The Extent and Organizational Determinants of Research Utilization in Canadian Health Services Organizations

Omar Belkhodja, Nabil Amara, Réjean Landry and Mathieu Ouimet

Science Communication 2007; 28; 377
DOI: 10.1177/1075547006298486

Science Communication
Volume 28 Number 3
March 2007 377-417

10.1177/1075547006298486
http://scx.sagepub.com
hosted at
http://online.sagepub.com

The Extent and Organizational Determinants of Research Utilization in Canadian Health Services Organizations

Omar Belkhodja
Virginia State University

Nabil Amara
Réjean Landry
Mathieu Ouimet
Université Laval, Québec, Canada

This article focuses on the use of research by managers and professionals in Canadian health service organizations (ministries, regional authorities, and hospitals). The results of the analysis of the 928 responses underlined the important role that the absorption, learning, culture, and linkage mechanism variables played in determining utilization. General linear regression and regression by organizational type confirmed the importance of the linkage mechanisms, research experience, unit size, and research relevance for the users. The emphasis could thus be put, according to the organization type, on research experience, linkage mechanisms, unit size, research culture, research relevance for the users, and research activities. The article also underscores the individual and organizational contextual factors' high degree of significance by expressing these contextual factors as organizational variables and by adopting a more organizational perspective of knowledge utilization analysis.

Keywords: *research utilization; organizational determinants; absorptive capacity; learning*

Authors' Note: Address correspondence to Omar Belkhodja, Assistant Professor, Department of Management and Marketing, Box 9209, Virginia State University, Petersburg, VA 23806; phone: (804) 524-5374; e-mail: Obelkhodja@vsu.edu.

This article discusses four questions: What is the extent of research utilization in Canadian health service organizations (HSOs)? Are there differences in the extent of research utilization according to the organizational type? What determines research utilization in Canadian health service organizations? What is the marginal impact of each determinant in explaining research utilization in health service organizations?

The tendency to call for greater accountability in research investments (Buxton and Hanney 1994, 1996; Cozzens 1997; Hanney et al. 2003) explains the increasing interest of planners and government decision makers in research transfer and, particularly, in the effective utilization of research results. However, despite attempts by researchers to develop conceptual models explaining research utilization (Beyer and Trice 1982; Huberman 1987; Landry, Amara, and Lamari 2001; Lester 1993; Lester and Wilds 1990; Oh 2000; Oh and Rich 1996; Sabatier 1978; Webber 1987), no one conceptual model has yet gained unanimous approval among knowledge utilization experts. By the same token, it is unfortunate that organizational sciences are not put to better use to help organizations. Indeed, many researchers have called for a greater and more efficient use of research in organizations (Mohrman, Gibson, and Mohrman 2001; Mowday 1997; Mowday and Sutton 1993) as well as for research that is better adapted to organizational needs. To our knowledge, none of the studies of research utilization by managers has, as of yet, closely examined the organizational determinants of knowledge utilization, nor have they helped health service organizations benefit from advances in organizational sciences. This article proposes to fill this gap by exploring various concepts from organizational literature, examining the extent to which these concepts apply to research utilization in health service organizations.

To our knowledge, there have as yet been no studies that have modeled knowledge utilization in terms of organizational variables. In past studies, the organizational determinants of knowledge utilization have been placed in a holdall category that ignores the essence of each organizational determinant. For example, the users' context, which is a utilization determinant, is made up of numerous dimensions that utilization studies neglect to report. This context is essential to better understand the dimensions underlying so-called organizational factors if we are to appropriately model knowledge utilization. Understanding how organizational mechanisms affect the acquisition of knowledge, its dissemination, and its incorporation in structures and routines will shed light on the concept of organizational factors and clarify the meaning of strongly associated concepts whose associations have often been ignored, poorly modeled, and inadequately explored. Past utilization models

have not been entirely responsible for this gap, which has also stemmed from, for example, learning and absorptive capacity studies that have adopted a purely organizational language and have shown little awareness of knowledge utilization research. This article attempts to bridge the gap between two research fields: knowledge utilization and organization research.

In this article, because we have adopted an organizational perspective of knowledge utilization, the contextual variables take on greater importance in the explanation of knowledge utilization. The determinants identified by the interaction model will be re-conceptualized from an organizational perspective and expressed in terms of absorptive, cultural, adaptation, learning, control, and facilitating-mechanism variables. These determinants are in keeping with studies that focus on the explanatory factors of utilization, such as linkage mechanisms and dissemination initiatives (Huberman 1994; Huberman and Thurler 1991; Landry, Amara, and Lamari 2001; Landry, Lamari, and Amara 2003; Lomas 1997, 2000). These determinants also complement studies examining research characteristics (Conner 1981; Knorr 1977; Larsen and Werner 1981; Pelz and Horsley 1981) and the contextual factors of decision making (Lee and Staffeldt 1977; Lester 1993; Lester and Wilds 1990; Sabatier 1978; Webber 1987; Whiteman 1985). By re-conceptualizing organizational and individual factors, we will be able to adopt a more organizational perspective when analyzing knowledge utilization determinants, and to go to greater depth when analyzing the contextual and noncontextual factors of research utilization by the managers of health service organizations.

Despite the fact that there is a considerable reservoir of research results, many researchers believe that the field of knowledge utilization is still highly underdeveloped (Landry et al. 2001; Lester 1993; Oh and Rich 1996; Rich 1997). Though research such as that conducted by Huberman and Thurler (1991), Lester (1993), Oh and Rich (1996), Oh (1997), and Unrau and McDonald (1995) has made it possible to identify certain research utilization determinants, it has not yet been able to propose a general utilization model. Overall, two different approaches have been taken to measure knowledge utilization. The first, the product perspective, associates knowledge utilization with an instrumental utilization that allows managers to make decisions that would not have been made if the research results in question were lacking. The product perspective is based on the instrumental use of knowledge. The second, the process perspective, is based on the knowledge utilization scale whose stages vary according to the different aspects and stages of the decision-making process (Landry et al. 2001). Several studies of administrators' use of knowledge have concluded that they tend to try to obtain their information from previously selected sources, to disseminate part of the information to a specific

group, and to use only information that supports their position (Rich and Oh 2000). The conclusions of Rich and Oh (2000) are supported by their earlier findings (Rich and Oh 1993), which would seem to indicate that government administrators rarely use knowledge to which they potentially have access, and use it even less often if this knowledge is counterintuitive or if it does not support the organization's interests and objectives (Oh 1997). This reasoning applies to the use of research results if they are not presented in a concise form that is adapted to the user (Huberman and Thurler 1991; Landry et al. 2001).

Organizational Perspective

The organizational perspective is based on the idea that organizational structures, tasks, roles, procedures, and routines are essential elements in understanding the acquisition, dissemination, and utilization of information and, in particular, knowledge. This view states that, based on the fact that managers try to maximize organizational interests, the acquisition and utilization of information depends on whether certain requirements are met (Rich and Oh 2000). This perspective implicitly takes into account the contextual variables that influence decision making and determine, to a certain extent, the utilization of research results. Organizations can be seen in various ways, that is as information-processing systems (Tushman and Nadler 1978), as organisms capable of symbolic representation (Pondy and Mitroff 1979), as bodies of thought and sets of thinking practices (Weick 1979), as interpretative systems (Daft and Weick 1984), and as organisms endowed with a mind (Sandelands and Stablein 1987). The organization as a system (Tuomi 1996) also supports this organizational perspective because it considers that information research, storage, and dissemination mechanisms (Akscyn, McCracken, and Yoder 1988; Carlson and Ram 1990; Morrison and Weiser 1994; Paradice and Courtney 1989; Stein and Zwass 1995) are part of an organization's foundations and are essential to its functioning. This being said, we cannot understand how an organization functions if we do not understand how the people who make it up function (Bougon, Weick, and Binkhorst 1977). These two levels of analysis influence each other and cannot be disassociated. Even though the cognitive process of organizations (Schneider and Angelmar 1993), the description of information processing (Cyert and March 1963), or the description of the organization concept (Weick 1969) do allow us to understand the basis of the organizational perspective, we must include the human element if we are to more fully analyze organizations as entities.

