

# Where is the knowledge we have lost in managers?

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## Abstract

**Purpose** – The aim of this paper is to theorize what relationship exists between knowledge loss and the manager type. Specifically, the purpose of this research is to determine if some types of middle managers report lower levels of information anxiety. A manager's knowledge classification was based on the seminal research of Davenport and Prusak, and Nonaka and Takeuchi.

**Design/methodology/approach** – A sample of Canadian Public Service middle managers completed an online survey instrument over a three-month period in the autumn of 2003. Ninety-nine usable survey results formed the basis of analysis for the project. To increase how one may generalize the findings, the sample was compared to a recent large random sample of the same population, which determined that the two samples were statistically the same. Segmenting the managers by knowledge transformation tasks (based on Davenport and Prusak) and knowledge exchange methods (based on Nonaka and Takeuchi) permitted the development of two hypotheses based on the dependent variable of information anxiety.

**Findings** – An empirical examination revealed that most of the sample reported relatively low levels of information anxiety. The type of tasks performed by the respondents was not a major factor; however, there was a significant negative relationship between frequency of task and information anxiety. The discovery of a weak positive relationship between tacit knowledge use and information anxiety provides the promise of exciting future research opportunities.

**Originality/value** – This pioneering research is the first project to consider the relationship between information anxiety and type of middle manager through the lens of knowledge transformation tasks and knowledge exchange methods.

**Keywords** Knowledge management, Public sector organizations, Middle managers

**Paper type** Research paper

Where is the wisdom we have lost in knowledge?

Where is the knowledge we have lost in information? (T.S. Eliot, 1935).

## Introduction

The works of poet T.S. Eliot appear regularly in knowledge management papers, notwithstanding the reality that he was not, technically, a management guru. His regular quotation is likely because he so eloquently stated what many of us try to express, when he penned the prose above. These two lines from the opening chorus of *The Rock* articulate the knowledge management dilemma. One would assume the aim is to gain, not lose, wisdom and knowledge as managers ascend the cognitive hierarchy. Tragically, T.S. Eliot's questions are more valid today than when they were scribed so long ago. Perhaps the real question is "Where is the knowledge we have lost in managers?"

## What is knowledge?

The majority of academics and knowledge management authorities make a distinction between the three related but discrete terms of data, information, and knowledge. The three terms are hierarchical in nature with data being the foundation upon which information builds to an apogee of knowledge. Occasionally researchers use the collective noun "knowledge"

to group together the three blocks of the knowledge pyramid. For example, in *War and Anti-War*, the futurist authors Toffler and Toffler (1993) use the term knowledge as “defined broadly to include information, data, communication and culture” (p. 293). The outcome of such an unfortunate assemblage is the fallacy that practices such as data processing, information management, and knowledge management are synonymous. Although that may suit their needs, avoiding such generalizations reduces confusion and provides a clearer description.

The concept of categorizing and defining the parts of knowledge is not new. In *Views of Knowledge are Humans Views*, Dueck (2001) describes ancient Greek philosophers’ differentiation of knowledge including:

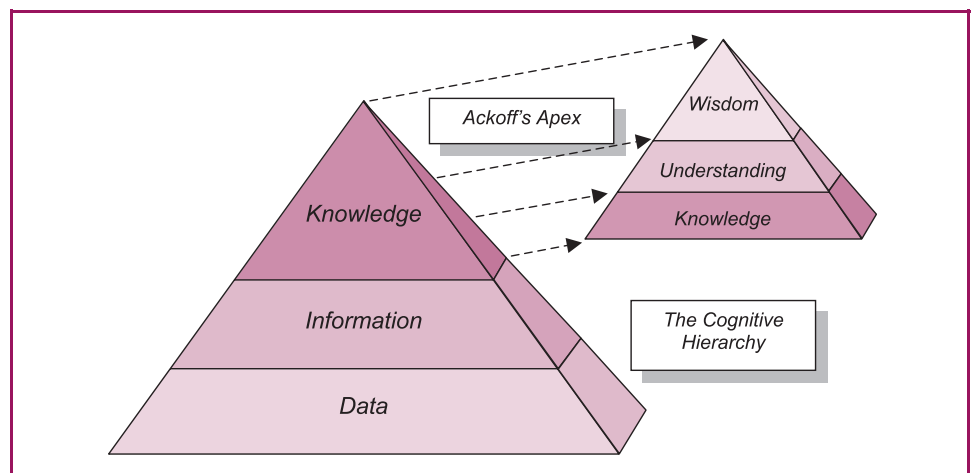
- *Episteme* – abstract generalizations, basis, and essence of sciences; scientific laws and principles;
- *Techne* – technical know-how, being able to get things done, manuals, communities of practice; and
- *Phronesis* – practical wisdom, drawn from social science (p. 885).

Sir Francis Bacon, attributed with saying “Knowledge is power”, studied knowledge in the early seventeenth century and published his views in *The Advancement of Learning*. Despite these seminal works, interest in epistemology waned until after the Second World War. In the 1950s, there was tremendous progress in the cognitive sciences, which resulted in a resurgence of epistemological research (Grover and Davenport, 2001).

Today, several cognitive theories exist that take into account the pyramid of data, information, and knowledge. Some research suggests the hierarchy should extend beyond these three basic building blocks. For example, the US Department of Defense (1996) suggests the hierarchy should include a fourth component – understanding. Systems theorist and Professor of Organizational Change Russell Ackoff’s hierarchy extends the Defense’s pyramid to five by adding wisdom (Allee, 1997). Finally, Allee’s (1997) knowledge archetypes enlarges the original three to seven by adding meaning, philosophy, wisdom, and union. Fortunately, the names of the three components of most relevance remain the same in most models. The most important terms are illustrated in Figure 1.

Despite identical names for the components, there is not consensus on their exact meaning. As is often the case when academia and the business world merge, a variety of definitions exist for data, information, and knowledge. In *Working Knowledge*, two leading knowledge management experts, Davenport and Prusak (1998), suggest clear definitions for the three

**Figure 1** The cognitive hierarchies as exposed by Davenport and Prusak (1998) and Ackoff



levels of the knowledge pyramid. Although not all pundits may accept these definitions, they provide a classification that articulates the essence of the terminology.

