International Journal of Industrial Organization* 22, 1115-1135.

Baker, S. (2005, May). The lowdown on Podcasting. *BusinessWeek* online. Available at: http://www.businessweek.com/print/technology/content/may2005/tc20050524_9688_tc_211.htm

Baker S. & Grean, H. (2005, May). Blogs will change your business. *BusinessWeek* online. Available at: http://www.businessweek.com/magazine/content/05_18/b3931001_mz001.htm

Barer, M. (2005). Evidence, interests and knowledge translation: reflections of an unrepentant zombie chaser. *Healthcare Quarterly* 8, (1) 46-49.

Barwick, M.A., Boydell, K.M., Stasiulus, E., Ferguson, H.B., Blasé, K., & Fixsen, D. (2005). Knowledge transfer and evidence-based practice in children's mental health. Toronto: Children's Mental Health Ontario.

Blood, R. (2002) *The Weblog Handbook*. Cambridge: Perseus Books.

Canadian Health Services Research Foundation, (2000, June). Health services research and...evidence-based decision-making. Available at www.chsrf.ca under document library.

Chan, Y.E., Dekker, A.R. & Ramsden, D.J. (2005). Information systems and health care III: diffusing healthcare knowledge: a case study of the care delivery network. *Communication of the Association for Information Systems* 15, 1-33.

Chen, W. (2005). Supporting teachers' intervention in collaborative knowledge building. *Journal of Network and Computer Applications* (in-press), 1-17.

Cowan, R. & Jonard, N. (2004). Network structure and the diffusion of knowledge. *Journal of Economic Dynamics & Control* 28, 1557-1575.

- Darlington, Y., Feeney, J.A. & Rixon, K. (2004). Complexity, conflict and uncertainty: Issues in collaboration between child protection and mental health services. *Children and Youth Services Review* 26, 1175-1192.
- Davies, P. (2004, February). Is evidence-based government possible? Jerry Lee Lecture 2004, Presented at the 4th annual Campbell Collaboration Colloquium, Washington, DC.
- Eccles, M., Grimshaw, J., Walker, A., Johnston, M. & Pitts, N. (2005). Changing the behaviour of healthcare professionals: the use of theory in promoting the uptake of research findings. *Journal of Clinical Epidemiology* 58, 107-112.
- Feng, L., Jeusfeld, M.A. & Hoppenbrouwers, J. (2005). Beyond information searching and browsing: acquiring knowledge from digital libraries. *Information Processing & Management* 41, 97-120.
- Fuchs, T. (2005). *The Web, V2.0. Agile Web Development with Rails*. London: The Pragmatic Programmers. Available at: <http://media.pragprog.com/titles/rails/Chapter18.pdf>
- Gongla, P. & Rizzuto, C.R., (2001). Evolving communities of practice: IBM global services experience. *IBM Systems Journal* 40, (4), 842-862.
- Gordon El-Bihbety, D. (2005). Leaders' Forum on health research in Canada: the urgent need for innovation. *Healthcare Quarterly* 8, (1), 84-86.
- Hall, H. (2003). Borrowed theory: applying exchange theories in information science research. *Library & Information Science Research* 25, 287-306.
- Hoegl, M. & Proserpio, L. (2004). Team member proximity and teamwork in innovation projects. *Research Policy* 33, 1153-1165.
- Holling, C.S. (2001). Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4, 390-405.
- Koch, C. (2004). Innovation networking between stability and political dynamics. *Technovation* 24, 729-739.
- Kvan, T. (2000). Collaborative design: what is it?. *Automation in Construction* 9, 409-415.
- Landry, R., Amara, N. & Lamari, M. (2001). Climbing the Ladder of Research Utilization. *Science Communication* 22, (4) 396-422.
- Lesser, E.L. & Storck, J. (2001). Communities of practice and organizational performance. *IBM Systems Journal* 40, (4), 831-841.
- Lieberman, S. & Wolf, K.B. (1997). The flow of knowledge: scientific contacts in formal meetings. *Social Networks* 19, 271-283.
- Locke, C., Levine, R., Searls, D. & Weinberger, D. (2000). *The Cluetrain Manifesto*. New York: Perseus Books.