The Necessary Remodeling of Contextual Factors

Progress is still being made in the modeling and operationalization of knowledge utilization (Landry et al. 2003). From a science push perspective, utilization determinants do not take into account the individual or organizational contextual variables that influence decision making. This perspective states that it is the advancement of research that determines the extent of utilization (Landry et al. 2003). The organizational perspective considers the influence of contextual and social variables, emphasizing three types of explanatory factors: organizational interests, divergent interests of researchers and users, and interaction between researchers and users. The organization's size, structure, needs, and field, as well as the occupational status (professional or manager), influence research utilization if we adopt an organizational perspective to explain research utilization. Research utilization increases as researchers consider and integrate the specific needs of users in their research instead of solely focusing on advances in research (Chelimsky 1997; Frenk 1992; Landry et al. 2003; Orlandi 1996; Silverside 1997). The explanation that focuses on the different interests of researchers and users states that their respective cultures are in opposition to each other, thereby resulting in a communication deficit and less utilization of research results (Caplan 1979; Frenk 1992; Landry et al. 2003; Oh and Rich 1996; Rich 1979; Webber 1987). This opposition will be even more noticeable if the research results are presented in a technical language that has not been simplified and adapted to the needs of decision makers (Caplan 1979; Dunn 1980; Landry et al. 2001, 2003; Rich and Oh 1993; Webber 1987). According to this organizational perspective, the type of research results and dissemination attempts (adaptation of research results to the needs of users and users' own attempts to acquire the results) are the main determinants of research utilization. The last series of explanatory variables focuses on the interaction between researchers and users (Dunn 1980; Huberman and Thurler 1991; Landry et al. 2001, 2003; Nyden and Wiewell 1992; Oh 1997; Yin and Moore 1988). Though it uses the determinants identified in the preceding utilization, it also brings forward a new category of determinants made up of formal and informal linkage mechanisms (Huberman and Thurler 1991; Landry et al. 2001, 2003). These mechanisms include informal personal contacts, participation in committees, and the conveying of research reports to organizations. Table 1 summarizes how these four knowledge-utilization models attempt to explain knowledge utilization and recapitulates the different research-utilization determinants found therein.

Table 1
The Determinants of Knowledge Utilization

Model	Key Attributes	Criticisms	Utilization Determinants	Past Studies
Science push model	Researchers are the source of ideas for directing research. Users are receptacles for the results of research. Linear sequence from supply of research advances to utilization.	Transfer of knowledge is not automatic. No one assumes the responsibility of the transfer. Raw research information is not usable knowledge.	Notable content attributes are efficiency, compatibility, complexity, observability, trialability, validity, reliability, divisibility, applicability and radicalness. Types of research include basic/applied, general/abstract, quantitative/qualitative, particular/concrete, research domains and disciplines. No relation between technical quality of research results and utilization.	Edwards (1991), Lomas (1993), Dearing and Meyer (1994), Machlup (1980), Huberman and Thurler (1991), Rich (1997), Oh (1997), Dunn (1983), Huberman (1987), Lomas (1990), Landry et al. (2001)
Demand pull model	Users are the major source of ideas for directing research. Linear sequence starts with the identification of the research problems by users.	Focus on the instrumental use of research. Too much stress on users' interests. Omits the interaction between producers and users.	Organizational structures, rules, and norms.	Yin and Moore (1988), Rich (1991), Rich and Oh (1993), Landry et al. (2001)

Dissemination model	Dissemination mechanisms used to identify useful knowledge and transfer it to potential users.	Potential users are neither involved in the selection of the transferable information, nor involved in the production of the research results.	Types of research results and the dissemination effort.	MacLean (1996), Oh and Rich (1996), Lomas (1997), Huberman (1987), Leung (1992), Landry et al. (2001)
Interaction model	Interaction and relationships existing between researchers and users at different stages of knowledge production, dissemination, and utilization.	Can lead to a selective use of research. Can be difficult to establish due to time and turnover issues. Overcomes the criticisms of the previous models.	Explanatory factors identified in the prior models Four categories of actors are: types of research and scientific disciplines, needs and organizational interests of users, dissemination, and linkage mechanisms.	Dunn (1980), Yin and Moore (1988), Huberman and Thurler (1991), Nyden and Wiewell (1992), Oh (1997), Landry et al. (2001)

In order to better understand how research results are used by managers and professionals in health service organizations, we set out to explore in greater detail some of the potential organizational determinants of utilization, including the organization's absorptive capacity (ACAP). As an essential condition of the acquisition, assimilation, transformation, and utilization of new knowledge, an organization's absorptive capacity would indeed seem to be an inescapable determinant of research utilization. In the following pages, we will try to explain the various dimensions of this potentially explanatory variable of research utilization. The type of links with the utilization variable will also be explored. We have deliberately chosen, beginning with the organizational perspective we adopted, to concentrate on an organizational analysis of absorptive capacity.

The Absorptive Capacity of Organizations

Absorptive capacity is seen in an organization's capacity to assimilate and reproduce new knowledge acquired from external sources (Cohen and Levinthal 1990). This capacity is dynamic and allows organizations to better create, absorb, and use knowledge, reinforcing the possibility of the organization having an advantage over its competitors and being able to maintain this advantage over time (Zahra and George 2002). Past research (Cohen and Levinthal 1990; Zahra and George 2002) reports that the absorption process is divided into two large phases, each one composed of two distinct and consecutive stages. Potential absorptive capacity, which comprises the knowledge acquisition and assimilation stages, precedes the realized absorptive capacity phase, which is made up of two consecutive stages, namely the transformation and exploitation of new knowledge. Past models have described four ACAP stages, namely:

Acquisition. Acquisition refers to an organization's capacity to identify, acquire, and generate the external knowledge that is critical to its operations (Zahra and George 2002). The amount of effort an organization puts into such an investment will affect the rate at which the organization develops its capabilities (Kim 1997a, 1997b; Zahra and George 2002). Organizations with solid capabilities that enable them to enhance and generate new knowledge in terms of intensity, speed, and direction (Zahra and George 2002) are able to accumulate knowledge and develop expertise that allows these organizations to institutionalize their knowledge acquisition process and turn it into organizational routines. The new routines can be considered to be socially

complex and to ultimately have significant value for organizations (Freed and Collins 1994).

Assimilation. The new knowledge assimilation stage (Dodgson 1993; Fichman and Kemerer 1999; Kim 1998; Szulanski 1996; Zahra and George 2002) refers to an organization's routines and processes that allow it to analyze, interpret, and understand knowledge acquired from external sources (Kim 1997a; Szulanski 1996; Zahra and George 2002). Assimilation is certainly sensitive to individual and organizational contexts that influence the establishment and development of organizational processes and routines. The individual and organizational dimensions can be seen when the learning process is analyzed at these two levels. Collective assimilation of knowledge is just as important and is influenced by already existing processes, know-how, and organizational routines (Dodgson 1993).

Transformation. This stage depends on an organization's capacity to develop and improve its routines so as to be able to combine newly acquired knowledge with already assimilated knowledge (Zahra and George 2002). It is the specific capabilities (Teece, Pisano, and Shuen 1990) of an organization, and even more so its core competencies (Prahalad and Hamel 1990), that determine how successful this stage will be. These capabilities will influence the coexistence of the two types of knowledge and their future management. The organization's past success and its capacity to transform new knowledge into information that can be used in decision making are indicative of its capacity to meet the transformation challenge.

Exploitation. As an organization assimilates new knowledge, learning takes place and future assimilation is facilitated and becomes more efficient (George, Zahra, and Wood 2002). In fact, what is important for an organization is not whether it has knowledge or knows that it has certain capabilities but whether it knows how to use and take advantage of them (Dodgson 1993) so as to generate new knowledge, develop its know-how and core competencies, and conserve and develop competitive advantages.

This phase is critical for finalizing and completing the knowledge-absorption process. However, exploitation has often been conceptualized as a synonym of knowledge utilization. As defined by Cohen and Levinthal (1990), absorptive capacity emphasizes the application of knowledge. Nonetheless, applying knowledge by making it accessible to organizational actors who subsequently use it appears to be more like the goal of the absorption process than as a

process component as such. In our opinion, this casts doubt on Zahra and George's (2002) inclusion of exploitation in the knowledge absorption process.

Is knowledge utilization a goal of absorption or a means to it? As specified earlier, many past models of knowledge absorption have focused on utilization as a stage in the absorption process (Cohen and Levinthal 1990; Zahra and George 2002). The exploitation of newly acquired knowledge, through its incorporation into existing organizational routines and the creation of new routines, represents the last absorption stage. Nonetheless, the absorption construct has been studied from several analytical viewpoints. These various perspectives, which emphasize organizational learning (Huber 1991; Kim 1998), industrial economics (e.g., Cockburn and Henderson 1998), resource theory (Lane and Lubatkin 1998), and dynamic capabilities (Mowery, Oxley, and Silverman 1996), were adopted in the past but have not succeeded in generating a coherent, integrated, and consensual model of absorptive capacity. Despite this, major studies such as those by Cohen and Levinthal (1990) or, more recently, Zahra and George (2002), which have tried to model or re-model the absorption construct, agree that absorption is incomplete if the knowledge is not exploited.

