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Diffusing Healthcare Innovations: A Case Study of the Care Delivery Network

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ABSTRACT

This article describes the experiences of the Care Delivery Network (CDN) Project, particularly as they relate to the diffusion of knowledge in healthcare settings. After outlining the history of the CDN Project, several propositions are tested and findings presented. The CDN's experience suggests that for innovations to be voluntarily adopted by health service delivery organizations dispersed throughout a large geographical region, key factors such as professional champions, information technology, trust, communication, and boundary-spanning individuals are necessary.

Keywords

Healthcare, knowledge, medical innovations, diffusion, professional networks, case study.

INTRODUCTION

How can a team of people encourage the diffusion of specific innovations and practices not only within a specific organization, but also across organizational and geographic boundaries? Such was the challenge facing the Care Delivery Network Project of Queen's University.

In 1997, an interdisciplinary team of researchers and practitioners based at Queen's University in Kingston, Ontario, Canada decided to confront the lack of healthcare service integration in their region, in an effort to address perceptions of inconsistency in the levels of service across the region. The region covers approximately 20,000 km^2, and the prevailing view was that service access and quality varied depending on distance from major centres. The Care Delivery Network (CDN) Project, a multi-year joint initiative of Queen's University and a private healthcare partner, grew out of this commitment to pursue the team's concerns. The CDN's objective was to foster research and development that would improve the integration of, and equitable access to, health service delivery across southeastern Ontario. To do this, the network depended on a team of academics and researchers from Queen's University's Faculty of Health Sciences and School of Business, and a broad range of healthcare practitioners in the region engaged in direct care delivery.

The initial contact among the people who developed the CDN occurred through the professional and non-professional associations among them. Together, they formed a group of researchers, physicians, and knowledge managers who were prepared to contribute their time and combined effort. Initial informal conversations rapidly became the foundation for more formal networks. Specifically, the CDN was founded as a separate legal entity, and it in turn faced the challenge of spreading information across a wide range of geography, professionals, and existing healthcare networks.

In this article, first we describe the diffusion of knowledge in organizations, with a focus on healthcare settings. Then we outline the history of the CDN project (1998-2001), followed by a discussion of findings based on the literature and the CDN experience. We close by summarizing and highlighting what we have learned.

THE DIFFUSION OF KNOWLEDGE AND INNOVATIONS IN HEALTHCARE SETTINGS

Knowledge management has been defined as a set of practices that include generating, codifying, and diffusing knowledge (Davenport and Prusak, 1998). The field of knowledge management has examined a broad range of approaches and activities, from creativity initiatives and the role of personal contacts to knowledge systems design and accessibility. Personal contacts, according to Coleman and his colleagues (Coleman, Katz and Menzel, 1966), are particularly important in knowledge

transfer and diffusion of innovations among physicians. Their study, in fact, defined a medical community as a set of personal relationships, which included hospital affiliations, office partnerships, discussion networks, and friendships. Knowledge management researchers still value the personal associations among people; although knowledge can flow through technology, it actually resides in people, and can only expand through sharing and use (Allee, 1999; Webber, 1993).

Adler et al. offer helpful findings in their article on knowledge management in healthcare settings. They contribute a series of propositions related to the diffusion of information in professional bodies, thereby offering a useful lens through which similar situations can be examined. Built on the foundation of knowledge management literature and the practices of professional bodies (e.g., physicians), their article suggests a direction for this paper by combining theory with known practice. The CDN tested the flow of information and knowledge in diverse healthcare settings, dependent on the interactions among various players, thus it enables us to test the Adler et al. propositions.