- Martin, A. & Sherington, J. (1997). Participatory Research Methods – implementation, effectiveness and institutional context. *Agricultural Systems* 55, (2), 195-216.
- Matzat, U. (2004). Academic communication and internet discussion groups: transfer of information or creation of social contacts? *Social Networks* 26, 221-255.
- McLure, M. & Faraj, S. (2000). “It is what one does”: why people participate and help others in electronic communities of practice. *Strategic Information Systems* 9, 155-173.
- Meng, P. (2005, March). Podcasting & vodcasting: definitions, discussions & implications. (White Paper) University of Missouri, IAT Services. Available at: http://edmarketing.apple.com/adcinstitute/wp-content/Missouri_Podcasting_White_Paper.pdf
- Morrison, A. (2005). Inside the rings of Saturn. *Computers and Composition* 22, 87-100.
- Nakata, N., Suzuki, Y., Fukuda, Y. & Fukuda, K. (2004). Accessible web-based collaborative tools and wireless personal PACS: feasibility of group work for radiologists. *International Congress Series* 1268, 260-264.
- Nielsen, B.B. (2004). The role of knowledge embeddedness in the creation of synergies in strategic alliances. *Journal of Business Research* (in press).
- Nückles, M. & Stürz, A. (2004). The assessment tool: a method to support asynchronous communication between computer experts and laypersons. *Computers in Human Behavior* (in press).
- Odlyzko, A. & Tilly, B. (2005). A refutation of Metcalfe’s Law and a better estimate for the value of networks and network interconnections. (Preliminary version, March 2, 2005) Available at: <http://www.dtc.umn.edu/~odlyzko>
- Ontario Hospital Association, (2005). Collaborating for change: optimizing the effectiveness of local health integration networks in Ontario. Available online at www.oha.com under Communications/Reports and Studies.
- Pederson, L. & Leonard, K. (2005), Measuring information technology investment among Canadian academic health sciences centres. *Electronic Healthcare* 3, (3), 94-102.
- Sauer, I., Bialek, D., Efimova, E., *et al.* (2004). “Blogs” and “Wikis” are valuable software tools for communication within research groups. *Artificial Organs*, 29 (1), 82-89.
- Statistics Canada, (2004) Household Internet Use Survey. Ottawa. Available online at <http://www.statcan.ca/Daily/English/040708/d040708a.htm>
- Suthers, D.D., Hundhausen, C.D. & Girardeau, L.E. (2003). Comparing the roles of representations in face-to-face and online computer supported collaborative learning. *Computers & Education* 41, 335-351.
- Technorati Inc. (2005, April). A growing tide of blogs. *BusinessWeek* online. Available at: http://www.businessweek.com/technology/tech_stats/bloggrowth050414.htm

Thomas, J., Harden, A., Oakley, A., *et al.* (2004). Integrating qualitative research with trials in systematic reviews. *BMJ* 328, 1010-1012.

Van Heijst, G., Schreiber, G., Lanzola, G. & Stefanelli, M. (1994). Foundations for a methodology for medical KBS development. *Knowledge Acquisition* 6, 395-434.

Walsh, J. (2005, January). Information wants to be liquid. *Wired News*. Available at: <http://www.wired.com/news/culture/0,1284,66382,00.html>

Wikipedia (2005a, June). Collaborative software. Available at: http://en.wikipedia.org/wiki/Collaborative_software

Wikipedia (2005b, June). Metcalfe's law. Available at: http://en.wikipedia.org/wiki/Metcalfe%27s_law

Wikipedia (2005c, June). Podcasting. Available at: <http://en.wikipedia.org/wiki/Podcasting>

Wikipedia (2005d, June). Weblog. Available at: <http://en.wikipedia.org/wiki/Blog>

Wikipedia (2005e, June). Wiki. Available at: <http://en.wikipedia.org/wiki/Wiki>