We believe that, from a process perspective, absorptive capacity explains knowledge utilization. Utilization would seem to result from the absorption of knowledge, the absorption coming to an end once the knowledge has been generated, conveyed, incorporated, and retained in organizational routines. This would seem to be true even if we admit that absorption is a dynamic concept. Consequently, the absorption process would include a final retention stage. It is this last stage that allows acquired and assimilated knowledge to be used. Indeed, the absorption process in organizations can be compared to cognition in humans. Organizations are thinking systems endowed with cognitive mechanisms (Weick 1979) and interpretation mechanisms (Daft and Weick 1984). They must, like people, not only assimilate knowledge but also retain it before using it. Indeed, if the cognitive effort is to be effective in people, it must be based on the assimilation and retention of the acquired knowledge (Szulanski 1996). We believe that the same cognitive effort in an organization can be seen in the absorption process, which is made up of the knowledge acquisition, assimilation, transformation, and retention stages that are part of organizational routines, structures, and information systems. Likewise, knowledge exploitation is influenced by the absorption process and brings out dysfunctional elements accumulated throughout the process. Absorptive capacity is similarly an organizational determinant of knowledge utilization and could be defined as follows: *the sum of the routines and*

processes through which an organization acquires, assimilates, transforms, and retains knowledge with a view to using it in the future to produce dynamic organizational capabilities. Utilization is the result of the absorption process and is affected by numerous factors related to individual and organizational contexts.

Absorption variables reflect an organization's capacity to react to new knowledge, to incorporate it into routines and structures, and to make it available to decision makers. As a potentially explanatory variable of research utilization, the capacity to absorb knowledge will be measured in the following pages using indicators of the capacity of organizational units to acquire, assimilate, and retain knowledge. These indicators are (1) The size of the unit, which reflects the capacity of the unit to acquire and absorb research, and (2) People in the unit paid to do research (yes/no), which is indicative of the resources allocation and of the unit's capacity to absorb the new knowledge acquired.

Like the absorptive capacity of an organization, learning seems to represent an indispensable dimension of knowledge utilization. However, the dimensions related to individual learning and the passage from individual to organizational learning need to be clarified. In this respect, the concomitance of knowledge absorption and learning in the phase preceding knowledge utilization influences its subsequent utilization. Learning is examined in the following pages and is used to help explain the foundations of knowledge utilization.

The Learning Issue

The concept of organizational learning was initially introduced to the field of organizational sciences by March and Simon (1958) and Cyert and March (1963). Cyert and March advocated the nonrationality of organizations and the impossibility for them to plan and foresee all their actions. Organizations thus adapt to environmental requirements through an organizational process. Several authors have attempted to model organizational learning (Argyris and Schön 1978; Brown and Duguid 1991; Cangelosi and Dill 1965; Cohen and Sproull 1996; Dodgson 1993; Duncan and Weiss 1979; Fiol 1994; Hedberg 1981; Levitt and March 1988; Weick and Westley 1996). Various perspectives have been adopted from the fields of psychology, administrative sciences, operations management, organizational theory, innovation management, et cetera. Learning is a process that is applicable to all organizations (Berends, Boersma, and Weggeman 2001; Easterby-Smith 1997) and is not limited to a certain category (Senge 1990). Nonetheless, organizational learning still suffers from

conceptual confusion despite its universality and a multitude of research (Berends et al. 2001). For example, the relationship between individual and organizational learning is far from being clear and well established (Nicolini and Meznar 1995, 730), this being equally true for the different levels that play a role in organizational learning (Crossan, Lane, and White 1999). The concept of learning is associated with other concepts such as knowledge, cognition, analysis, and conscience, which are individual characteristics, but which can also be applied to organizations. Must we, nonetheless, consider organizational learning as a metaphor (Argyris and Schön 1978; Dodgson 1993)? Must we see it from the cognitive perspective (Weick and Westley 1996; Yanow 2000), which states that organizations have cognitive abilities, which simply means that organizational learning is nothing more than the learning of individuals taken in a precise organizational context? Organizational learning goes beyond the simple accumulation of individual learning (Crossan et al. 1999; Duncan and Weiss 1979), even though individuals are the agents through which learning becomes concrete (Argyris and Schön 1978; Cyert and March 1963; Hedberg 1981; Shrivastava 1983).

Several authors have examined the passage from individual to organizational learning. Some consider that we can speak of organizational learning only when the knowledge of individuals is incorporated into the organizational memory (Argyris and Schön 1978), into the organizational memory and structure (Kim 1993), or institutionalized and integrated in organizational systems, structures, strategies, routines, and practices (Crossan et al. 1999). To become organizational, the knowledge of individuals must be disseminated, transformed, legitimized, and justified at the organizational scale (Nonaka 1994). The organization will learn only if its different units consider that the acquired knowledge is useful to the organization (Huber 1991). The transition from individuals to the organization seems, according to these different authors, to stem from two main elements: first, the incorporation of knowledge into organizational memory, structures, and routines; and second, the usefulness of the knowledge as perceived by the individuals who make up the different organizational units. We should likewise mention Duncan and Weiss's (1979) definition, in which an organization learns only when relevant knowledge becomes available to decision makers.

Organizational learning thus stems from the learning of individuals and the institutionalization of knowledge in (old and new) organizational routines, memory, and structure. The absorptive capacity of an organization will influence the learning process. The greater an organization's absorptive capacity, the easier is the transition from individual to organizational learning. According to our above-mentioned definition of absorptive capacity,

the incorporation of new knowledge in organizational routines through the creation of new routines (knowledge assimilation and incorporation stages) is an integral part of the absorption process. Learning thus becomes organizational once the assimilation, transformation, and retention stages of the absorption process are completed and the knowledge is made available to the actors. As defined by Duncan and Weiss (1979) and Huber (1991), the usefulness of knowledge and its availability for decision making are criteria that must be considered to be able to qualify learning as organizational. These two authors include more elements in their definition of organizational learning than are found in other definitions because they consider that it does not suffice that knowledge be incorporated in routines and organizational memory (Argyris and Schön 1978). Rather, it must also be made available and be useful in an organization's decision making. Huber's (1991) definition of organizational learning states that knowledge that is retained and incorporated but which is not immediately useful does not bring about organizational learning. In this case, learning will remain dormant until the knowledge is exploited.

Most authors agree that there is a passage from individual learning to organizational learning once the absorptive capacity is set in motion and the knowledge-transformation stage has been completed. Our definition of absorptive capacity substitutes the retention stage, which we see as an indispensable condition of knowledge absorption by an organization, for the exploitation stage, which is no longer a stage of the absorption process but rather the result of it. Thus, even if there are an assimilation of knowledge, the creation of routines, and incorporation in organizational systems, there will be no effective knowledge absorption without retention because, just like cognitive and interpretative schemata in individuals and the retention that must follow, organizations must retain knowledge if they are to absorb it. The exploitation of knowledge is no longer seen as an absorption stage but as a result of the absorption process. The transition to organizational learning likewise precedes knowledge utilization. This transition continues during the utilization and postutilization phases. Learning is dynamic and continues throughout the whole life of an organization, representing a concept that can change over time. In the following pages, we set aside these potential effects of learning on an organization's absorptive capacity and vice versa. Only the dimensions of learning process that affect knowledge utilization are taken into consideration.

The two concomitant processes, absorption and the passage from individual to organizational learning, occur prior to and influence the utilization of acquired knowledge. Organizational learning and knowledge absorption are

Table 2
The Different Perspectives Describing the Passage from Individual to Organizational Learning

Argyris and Schön (1978)	The results of individual learning have to be embodied in organizational memory in order to speak of organizational learning.
Huber (1991)	An organization learns if any of its units acquires knowledge that it recognizes as potentially useful to the organization.
Kim (1993)	What an individual has learned needs to become embedded in an organization's memory and structure; this requires an exchange of individual and shared mental models.
Dodgson (1993)	Organizational learning is the learning of the dominant coalition.
Nonaka (1994)	What an individual has learned needs to be organizationally amplified, crystallized, transformed, legitimized, and justified.
Crossan et al. (1999)	What an individual has learned, in interaction, needs to be institutionalized and embedded in systems, structures, strategy, routines, and prescribed practices of the organization.
Duncan and Weiss (1979)	An organization has learned if new communicable, consensual, and integrated knowledge, relevant to organizational activities, has become available to organizational decision makers.
Hedberg (1981)	An organization has learned if the results of individual learning have been incorporated in organizational memory and have therewith become independent of any individual.

nonetheless dynamic processes whose continual evolution depends on contextual factors, newly acquired knowledge, and the impact of the utilized knowledge. The usefulness drawn from knowledge or the actualized usefulness will become concrete only after the knowledge has been used. In the absence of this, usefulness remains strictly potential in nature.

As a potentially explanatory variable of research utilization, learning will be measured in the following pages through indicators that reflect the capacity of individuals to learn. (1) Learning variables are actualized in activities (training or otherwise) initiated by users to transfer and better integrate research results. These are either learning activities or activities facilitating learning. They are organized by research users to integrate research results, thereby generating individual learning and supporting the exploitation of

organizational learning. In the same vein, (2) the research experience of managers and professionals is also indicative of support for learning. Indeed, their experience reflects the ease with which research results are learned and retained and influences the utilization of the acquired knowledge. (3) The percentage of time allocated to research reflects the manager's or professional's degree of familiarity with research and the capacity the manager or professional has acquired to learn from research. (4) The highest degree completed indicates the manager's or professional's capacity to understand, to assimilate, and to learn from research results. The diploma will be considered as a variable suggesting an individual ability to learn. However, one must notice that an individual's higher educational attainment reinforces the firm's ability to use the prior knowledge (Knudsen and Roman 2004), which as Cohen and Levinthal (1990) argued is central to the ability to comprehend and apply the new knowledge. A diploma is consequently an individual learning variable which is, in turn, highly associated to the firm's absorptive capacity. (5) The degree of research relevance as perceived by the user measures the manager's or professional's openness to research and is indicative of their capacity to learn from newly acquired knowledge.