RESEARCH MOTIVATION AND METHOD

A key objective of our research was to investigate, document, learn from, and disseminate a local innovation of practice "success story." We wanted to describe the approach this fledgling group took to develop, diffuse, and promote the acceptance of innovative healthcare protocols throughout a large geographical region. What was particularly interesting was the absence of any coordinating or unifying organizational structure spanning the approximately thirty-six organizations providing healthcare services in this region. Regionalization of the healthcare delivery system, the bringing together of proximate institutions under the governance of regional authorities, has occurred in virtually every province and territory of Canada, but Ontario has not followed suit. Lastly, we wanted to determine the extent to which their practices mesh with the research findings described in the literature in general and the Adler et al. "best practices" in particular.

In order to address these questions, a case study on the diffusion of an innovative stroke protocol by the CDN was carried out. One of the authors conducted multiple interviews with various CDN participants and stakeholders. Each interview lasted between 45 and 90 minutes, and was taped. The authors reviewed interview transcripts, and also examined historical documents (files in the public domain and project documents). Our research findings are described below.

THE CARE DELIVERY NETWORK PROJECT

The CDN was a regional healthcare initiative focused on an area of southeastern Ontario covering some 20,000 km^2. The Southeastern Ontario Health Sciences Centre in Kingston provides tertiary care needs for this region. Recent financial cuts and mandated restructuring of publicly funded health services by the provincial government highlighted the growing usefulness – even necessity – of voluntary collaboration among otherwise unrelated health service providers. A multinational pharmaceutical organization (called Glaxo Wellcome at the time, but now known as GlaxoSmithKline) agreed to fund a healthcare "demonstration project" to attempt to illustrate the benefits of voluntary collaboration amongst healthcare organizations and providers. A Board of Directors, including representation from key stakeholders (e.g., the pharmaceutical firm, the hospital community, community health initiatives, Queen's University, etc.), governed the CDN. It employed a Project Director, a Project Manager, and other professionals who worked under contract on the project. Project goals and a clear direction were determined from the very outset to increase the likelihood of project success, so the project created a formal vision statement, and documented what it hoped to accomplish and how healthcare in the region would benefit. This was in keeping with Satinksy's (1997) wisdom: "Because organization may be the first activity in which previously unrelated parties participate, it offers the potential for both positive opportunity and peril. … Ideally, integrated healthcare delivery systems … achieve consensus *before* making other decisions that may facilitate or obstruct their achievement" (emphasis in original).

The CDN project's vision was to demonstrate, within specific programs, services and conditions (e.g., stroke care), improvements in the coordination and delivery of regional healthcare and prevention activities. They sought an approach that would appeal to healthcare providers, whose participation was vital to the plan. In order to accomplish its goals, the CDN operated in partnership with the organizations that make up the Health Care Network of Southeastern Ontario (HCNSEO, a voluntary partnership of the hospitals, Community Care Access Centres, Public Health Units, District Health Council, Queen's University, Kingston Regional Cancer Centre, and the Health Information Partnership of the Eastern Ontario Region), and with its private sector sponsor. The CDN developed partnerships strategically based on its definition as a facilitative time-limited entity within the health services environment in southeastern Ontario. Given that the CDN did not have autonomous power or authority, it recognized early on the importance of appearing credible, competent, and relevant to those with whom it worked. Furthermore, given its time-limited status, the CDN recognized it had to ensure that the changes it facilitated and implemented were not CDN-dependent, but became incorporated into the evolving functioning of the health

services system. Effective partnerships, therefore, were essential. Adler et al. emphasize the vital importance not only of organizational partnerships, but also of individuals, respected professionals with a track record in the community, who champion an innovation. As anticipated, this was crucial to the spread of an innovative stroke protocol by the CDN. (Table 1 provides a synopsis of the Adler et al. propositions related to the CDN experience, except the two that could not be tested directly.)

CDN staff attempted to position CDN as a catalyst to support regional providers in implementing new initiatives and ideas emanating from the region. Early on, the leadership of CDN adopted a condition-specific (stroke care-focused) approach, in the belief that a more targeted approach would better demonstrate the value of service integration. The view was that generic system issues would be identified along the way, and that general clinical services integration of health services across the continuum of care would also be achieved. (See Figure 1 for an illustration of the continuum of care as it pertains to stroke.)