### *Data*

The definition of data is almost certainly the least contentious, as it is relatively straightforward and intuitive. Davenport and Prusak (1998) define data “as a set of discrete, objective facts about events” and they suggest, “in an organizational context, data is most usefully described as structured records of transactions” (p. 2). From a management perspective two features are worthy of note. First, data is the lowest level in the value chain and by itself is not very beneficial. Arguably, too much data exists and until or unless managers transform this data into information, it is simply occupying valuable space. Second, data’s symbolic nature permits ease of storage in and processing by computers. This characteristic drove the technical revolution of mechanical and then computer data processing permitting machines to replace humans in the repetitive tasks of data entry.

### *Information*

Davenport and Prusak (1998) describe information as “a message, usually in the form of a document or an audible or visible communication” (p. 3). Fundamental to their definition is the underlying assumption that a message must have a sender and a receiver. Davenport and Prusak (1998) suggest that “information is meant to change the way the receiver perceives something, to have an impact on his judgment and behavior” (p. 3). This supports Drucker’s (1998) claim that “Information is data endowed with relevance and purpose” (p. 5). Combining these premises, one may deduce that the recipient, not the sender, is the real judge as to whether the packet received is data or information. In other words, even if a sender believes that information is being sent, the receiver may judge the package to be data if it does not have an impact on his or her perception, judgment or behavior.

There are five major ways to transform data into information. First, one may put the data into *context* by communicating the reason for gathering the data. Second, one may *categorize* the data by describing the breakdown or the essential components of the data. Third, one may mathematically or statistically *calculate* the data. Fourth, one may *correct* errors in previously reported data. Finally, one may *condense* the data by providing a summary instead of the entire collection of data (Davenport and Prusak, 1998).

In reviewing the five “C’s” of transforming data to information, it is apparent that technology may only assist in some forms of the transformation. For example, computers are very useful for calculating data; however, computers tend to be less able to assist in the contextual transformation (Davenport and Prusak, 1998). From this deduction, one concludes that an increase in an organization’s information technology resources will not necessarily improve the state of knowledge within the organization.

### *Knowledge*

Authors Boyett and Boyett (2001) suggest that “knowledge is easy to talk about but hard to define” (p. 104). Virtually all scholars agree that knowledge is above data and information in the value chain but unfortunately, the common ground ceases at this point. Beyond the basic recognition of an ordinal relationship, few academics or business leaders agree on the exact meaning of knowledge, despite more than 2000 years of epistemology. The lack of a clear definition adds to the mystery of knowledge and enhances knowledge management’s research appeal.

Davenport and Prusak (1998) offer a definition that illustrates the value of knowledge and highlights the difficulty in managing knowledge. Despite the variety of definitions that exist, the proposed definition is a workable description to study knowledge management within organizations. Finally, this definition incorporates the spirit of the higher levels of the pyramid put forward in other models (US Department of Defense, 1996; Allee, 1997). Davenport and Prusak (1998) eloquently penned:

Knowledge is a fluid mix of framed experience, values, contextual information, expert insight that provides a framework for evaluating and incorporating new experiences and information. It

## “Until relatively recently most Westerners viewed the application of knowledge as a rigid and formal process.”

originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (p. 5).

Just as information is data that has a meaning or purpose, information may metamorphose into knowledge through a series of activities that increases its value. Four such activities transform information into the knowledge. First, one may *compare* information with previous information, primarily to determine what has changed in a particular situation. Second, one may determine the *consequences* or repercussions of this information on decisions. Third, one may consider how this information *connects* or correlates to other information. Finally, through *conversation* one may conclude what people think about the information (Davenport and Prusak, 1998).

A brief examination of these knowledge-enabling activities concludes that current computers are not particularly well suited for the transformation mission. These are tasks normally completed amongst people or inside an individual's mind. That is not to say that computers may not store the processed knowledge, much as books may store knowledge; however, computers are rarely able to execute the task of transforming information to knowledge. The vital inference is that knowledge management, unlike information management, will not generally be a technological solution; more often than not knowledge management will comprise both human and technological components.

### What types of knowledge exist?

Until relatively recently most Westerners viewed the application of knowledge as a rigid and formal process. Through the application of practices and procedures, managers would apply knowledge to attain some measurable improvement in performance, typically, something related to a better bottom line. In 1995, the award-winning book *The Knowledge Creating Company: How Japanese Companies Create Dynamics of Innovation* began a knowledge revolution (Nonaka and Takeuchi, 1995). The spark for this revolution was the declaration that two distinct types of knowledge existed: tacit and explicit. Nonaka and Takeuchi (1995) argued convincingly that the Japanese understanding and application of tacit knowledge provided a clear competitive advantage over the Western approach of explicit knowledge.

Nonaka and Takeuchi (1995) did not suggest that they invented the concept of tacit knowledge, but rather they chronicled the successes of Japanese executives in mastering the concepts. Aristotle was probably the first to make this distinction (Prusak, 2001), though most forgot his revelation until Michael Polanyi, a chemist and philosopher, described the theory of tacit knowledge in his book *Personal Knowledge* (Polanyi, 1958). Even Polanyi's writings did not attract much attention until Nonaka reinvigorated interest over three decades later in a research paper entitled “The knowledge creating company” (Nonaka, 1998) – the prequel to Nonaka and Takeuchi's (1995) seminal work of the same name.

Nonaka (1998) suggests explicit knowledge is “formal and specific ... it can be easily communicated and shared” (p. 27) whilst he and Takeuchi describe tacit knowledge as:

Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate and to share with others. Subjective insights, intuitions and hunches all fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideals, values, or emotions he or she embraces (Nonaka and Takeuchi, 1995, p. 8).

Nonaka and Takeuchi (1995) segment tacit knowledge into two dimensions, one technical and the other cognitive. They use a master artisan's gaining knowledge through experience to illustrate the technical dimension. Often these masters are unaware of the scientific or technical principles behind their work and yet they are able to create masterpieces. The cognitive dimension is based on individuals' beliefs of what is today and what ought to exist in the future. Clearly both tacit dimensions are very difficult to document or record in a computer. Conversely, explicit knowledge, which is based largely on known practices, procedures, and processes, is relatively easy to document.