Like absorptive capacity and learning, organizational culture defines the behavior of managers and professionals through values, beliefs, attitudes, and so on. As such, it constitutes a potential contextual determinant of knowledge utilization. The variables associated with organizational culture reflect the vitality with which research is promoted and encouraged by organizations.

Organizational Culture

Organizational culture must not be confused with such concepts as organizational learning or perceived as a component of the organizational absorption process. Organizational culture is a specific set of standards, values, attitudes, beliefs, traditions, language, and ways of doing things that are particular to a given organization; it is "a pattern of basic assumptions—invented, discovered, or developed by a given group as it learns to cope with its problem of external adaptation and internal integration—that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (Schein 1985). Though values, standards, and practices reflect different levels of observability in organizational culture, they are nonetheless fundamentally related (De Long and Fahey 2000). Knowledge and organizational culture are likewise two intimately related concepts (Brown and

Duguid 1991). Among the different levels of analysis, culture, in the broad sense of the term, can be found in the social, political, and economic contexts and in both formal and informal structures in organizations (Adams 1993). People shape and affect organizational culture, and this culture in turn affects their beliefs and behaviors. Interpersonal and intergroup relations represent two other levels of organizational cultural analysis. Organizational culture evolves as the amount of knowledge acquired and absorbed by an organization at the individual and organizational levels grows. The way in which knowledge is structured and incorporated in routines and organizational structures is likewise sensitive to the specificities of organizational culture. Two different organizations acquire the same knowledge differently. This results in a different absorptive capacity in each organization and a different approach to the transition from individual learning to organizational learning. In the following pages, we set aside these potential effects of organizational culture on an organization's absorptive capacity and on the organizational learning process and vice versa. Only the dimensions of organizational culture that affect knowledge utilization are taken into consideration.

As a potentially explanatory variable of research utilization, organizational culture will be measured below through the following openness-to-research indicators: (1) research constitutes a preferred source of information that reflects whether an organization is open to research coming from external sources or closed and inward directed; and (2) the intensity with which research sources are used reflects the individual and organizational commitment to promote research culture within an organization. These two dimensions help to define the individual and organizational contexts in which knowledge utilization occurs.

Other determinants of the utilization of research results that are already well established in the literature will be taken into consideration. These determinants include adaptation efforts that are indicative of users' efforts to acquire research as well as formal and informal linkage and facilitation mechanisms that measure the intensity of the links between research suppliers and users. As for control variables (organization type, experience in a position, occupational status), they will indirectly influence knowledge utilization according to their level and intensity.

Table 3 recaps the different categories of variables that potentially affect research utilization among HSO managers and professionals. The following dimensions are presented: ACAP variables, adaptation efforts, learning variables, cultural variables, linkage variables, and control variables. The expected effect of the absorption, learning, culture, adaptation, and linkage-mechanism variables on the dependent variable was positive. The potential effect of the control variables is not identified.

Table 3
Predictions Regarding the Impact of the Independent Variables on Knowledge Utilization

Independent Variables	Expected Effects on the Dependent Variable
Learning Variables	
RESTIME = percentage of time allocated to research (Log)	+
DIPLOMA = most advanced university degree completed	+
RESPERT = pertinence of research for the user's professional practice and for user's needs and expectations (research characteristics)	+
TRAINACT = users of research organize training activities that integrate research results	+
EXPRES = users' experience in research	+
Organizational Absorptive Capacity	
UNITSIZE1 = Size of the unit (Category 1)	?
UNITSIZE2 = Size of the unit (Category 2)	+
PUNIIRES = People in the unit paid to do research	+
Organizational Culture Variables	
RESCULT = research is a preferred source of information	+
INTRES = intensity of use of research sources	+
Adaptation Efforts	
ADAPTEFF = adaptation of research products to users	+
Facilitation Mechanisms (facilitators)	
FORMALINK = formal linkage mechanisms between researchers and users	+
INFORMLINK = informal linkage mechanisms between researchers and users	+
Control variables	
ORGTYPE = type of organization (ministry, regional health authority, hospital)	?
PROFSTAT = professional status of the respondent	?
EXP = years of experience in the current position (Log)	?

Method

Data

The data used in this research were obtained with a Canada-wide survey administered in 2001 by the Québec City polling firm Infras Inc. The target population was managers and professionals in ministries, regional authorities, and hospitals with a quota for each province proportional to its percentage of

the Canadian population. Lists with the names, addresses, and telephone numbers of the professionals and managers of each of the three groups (ministries, regional authorities, and hospitals) were not available. Three information sources were used to find and identify the target population. In the case of regional authorities, the Health Evidence Applications and Linkage Network (HEALNet) was used to gain access to the names, complete addresses, and telephone numbers of decision makers working in Canadian regional authorities (excluding Ontario). It was through the former organization that we gained access to the decision makers of the Ontario District Health Councils, a structure that is similar to the regional authorities in the other provinces. Similar information about the managers and professionals working in ministries (executive directors, directors, and/or division heads in each ministry or governmental agency) was collected by consulting the Scott's Government Index (2001). The government divisions and departments whose tasks did not directly involve formulating, establishing, and evaluating policies were ignored. Information on the addresses and telephone numbers of the hospital professionals and managers was provided by the Canadian Health Facilities Directory (2001). Unfortunately, this database did not provide the names of the people in question.

The polling firm's goal was to collect 340 usable questionnaires collected from each of the three groups of decision makers. The questionnaire was administered on the phone by the polling firm, which used CATI (Computer-Assisted Telephone Interviewing) software to simultaneously encode and enter the data during the data collection phase. The snowball sampling method was used to deal with the nonavailability of exhaustive information for the whole target population. As concerns the decision makers in the regional authorities, the polling firm contacted the direct assistant of the decision maker and talked to the assistant about the person in charge of hospital/acute care, community care, population or public health, long-term care, or continuing care. The polling firm had to select the head managers in 25 percent of the cases and managers in the remaining 75 percent. As for hospital decision makers, the polling firm had to contact the executive assistant of the president/director and ask him/her to identify two resource people in charge of operations in 18 departments. The number of valid questionnaires was 942. In fact, the number of useable questionnaires was 928 because we eliminated respondents working in federal ministries ($n = 6$) and the Ontario District Health Council's responses ($n = 8$). The generated response rate was greater than 100 percent, which can be explained by the use of the snowball sampling method.

Sample Characteristics: Descriptive Statistics

Of the 928 questionnaires, 916 were valid, producing an invalid response rate for the highest degree obtained of 1.3 percent ($n = 12$). Of the 916 valid responses, 11.6 percent ($n = 106$) had completed community college studies, 29.7 percent ($n = 272$) a bachelor's degree, 47.6 percent ($n = 436$) a master's, and 11.1 percent ($n = 102$) a PhD. As concerns the type of organization, the invalid response rate after recoding was 1.2 percent ($n = 11$). The valid responses indicated that 41.7 percent ($n = 382$) were in provincial ministries or government agencies, 31.7 percent ($n = 291$) in regional authorities, and 26.6 percent ($n = 244$) in hospitals. The invalid response rate totaled 0.4 percent ($n = 4$) for the respondents' status. Of the 924 valid responses, 54.9 percent ($n = 507$) of the respondents declared that they were professionals, while 45.1 percent ($n = 417$) stated they were managers. In 60.4 percent ($n = 550$) of the cases, these Canadian health organization professionals and managers had more than five years of experience in the position they held at the time of the survey. Only 39.4 percent ($n = 359$) of them had more than ten years. The percentage dropped, respectively, to 25.4 percent ($n = 231$) and 13.8 percent ($n = 126$) for 15 and 20 years of experience. The invalid response rate after recoding totaled 1.9 percent ($n = 18$). In 66.1 percent ($n = 612$) of the cases, the respondents said they devoted 10 percent or less of their time to research, whereas only 9.9 percent ($n = 92$) of these health managers and professionals devoted more than 50 percent of their time to research activities. Finally, 47.1 percent ($n = 423$) of these respondents devoted more than 10 percent of their time to research acquisition activities, 23.3 percent ($n = 209$) devoted more than 25 percent, and only 7.2 percent ($n = 65$) more than 50 percent of their time. The invalid response rate with respect to the time devoted to research acquisition was 3.2 percent ($n = 30$).

