Handbook of Research on Knowledge-Intensive Organizations

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Chapter XXVII
Knowledge Intensive Work in a Network of Counter-Terrorism Communities

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ABSTRACT

Knowledge management is often associated with the need for change and related shifts in ontologies, ways of knowing and ways of working. Combine the centuries-old debates about what defines knowledge with proposed paradigm shifts to become knowledge-oriented, focused on inter-relationships, and cognisant of the complex and voluntary nature of knowledge work, and there is bound to be controversy and ambiguity. However, knowledge management research and practice becomes more focused and less ambiguous when set in the context of an urgent need. This chapter describes a study of a Canadian public sector science initiative. The terrorist attacks of 9/11 catalyzed ripples of reflection and innovation over great distances. In Canada, the federal government initiated the Chemical, Biological, Radiological and Nuclear (CBRN) Research and Technology Initiative (CRTI) to enable learning and progress, using what is essentially a communities of practice model. CRTI established a knowledge management office, to help this network of communities generate, share and use tacit and explicit knowledge. Some aspects of the initiative were working better than others and I was asked to conduct research to explore how CRTI members understand their work in a complex, knowledge-rich environment. I collected data through interviews and observation, and used phenomenography: a qualitative methodology from Scandinavia, which reveals qualitatively different ways of understanding phenomena. Phenomenography is usually driven by the desire to improve something, rather than simply to deepen understanding. As part of the analysis, I used a model for understanding communities of practice that was developed by [then] Major Pete Kilner in his work with the internationally respected CompanyCommand community.

Participants who understood their work as complex and unpredictable tended to emphasize connections and relationships, focused on learning more than doing, spontaneously referenced all aspects of Kilner's model, saw knowledge as more of a flow than a thing, and were more satisfied with their individual and community effectiveness. This research had added value in that CRTI is considered successful and is being considered as a potential model for other science and technology work in the Canadian public service. The research has implications for knowledge-intensive work in complex environments and suggests that there is fertile ground for more qualitative research that integrates thinking from knowledge management and complexity thinking.

INTRODUCTION

Senior managers often initiate knowledge management work because issues or crises push them to think in new ways and to encourage their staffs to innovate and adapt. The terrorist attacks of 9/11 were one such crisis, which led to ripples of reflection and innovation far from the physical impacts of the planes. Canadian officials recognized the need to improve counter-terrorism capacity and capability and launched the Chemical, Biological, Radiological and Nuclear (CBRN) Research and Technology Initiative (CRTI) to enable learning and capacity-building. CRTI is now situated in a unit called the Centre for Security Science. They employ what is essentially a *communities of practice* model in which a threat type (such as radiological/nuclear) forms the domain of each community. Community members who work in different parts and levels of government interact in these communities to learn from each other, and they undertake projects that make sense to the members. The named leaders of these communities work without positional authority. When I conducted research in CRTI, there were four such communities. The original three were threat-based: chemical, biological and radiological/nuclear. The newer forensics community focused on front line response and procedures for gathering evidence so that it would stand up in a court of law. Since then, an explosives community—which was approved in principle at the time of the interviews—has been formalized, expanding the acronym to CBRNE. Members of these groups often refer to them as clusters, so I retain this term where it was used in direct quotes.

CRTI's knowledge management office helps this network of communities generate, share and use tacit and explicit knowledge. They have taken on initiatives as diverse as the development of a portal, support of scientific and social science research, and the organization of an annual symposium, the goal of which is "to provide a forum to share and exchange the knowledge created by CRTI partners and to learn about related allied work in CBRN" (*Proceedings of the 2006 CRTI Summer Symposium*).

CRTI knowledge management leader Susan McIntyre contacted me in 2005 when I was directing knowledge management graduate programs at Royal Roads University. She wanted to better understand why some aspects of CRTI were working better than others. She also relayed her interest in spanning disciplines and her desire to ground her work in theory.

Susan said the comments and case studies in my response whetted her appetite. I had written that the highly contextual nature of the work is what makes knowledge management so interesting. "Part of it is a function of the newness of the field; part of it is the complex and messy nature of human beings, organizational cultures and emergent needs." In 2006, our conversations

gelled in the form of a research project to explore how CRTI members understood their work in a "complex, knowledge-rich environment."