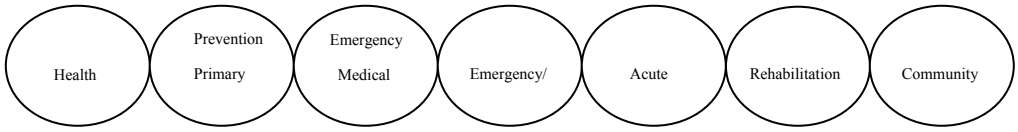

Figure 1. Continuum of Care for Stroke

It is standard practice within a healthcare organization to develop and implement care guidelines and protocols, to ensure that recommended approaches are clear, concise, and unambiguous. The CDN did not know if such an approach would be feasible and effective on a regional basis, so it first set about assessing regional readiness to accept care protocols. Secondly, it set out strategically to identify a first 'condition' (stroke) that could benefit from improved region-wide integration of care. The CDN recognized that standardized care protocols would limit the freedom of health service organizations and the professionals within them to treat conditions as they saw best. Two things were required to lay the necessary foundation: first, education regarding the benefits of standardized care (e.g., improved integration of service, exposure to best practices, improved access to the same quality of care throughout the region); and second, negotiation with respect to the details of the care protocols (given that professionals and institutions had related but somewhat divergent practices throughout the region).

CDN project staff appraised regional readiness through a series of presentations and meetings with healthcare providers during the spring and summer of 1998. In addition to information-sharing, these meetings provided an opportunity to gauge the willingness of healthcare providers to participate in the development of a regionally integrated program for selected conditions. Staff found a generally receptive attitude towards the principles and objectives of the CDN project. 'Boundary-spanning' individuals are especially important to the diffusion of innovations, but in the absence of such individuals, the CDN was prepared to facilitate exchanges across professional and organizational boundaries. First, they had to interpret the willingness of professionals from various healthcare communities (e.g., primary providers, nurses, specialists, emergency response personnel) to embrace a stroke care protocol innovation, and to expose their practice, knowledge, and potential gaps in knowledge to other professionals.

Integration of services was seen as a generally positive innovation, and the focus on patient care rather than governance or management seemed to create a 'non-political' focal point. Providers appreciated the focus on the patient and the family. According to one CDN staff member,

> *during the first year … we focused our efforts on the education required within the protocol. So all the work that I did in the region with the nurses in the various hospitals to give them the process updates on the work that I did here [at the stroke centre] was part of that. In response to a need identified by us primarily because we knew that everyone in the region had to know what their piece of the protocol was. We had an acute stroke workshop in November of 1999 … where we brought people together from across eastern Ontario. … A lot of the staff were saying that we really needed an update on stroke, we really don't understand stroke that well.*

The CDN identified stroke care as the area with the most potential to benefit from their primary attention because:

- Stroke spans the continuum of care, and was therefore a good proxy for system integration issues and relevant for health service providers throughout the system. (See Figure 1.)
- The impact of stroke on primary care physicians was deemed to be significant; they were invaluable as the front line of defence in providing risk factor assessments and in pre- and post-stroke care and follow-up.
- Circulatory disease, which includes stroke, is the leading cause of mortality in all parts of southeastern Ontario.
- Stroke care was relevant to all CDN partners not only because of population needs, but also because many professionals recognized the opportunity to address generic issues such as access, communication, and coordination of care.
- There were new approaches to care, particularly the application of new drugs that provided more options to intervene in stroke patients.

Consequently, the Regional Coordinated Stroke Strategy was initiated in 1999. Its goals were generally to decrease the incidence of stroke in the region, to reduce the risk factors, to improve care and access to care, to improve the flow of information, and to improve patient outcomes. Collaboration and information management strategies were the key to these objectives.