Range and Differences in Health Research Utilization

The results shown in Table 4 indicate that 57 percent of the health managers and professionals often or very often received university research results that were relevant to their work, whereas 4.7 percent of the respondents felt that they never received research that was relevant to their work or that the question did not apply to their work context. Close to 30 percent of the professionals and managers reported that they sometimes received relevant research results, while 8.5 percent said that they rarely received relevant research. It can be seen, moving from one research-utilization stage to another, that the utilization percentages change very little even if there is a

small increase in the percentages of respondents who felt that they never or rarely used research results. The cumulative percentages oscillate between 3.8 percent for the cognition stage to 16.9 percent for the adaptation of research results. Overall, between 6.2 percent and 19.1 percent responded that the question did not apply to their work context, or that they never or rarely used the knowledge. The table also shows a drop in the percentage of respondents who used the research results very often as we move toward the utilization stage. There is a significant drop if the cognition, influence, and application stages are considered. Indeed, the percentage decreases from 30.4 percent to 13.5 percent and 10.2 percent, respectively. However, the percentages tend to increase if the respondents who sometimes used the research results are considered. In the cognition, influence, and application stages, these percentages go from 20.6 percent to 38.4 percent and 46 percent, respectively. This suggests that the effective utilization measured in terms of influence and impact tended to be fairly low, which leads us to conclude that a large part of the research that was received and adapted did not have an impact on decision making. The effective utilization of research by health managers and professionals was irregular, since, for 38.4 percent of the respondents, the acquired research sometimes influenced their professional choices and decisions, while in 46 percent of the cases, the impact was relative. The utilization scale is composed of seven stages: reception, cognition, reference, adaptation, effort, influence, and application. The utilization scale is cumulative and each stage is built on the preceding stage (Landry et al. 2001, 2003; Lester 1993; Lester and Wilds 1990; Knott and Wildavsky 1980). The utilization index, which includes the seven research-utilization stages, was created on this basis. The respondents were asked to indicate, on a 0-to-5 scale (0 = *not applicable*, 1 = *never*, and 5 = *always*), the frequency that best described their utilization of research in the past five years (refer to Table 4 for the exact wording of each stage's content).

Regression Models

The research utilization of health professionals and managers was analyzed with the explanatory variables shown in Table 5. The dependent variable was based on the different utilization stages defined in the utilization scale developed by Knott and Wildavsky (1980). To study the impact of these explanatory variables on the quantitative dependent variable, we developed the following simple linear regression model:

Table 4
Frequency Distribution by Stages of Knowledge Utilization

	Frequency of Knowledge Utilization							
	Does not apply and missing data	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Very often (5)	Total	Average on 1-to-5 scale (*SD*)[a]
Stages of Utilization	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	
Reception:	*I have received research results concerning the areas for which I am responsible.*							
	11	32	79	277	343	186	928	3.62
	(1.2)	(3.5)	(8.5)	(29.8)	(37)	(20)	(100)	(1.01)
Cognition:	*I have read and understood the research reports that I have received.*							
	22	10	26	191	397	282	928	4.01
	(2.4)	(1.1)	(2.7)	(20.6)	(42.8)	(30.4)	(100)	(0.86)
Reference:	*I have cited research evidence to colleagues or patients as a reference in my work.*							
	16	45	59	272	363	173	928	3.61
	(1.7)	(4.8)	(6.5)	(29.3)	(39.1)	(18.6)	(100)	(1.02)
Adaptation:	*I have adapted the format of the research results to provide information useful to our decision makers.*							
	20	55	102	327	290	134	928	3.38
	(2.2)	(5.9)	(11)	(35.2)	(31.3)	(14.4)	(100)	(1.06)
Efforts:	*I have made efforts to promote the adoption of research evidence in my field.*							
	21	52	88	287	321	159	928	3.49
	(2.3)	(5.6)	(9.5)	(30.9)	(34.6)	(17.1)	(100)	(1.07)
Influence:	*Research evidence has led me to make professional choices and decisions that I would not have made otherwise.*							
	20	41	86	357	299	125	928	3.42
	(2.2)	(4.4)	(9.3)	(38.4)	(32.2)	(13.5)	(100)	(0.99)
Application:	*The utilization of research evidence has led to concrete changes in the programs or services provided by my organization.*							
	34	21	86	427	265	95	928	3.37
	(3.7)	(2.3)	(9.2)	(46)	(28.6)	(10.2)	(100)	(0.88)

a. Standard deviation.

$$KU = B_0 + B_1\text{RESTIME} + B_2\text{DIPLOMA} + B_3\text{RESPERT} + B_4\text{TRAINACT} + B_5\text{EXPRES} + B_6\text{UNITSIZE} + B_7\text{PUNIRES} + B_8\text{RESCULT} + B_9\text{INTRES} + B_{10}\text{ADAPTEFF} + B_{11}\text{FORMALINK} + B_{12}\text{INFORMLINK} + B_{13}\text{ORGTYPE} + B_{14}\text{PROFSTAT} + B_{15}\text{EXP} + e,$$

where $B_i (i = 0 \ldots 15)$ are the coefficients.

This model was estimated for all the health service organizations taken as a whole and was likewise estimated for each type of organization taken separately. These two different estimations were based on the hypothesis that different factors explain research utilization in different types of organizations.

Measurement of the Dependent Variable and Independent Variables

Borrowing from Lester and Wilds (1990), Lester (1993), Landry, Amara, and Lamari (2001), and Landry, Lamari, and Amara (2003), we chose for this study's dependent variable a derived index of the Knott and Wildavsky scale (1980). The scale comprised seven stages: reception, cognition, reference, adaptation, effort, influence, and application.

An item analysis of the index-utilization components was conducted. We tested the internal consistency of each factor using Cronbach's alpha test (Cronbach 1951). Even though there exist no specific criteria for evaluating the results of this test (Ahire and Devaraj 2001), Nunnally (1967, 1978) recommends a limit below 0.50 for new constructs and a limit of 0.70 for constructs that are well established in the literature. The dependent variable's Cronbach alpha (.87) and that of each one of the explanatory variables measured on the multiple item scales are presented in Appendix 1. The different values of the Cronbach alpha coefficient shown in that appendix indicate that the multiple item scales used in this study are valid.

The operational definitions of the dependent variable and independent variables are presented in Appendix 2.

Results

The regression results are presented in Table 5. As concerns the general model, which includes all the types of health service organizations, it can be seen that the percentage of time allocated to research, highest degree, research relevance, training activities, research experience, research culture,

intensity of research source use, formal linkage mechanisms, informal linkage mechanisms, size of the unit (Category 2), people in the unit paid to do research, and type of organization (regional health authority) were significantly correlated with research utilization. All these variables were positively correlated with the dependent variable, with the exception of the organization type. The negative sign indicates that the professionals and managers working in regional health authorities made less use of research results than those working in hospitals. The variables for the respondents' occupational status, adaptation index, years of experience in the current position, unit size (Category 1), and the organization type (ministry and agency) were not significantly correlated with research utilization, meaning that the formers did not explain the latter. The total variance of research utilization explained by this model was expressed by an adjusted R^2 of 46.6 percent. We then went on to use the same explanatory variables, with the exception of the organization-type variable, to show that these variables did not all have the same influence on research utilization in the different types of health service organizations.

The three columns in Table 5 show the regression results for each type of health service organization. First, let us begin by trying to understand the ability of different variables to explain research utilization in the different types of organizations. For instance, the linkage mechanisms and research experience all were significant in all three models. Five separate variables explained research utilization in two types of health service organizations. Research relevance as perceived by the users explained research utilization in the regional authorities and hospitals, but did not explain utilization in the ministries. Relational capital was significantly correlated with utilization in the ministries and hospitals, but was not so in the regional authorities. Intensity of research source use explained research utilization in the ministries and regional health authorities, but did not explain it in the hospitals. Research culture explained research utilization in the ministries and regional health authorities, but did not explain utilization in the hospitals. Size of the unit (Category 2) was significantly correlated with utilization in the ministries and hospitals, but was not so in the regional authorities. Finally, five variables explained research utilization in only one organization type, namely: the highest degree obtained, which explained utilization only in the hospitals; training activities related to research, which explained utilization only in the hospitals; size of the unit (Category 1), which was significantly related to research utilization in regional health authorities; percentage of time allocated to research, which explained utilization only in the ministries; and people in the unit paid to do research, which was significantly related to research utilization in the ministries.