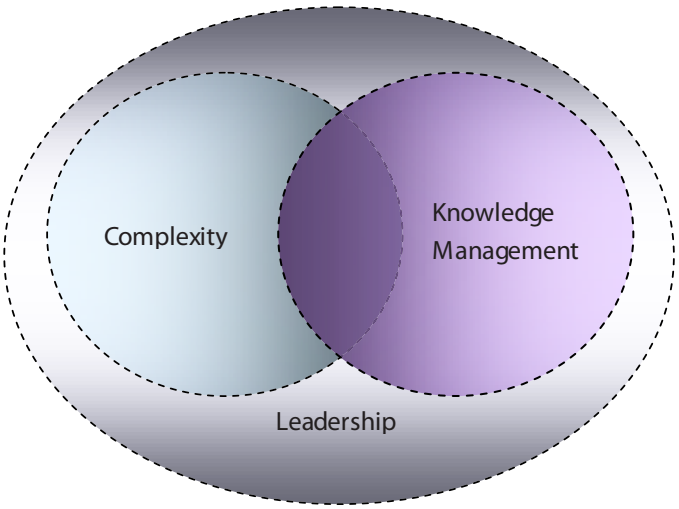
SCOPE OF STUDY AND CHAPTER

In the full study, I focused on overlaps between and amongst the fields of knowledge management, leadership and complexity. They are intertwined in many ways. For example, knowledge—particularly tacit knowledge—is shaped by an individual's experience and context. Knowledge sharing is a voluntary activity inspired by context and enabled by trust. In knowledge-intensive work, the shift from a "things" mindset to a mindset of intangibles and human relationships typically involves leadership at many levels of an organization. The variables involved in individual experience, relationships, leadership, trust and context make knowledge-intensive work complex. I am using the term "complex" as used in complexity theory and thinking. These involve the study of environments in which there are many interacting entities, which exhibit emergence and where results are difficult to predict with any degree of accuracy. In this chapter, I am focusing primarily on the knowledge management sphere with some reference to overlaps with leadership and the complex, knowledge-intensive nature of CRTI work.

Knowledge Management Research

Knowledge management is often associated with the need for change and related shifts in ontologies, ways of knowing and ways of working. Combine the centuries-old debates about what defines knowledge with proposed paradigm shifts to become knowledge-oriented, focused on interrelationships, and cognisant of the complex and voluntary nature of knowledge work, and there is bound to be controversy. Verna Allee writes about the shifting foci of organizations in the industrial era from "plan, organize and control" to "vision, values and empowerment," and the further shift in the knowledge era to "emergence, integrity and relationships" (2003, p. 30). Simon Lelic outlines experts' perspectives on new generations of knowledge management, including Snowden's observation that context was gaining ground over

Figure 1. Scope of study



information distribution for decision support and McElroy's view that there is a shift from supply- to demand-oriented knowledge processing (2002). Snyder and Wenger write:

No formal structure can fully address problems that are too complex to predict or standardize. Moreover, these problems invariably require a configuration of disciplines and resources that are rarely contained in any one agency, level, or sector. This calls for the explicit cultivation of knowledge-based, boundary-crossing structures such as communities of practice to complement formal agency and program structures. (2003, p. title page)

These scholar-practitioners paint pictures of increasingly multi-faceted, dynamic knowledge landscapes. In a culture where uncertainty is to be eliminated, knowledge management looks bad, or at least immature.

Some authors have dealt with uncertainties and ambiguities by drawing firm boundaries around descriptors of knowledge or knowledge management and by developing associated models or processes (e.g., Firestone & McElroy, 2003; Koenig, 1996). Others have created conceptual landscapes that accommodate various definitions and descriptors (e.g., Davenport & Prusak, 1998; Rumizen, 2002; Wiig, 2002).

Knowledge management research is still in its infancy. A scan of papers in one peer-reviewed journal provides insights into the nature of the current literature. Figure 2 shows the types of papers, as defined by the authors and journal in the abstracts, in recent issues of the Emerald Journal of Knowledge Management. Papers in the "Other" category were—in order of frequency—literature reviews, general reviews, technical papers and one viewpoint paper.

Within the research paper category, there is a mixture of quantitative studies working towards prediction, qualitative studies working towards understanding and other papers in which the approach is not as clear cut. These papers frequently include reviews of literature or other documents, exploration of concepts and sometimes preliminary development work towards a model or framework. The breakdown of research paper types (the 58% pie wedge in Figure 2) is shown in Figure 3. For the quantitative and qualitative categories, the authors often stated this explicitly. If they did not, I used information they provided about method (a small number of in-depth interviews as evidence of qualitative work, for example) or next steps (the need for further statistical validation as evidence of quantitative work, for example.)

Few of the qualitative papers explicitly state a methodology or culture of inquiry; when they do, it is typically grounded theory or ethnography. So, based on this sample—*even when mixed method and action research projects are included*—fewer than 20% of all the papers in these issues are qualitative studies that might deepen our understanding of any aspect of knowledge management.

Furthermore, nine of the 129 papers reference complexity theory or science, and about half of those references were simply titles of papers in the reference list or brief mentions of complexity in the body of the paper. Similarly, of 570 knowledge management theses and dissertations in the ProQuest database, nine include "complexity

Figure 2. Types of papers in Journal of Knowledge Management, n=129

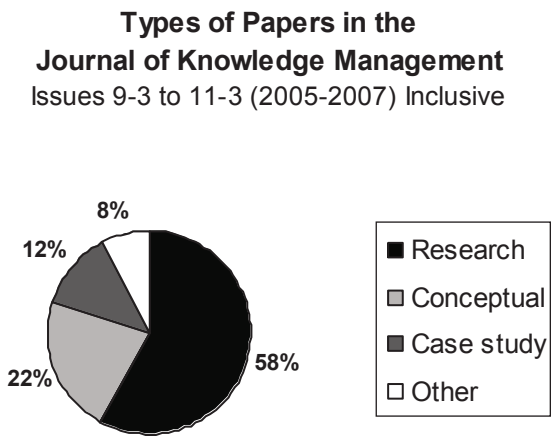
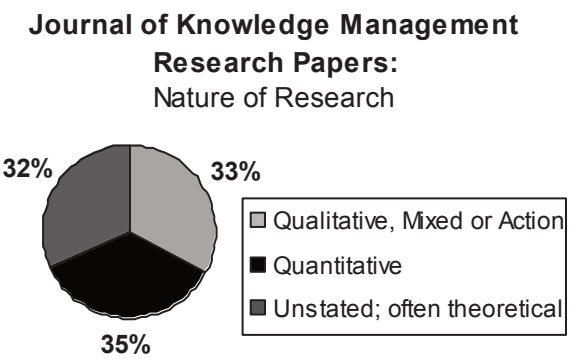


Figure 3. Types of research papers in Journal of Knowledge Management n=76



theory," "complexity science" or "complex adaptive system*" in the citation or abstract.