The presence of a new stroke intervention drug, recombinant tissue plasminogen activator (rtPA), underscored the need for collaboration and coordination across the region. The administration of rtPA had been successful in reversing some of the damaging effects brought on by some types of stroke. Most strokes are due to a sudden blockage of blood flow in the brain by a clot, and rtPA has the ability to dissolve such clots. Administration of the drug was recommended within three hours of onset of stroke symptoms. Moreover, the drug needed to be administered in a tertiary care facility, under the care of neurological specialists. Regional officials estimated initially that 75 percent of the region's residents would be ineligible for the new drug because of time delays in moving patients to the tertiary care facility.

KNOWLEDGE MANAGEMENT AND THE CARE DELIVERY NETWORK PROJECT

The flow of information among people and groups within an organization or external to it has been the subject of much research. One common thread that runs through much of the literature is that some diffusion of knowledge is unexplainable except by observing personal relationships among people (Nonaka and Takeuchi, 1995). Karl Sveiby (1999) explains this phenomenon by comparing it to the situation between a master and an apprentice: "An art that cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists. It can be passed on only by example from master to apprentice. This restricts the range of diffusion to that of personal contacts." He also admits that the term he uses, knowledge 'transfer', is not quite appropriate, "since knowledge is not moved as goods. The 'receiver' reconstructs his or her version of the 'supplier's' knowledge." Knowledge, it seems, is at least partially in the mind of the beholder. In fact, Lawson and Lorenz (1999) define tacit knowledge as just that: internal knowledge embodied in organizational routines and procedures. Tacit knowledge is what allows members of an organization "to co-ordinate their actions and act capably without needing, or necessarily being able, to articulate in words or diagrams exactly how they accomplish this. For this to be possible, members must draw upon knowledge that they have come to hold tacitly by acting within, and reproducing, the organization's routines."

For the CDN, getting the message out was the focus of much thought and careful planning. A diverse range of people had to be told in as many different ways about the potential benefits of the stroke protocol, so CDN staff had to be creative and persistent in the methods they chose:

> *There are 36 different organizations involved and no 'one size fits all' approach for communication so that you know the posters, the newsletters, all of those different things … all were in response to the needs identified. So the brochure for the paramedics to use in the ambulance if the family asks, "why are we being taken directly to Kingston?" is in response to a question from paramedics. The community provider brochure was in response to how do we get community providers like in-home nursing, in-home housekeeping, that type of thing. How do we let them know what to do and, well, we could do sessions with many people, [but] we could never reach all of them so, it was a way of working through their organizations that they got that information out. So it started off fairly small, tight and then it grew in response to, it's a very big system in itself.*

Communications frequently involved e-mail, fax and phone transmissions. Preliminary discussions were held to explore making current stroke practices, clinical evidence, and assessment tools web-available so that health care providers could

remain current with state-of-the-art practices. In this way, information systems and technology were used to diffuse knowledge.

Diffusion is influenced by both the audience and the method of delivering information to each affected group. However, regardless of media, motivation, or message, one factor seems to have much to do with the effective communication of a message: trusting relationships. Given that the transmission or movement of knowledge is intrinsically linked to interpersonal relationships, the structuring of these relationships takes on remarkable significance. The vast array of interactions between widely differing people make flexibility of paramount importance. Organizations and bodies such as the CDN also have to be cautious regarding what systems of knowledge diffusion they encourage. Reliance on cross-functional teams alone can lead to an unforeseen side effect of isolation among people of like responsibilities who may belong to different teams (McDermott, 1999). McDermott observes that a "double-knit organization" can capture both the positive attributes of cross-functional teams and those of "within function" communities of practice (COPs). Communities of practice have a learning focus, and teams have an output orientation. The CDN's actions needed to combine the best of both team and COP structures in order to achieve effective and meaningful exchange of knowledge and ultimately learning. The CDN role differed somewhat from that of a COP in that, from the very beginning, its intent was to withdraw from the community once the initiatives it spearheaded were self-sustaining.