Table 5
Regression Equations Predicting Utilization of Health Research

	Comprehensive Model	Ministry Model	Regional Health Authority Model	Facility Model
Independent Variables				
INTERCEPT	0.658	0.801	0.357	0.245
	(3.28)***	(2.565)**	(1.03)	(0.610)
Learning Variables				
Training activities which integrate research results (TRAINACT)	0.092	0.071	0.084	0.110
	(2.082)*	(0.988)	(1.094)	(1.322)*
User's experience in research (EXPRES)	0.073	0.056	0.090	0.096
	(6.16)***	(3.024)***	(4.506)***	(3.825)***
Ln(Percentage of time allocated to research)[a] (RESTIME)	0.01	0.015	0.007	0.001
	(1.84)*	(1.828)*	(0.786)	(0.050)
The most advanced university degree completed (DIPLOMA)	0.059	0.014	–0.034	0.238
	(1.49)*	(0.209)	(–0.525)	(2.915)**
Relevance of the research for the user (RESPERT)	0.054	0.016	0.087	0.090
	(3.668)***	(0.734)	(3.331)***	(2.924)***
Organizational Absorptive Capacity				
Size of the unit (Category 1) (UNITSIZE1)	–0.019	0.018	–0.146	0.057
	(–0.436)	(0.245)	(–2.009)*	(0.699)
Size of the unit (Category 2) (UNITSIZE2)	0.065	0.116	–0.093	0.165
	(1.289)*	(1.384)*	(–1.157)	(1.520)*
People in the unit paid to do research (PUNIIRES)	0.072	0.145	0.022	0.003
	(1.789)*	(2.213)**	(0.320)	(0.037)
Organizational Culture				
Research is a preferred source of information (RESCULT)	0.170	0.138	0.235	0.079
	(3.621)***	(1.779)*	(3.141)***	(0.856)
Intensity of use of research sources (INTRES)	0.028	0.052	0.021	–0.002
	(3.506)***	(3.987)***	(1.456)*	(–0.116)
Adaptation Efforts				
Adaptation efforts (ADAPTEFF)	0.008	–0.021	0.02	0.022
	(0.26)	(–0.45)	(0.403)	(0.378)
Linkage Mechanisms				
Formal linkage mechanisms (FORMALINK)	0.255	0.272	0.315	0.198
	(7.142)***	(4.966)***	(4.759)***	(2.758)**
Informal linkage mechanisms (INFORMLINK)	0.108	0.099	0.046	0.193
	(3.251)***	(1.737)*	(0.806)	(3.253)***

Table 5 (continued)

	Comprehensive Model	Ministry Model	Regional Health Authority Model	Facility Model
Control Variables				
Organization type (ministry and agency) (ORGTYPE1)	–0.048 (–1.018)			
Organization type (regional health authority) (ORGTYPE2)	–0.086 (–1.728)*			
Professional status (PROFSTAT)	–0.046 (–1.21)	0.011 (0.186)	–0.048 (–0.771)	–0.075 (–0.951)
Ln(Years of experience in the current position) [a] (EXP)	0.021 (0.952)	0.014 (0.391)	0.035 (0.949)	–0.005 (–0.12)
N	821	349	257	213
Adjusted R^2	0.466	0.435	0.49	0.518
Calculated *F*	43.093	18.884	17.429	16.258
Theoretical *F*	(17; 804) *df* = 1.98 at 1%	(15;334) *df* = 2.09 at 1%	(15; 242) *df* = 2.11 at 1%	(15; 198) *df* = 2.13 at 1%

a. Ln indicates the logarithmic transformation of the variable whose name it precedes.
Figures between parentheses indicate *T* ratios
*Indicates that variable is significant at 10 percent level respectively.
**Indicates that variable is significant at 5 percent level respectively.
***Indicates that variable is significant at 1 percent level respectively.

All the variables that explained research utilization in one, two, or three types of health service organizations were positively correlated with the dependent variable with the exception of the size of the unit (Category 1), which was negatively correlated with research utilization in the regional health authority model. Linkage mechanisms and research experience had a positive effect in all three types of organizations. Research relevance as perceived by the users explained research utilization in the regional authorities and hospitals. This was likewise the case for relational capital in the ministries and hospitals, for the intensity of research source use in the ministries and regional authorities, for the relational capital in the ministries and the hospitals, for the research culture in the ministries and regional health authorities, and for the size of the unit (Category 2) in the ministries and the hospitals. The highest degree obtained was significantly and positively correlated with research utilization in the hospitals, as was size of the unit (Category 1) in the regional authorities, training activities in the hospitals, people in the

unit paid to do research, and the time devoted to research in the ministries. Overall, research utilization was not sensitive to research adaptation efforts, to the respondents' experience in their current job, and to their occupational status in the three organizational structures and in the general model too. The total variance in research utilization explained by the ministry model was expressed by an adjusted R^2 of 43.5 percent. The predictive strength of the regional authority model was indicated by an adjusted R^2 of 49 percent, whereas the hospital model had an adjusted R^2 of 51.8 percent.

To better determine the effects of the significant variables on research utilization, we estimated the partial elasticity for the continuous variables and the change in research utilization for the binary variables. The results are presented in Table 6. They show that, for the general model, the formal linkage mechanisms and the user's research experience had the highest impact on research utilization. Indeed, an increase of 10 percent in research experience led to a 2.35 percent increase in research utilization by professionals and managers, and an increase of 10 percent in formal linkage mechanisms led to a 2.39 percent increase in research utilization A 10-percent increase in informal linkage mechanisms, in the research use intensity, and in the perceived relevance of research, respectively, increased utilization by 0.88 percent, 1.01 percent, and 1.15 percent. These results underline the importance of research use intensity, of setting up informal linkage mechanisms between researchers and users, and of research usefulness as perceived by the users. They also underline the extreme importance of research experience and of setting up formal linkage mechanisms between researchers and users. Health service organizations that made their professionals and managers sensitive to research culture, that established training activities based on research results, that paid, in their different units, people to do research, and that developed medium-sized units (11 to 20 people) were likely to increase research utilization by 4.81 percent, 2.55 percent, 2.04 percent, and 1.79 percent, respectively, when these variables increase by 10 percent.

As concerns the organization type models, the results underline the importance for formal linkages and user's experience in research for all types of organizations. Indeed, a 10 percent increase in formal linkage mechanisms led to a respective increase in research utilization of 2.56 percent, 2.96 percent, and 1.85 percent in the ministries, regional authorities, and hospitals while a 10 percent increase in research experience led to a respective increase in research utilization of 1.80 percent, 2.97 percent, and 3.03 percent in the ministries, regional authorities, and hospitals. A 10 percent increase in relational capital increased research utilization by 0.82 percent and 1.51 percent,

Table 6
Impacts of the Statistically Significant Variables on the Utilization of Research

	Comprehensive Model	Ministries	Regional Health Authorities	Facilities
	Partial Elasticity[a]			
(A) Continuous Variables				
Relevance of the research for the user (RESPERT)	1.15		1.85	1.90
Intensity of use of research sources (INTRES)	1.01	1.88	0.77	
User's experience in research (EXPRES)	2.35	1.80	2.97	3.03
Formal linkage mechanisms (FORMALINK)	2.39	2.56	2.96	1.85
Informal linkage mechanisms (INFORMLINK)	0.88	0.82		1.51
Ln(Percentage of time allocated to research) (RESTIME)	–0.01	–0.01		
	Impacts[b]			
(B) Binary Variables				
The most advanced university degree completed (DIPLOMA)	1.69			7.64
Size of the unit (category 1) (UNITSIZE1)			–4.11	
Size of the unit (category 2) (UNITSIZE2)	1.79	3.21		4.47
Research is a preferred source of information (RESCULT)	4.81	3.88	7.01	
Training activities (TRAINACT)	2.55			2.99
People in the unit paid to do research (PUNIIRES)	2.04	4.20		
Organization type (regional health authority) (ORGTYPE2)	–2.35			

Note: Analysis used results from the comprehensive model, the ministry model, the regional health authority model, and facility model.
a. Elasticities are reported for a 10 percent increase in the different variables.
b. The impacts of the binary variables on the utilization of research are estimated using the following formula: impacts = $100*(Z_1–Z_0)/Z_0$, where Z_1 is the value of Utilization when the reference variable is set to 1 and Z_0 is the value when it is set to 0.

respectively, in the ministries and hospitals. This factor did not, however, explain research utilization in the regional authorities. Research utilization likewise increased by 1.85 percent and 1.90 percent in the regional authorities and hospitals, respectively, when the users' perceived usefulness of research increased by 10 percent. A 10 percent increase in the intensity of use of research sources is likely to increase the research utilization by 1.88 percent and 0.77 percent, respectively, in the ministries and regional health authorities. As concerns impact, it was in the interest of all types of health service organizations except the hospitals to make their professionals and managers aware and sensitive to research (research culture), given that such a measure increased research utilization by 3.88 percent in ministries and 7.01 in regional health authorities. The positive marginal impact of training activities, unit size (Category 2), and people, in the unit, paid to do research on the dependent variable is also worth noting. Finally, there was a marginal impact of 7.64 percent on research utilization when the education level of the hospital respondents went from a community college or bachelor's degree to a master's or PhD degree. This difference indicates the importance of education level for research utilization in this type of organization.

Discussion and Implications

This article has explored four questions, namely: What is the extent of research utilization in health service organizations in Canada? Are there differences in the extent of research utilization according to organization type? What determines research utilization in Canadian health service organizations? What is the marginal impact of each determinant in explaining research utilization in health service organizations?