In other words, if these theses, dissertations and recent papers in the Journal of Knowledge Management are typical, we are still in the early stages of exploring how knowledge management and complexity inform each other and in using qualitative cultures of inquiry to deepen our understanding of work in complex, knowledge intensive environments. Because many papers are conceptual or theoretical and attempting to make sense of trans-disciplinary literature, scholarly work in knowledge management can appear ambiguous. Some practitioners prefer to rely on literature from fields that seem simpler and more predictable, and some academics adopt positivist views, hoping to find theories that can be applied in many varied contexts.

In my practitioner role, many knowledge management ambiguities fade in specific contexts. Such contexts are often shaped by challenges or crises, which catalyze pioneering efforts in the generation, sharing and use of knowledge. In the case of CRTI, scientists needed to learn about and from each other to increase counter-terrorism capability and capacity. Their outputs might include increased common knowledge, new knowledge, newly defined roles and responsibilities, intellectual capital, expanded networks and social capital, new vehicles for collaboration, and innovations such as new technologies and practices. In some cases, outputs would need to flow out well beyond the boundaries of CRTI into their home organizations, other groups, universities, first responders, the public, and so on. So there were uncertainties, but there was no need to debate—for example—whether the field of knowledge management includes the acquisition or creation of new knowledge. New knowledge was either needed or not, and tools and techniques for knowledge acquisition and generation would be used as and when needed.

PURPOSE OF RESEARCH

This research was driven by the Centre for Security Science Knowledge Management office and their need to better understand what was working well in the CRTI communities, what was working less well, and why, so that they could provide better support. From that practical perspective, I was exploring how individuals understood their work in the CRTI communities, and potential relationships between perceived effectiveness and literatures from complexity, knowledge management and leadership. As mentioned previously, this chapter focuses primarily on knowledge management.

METHODOLOGY

This research project uses phenomenography, which explores qualitatively different ways of understanding a phenomenon such as knowledge generation and sharing ("Phenomenography"). Like ethnography, it is considered qualitative, empirical and interpretive. Phenomenography is relatively young and there are debates about details of how to use it, so I will provide context for the decisions I made.

Marton and Pang (1999) explain that phenomenography does not have an *either/or* view

of the world and respects the different ways in which our backgrounds and perceptions shape our understandings. It emerged in Sweden as a pragmatic methodology in the early 1970s through the work of Marton, Säljö, Dahlgren and Svensson (Bowden & Walsh, 2000; "Phenomenography"). Early applications grew from observations that some students learned better than others. It explored students' different ways of understanding a concept, with the goal of helping them learn more effectively. It has since been used in several continents to explore many topics and issues (Bowden & Walsh, 2000) including health care (Larsson, Holmström, & Rosenqvist, 2003) and organizational change (Wagner, 2006). It is an intriguing approach for work in complex systems, because of its systemic, non-dualist orientation and its recognition of diversity, which is important in complex systems (McKelvey, 2002; Michaels, 2002). Because CRTI wanted to support positive change, the action-oriented history of phenomenography was a good fit.

Phenomenographers usually collect data through interviews. Questions are very open-ended so that participants have the freedom to decide on the scope and focus of their responses (Bowden, 1996 citing Marton). Data are analyzed for patterns in ways of understanding. A way of understanding is the normal unit of analysis; individuals could span more than one. The coding approach resembles that of grounded theory in that researchers code, re-code and refine their framework over time. Inter-rater reliability is uncommon, because most experts agree that good researchers could work with participants to come to different, defensible conclusions about how to categorize ways of understanding (true to phenomenographic assumptions). Researchers should be transparent about how they create categories and illustrate them with quotes.

Work with about 15–20 participants (Sandberg, 2000; Wagner, 2006) usually achieves saturation. Sandberg's findings of workers' conceptions of competence at Volvo became repetitive after 15 participants. In this study, I interviewed each of 14 participants for about an hour, with the longest interview being an hour and a half. Because I adjusted some questions after the first interview, the first participant's responses are only included where the questions matched. Interview data were supplemented by observations during a week-long symposium.

Because phenomenography is a qualitative methodology—intended to deepen understanding more than to predict—it does not employ representative samples. Sampling in exploratory research is strategic (Palys, 1997); a diverse sample illuminates the variation that phenomenography seeks to reveal. If some ways of understanding are more effective than others, the categories become catalysts for dialogue about knowledge sharing and mobilization.

To select participants, I used a combination of purposeful sampling (more specifically intensity sampling (Palys, 1997)) by working with the CRTI Secretariat and snowball sampling to broaden out from the core of the network. My CRTI contact, Susan McIntyre, sent community participants a note about the research and provided me with a list of potential participants whom I contacted by electronic mail. She announced the study at the 2006 CRTI symposium in Ottawa-Gatineau, Canada, encouraging individuals to volunteer. If those approaches did not yield enough variation, CRTI members suggested other individuals. Some of them agreed to participate and others did not. Three interviews took place in offices, nine at the symposium and two by telephone.