The distinction between the two types of knowledge is a major reason why knowledge management is an exciting research area today. Without a clear understanding of this notion, Western knowledge management practices would have been unable to flourish. Until the 1990s, the focus of most Western knowledge management projects was the codification of explicit knowledge. In other words, they focused on documenting the formal and specific knowledge created by one person or organization to permit retrieval and utilization of this knowledge by others.

### *The spiral of knowledge*

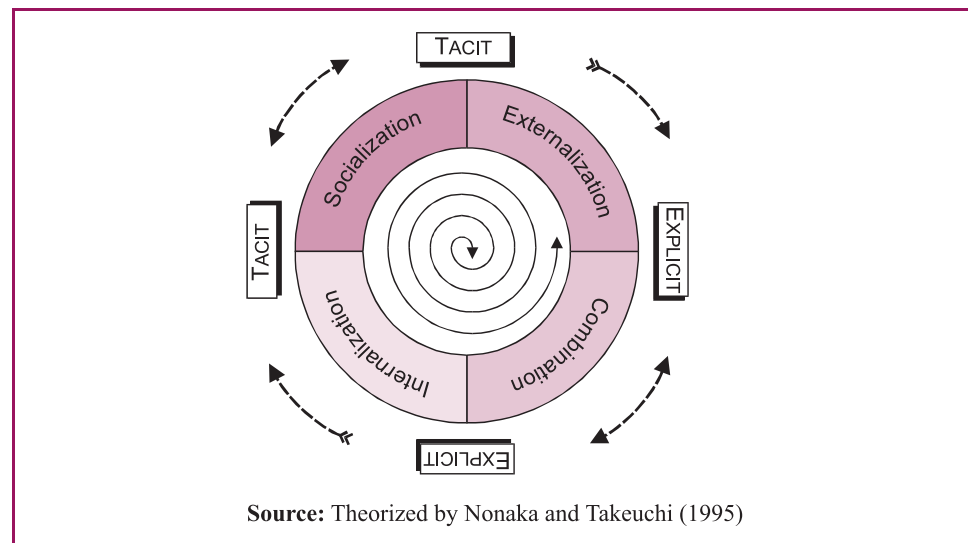
Nonaka (1998) suggests that "new knowledge always begins with an individual" (p. 26). This notion is crucial to understanding knowledge and its relationship to management. Knowledge creation may take one of four forms (see Figure 2):

1. from tacit to tacit;
2. from explicit to explicit;
3. from tacit to explicit; or
4. from explicit to tacit.

A brief description of each of these concepts is below (Nonaka, 1998; Nonaka and Takeuchi, 1995).

Nonaka (1998) describes the transfer of tacit to tacit knowledge as socialization. Through social interaction, people may gain highly personal and difficult to formalize knowledge. One of the best examples is the apprentice shadowing the master artisan. Almost through osmosis, the young journeyman learns the craft of the master. He or she will probably not understand the scientific principles underlying the master's skill, but through socialization, the student slowly gains the knowledge required to replicate the teacher. At this point, the

**Figure 2** A modified version of the spiral of knowledge



student crosses the threshold and becomes a master in his or her own right. Occasionally the apprentice will surpass the master, thus creating new tacit knowledge for the next generation of students.

The most common Western method of knowledge transfer is explicit to explicit. Through the process of codification, one person may document specific knowledge into some form of repository so that many others may access knowledge. An organization developing and formalizing best practices is a classic example of transferring explicit knowledge. Equally common is the creation of new knowledge by combining previously documented explicit knowledge.

The third concept of knowledge transfer or creation is foreign to Western thinkers. In this case, people strive to create or transfer tacit knowledge to the explicit form. Using a previous example, one would wish to articulate or externalize the highly personal knowledge of the master artisan into an explicit form that is easier to formalize or document. For example, if one were able to shadow the artisan and deduce the application of scientific principles then one could create new explicit knowledge.

The final classification, internalization, is the reverse of the previous notion, externalization. The premise is knowledge creation through an amalgamation of codified explicit knowledge and fuzzy tacit knowledge. Consider the master artisan who educates himself in the sciences and through this education and his intuition is able to develop a better way to produce his craft.

The four concepts of knowledge creation need not operate in isolation. In fact, organizations or managers who believe in Nonaka's tenets would wish to maximize the use of each method of exchanging and transferring knowledge. Imagine the middle manager who patiently observes executives at work. Through socialization, she slowly learns the inner working of the boardroom. In an effort to formalize her knowledge, she articulates or externalizes the executives' ideas into a series of procedures based on economics principles. By combining the codified procedures of several managers, she develops and documents new concepts. Finally, she presents these new concepts to a number of managers, perhaps at a conference, and they internalize the ideas and create even better ways of affecting their technique and thereby creating a competitive advantage. At this point, the process may recommence.

### The problem

A recent knowledge management study reported that two-thirds of the sample complained of information overload (KPMG, 2000). A second study determined that 38 percent of the managers surveyed waste a substantial amount of time locating information and that 43 percent of the managers delayed decisions because of too much information (Wilson, 2001). Other research suggests that a major driver of this problem is distraction, since many managers "dwell on information that is entertaining but not informative, or easily available but not of high quality" (Linden, 2001, p. 2). A myriad of other studies report similar disturbing findings, which appear to be information-related.

From these studies, one may deduce that managers suffer from information bombardment and yet they seem to crave more information. This vicious cycle is caused because most of the information available to these managers is unstructured and not of much value. In other words, these managers are dealing with data or information instead of the sought-after knowledge. Ironically, the more information many managers receive, the more they yearn for supplementary information, further compounding the crisis.

If information tribulations exist today, what will the future hold? Not surprisingly the amount of data and information available will increase in the future, but by how much? The number of books published annually has increased exponentially since the sixteenth century. At present, the prediction is that the number of books doubles every 33 years (Hanka and Fuka, 2000). A separate report corroborates this harsh reality by suggesting humankind produced more information in the last three decades than in the previous five millennia (White and Dorman, 2000).