Adler et al. note that knowledge has as great a social aspect as a personal component. Adler and his colleagues bring the knowledge management and innovation diffusion discussion firmly into the healthcare realm. Their thinking is in keeping with what was manifest in the CDN experience. For instance, the CDN Project Manager admitted that he could be swayed by the actions and messages of those he respected: "My perspective can be shaped … by contacts I am working with." As Adler et al. note, aligning contacts evidently lends strength and resilience to an innovation. The Project Manager further noted that the CDN "made the contact across the region by coordinating the activities of a lot of different people where before there was an extremely complex and very diverse context." In fact, the strong leadership of two individuals went far in promoting the initial adoption of the stroke protocol. According to the Project Manager, "Those two believed in [the stroke protocol] and were prepared to put their professional weight behind it and so when … the protocol was implemented … the other members … came around to it." This lends support to another of Adler et al.'s propositions which stated "When acknowledged experts play an active role in promoting innovations, diffusion will be more effective." (See Table 1 for a more complete listing of the Adler et al. propositions and the support received for several – but not all – of these propositions by our examination of the CDN experiences.)

According to Pisano, Bohmer, and Edmondson (2001), "learning-by-doing" plays a central role in the adoption of new practices and technologies in a healthcare setting. These researchers also speak of the importance of experience in the learning curve, but caution that not all organizations build on and exploit their accumulated experience effectively and efficiently. In the context of the CDN, organizers ascertained regional strengths and then used those with the view to improving patient care. Where the stroke treatment could be accomplished most effectively at a central location, this was put into practice despite the anticipated reluctance of other organizations whose stroke treatment services would no longer be utilized. In cases where the primary caregivers and community health workers could get the message about prevention out most effectively, the CDN used this strength. One of the critical elements in increasing the number of patients eligible for rtPA administration was early identification of stroke symptoms by the patient, patient's family, and other primary caregivers. An extensive public awareness campaign was launched to educate people about the symptoms, and to encourage people believed to be suffering a stroke to seek help immediately.

Paramedic and other regional ambulance service employees were educated on the identification of stroke symptoms as well, since they were key players needed to invoke the transportation 'bypass' rules and enable patients to be sent directly to the tertiary centre for rtPA administration, thus frequently bypassing the hospital nearest to the patient.

Evidence from a broad range of stroke studies has shown the value of an overall coordinated approach to stroke care. In the development of this particular protocol, it became apparent that there was a need for and an interest in enhanced stroke care skills. Thus, programs were developed to aid community health centre and local hospital staff in post-stroke care and rehabilitation. This effort was linked in part to the need to improve overall quality of care, and in part to the need to enable every part of the regional healthcare system to fulfill its appropriate role. The tertiary care facility was best suited to be the destination to enable rapid treatment of the stroke, but it was not an appropriate location for ongoing and rehabilitative care. Thus, repatriation of patients to an institution closer to their home was important early on in the recovery period.

Emergency room personnel in the tertiary facility were significantly impacted. Not surprisingly, the opportunity to provide some modicum of support and assistance to many stroke victims provided substantial relief to the nursing staff and paramedics. They subsequently became strong advocates for the overall protocol once it was invoked. Emergency room physicians and the attending neurologists bore the greatest risk in this endeavour. One the one hand, they were witness to the