Participants were stationed in at least three provinces, two jurisdictions and at least seven organizations. I say at least, because some organizations were huge and individuals identified with a subsection of the larger entity. Almost all participants considered themselves scientists, though the type of science varied from relatively pure laboratory-centred work to applied field work. Men and women, and Francophones and Anglophones, participated in the study. Experience

in the field ranged from decades to a few years. Some individuals had worked in one community of practice (with biological threats, for example) in relative isolation; others were familiar with the workings of other communities. Typically, participants were in key places in their organizations—for example, working as senior managers or senior scientists, sometimes leading their area of specialization for the country, and frequently working in international circles.

The interview questions were open-ended and of two types. An example of the first type follows:

Your goal is to provide science solutions to CBRN terrorist threats, through linkages among non-traditional partners and across organizational boundaries. That seems like a field with many variables and uncertainties. How to you deal with that uncertainty in your work?

These questions got people talking about their experiences. In response to the question above, some spoke at length about the complexity and unpredictability of their work, with stories to illustrate their points. Others spoke about how there really was no uncertainty, and described the sequential processes they employed.

In the second type of question, participants had sheets of paper on which lines were drawn, with contrasting statements at the ends of the lines. They were asked to make a mark on the line to illustrate where they thought they were in their community at present, and to explain why. Later they were asked where they would like to be in an ideal world, to be as effective as possible. A sample of these somewhat contradictory statements is shown in Table 1. These questions elicited interesting insights, especially when the questions surprised participants. They also provided data for descriptive statistics and content analysis, which some phenomenographers consider appropriate, particularly if the participants' contexts are kept in mind during the analysis.

Both question types were informed by literatures from knowledge management, complexity and leadership. Where a transcript in isolation would be stripped of some obvious context, I probed in order to make non-verbal reactions and emotions behind words more explicit.

Transcripts and related pseudonyms were stored in a password-protected folder, with qualitative data analysis supported by Atlas.ti™ software. In the first coding pass, I highlighted phrases that seemed significant as a reference point rather than as a formal part of the analysis. I then coded the text with straightforward items, such as the name of the community, whether the person was a formal leader, and how each portion of the narrative linked to specific interview questions.

Table 1. A sample of somewhat oppositional statements from interview questions

We interact when we formally meet face to face		We interact regularly in different ways
Our ideas spread easily to the people who need them		Our ideas stay within our group
In our meetings, we stick to a pre-determined agenda		In our meetings, the agenda evolves as we interact
We try things out (as long as they are safe) and see what happens		Before trying things out we carefully plan and analyze
Because we are such a diverse group, we confine our conversations to common ground, where it's easy to understand each other and work is efficient		Because we are such a diverse group, we spend a lot of time trying to understand each other and establish new common context
We focus on doing		We focus on learning

I then moved into conceptual coding. Some was unplanned; for example, participants often made emotional statements about their experiences, so I coded for different types of emotions. Other coding was linked to the literature. Because this work was qualitative, exploratory and inductive, I began with a broad review of the literature, but did not set out to fill a targeted theoretical gap. Rather, I iteratively referenced various theories, descriptors, studies, frameworks and issues, bringing them to the foreground when it made sense to elicit new information or make sense of what I heard. For example, I drew on a community of practice model—referred to as the C4P model—developed in the U.S. military. The model, described below, had not yet been published in peer-reviewed journals. I selected it because of links to 1) a successful community of practice and 2) a promising model deserving of testing and 3) another North American community with military elements. Leaders of this community were offered full professorships at the United States Military Academy (USMA) and have pursued doctoral studies as part of that move (pers. comm. Pete Kilner 2004).

The CompanyCommand (CC) community began in 2000 as a labour of love, when a few individuals in the U.S. Army recognized the importance of new ways of learning for the knowledge-intensive work of company commanders. I watched their online portal with interest until it was closed to participants who did not have a U.S. military e-mail address, and later narrowed to persons with specific responsibilities in the army. Core members say the community is still thriving, with thousands of members in over one hundred countries, though it has shifted from off-the-sides-of-desks to a U.S. Military Academy-supported community. Vice-Dean for Education George Forsythe recently wrote, "I can only imagine what the Army profession will be like when Soldiers who have grown up with these professional forums are leading the profession in the years to come. I'm inspired and encouraged by the possibilities" (Dixon, Allen, Burgess, Kilner, & Schweitzer, 2005, p. viii).

The name C4P comes from the interactions of Content, Connections, Conversation and Context around the community's Purpose. The importance of a central purpose, as emphasized by many authors, cannot be understated. Through experience, Major Pete Kilner had found that these four other elements and their interrelationships are also important.

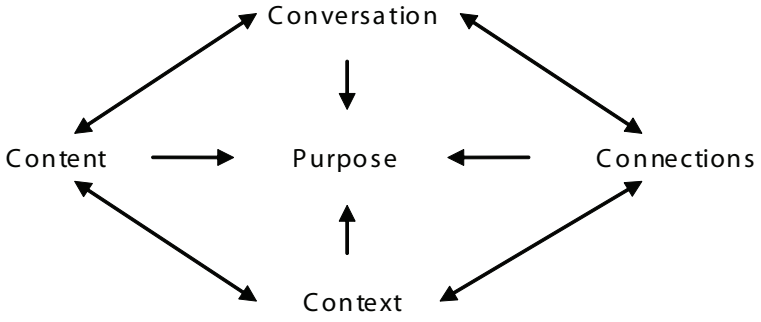
In this model, *content* refers to explicit knowledge that can be codified and stored, in databases: standard operating procedures, for example. This information is pushed out in one direction, in contrast to *conversation*, which involves dialogue. *Connections* describe contacts that involve relationships between community members. *Context* "is the who, what, where, when, why, and how that enables community members to assess whether and how information is relevant to them" (Hoadley & Kilner, 2005, p. 34).