**“ At present the doubling of knowledge occurs every seven years and some predict this will double twice a day by 2010. ”**

If one considers the total accumulated codified database of the world, which includes all books and all electronic files, at present the doubling occurs every seven years and some predict this will double twice a day by 2010 (Bontis, 2001). Tragically, this total codified database includes a significant amount of unprocessed, unstructured or duplicate data. This mountain of unprocessed data is becoming so large that it is smothering itself and preventing its metamorphosis to knowledge. Recent research suggests that it may be quicker for scientists to repeat experiments rather than search for previous results (White and Dorman, 2000). This attitude further exacerbates the problem by the creation of more duplicate data. Clearly current practices will not permit managers to cope with the predicted data explosion.

A KPMG study in 2000 found that 65 percent of respondents with a knowledge management program suffered from information overload whilst 69 percent respondents without a knowledge management program suffered from information overload – hardly the vast improvement promised by so many gurus. A Gartner Research study actually reported a 50 percent increase in information overload in knowledge management enabled organizations (Linden *et al.*, 2002). However, neither study considered the type of managers, typical tasks, knowledge transfer environmental conditions or a whole host of other factors that may cause information overload.

The question remains: “Where is the knowledge we have lost in managers?”. One wonders how organizations that invested millions of dollars in programs to manage knowledge are now discovering that their managers are less efficient than before the implementation. The aim of this paper is to theorize what the relationship is between knowledge loss and the manager type.

### Information anxiety

Neither information overload nor the study of the subject is new. According to Bawden (2001), more than 245 academic papers were produced on the subject between 1972 and 2000. Predictably, despite the vast quantity of research, there is not a single accepted definition for information overload. In fact, there is even debate about the best term to use. Many suggest “information overload” (Speier *et al.*, 1999; Bawden, 2001) whilst others recommend terms such as “information anxiety” (Wurman, 1989) and “cognitive overload” (Kirsh, 2000). Despite the variety of labels and characterizations there are a number of recurring themes.

Wurman (1989, p. 34) defines information anxiety as “the black hole between data and knowledge. It happens when information doesn’t tell us what we want or need to know”. Kirsh (2000) opted not to provide an actual definition; instead he related four causes of cognitive overload, which are:

1. too much information supply;
2. too much information demand;
3. the need to deal with multi-tasking and interruption; and
4. the inadequate workplace infrastructure to help reduce metacognition.

Wurman introduces a novel notion whilst describing information anxiety by stating “Information anxiety can afflict us at any level and is as likely to result from too much information as too little information” (Wurman, 1989, p. 44). This concept is fundamental to comprehend, as many researchers focus entirely on the idea of information overload and thus infer that the only challenge is too much information. Wurman notes that a major cause

of information anxiety is the uncertainty surrounding the existence of a particular piece of information.

Wurman's definition is particularly useful for this study as he delineates the phenomenon much as shown in Figure 1 (cognitive hierarchy). This pyramid is especially appropriate as it depicts an important relationship in the battle against information anxiety. Wurman theorizes there are five broad circumstances, which are liable to initiate information anxiety. Other research supports all five ideas as reported above. The five components of information anxiety are:

1. not understanding information;
2. feeling overwhelmed by the amount of information to be understood;
3. not knowing if certain information exists;
4. not knowing where to find information; and
5. knowing exactly where to find the information, but not having the key to access it (Wurman, 1989, p. 44).

### Types of managers

A middle manager's ability to metamorphose data into information or information into knowledge may be one of the most important management functions in the knowledge age. Davenport and Prusak's (1998) description of the three similar but distinct terms of data, information and knowledge combined with the activities associated with each term creates an efficient mechanism for aiding decision-makers.

According to Davenport and Prusak (1998) there are two distinct stages in the process and it appears these phases may be a useful way of categorizing managers. Therefore, two specific types of managers exist:

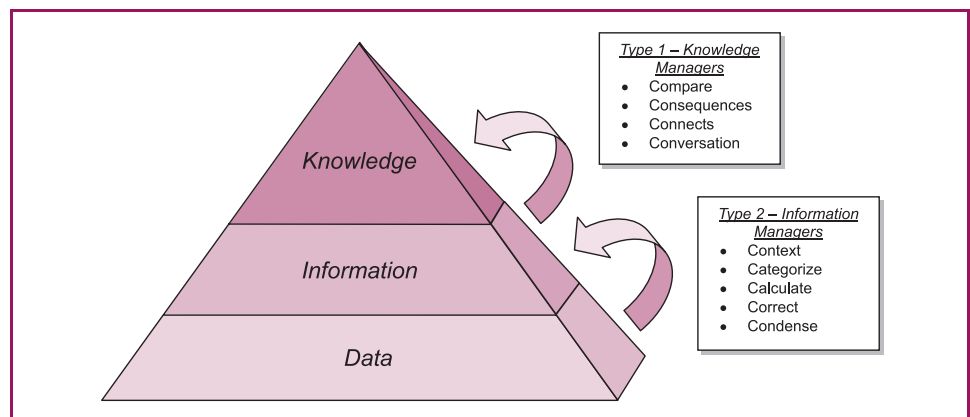
1. information managers; and
2. knowledge managers (see Figure 3).

The former includes all managers responsible for creating information by transforming data. The latter group includes all managers focused on producing the end product of knowledge, either from information or from data. The first hypothesis is:

- H1.* Knowledge managers report a significantly lower level of information anxiety than do information managers.

The difference between the two general types of knowledge, tacit and explicit, and the methods for exchanging or transferring knowledge is academic unless or until the difference

**Figure 3** The metamorphosis of knowledge as it relates to managers



may be used to add value to an organization. The interest lies in whether a relationship exists between the type of knowledge and information anxiety. By segmenting the managers, an analysis of the relationship between information anxiety and manager type is possible.

Tacit managers (Type A) are those managers who subscribe to Nonaka's thinking and seek to increase their tacit knowledge through internalization and socialization (see Figure 4). These managers will rely on tacit knowledge to make decisions. Alternatively, explicit managers (Type B) are those who rely on the more traditional processes of externalization and combination to gain knowledge. These managers will make decisions based on the explicit knowledge they have amassed. If Nonaka's revelation that tacit knowledge transfer adds value is true, then managers who apply these principles should report lower levels of information anxiety, thus:

H2. Tacit managers report a significantly lower level of information anxiety than do explicit managers.