To answer these questions, which will contribute to the advancement of knowledge in both the field of knowledge utilization and that of organizational sciences, we specified four conceptual and methodological issues: the specification of the dependent variable "research utilization" as it has been modeled in past research, the re-conceptualization of certain utilization determinants based on the organizational literature, an in-depth exploration of the organizational determinants of research utilization, and the presentation of knowledge utilization from an organizational perspective. To test these theoretical concepts, we worked with a large sample ($n = 928$) of professionals and managers in three types of Canadian health service organizations (ministries, regional

authorities, and hospitals). This study adopted an organizational perspective of utilization while conceptualizing and measuring the utilization variable through the different stages corresponding to those of the decision-making process. The lack of an agreed-on model of knowledge utilization led us to draw up lists of explanatory variables based on earlier conceptual and empirical research into knowledge utilization and to reclassify these variables in keeping with an organizational literature perspective. The variable categories resume the determinants identified by supply, demand, dissemination, and interaction models but reinterpreted from an organizational viewpoint of knowledge utilization. To avoid the perception bias found in studies based on the instrumental measure of utilization, we asked the respondents to describe their daily activities in relation to each of the identified stages of knowledge utilization.

Based on the answers of the 928 professionals and managers from Canadian health service organizations, the results show that close to 57 percent of the respondents frequently or very frequently received research results, that the received research never or rarely influenced their decisions and choices in close to 14 percent of the cases, and that it was never or rarely transformed into concrete applications in another 11.5 percent of the cases. These descriptive statistics suggest that numerous research results were received and made it through the reference, adaptation, and effort stages only to run aground at one of the last two stages of the utilization process. We likewise wanted to know if there were significant differences among the factors explaining knowledge utilization in the different types of health service organizations. The regression models were used to answer this question.

The regression model results show that the learning variables were significant in the general model with a positive effect on research utilization. All the predictive variables of research utilization were significant in the general model, except for the respondents' occupational status, experience in the current position, and adaptation efforts, which were neither significant in the general model nor in the organizational-type models. Also, the size of the unit (Category 1) and organization type (ministry and agency) were not significant in the general model. As concerns these latter models, the respondents' involvement in assessing formal linkage mechanisms between researchers and users, and their research experience, made up the group of variables that best predicted research utilization in the three types of organizations. The respondents' occupational status, their experience in their current job, and the research adaptation efforts were not significant in

any of the organizational type models. The informal linkage mechanisms were good predictors of research utilization in the ministries and hospitals whereas the research culture and the intensity of use of research sources were good predictors in ministries and regional authorities. Experience in research was likewise a highly significant variable in the general model and organizational type models. The user's experience in research strongly explained research result use among health managers and professionals. This article clearly demonstrates the importance of variables that reflected the capacity of organizations to absorb newly acquired knowledge and transform learning acquired at the individual level into organizational learning. The variables that reflected an organization's culture and its openness to research, as well as the linkage mechanisms between researchers and research users, are underscored in this article.

The calculation of the partial elasticity of the continuous variables and of the marginal impacts of the significant binary variables on research utilization for the general model and organizational type models confirmed the importance of intervening through specific actions related to certain research-utilization determinants instead of other factors that were insignificant or whose partial elasticity or marginal impact were not high enough to justify establishing policies based on these factors. Our results showed, for example, that making research one of the main pillars of the organizational culture of health service organizations, setting up training activities that integrate research results, developing formal and informal linkage mechanisms, and creating policies that foster user's experience in research are key factors to increase research utilization in HSOs.

Overall, our results proved that research utilization in health service organizations was sensitive to learning variables, linkage mechanisms, organizational culture, and certain variables reflecting the capacity to absorb knowledge. The formal linkage mechanisms and the user's experience in research influenced the amount of research utilization a great deal. Certain variables, such as research culture or research relevance, stood out by their highly significant level. The nonsignificance of the research adaptation effort is likewise worth noting.

One has to notice, according to our framework and to results obtained, that linkages exist undoubtedly between many organizational and individual aspects of knowledge absorption and utilization. We have demonstrated that knowledge utilization measured at the individual level is affected not by determinants that are solely related to an individual perspective of study

but by determinants that are as well inspired from an organizational perspective of study of the knowledge utilization phenomenon. The framework adopted was dedicated to refine this well-known perspective of study of knowledge utilization.

The results confirmed that managers and professionals in Canadian health service organizations react differently to research results according to the effects of a wide range of individual and organizational factors. For example, respondents in the hospitals were not reactive at all to the effects of cultural variables compared to respondents in ministries and health authorities who were more sensitive to these organizational factors. Variables explaining the researcher's individual context were, in turn, highly significant to explain the managers' and professionals' utilization of knowledge in hospitals. Globally, the analysis of knowledge utilization through an organizational perspective stresses the role played by the contextual variables to explain the users' behavior. The study also confirmed the benefits of setting up formal and informal linkages to improve the level of knowledge used by HSOs' managers and professionals. Finally, it validated that learning, absorptive capacity, and cultural dimensions explain partly how managers and professionals in Canadian HSOs react when they are exposed to knowledge. The organizational perspective of knowledge utilization was analyzed in depth and was confirmed as a realistic framework explaining the contextual part of their behavior.

The study showed that research utilization in health service organizations was more complex and much more sensitive to organizational factors and processes than previous studies seemed to affirm. We re-conceptualized certain utilization determinants found in previous research as organizational variables, thereby confirming the important role played by organizational theories in understanding research utilization. More theoretical research is, however, necessary to refine the list of explanatory utilization variables, and, likewise, more empirical studies are needed to identify the factors that best explain research utilization in various types of health service organizations. In addition to that, a more in-depth exploration of linkages between an organizational perspective of knowledge utilization and an individual perspective is needed to establish with more accuracy the mechanisms linking the organizational determinants of knowledge utilization referring explicitly to dimensions revealed at the organizational level to those related to the individual determinants.

Appendix 1
Internal Reliability Coefficients (Cronbach's alpha) for Variables Including Multiple Item Scales[a]

Name of Variables	Number of Cases	Number of Items in Scale	μ
Utilization of research	848	7	.87
Experience in research	906	7	.74
Relevance of the research for the user	927	2	.65
Intensity of use of research sources	875	4	.72
Adaptation efforts	905	4	.76
Linkage mechanisms	855	8	.85
Relational capital	880	5	.74

a. Appendix 1 reports an item analysis of the variables based on multiple-item scales performed by computing the Cronbach's alpha. The values of the alpha coefficients reported in this appendix indicate that all the multiple-item scales used in analysis are reliable.

Appendix 2
Definitions of Dependent and Independent Variables

	Measure	Subitems	Method (Range)
Dependent variable			
Utilization of research index	Measured as an index on a Likert-type scale of frequency ranging from 1 = *Never* to 5 = *Very Often*, regarding six aspects:	During the last 5 years *Reception:* I have received research results concerning the areas for which I am responsible. *Cognition:* I have read and understood the research reports that I have received. *Reference:* I have cited research evidence to colleagues or patients as a reference in my work. *Adaptation:* I have adapted the format of the research results to provide information useful to our decision makers. *Effort:* I have made efforts to promote the adoption of research evidence in my field.	Sum (7-35)

		Influence: Research evidence has led me to make professional choices and decisions that I would not have made otherwise *Application:* The utilization of research evidence has led to concrete changes in the programs or services provided by my organization.	
Independent variable			
Relevance of the research for the user index	Measured as an index on a Likert-type scale of frequency ranging from 1 = *Never* to 5 = *Very Often*, regarding two aspects.	Overall, in the field of my professional practice, – research is pertinent for my professional practice – meets my needs and expectations	Sum (2-10)
Intensity of use of research sources of information index	Measured as an index on a Likert-type scale of frequency ranging from 1 = *Never* to 5 = *Very Often*, regarding four aspects.	How frequently do you use the following sources of information for your day professional activities? – evaluation reports for a project with which you were personally involved – researchers in universities or colleges – researchers in government agencies or government laboratories – researchers in hospitals or RHAs	Sum (4-20)
Linkage mechanisms index	Measured as an index on a Likert-type scale of importance ranging from 1 = *Not important at all* to 5 = *Extremely important*, regarding seven aspects.	In terms of your professional satisfaction, what is the importance of the following? – active involvement in research projects – participation in professional conferences and workshops involving researchers – membership on expert-panels, and committees involving researchers	Sum (8-40)

(continued)

Appendix 2 (continued)