Kilner describes what happens if elements are missing:

If content is absent, conversation is likely to have difficulty getting started and staying focused on the community's purpose. If conversation is missing, knowledge may transfer but is unlikely to be generated. If connections are absent, there will be fewer contributions of content and conversation, and the contributions will have less context. If information context is absent, the community is prone to misinterpret content or apply knowledge inappropriately to new situations. Finally, without purpose, knowledge building will founder. A clear communal purpose gives meaning to content, provides direction to conversation, fosters connections, and is the unifying context for all activities in the community (2005, p. 33).

In my coding, I looked for narrative that described content, conversation, connections and context as defined by Kilner and Hoadley.

Figure 4. C4P model of community leadership



FINDINGS

Phenomenography seeks to find qualitatively different ways of understanding, and these ways of understanding are normally labelled using participants' terms. CRTI community members understood their work with knowledge in three ways, labelled *free-flowing, increasing* and *stuck*. Although I did not set out to explore the concept of boundaries, it emerged—explicitly or implicitly—during interviews. Ways of understanding boundaries are labelled *integrated*, *overlapping* and *constrained*. These are shown in table 2 and described below. The ways of understanding are grouped to reflect the conceptual coherence between free-flowing and integrated, and between constrained and stuck. Most individuals' comments fit consistently into a single way of understanding for each concept. There were also patterns within each community or cluster.

Ways of Understanding Knowledge Management

Use of the C4P model helped to highlight the variations in the breadth and variations of perspectives about knowledge work.

In the *free-flowing* category of knowledge management, participants

- made statements relating to all four Cs: context, content, connection and conversation;
- said they interacted in many different ways;
- contextualized their responses to whether they focus on *learning or doing* with specific examples of where each was appropriate; and
- contextualized their responses to the question about the nature of conversation ("Because we are such a diverse group…") with specific examples of where each was appropriate.

Sample quote from *free-flowing* category of knowledge management:

Lloyd talked about the importance of knowledge flow within clusters on several levels:

Lloyd: so we're looking for ways to draw out those new ideas. And so my personal belief from my involvement in science has been that one of the fastest ways to get new ideas to the forefront is to have lots of interaction with people. And to generate lots of ideas—and to do that people have to be knowledgeable about what other people are doing—so the goal is really by bringing these people together and you have to balance off enough structure, so that you're accountable but sufficiently loose structure that you don't prevent the free flow of ideas and the innovation that needs to come forward.

Statements from the free-flowing category showed fluidity, resilience and thoughtful flex-

Table 2. CRTI members' ways of understanding boundaries and knowledge management

	Ways of Understanding Research Elements		
Research Element	**Category I**	**Category II**	**Category III**
Knowledge Management • from flowing to static	Free-flowing	Increasing	Stuck
Perceived Nature of Boundaries • from permeable to impermeable	Integrated	Overlapping	Constrained

ibility when dealing with different contexts and types of knowledge.

In the *increasing* category of knowledge management, participants

- made statements relating to three of the four Cs;
- with one exception, said they interacted in many different ways; and
- with one exception, emphasized learning in the learning-doing spectrum, often tied to specific contextualized examples of where each was appropriate.

Sample quote from *increasing* category of knowledge management:

Some spoke about improved flow in professional networks. Martin talked about how it can take a long time for organizations and jurisdictions to really connect, but he gives an example of doors opening in a conversation with a Defence Innovation member, as soon as that person knew Martin was in a CRTI cluster.

Martin: It simplifies the few contacts there.
Alice: Okay.
Martin: If nobody has heard about you—well at least you're in the [community name]—"Ah you're in the [community name]!" This is not because you are John Smith or you're Rita Boubeau; it's … as if you went through a kind of filter system.

Statements in the *increasing* category showed some of the diversity and resilience of the *free-flowing* category, but their stories were also interwoven with struggles to overcome barriers, perhaps because several people in this category tended to think about a very broad range of responsibilities from prevention to prosecution. Despite the challenges, participants spoke as change leaders who were experiencing benefits and who were confident they would enable progress in the future. Sometimes they expressed concern that if they could no longer participate, there were few people with the perspectives and tenacity to carry on with the work.

In the *stuck* category of knowledge management, participants

- made statements relating to two of the four Cs;
- on the *learning vs. doing* focus spectrum, responded on the *doing* half of the spectrum;
- on the methods of interaction spectrum, responded on the *few* half of the spectrum;
- on the nature of conversation question, responded on the *confined to common ground* half of the spectrum; and
- on the *ideas spread easily to those who need them* spectrum, responded on the *stay within the group* half of the spectrum and they had much larger gaps than other categories between current and desired states.