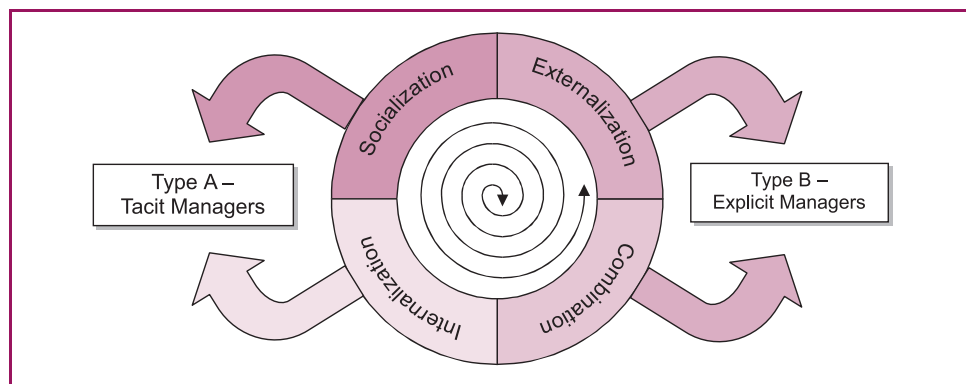
## Methodology

In order to determine whether the various types of managers report different levels of information anxiety, an online survey instrument was created. A snowball sample of Canadian Public Service middle managers completed the survey over a three-month period in the autumn of 2003. Ninety-nine usable survey results formed the basis of analysis for the project. If the sample was random this would result in a confidence level of 95 percent and a confidence interval of 9.83; however, a snowball sample is really a convenience sample and may not be considered truly random.

A sample of just 93 brings into question the generalizability of the findings. To increase how one may generalize the findings, the sample was compared to a recent large random sample of the same population. However, the demographics of this sample were compared to the 2002 Public Service Commission (PSC) online survey of Canadian Government Middle Managers. The larger survey randomly selected 8,576 people from the population of nearly 26,000, ultimately yielding 2,650 usable responses, for a 31 percent response rate, a confidence level of 95 percent, and a confidence interval of 1.8 (Public Service Commission of Canada, 2002).

The demographic analysis concluded that much of the data collected was the same. A series of null hypothesis tests, including gender ( $t(2747) = 0.366, p = 0.7143$ ), education ( $t(2747) = 0.659, p = 0.5099$ ), and language ( $t(2747) = 0.565, p = 0.5724$ ), indicate that this sample is not statistically different from the larger PSC survey. Therefore it seems highly probable that the sample is representative of the population. Whilst acknowledging that bias exists in all studies utilizing the snowball sampling technique, the analysis of the demographic data indicates that the sample is not statistically different from the PSC Survey. Hence one should be able to generalize, with confidence, the finding across the population.

**Figure 4** The type of managers based on the spiral of knowledge



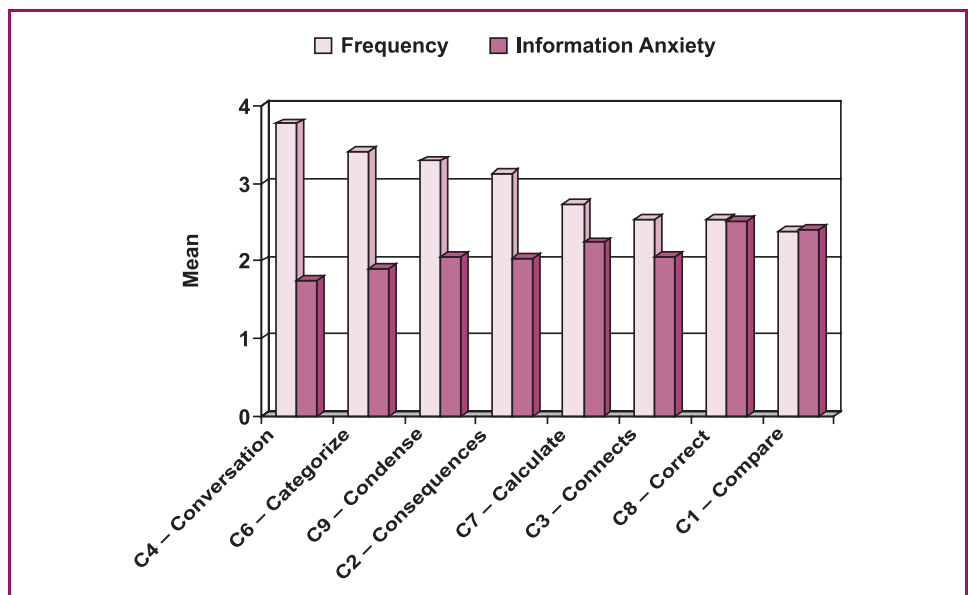
## Findings

The survey instrument included eight scenarios based on the Davenport and Prusak segmentation of management tasks (see Figure 3). For each scenario, respondents answered the question "I routinely complete tasks similar to this scenario" using a five-point Likert scale where the higher score represents tasks that are more common (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). Illustrated in Figure 5 are the frequency of response and levels of information anxiety reported.

As shown in Figure 5 and Table I, it is clear that the middle managers performed a wide variety of tasks spanning the entire spectrum of duties. Of particular note is the fact that more than 50 percent of the sample agreed or strongly agreed that they completed tasks similar to those with the three highest rated tasks: conversation (C4), categorization (C6), or condensing (C9) information. Equally, it is interesting to note that more than half of the sample disagreed or strongly disagreed that they completed tasks comparable to the three lowest rated tasks: compare (C1), correct (C8), and connect (C3).