Proposition	Conclusion
1. Professionals have more control than non-professionals over the diffusion of innovations affecting their work.	Supported
2. Innovations generated within the professional community will diffuse more effectively than those coming from without.	Supported
3. When professional actors play an active role in championing innovations, diffusion will be more effective.	Supported
4. When acknowledged experts play an active role in promoting innovations, diffusion will be more effective.	Supported
5. When boundary-spanning individuals facilitate information flow across boundaries, innovations will diffuse more effectively.	Partially supported
6. Boundary-spanners will be more important to effective diffusion in professional than non-professional settings.	Supported
7. In professional organizations as in other settings, innovations that are high on relative compatibility, simplicity, trialability, and observability will diffuse more effectively than those that do not.	Supported
8. Compared to innovations in non-professional settings, the diffusion of innovations in professional settings will be less sensitive to the innovation's cost advantages for the organization and more sensitive to quality advantages for the client.	Supported
9. When the organization devotes resources to diffusion activities, offers incentives for participation in diffusion, and otherwise makes diffusion a strategic priority, diffusion will be more effective.	Partially supported
10. When professional organizations involve professionals more actively in the strategy process, diffusion will be more effective.	Supported
11. When structures are designed to facilitate horizontal information flow across professional and organizational boundaries, innovations will diffuse more effectively.	Supported
12. When structures are designed to facilitate two-way vertical flows of information and influence across professional status and authority rank boundaries, innovations will diffuse more effectively.	Partially supported
13. The greater the importance of professionals in the organization, the greater will be the effect of participative structures on diffusion effectiveness.	Supported
14. When horizontal and vertical trust is strong in the organization, diffusion will be more effective.	Supported
15. The greater the importance of professionals in the organization, the greater will be the impact of trust on diffusion effectiveness.	Supported
16. When professionals are provided with management and performance improvement skills and training, diffusion will be more effective.	Partially supported
17. When accountability systems support collaborative learning, diffusion will be more effective.	Partially supported
18. When information systems make it easy for professionals to access information, diffusion will be more effective.	Partially supported
19. When human resources systems evaluate and reward professional participation in diffusion processes, diffusion will be more effective.	Not supported

Table 1. Adler et al.'s Propositions and the CDN Experience

tremendous effort exerted by the various parts of the healthcare system responsible for getting the patient to the tertiary facility within the time window. On the other hand, they were required to assess the risk to each patient associated with administration of the rtPA, since one of the potential negative effects was catastrophic hemorrhaging. One effect of this is that only a small percentage of stroke patients arriving at the tertiary facility actually receive rtPA, although outcomes of the rtPA recipients are generally seen as positive.

This method of involving as many professional organizations as possible was seen as one of the successful strategies of the CDN project. On the other hand, such inclusiveness had its downsides. Another protocol was subsequently developed to increase patient access to cardiac catheterization therapy. Patients could receive a light breakfast before setting out on their journey to the tertiary facility, but consensus over how to enact that agreement was difficult to attain. At one point, a room full of cardiac specialists agonized for a considerable amount of time over the definition of a light breakfast!

Diffusion of innovation is expected to be most effective when professionals are invited to actively participate in the strategy process, a proposition that received strong support in the CDN experience (see Table 1). A more detailed version of Table 1, providing CDN specifics that support or refute each of the Adler et al. propositions, is available from the authors. It is not provided here because of space constraints. The testing of the research propositions is an important contribution made by our study.

CONCLUSIONS

The propositions developed by Adler et al. provided a helpful lens through which the CDN experience could be examined. Adler et al.'s research suggested that the CDN generally had positioned itself well, and developed helpful strategies, to accomplish important goals. It had set the stage for further innovations to benefit patient care. Regional leaders had witnessed the importance of information technology, training, interorganizational communication and trust, community champions, and the role boundary-spanning professionals play. They had evidence that healthcare innovations and knowledge could be successfully disseminated throughout the region.

> *This experience illustrates several valuable lessons. With the CDN, strong leadership, clear vision, clearly articulated goals, and dedicated resources were essential for project success. Also important was the structured approach to spanning boundaries that was undertaken by a team of individuals who were not seen as beholden to any single profession or organization. Encouraging stakeholders to rally around shared beliefs (e.g., "we should do what is best for the patient") permitted cooperation even when that involved the reduction of personal and institutional power and freedoms. Similar approaches could be helpful in situations involving the diffusion of other professional innovations.*

With the CDN, formal and informal interactions were vital for successful innovation. Once one or more influential people were 'on board,' it was easier to accumulate a critical mass. Supportive, influential professionals helped to legitimate, and hence diffuse, the innovation. Such was the case with the emergency room nursing staff and regional paramedics.