Sample quotes from *stuck* category of knowledge management:

David spoke about a range of challenges in the production and application of knowledge. An example follows:

David: We've had to tackle a lot of issues and some are still far from being resolved. For example, there are a lot of requests from some of the provincial labs—what tests should they use? There are different commercial tests. As a cluster, how can we recommend tests? Well, then we have legal issues, and my God ... it's a really ugly one. It's almost a no-win situation.
Alice: Hmmm.
David: If you recommend one test in particular, you can have the other competitors on your back, and if it's being used and somehow it's not performing, then you could be blamed legally. You could be liable, because you recommended that test ... So it's a kind of a no-win situation. We have a lot of issues like this.

Statements from this *stuck* perspective showed participants' struggles. These individuals cared very much about their work, realized there were gaps between the current and ideal state—of knowledge sharing, for example—but had not been able to find their ways out of patterns and perspectives that were not serving them well.

WAYS OF UNDERSTANDING BOUNDARIES

The topic of boundaries is more prominent in complexity literature than in traditional management and leadership literature. Richardson (2001) states that "the boundaries delimiting subsystems in a complex system are emergent and temporary." In the *integrated* category of boundaries

- over 70% of their boundary-related statements were about permeable boundaries;
- permeability was generally seen as positive; and
- the focus of permeable boundaries varied considerably and included boundaries between different identities, roles and perspectives; the cluster and participating organizations; between clusters; between countries and cultures; and between the cluster and other communities or networks, including universities and international organizations.

Sample quotes from *integrated* category of boundaries:

Brad is among many participants who describe how the CRTI initiative has facilitated the creating of more permeable boundaries:

Brad: I think CRTI is well placed to link agencies together…we're not hampered by formality and structure.... It's comfortably loose and people are very open in their comments.

Barrett describes some of the linkages at an interpersonal level:

Barrett: People assume that the [discipline/cluster name] program in Canada was well-connected, but in point of fact, I think I met [name] once before CRTI started. And people like [name] at [organization] and [name] at [organization], I never worked with these people before. So they're brand new and they're very good relationships.

Barrett also described new and productive connections nationally and internationally.

Statements from the *integrated* category of boundaries held a kind of energy, similar to the free-flowing statements about knowledge and learning. Many seemed oblivious to boundaries. Their stories suggested they had used well-developed skills to engender recognition and trust; perhaps others saw no need to block their work or communication. I heard a few stories about problems and conflicts, and it was interesting to note that statements in this category had nothing

to do with retrenching or competing. The default strategy was to collaborate with the group that initiated the difficulty so that their collective efforts would be stronger.

In the *overlapping* category of boundaries:

- 50%–70% of their boundary-related statements were about permeable boundaries;
- permeability was generally seen as positive; and
- the focus of permeable boundaries varied somewhat and included boundaries between the cluster and participating organizations, between clusters, and between the cluster and other communities or networks.

Sample quotes from *overlapping* category of boundaries:

Although Ken described cluster work as "onerous" and "absolute overhead," he also saw it overlapping in some ways with his regular work:

Alice: So I'm curious, how in the [community name] you see that division or boundary between cluster work, and line organization work?
Ken: In many ways there's significant overlap. I mean, what I do for example ... We've just extended to a field capability that we didn't have before.
Alice: In your organization?
Ken: For my particular group. For other groups, they basically beefed up capacity, so they just can do more.

The *overlapping* category sits between the permeable character of the *integrated* category and the closed, *constrained* category. However, it felt distinctive enough to have its own category.

In the *constrained* category of boundaries,

- under 40% of their boundary-related statements were about permeable boundaries;
- binary thinking was common in their world of primarily impermeable boundaries—whether they be desirable or undesirable, imposed or created, real or assumed. A task was either the responsibility of x or y; one can either do work for one's organization or work for CRTI, etc.;
- permeability was frequently seen as a negative thing or as a symptom of something negative in relation to other categories; and
- the focus of permeable boundaries was usually localized (specifically, the boundaries between the cluster the secretariat or participating organizations).

Sample quotes from *constrained* category of boundaries:

David speaks to perspectives of boundaries constraining progress on a practical level:

David: Okay, just the movement of money from department to department… financial mechanisms… just the plain day-to-day bureaucracy of doing something like this is so difficult. There are days… why should I bother?
Alice: Yes.
David: It's a lot easier to do my own work in [names setting and organization]. But when you're trying to do something at this level… [name of central agency] is really hard to work with, so the… getting security clearance because were trying to get outside people in there…

It's just one piece of bureaucracy after another. It's a killer. To the point where we're delayed, and people know; it doesn't look good.

Some of the *constrained* statements were based on standard principles of government structures: divisions and lines of authority are created intentionally, and one is not supposed to duplicate or usurp responsibilities of other units. Such statements were along the lines of "We can't do that…that is Organization X's role." Others, such as David's above, showed emotional, financial or workload costs associated with firm boundaries in boundary-spanning environments.

WAYS OF UNDERSTANDING SATISFACTION AND EFFECTIVENESS

Because the CRTI Secretariat was interested in building on successes, I explored participants' perceptions of satisfaction and effectiveness and links between these perceptions and the ways in which they understood their knowledge work. I therefore asked questions and prompted conversations in ways that revealed how they felt and where they would like to see improvements. For example, one question read, "What three words or phrases best describe your experience in this group?" and one of the spectrum questions in this category used the phrases "I think I am a worthwhile contributor" and "I think my expertise is not well used." Analysis of these and all other parts of the narrative yielded three ways of conceptualizing their satisfaction and sense of effectiveness. The satisfaction and effectiveness categories are labelled *mutual benefit*, *shared opportunity* and *difficult*. Sample quotes from each category follow.