It is also worth observing that there does not appear to be an association with Davenport and Prusak's (1998) segmentation of tasks. In other words, the tasks associated with knowledge managers, tasks C1-C4, or those associated with information managers, tasks C5-C9, do

**Figure 5** Information anxiety by task



**Table I** Information anxiety by task

<i>n</i> = 99	Mean	Information anxiety component					Frequency of task
		AI	IE	FI	IO	UI	
C8 - Correct Task	2.52 <sup>a</sup>	2.54 <sup>a</sup>	2.80 <sup>a</sup>	2.73 <sup>a</sup>	2.32 <sup>a</sup>	2.21 <sup>a</sup>	2.54 <sup>b</sup>
C1 - Compare Task	2.41 <sup>a</sup>	2.58 <sup>a</sup>	2.56 <sup>a</sup>	2.48 <sup>a</sup>	2.29	2.12 <sup>a</sup>	2.39 <sup>b</sup>
C7 - Calculate Task	2.24	2.30	2.32	2.22	2.32 <sup>a</sup>	2.04	2.74
C9 - Condense Task	2.06	2.37	2.35	2.01	2.08	1.47 <sup>b</sup>	3.29
C3 - Connects Task	2.06	2.31	2.16	2.09	1.94	1.79	2.54
C2 - Consequences Task	2.03	2.32	2.05	2.12	1.92 <sup>c</sup>	1.72	3.13
C6 - Categorize Task	1.91 <sup>b</sup>	2.04 <sup>b</sup>	2.01 <sup>b</sup>	1.83 <sup>b</sup>	2.03	1.64	3.41 <sup>a</sup>
C4 - Conversation Task	1.74 <sup>b</sup>	2.12 <sup>b</sup>	1.86 <sup>b</sup>	1.68 <sup>b</sup>	1.66 <sup>b</sup>	1.48 <sup>b</sup>	3.77 <sup>a</sup>
Cronbach's alpha		0.872	0.836	0.840	0.895	0.815	0.800

Notes: <sup>a</sup>Top two in category; <sup>b</sup>bottom two in category

not represent the most common or least common tasks, but rather, are distributed throughout the spectrum of tasks reported by the sample.

Shown in Table I are the frequencies for each of the eight scenarios with the reported level of information anxiety, including a breakdown for each of the five subcomponents of information anxiety. A review of this breakdown revealed several interesting findings. First, the two most troubling tasks, C1 (Compare task) and C8 (Correct task), remain constant for four of the five components of the dependent variable, in fact C8 was one of the top two troubling tasks for all five subcomponents. Not only were these the most troubling tasks, but as Table I illustrates, this duo was also the least commonly performed tasks. Similarly, the least troubling tasks, C4 (Conversation task) and C6 (Categorize task), were constant for three of the five components, while C4 was one of the two least concerning tasks for all five components. Interestingly, this twosome was the most commonly performed tasks, suggesting that there was a relationship between frequency of task and the associated level of information anxiety.

To determine whether a significant relationship existed between the frequency of task and information anxiety a simple linear regression was performed. The  $t$ -statistic for the slope was significant at the 0.05 critical alpha level,  $t(6) = -4.243$ ,  $p = 0.005$ . Consequently, we reject the null hypothesis and may conclude that there was a significant negative relationship between frequency of task and information anxiety. Furthermore, the  $r^2$  value of 0.75 indicates that frequency of task explains 75 percent of the variability in information anxiety.

In addition, of interest is the high scale reliability associated with the survey instrument, as illustrated by a Cronbach's alpha of 0.800 for task questions and Cronbach's alphas from 0.815 to 0.895 for the information anxiety questions. Although the literature is undecided on the exact point at which one may declare a scale reliable, a Cronbach's alpha of greater than 0.7 is an acceptable reliability coefficient (Santos, 1999). This reliability benchmark was used for the remainder of this analysis.

A survey instrument developed by Giunipero *et al.* (1999) provided the basis for the independent variable of knowledge environment. This proven instrument allowed a measure of tacit knowledge use to be determined for each respondent, where a higher number indicates more reliance of the use of tacit knowledge in decision-making (see Figure 6).

The survey instrument proved an excellent gauge of tacit knowledge; their path finding work provided an excellent foundation on which other research may build. Of particular note for this project was the determination that middle managers use both tacit and explicit knowledge in making decisions (see Figure 7).

Giunipero *et al.* (1999) found that their sample of purchasing managers used "equal amounts of formal data and tacit knowledge". Using the same methodology, i.e. comparing the sample's mean to a value of three, one may conclude that this sample also uses equal amounts of explicit (formal data) and tacit knowledge, where  $t(98) = 3.808$ ,  $p = 0.0001$  (two-tail). Once again, the scale reliability is acceptable, with a Cronbach's alpha of 0.765.

### *Hypothesis 1 – managing the metamorphosis of knowledge*

The purpose of  $H1$  was to test whether knowledge managers (MT 1) and information managers (MT 2) reported significantly different levels of information anxiety. This hypothesis presupposed that there was a relationship between the dependent variable of information anxiety and the independent variable of manager type.

The first phase of the analysis was to segment the sample into two groups based on the type of tasks they managed, as illustrated in Figure 3. Knowledge managers were those whose mean response for the independent variable knowledge tasks was above the sample's median. Information managers were those whose mean response for the independent variable information tasks was above the sample's median. Those managers who were above both medians were declared knowledge managers.

The research question was: "Is there a significant difference between the levels of information anxiety between the two types of managers?". The null hypothesis was: "There is

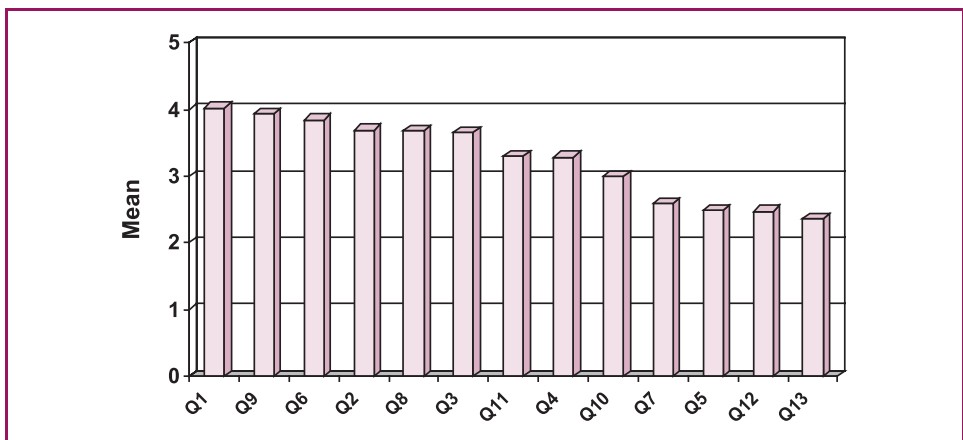
**Figure 6** Survey instrument

**When you think of the how you make day-to-day decisions, how much do you agree/disagree with the following statements?**