Organizations were encouraged to exploit, as far as possible, existing strengths and systems. In the case of the CDN, the newly created regional stroke centre was housed in a well-respected hospital with an existing reputation for innovation (which Adler et al. suggest is key). Furthermore, rather than forging new lines of communication, education and innovation diffusion followed existing venues and sources of information. Information technology was used to facilitate communication. For the CDN, homecare was already in existence, so working with professionals responsible for this care permitted the stroke care innovations to diffuse quickly. The CDN personnel strengthened networks for communicating when they traveled throughout the southeastern Ontario region conducting educational seminars and making presentations. By building these networks at the project's beginning, they made their job easier when the time came to communicate protocols and establish best practices. As is seen in propositions 11, 12 and 18 in Table 1, the horizontal and vertical flow of information among organizations and individuals was vitally important. By establishing patterns for information flow and knowledge transfers, and encouraging existing avenues for communication, CDN was better able to achieve its goals. Turning over the initiatives to existing organizations represented, paradoxically, a strength and a weakness of the CDN plan. CDN, having accomplished what it set out to do, disbanded. Before doing so, it embedded its key initiatives into the operations of influential, ongoing organizations that unfortunately were, as a result of their very strength and dominance, viewed as being partisan.

The CDN Project Manager believes that the stroke protocol initiative provided an excellent learning experience for all the stakeholders involved because it taught them how to "work out some of the wrinkles in the interorganizational activities. How do you make sense of a bunch of independent organizations attempting to work together, attempting to achieve

productive outcomes? There was a lot that we can learn from stroke, there is a lot that we did learn from stroke, … we used stroke as a way of demonstrating what could be done."

REFERENCES

1. Adler, P.S., Kwon, S. and Signer, J.M.K. (2001) The "Six West" Problem: An Essay on the Role of Professionals in Knowledge Management, with Particular Reference to the Case of Hospitals, <http://www.marshall.usc.edu/diffusion/KM&Profs3_29.pdf>.
2. Allee, V. (1999) The Art and Practice of Being a Revolutionary, *Journal of Knowledge Management*, 3, 2, 121-131.
3. Coleman, J.S., Katz, E. and Menzel, H. (1966) Medical Innovation: A Diffusion Study, Bobbs-Merrill Co, Indianapolis.
4. Davenport, T. and Prusak, L. (1998) Working Knowledge: How Organizations Manage What They Know, Harvard Business School Press, Boston.
5. Lawson, C. and Lorenz, E. (1999) Collective Learning, Tacit Knowledge and Regional Innovative Capacity, *Regional Studies*, 33, 4, 305-317.
6. McDermott, R. (1999) Learning Across Teams: How to Build Communities of Practice in Team Organizations, *Knowledge Management Review*, 8, May-June, 4-8.
7. Nonaka, I. and Takeuchi, H. (1995) The Knowledge-Creating Company, Oxford University Press, New York.
8. Pisano, G.P., Bohmer, R.M.J. and Edmondson, A.C. (2001) Organizational Differences in Rates of Learning: Evidence from the Adoption of Minimally Invasive Cardiac Surgery, *Management Science*, 47, 6, 752-768.
9. Satinsky, M.A. (1997) The Foundations of Integrated Care, American Hospital Publishing, Chicago.
10. Sveiby, K.E. (1999) Tacit Knowledge, *The Knowledge Management Yearbook 1999-2000*, Butterworth-Heinemann, Boston.
11. Webber, A.M. (1993) What's So New About the New Economy?, *Harvard Business Review*, 71, 1, 4-11.