Ken described the early momentum of counter-terrorism work in the *mutual benefit* category of satisfaction and effectiveness:

Ken: I have to give it to the Canadian government. They reacted extremely quickly. When I was in [location outside Canada] giving talks about the work we were doing with the money we received from CRTI, the [nationality], at least in the early days, came up to me and said, "how the devil did you get to do this so quickly?"
Alice: Wow.
Ken: We were a year, if not 18 months ahead of [the country] in getting this thing rolling.

Stan was one of many participants to discuss scope-related challenges. His portrayal of challenges, coupled with plans to overcome them, was typical of the *shared opportunity* category of satisfaction and effectiveness:

Stan: A lot of that work has been done and there's still a lot more that has to be done, but moving more now towards prevention, disruption, interdiction the intelligence side of things and moving it further in advance of the event is I think probably the priority that we're looking at now.
Alice: Do you find it's different working with the [names of other] clusters?… On the prevention side vs. the reaction side?
Stan: (Deep breath). We really haven't gone far enough down that road with any of the…clusters.

The energy in *shared opportunity* comments was similar to the increasing category of knowledge management. As exemplified by Stan's statements above, these individuals seemed to be climbing a steep hill, struggling with challenges, but with no sense of feeling defeated. They didn't speak about distant goals or vision; it was more of a step-by-step process, scanning the environment, watching for opportunities, and recruiting allies through successes en route.

Jordan was one of the individuals who spoke about how difficult it can be to get good conversation going in the *difficult* category of satisfaction and effectiveness.

Jordan: Or the tendency too is if you don't understand the common ground… you maybe get too quiet instead of saying, 'well, I don't understand where you're going.'

As a researcher, it was difficult to hear some of the stories and statements in the *difficult* category. I was there to help deepen understanding; this was not an action research project, and my results were compiled in a way that would maintain participant and community anonymity. The most striking characteristic of this category was the emotion with which people spoke and the palpable tension between their hopes and their experience.

This research did not include external measures of satisfaction or effectiveness. However,

individuals sometimes introduced them to the conversation. Barrett—in the *mutual benefit* category—stated:

Barrett: We are the strongest cluster. We always have been, for five years now.
Alice: Hmmm.
Barrett: And I'm not just saying that… [Name of senior person] said that and other people.
Alice: What kinds of criteria are you thinking about?
Barrett: Exercises; publicity; CRTI awards; we're well above what our quota would be.

Satisfaction and effectiveness categories are included in Table 3.

As mentioned earlier, individual participants tended to have a consistent way of understanding for each research element such as knowledge management. When ways of understanding were mapped for the four communities, interesting patterns emerged. The profiles of communities three—in Table 4—and one—in Table 5--were the least similar:

If we contrast these two communities—which had developed distinctive cultures—we see that participants who perceived their work (individually and in the community) to be satisfying and effective were in Community 3. Most individuals in this community conveyed ideas about the importance of three elements in the context, conversation, connections and content model, said they interacted in their community in many ways, and emphasized learning over doing. They also tended to ignore boundaries or worked to span or integrate in ways that would facilitate learning and effectiveness.

Community 1 participants perceived their work as relatively unsatisfying and ineffective, though they did considered it important. With the exception of the named leader, their perceptions of knowledge work were in the "stuck" category. Members of this community focused on doing rather than learning, interacted in relatively few ways, said they focused primarily on common ground in conversations and in comparison with the other three communities saw the most room for progress in having their ideas flow out to those who need them. They felt constrained by boundaries, such as limits imposed by organizational mandates and procedures, and yet spoke about reinforcing boundaries more than opening them, as in Jordan's response to a member's suggestion: "But isn't that [named organization's] responsibility or mandate?"

Another aspect of this study—not included here—explored the ways in which participants understood leadership, and how that wove into patterns within communities.

It is interesting to note that regardless of which community participants were in, they rarely spoke about data or information management or the im-

Table 3. CRTI members' ways of understanding facets of their work

	Ways of Understanding Research Elements		
Research Element	**Category I**	**Category II**	**Category III**
Perceived Satisfaction and Effectiveness • from most to least	Mutual benefit	Shared opportunity	Difficult
Knowledge Management • from flowing to static	Free-flowing	Increasing	Stuck
Perceived Nature of Boundaries • from permeable to impermeable	Integrating	Overlapping	Constrained

Table 4. Community 3 profile with high level of satisfaction

	Ways of Understanding Research Elements		
Research Element	**Category I**	**Category II**	**Category III**
Perceived Satisfaction and Effectiveness • from most to least • mutual benefit, shared opportunity & difficult			
Knowledge Management • from flowing to static • free-flowing, increasing and stuck			
Perceived Nature of Boundaries • from permeable to impermeable • integrating, overlapping and constrained			

Table 5. Community 1 profile with low level of satisfaction

	Ways of Understanding Research Elements		
Research Element	**Category I**	**Category II**	**Category III**
Perceived Satisfaction and Effectiveness • from most to least • mutual benefit, shared opportunity & difficult			
Knowledge Management • from flowing to static • free-flowing, increasing and stuck			
Perceived Nature of Boundaries • from permeable to impermeable • integrating, overlapping and constrained			

Table 6.