1. Experience is really the best teacher.
2. My gut feelings on important job decisions are usually on target.
3. When I face a new important decision I study up on it but then follow my own common sense.
4. When in doubt on an important job decision, I tend to go with my intuition.
5. Relying too much on facts and figures often results in bad or unrealistic decisions.
6. I am usually right when I use common sense in job decision-making.
7. I have found that relying on my common sense rather than formal data such as reports, articles, and presentations is a better way to make a job decision.
8. I feel I have good insight and easily figure important decisions.
9. I feel I have a vast store of useful information I can draw on when making important job decisions.
10. I believe most of the important decisions I face on the job can be solved by just using common sense.
11. I surprise myself sometimes by how much I know intuitively when I make important job decisions.
12. When making a job decision I generally rely more heavily on my common sense than on concrete facts.
13. I frequently make important decisions without extensive use of reports, facts, figures and concrete data.

**Source:** Developed by Giunipero *et al.* (1999)

**Figure 7** Tacit decision making responses



no significant difference between the levels of information anxiety between the two groups''. A two-sample *t*-test between proportions was performed to determine whether there was a significant difference between the samples with respect to the level of information anxiety reported. The *t*-statistic was not significant at the 0.05 critical alpha level,  $t(54) = 0.211$ ,  $p = 0.417$  (one-tailed). Therefore, we fail to reject the null hypothesis and conclude that the difference in information anxiety was not significant.

This analysis revealed an unanticipated anomaly, as just 56 of the 99 respondents were included in this grouping. Further data analysis determined that the remaining 43 respondents formed a third group, best described as other managers (MT 3). This third group included those whose mean response for the independent variable knowledge tasks and information tasks were equal to or below the sample's medians. In other words, members of this third group reported very low levels of both types of tasks.

As three groups existed, the most appropriate statistic test was the ANOVA. A one-factor ANOVA between manager types was performed to determine whether there was a significant difference between their means. The  $F$ -statistic was not significant at the 0.05 critical alpha level,  $F(2, 96) = 0.075$ ,  $p = 0.928$ . Therefore, we fail to reject the null hypothesis and conclude that the difference between manager types was not significant. However, as noted earlier, there was a significant negative relationship between frequency of task and information anxiety,  $t(6) = -4.243$ ,  $p = 0.005$ . Additionally it was noted that 75 percent of the variability in information anxiety could be explained by frequency of task.

At first glance, the rejection of this hypothesis appears to be a bad news story, but in fact, nothing is farther from the truth. This is pioneering research and each such discovery adds to the body of knowledge. Arguably, this finding is equally important as a determination of a strong relationship. In both cases, the wider community now understands the problem better. Researchers may now build on this discovery to enhance our understanding of middle managers.

The finding does call into question the segmentation used for this project. This appears to be the first project to segment managers based on the tasks described by Davenport and Prusak (1998). The fact that more than 40 percent of the sample formed a third group suggests that a different segmentation may be more appropriate. That said, Davenport and Prusak (1998) probably did not envisage their work being used for this purpose. Their work remains an excellent basis from which researchers may explore many areas in the quest for knowledge.

### *Hypothesis 2 – nature of knowledge*

In this study, the interest lied in whether a relationship existed between the type of knowledge and information anxiety. By segmenting the managers, an analysis of the relationship between the dependant variable of information anxiety and the independent variable of manager type was possible. Tacit managers (Type A) were those managers who relied on tacit knowledge to make decisions. Alternatively, explicit managers (Type B) were those who relied on the explicit knowledge they have amassed.

As with  $H1$ , the first phase of the analysis was to segment the sample into two groups based on the type of tasks they manage. Tacit managers were those whose mean response for the independent variable knowledge environment was above the sample's mean. Explicit managers are those whose mean response for the independent variable was below the sample's mean.

The research question was: "Is there a significant difference between the levels of information anxiety between the two types of managers?". The null hypothesis was: "There is no significant difference between the levels of information anxiety between the two groups". A two-sample  $t$ -test between groups was performed to determine whether there was a significant difference between the samples with respect to the level of information anxiety reported. The  $t$ -statistic was not significant at the 0.05 critical alpha level,  $t(97) = 1.314$ ,  $p = 0.096$  (one-tailed). Therefore, we fail to reject the null hypothesis and conclude that there was no significant difference between the two levels of information anxiety.

However, closer examination revealed another irregularity – that being the direction of the relationship. The hypothesis was that tacit managers report a significantly lower level of information anxiety than do explicit managers. As it turns out the reverse is true: in fact, tacit managers reported a higher, albeit not significant, level of information anxiety than did explicit managers. Based on this revelation, some may argue that it may have been more proper to consider a two-tailed probability, rather than a one-tailed probability. The literature

is unclear, though many argue that the two-tailed testing is more suitable in such situations. When the two-tailed test was applied the  $t$ -statistic was not significant at the 0.05 critical alpha level,  $t(97) = 1.314$ ,  $p = 0.192$  (two-tailed).

## Conclusion

The first hypothesis considered management task, the genesis of which was Davenport and Prusak's (1998) description of tasks that transform data to information and information to knowledge. Managers who performed the former tasks were declared information managers, whilst those operating in the latter domain were deemed knowledge managers. This was the first project to consider whether these different types of managers would report different levels of information anxiety or even information overload.

An analysis of the management segmentation suggested there was not a significant difference between types of middle managers and the level of information anxiety that they reported. That is to say, those managers who reported working in the knowledge domain did not report significantly different levels of information anxiety than their colleagues working in the information domain. This provides a plausible explanation of why a KPMG study found that respondents with a knowledge management program reported virtually the same level of information overload as those respondents without a knowledge management program (KPMG, 2000). Often the provision of an explanation to a previously puzzling question, such as KPMG's conundrum, is as important as demonstrating support for the study's hypotheses. In both cases, the project adds to the body of knowledge, the ultimate aim of research.

Though no relationship between the type of task and the level of information anxiety was detected, another fascinating, though unpredicted, relationship was discovered. A statistically significant negative relationship existed between frequency of task and the level of information anxiety reported. In other words as the task frequency increased there was a proportional reduction in the level of information anxiety reported. This important finding underscores that the frequency of task, and not the type of task, is the predominant factor in the level of information anxiety.

This research provides quantitative evidence to support a notion many managers intuitively believed for many years, that is, the performance of new or less common tasks results in higher levels of anxiety. In the short term, this finding should be included in middle manager training to ensure they understand the consequences of delegating these types of tasks. The completion of infrequent tasks must be monitored to ensure employees are not subject to unnecessary levels of anxiety. In the longer term, the implementation of a knowledge strategy that emphasizes a culture of knowledge sharing and provides the technology to find and access information quickly will go some way to reducing the anxiety associated with infrequent tasks.

The second hypothesis was concerned with the environment in which the managers worked. Two particular environments were of interest, the tacit environment and the explicit environment, both of which were derived from Nonaka's analysis and models. A proven survey instrument developed by Giunipero *et al.* (1999) was used to gauge the level of tacit knowledge and explicit knowledge used in decision-making, a task that is commonplace for all middle managers.

**“Cognitive overload is due to too much information supply, too much information demand, the need to deal with multi-tasking and interruption, and the inadequate workplace infrastructure to help reduce metacognition.”**

The analysis of the knowledge environment segmentation produced notable results, suggesting some evidence that a relationship exists between the type of manager, either tacit or explicit, and the level of information anxiety they reported. Surprisingly, the direction of the relationship discovered was opposite to what had been projected. The analysis indicated that tacit middle managers reported higher levels of information anxiety than did their colleagues who operated more in the explicit environment.

At first, this revelation appeared unexplainable; however, further analysis provided a rational explanation of why the projected direction was reversed. Although, the use, transfer, and exchange of tacit knowledge are generally a good idea, we often forget that there is a cost associated with the implementation of many best practices. In this case, the cost is increased information anxiety. Specifically, middle managers who rely on tacit knowledge to make decisions, for example those who apply Nonaka's philosophies of socialization and internalizations experience higher levels of information anxiety.

Such an inference may appear counterintuitive to some; however, it goes some way to explaining the findings of recent research. For example, a Gartner Research study reported a 50 percent increase in information overload in knowledge management enabled organizations (Linden *et al.*, 2002). It seems plausible that this increase in information overload, and perhaps even the other components of information anxiety, may have been the result of the embracing of knowledge management practices, many of which emphasize the tacit dimension. Once again, the possible explanation of a heretofore unexplainable research result demonstrates the value of this project.

The relationship between the type of knowledge manager and the level of information anxiety discovered in this project was weak, too weak to state with certainty that a relationship exists between the two variables; however, it is strong enough to acknowledge the existence of a relationship and to recommend additional research. If one considers just the information overload issue then the relationship discovered was stronger, albeit still not statistically significant at the 0.05 critical alpha level.

The environment in which the sample operated is clearly a bureaucracy where most managers are expected to base decisions on current policies, regulations, or law. Such an environment does not promote the use of many tacit components of decision-making, for example intuition, gut feel, or experience. This unique environment probably breeds more risk-averse managers than one might expect to find in many other segments of society. That said, in the recent past there have been several modern management initiatives in government that which encourage the use of knowledge management principles and permit a more progressive decision-making style.

The result of this change initiative is that the middle manager group may be moving toward a more permissive environment. The new environment will almost certainly demand a higher reliance on the use of tacit knowledge. Once this transformation is complete, one would expect to see a stronger relationship between the information anxiety and the use of tacit knowledge. One can envision the weak relationship discovered with this sample to develop into a stronger relationship. Future government leaders should be warned that their middle managers will likely exhibit higher levels of information anxiety in the future. To prepare for this inevitable new world, a knowledge strategy should be developed, one which will chart a course toward the new knowledge environment.

The intention of this paper was to consider the puzzling question of "Where is the knowledge we have lost in managers?". Clearly, a play on words of T.S. Eliot's poem *The Rock*, the root of the question is really "Why are managers less effective in knowledge empowered organizations?". Intuitively, one would expect these managers to be substantially more effective than their counterparts in organizations that are more traditional. However, at the end of the day no correlation was discovered between the type of manager and the information anxiety they report, leaving one to wonder "Where is the knowledge we have lost in managers?"

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## About the author

John Girard is an Associate Professor of Business Administration and Business Information Technology at Minot State University. After more than 24 years as an officer in the Canadian Forces John, his wife JoAnn, and their two dogs moved to picturesque Minot, North Dakota where he is Lead Professor for Knowledge Management and the Director of two graduate programs: the Job Corps Executive Management Program and the Master of Science in Management Program. John teaches both graduate and undergraduate courses. He is actively researching the relationships that exist between information anxiety, organizational memory loss, and contemporary knowledge management theories.

Throughout his military career John had the pleasure to serve in a variety of command and staff positions in Canada, the United Kingdom and Germany, gaining experience as a leader, trainer, policy officer, human resource manager and project manager in the public sector environment. In 2004, whilst acting as Director of Knowledge Management at National Defence Headquarters in Ottawa, he accepted an Associate Professorship at Minot State University, retiring at the rank of Lieutenant-Colonel.

John is a graduate of Touro University International, where he completed a PhD in Business Administration and an MBA with an Information Technology Management concentration, and the University of Manitoba where he achieved a BSc with a Computer Science major. In addition, John is a graduate of Canadian Forces College, Toronto and the Royal Military College of Science in the United Kingdom.

John speaks regularly on the subject of knowledge management and how enterprises may reap the benefits of creating and exchanging organizational knowledge. He has spoken in the USA, Canada, Europe and the Middle East at such events as KM World, APQC's Knowledge Management Conference, the World Congress on Intellectual Capital, and many other events.

The City and Guilds of London Institute awarded John their Insignia Award for his research into the application of robotic technology and subsequently appointed him a member of the City and Guilds Institute (MCGI). In 2003 John received the Chartered Manager (F.CIM) designation from the Canadian Institute of Management.

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