	Formal community leader's way of understanding
	Community participants' way of understanding
	Single community participant's way of understanding
	Formal leader and community participants' way of understanding

portance of codifying knowledge. In one respect, this surprised me, given the scientific nature of their domains and the tendencies for governments to store information. They did store and access some important documents. But in our conversations, they chose to focus on the importance of tacit knowledge and expertise, especially when innovation was required. This fits with many studies such as Tom Allen's book *Managing the Flow of Technology (1984),* in which he wrote that scientists approached individuals for important information much more often than using codified sources such as files or databases. Later, when knowledge repositories had become much more sophisticated, Cross, Parker, Prusak and Borgatti researched the practices of 40 Fortune 500 managers and found that "these managers overwhelmingly indicated (and supported with vivid stories) that they received this information from other people far more frequently than impersonal sources such as their personal computer archives, the Internet or the organization's knowledge management database" (2001). This reflects a trend in knowledge management research to focus more on human and social capital, networks, communities of practice and the complex systems in which knowledge is generated and shared, even if this research is not embraced by consultants and organizations craving quick fixes and technology solutions.

CONCLUSIONS AND REFLECTIONS

Rigorous qualitative research deepens understanding through exploration with relatively few participants. CRTI managers found that this research enriched their understanding and was of immediate value. Qualitative research does not seek universal laws or definitive cause and effect relationships, so the findings from one context may not transplant to another without adaptation. However, it can be worthwhile to hold up the results of such studies against theories, frameworks and models from related disciplines.

This study helped us gain insights into an interdisciplinary knowledge-intensive network of counter-terrorism communities, and has implications for any complex, knowledge-intensive work, such as work with public sector challenges relevant to different governments, ministries and stakeholder groups. Participants dealt with uncertainties ranging from the challenges of trans-organizational collaboration to the difficulty predicting if, when, where or how terrorists might attack. Watching their work from the periphery, I consider it to be classically complex: having many interacting entities and systems in which emergence and unexpected results are commonplace. However, I must point out that participants' views about the degree of complexity varied, depending—in part—on how they drew boundaries around the scope of their work.

Using Dave Snowden's Cognitive Edge (formerly Cynefin) model (2002), one would expect formal or informal leaders to work in fluid ways: probing, watching for patterns and supporting the growth of positive results. In Community 3, where members felt most effective, this is similar to the way in which the formal leader described their work, with narrative such as the following:

...so the goal is really by bringing these people together and you have to balance off enough structure, so that you're accountable but sufficiently loose structure that you don't prevent the free flow of ideas and the innovation that needs to come forward.

One Community 3 participant spoke about stimulating knowledge generation and sharing by "increasing the complexity" in the work as they progress, by introducing risks and human factors in exercises. This comfort with complexity is also reflected in Community 3 members' unsolicited thinking about the application of connection, conversation, context and/or content to their purpose, and their desire to expand conversations and understanding beyond comfortable common ground.

Knowledge management authors (Davenport & Prusak, 1998; Kock, McQueen, & Baker, 1996) have written about knowledge being different, and more human, than information. Some have written about knowledge as a flow rather than a thing (Currie & Kerrin, 2004; Halal, 2005; Snowden, 2002) and the pitfalls of emphasizing "knowledge stock to the detriment of knowledge flow" (Fahey & Prusak, 1998, p. 266). These perspectives overlap with those depicting knowledge and learning as being embedded in practice (Lave & Wenger, 1991; Wenger, 1998). Portrayals of knowledge as highly contextualized and flowing imply that boundaries can be permeable or temporary and emphasize relationships amongst entities. In his reflections on complex organizational work, Kurt Richardson writes, "A clear lesson, which follows directly from complex versions of management theory, is that project boundaries (if one chooses to organize around the notion of a project) must not be reified, they must not be taken too seriously; they need to be allowed to flow" (2005, p. viii).

My research in the counter-terrorism communities shows that in the CRTI context, the individuals who felt most satisfied with their contributions and the effectiveness of their community (perceptions supported anecdotally by their examples of evidence) understood their environments as complex. They learn through largely unplanned stimulations of the flow of knowledge, in practice-oriented contexts such as exercises and through collaborative innovations. This contributes to the strength of several authors' conceptual publications, and suggests there is fertile ground for more exploration of decision-making and innovation in complex, knowledge-rich environments.

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KEY TERMS

Boundaries: Are [often socially constructed] areas of discontinuity containing or dividing entities.

Communities of Practice: Groups of people who engage in ongoing, voluntarily interaction to learn from each other and improve their work in a given field or domain.

Complex System: A complex system has many elements involved in non-linear interactions, making precise predictions impossible.

Counter-Terrorism Work: Work that improves capability and capacity for prevention of, preparedness for, and response to terrorism-related threats to public safety and security.

Effectiveness: Improvement that is broader than efficiency. Improvements can include increased relevance, perceived value, acceptance by stakeholders, protection of assets, achievement of results, secondary benefits, and so on.

Knowledge Management: In this paper I draw on work of Snowden and McElroy to describe knowledge management as work that helps to establish common context in order to enable organizational learning. Resulting activities could include knowledge generation, acquisition, sharing, re-use, and mobilization for decision-support and innovation.

Phenomenography: A qualitative research methodology originating in Scandinavia, which seeks to reveal qualitatively different ways of understanding concepts.