	Measure	Subitems	Method (Range)
		– newsletters and research information delivered directly to me – research reports sent to me by e-mail – research evidence available on the Internet – research evidence delivered through professional associations, and other venues – information on best practices or benchmarking studies	
Relational capital index	Measured as an index on a Likert-type scale of frequency ranging from 1 = *Never* to 5 = *Very Often*, regarding five aspects.	How frequently do you have person-to-person contact with researchers in these areas? – universities – hospitals – regional health authorities – government agencies – private firms	Sum (5-25)
Adaptation of research results index	Measured as an index on a Likert-type scale of importance ranging from 1 = *Not important at all* to 5 = *Extremely important*, regarding four aspects.	In terms of reading and using the results of research studies, how important are the following? – presentation of research results in nontechnical language – examples or demonstrations of how to use research results – focus on implications of research results for use in medical practice – appeal of reports and products (graphics, color, humor, packaging)	Sum (4-20)
Users' experience in research index	Measured as a variety index indicating the number of the different categories of research	In the last 5 years, have you: (Yes/No) been principal investigator for research study? been a co-investigator for a	Sum (0-7)

	activities (Yes = 1, No = 0) in which the respondent was involved in the last 5 years. research study? collected data for a research study? contributed data from my organization for a research study? been involved in outcomes, evaluation or quality assurance projects? carried out in-depth review of the literature? been involved in a research study that combine university and nonuniversity investigators?
Number of years of experience	The number of years of experience in the current position
Time allocated to research	The percentage of time allocated to research
Binary Variables	
Research culture: . . . is a preferred source of information	Overall, in the field of my professional practice, research . . . Dichotomous variable: coded 1 if the user responds *often* or *very often*, and 0 *otherwise*.
People in the unit paid to do research	Do you have any people in your department or practice who have paid time to do research? If yes, what is the number of FTEs (full time equivalents)? Dichotomous variable: coded 0 if the user responds no or not applicable data and 1 otherwise.
Learning activities . . . organize training activities which integrate research results.	In my professional, research users . . . Dichotomous variable: coded 1 if the user responds *often* or *very often* and 0 *otherwise*.
Professional status	What is your current professional status? Dichotomous variable: coded 1 if the user is a professional and 2 if user is a manager.
Education degree	What is the most advanced university degree you have completed? Dichotomous variable: coded 1 if the user has a college degree, a bachelor degree and 2 if he had a master degree or a PhD.
Size of the unit	What is the approximate number of employees in your immediate administrative unit?

(continued)

Appendix 2 (continued)

Category 1 (1 to 10)	Dichotomous variable: coded 1 if the size is between 1 and 10, and 0 otherwise.
Category 2 (11 to 20)	Dichotomous variable: coded 1 if the size is between 11 and 20, and 0 otherwise.
Category 3 (more than 20)[a]	Dichotomous variable: coded 1 if the size is greater than 21, and 0 otherwise.
Organization type	Do you work in federal ministry or agency, provincial ministry or agency, regional health authority or health care facility?
Ministry	Dichotomous variable: coded 1 if the respondent works in a ministry, and 0 otherwise.
Regional health authority	Dichotomous variable: coded 1 if the respondent works in a regional health authority, and 0 otherwise.
Health care facility[a]	Dichotomous variable: coded 1 if the respondent works in a health care facility, and 0 otherwise.

a. Used as reference category in regression models.

References

Adams, G. B. 1993. Organizational metapatterns: Tacit relationships in organizational culture. *Administration and Society* 25 (2): 139–159.

Ahire, S. L., and S. Devaraj. 2001. An empirical comparison of statistical construct validation approaches. *IEEE Transactions on Engineering Management* 48 (3): 319–329.

Akscyn, R. M., D. L. McCracken, and E. A. Yoder. 1988. KMS: A distributed hypermedia system for managing knowledge in organizations. *Communications of the ACM* 31 (7): 820–835.

Argyris, C., and D. A. Schön. 1978. *Organizational learning*. Reading, MA: Addison-Wesley.

Berends, H., F. K. Boersma, and M. Weggeman. 2001. The structuration of organizational learning. *ECIS working paper 01.12.*

Beyer, J. M., and H. M. Trice. 1982. The utilization process: A conceptual framework and synthesis of empirical findings. *Administrative Science Quarterly* 27: 591–622.

Bougon, M., K. Weick, and D. Binkhorst. 1977. Cognition in organizations: An analysis of the Utrecht Jazz Orchestra. *Administrative Science Quarterly* 22: 606–639.

Brown, J. S., and P. Duguid. 1991. Organizational learning and communities of practice: Toward a unified view of working, learning, and innovation. *Organization Science* 2: 40–57.

Buxton, M., and S. Hanney. 1994. *Assessing payback from department of health research and development.* Uxbridge, Brunel University: Health Economics Research Group.

———. 1996. How can payback from health services research be assessed? *Journal of Health Services Research and Policy* 1: 35–43.

Canadian Health Facilities Directory. 2001. Southam Communications Ltd.

Cangelosi, V. E., and W. R. Dill. 1965. Organizational learning: Observations towards a theory. *Administrative Science Quarterly* 10 (2): 175–203.

Caplan, N. 1979. The two communities' theory and knowledge utilization. *American Behavioral Scientist* 22: 459–470.

Carlson, D., and S. Ram. 1990. Modelling organizations as a social network of distributed knowledge-based systems. *Proceedings of the 23rd annual conference on systems science*. New York: IEEE Computer Society Press 3: 271–280.

Chelimsky, E. 1997. The coming transformation in evaluation. In *Evaluation for the 21st century,* edited by E. Chelimsky and W. R. Shadish. Thousand Oaks, CA: Sage.

Cockburn, I., and R. Henderson. 1998. The organization of research in drug discovery. *Journal of Industrial Economics* 46 (2): 157–182.

Cohen, M. D., and L. S. Sproull. 1996. *Organizational learning*. Thousand Oaks, CA: Sage.

Cohen, W., and D. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35: 128–152.

Conner, R. 1981. Measuring evaluation utilization: A critique of different techniques. In *Utilizing evaluation. Concepts and measurement techniques*, edited by J. A. Ciarlo, 59–76. Beverly Hills, CA: Sage.

Cozzens, S. E. 1997. The knowledge pool: Measurement challenges in evaluating fundamental research programs. *Evaluation and Program Planning* 20 (1): 77–89.

Cronbach, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrica* 16: 297–334.

Crossan, M. M., H. W. Lane, and R. E. White. 1999. An organizational learning framework: From intuition to institution. *Academy of Management Review* 24 (3): 522–537.

Cyert, R. M., and J. G. March. 1963. *A behavioral theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.

Daft, R. L., and K. E. Weick. 1984. Toward a model of organizations as interpretation systems. *Academy of Management Review* 9: 284–295.

De Long, D. W., and L. Fahey. 2000. Diagnosing cultural barriers to knowledge management. *The Academy of Management Executive* 14 (4): 113–127.

Dearing, J. W., and G. Meyer. 1994. An exploratory tool for predicting adoption decisions. *Science Communication* 16: 43–57.

Dodgson, M. 1993. Organizational learning: A review of some literature. *Organization Studies* 14: 375–394.

Duncan, R., and A. Weiss. 1979. Organizational learning: Implications for organizational design. *Research in Organizational Behavior* 1: 75–123.

Dunn, W. N. 1980. The two communities metaphor and models of knowledge use. *Knowledge: Creation, Diffusion, Utilization* 1: 515–536.

———. 1983. Measuring knowledge use. *Knowledge: Creation, Diffusion, Utilization* 5 (1): 120–133.

Easterby-Smith, M. 1997. Disciplines of organizational learning: Contributions and critiques. *Human Relations* 50 (9): 1085–1114.

Edwards, L. A. 1991. Using knowledge and technology to improve the quality of life of people who have disabilities: A prosumer approach. Knowledge Utilization Program, Pennsylvania College of Optometry, Philadelphia.

Fichman, R. G., and C. F. Kemerer. 1999. The illusory diffusion of innovation: An examination of assimilation gaps. *Information Systems Research* 10 (3): 255–275.

Fiol, C. M. 1994. Consensus, diversity and learning in organizations. *Organization Science* 5 (3): 403–420.

Freed, M., and G. Collins. 1994. Adapting routines to improve task coordination. In *Proceedings of the conference on AI planning systems* 4: 255–259.

Frenk, J. 1992. Balancing relevance and excellence: Organizational response to link research with decision-making. *Social Science Medicine* 35 (11): 1397–1404.

George, G., S. Zahra, and D. Wood. 2002. The effects of business-university alliances on the innovative output and financial performance: A study of publicly traded biotechnology companies. *Journal of Business Venturing* 17 (6): 577–608.

Hanney, S. R., M. A. Gonzalez-Block, M. J. Buxton, and M. Kogan. 2003. The utilization of health research in policy-making: Concepts, examples and methods of assessment. *Health Research Policy Systems* 1 (1).

Hedberg, B. 1981. *How organizations learn and unlearn.* New York: Oxford University Press.

Huber, G. P. 1991. Organization learning: The contributing processes and the literature. *Organization Science* 2 (1): 88–115.

Huberman, M. 1987. Steps toward an integrated model of research utilization. *Knowledge: Creation, Diffusion, Utilization* 8: 586–611.

———. 1994. Research utilization: The state of art. *Knowledge and Policy* 7 (4): 13–33.

Huberman, M., and G. Thurler. 1991. *From research to practice*. Bern, Switzerland: Peter Lang SA.

Kim, D. H. 1993. The link between individual and organizational learning. *Sloan Management Review* 35 (1): 37–50.

Kim, L. 1997a. The dynamics of Samsung's technological learning in semiconductors. *California Management Review* 39 (3): 86–100.

———. 1997b. *From imitation to innovation: The dynamics of Korea's technological learning*. Cambridge, MA: Harvard Business School Press.

———. 1998. Crisis construction and organizational learning: Capability building in catching-up at Hyundai Motor. *Organization Science* 9: 506–521.

Knorr, K. D. 1977. Producing and reproducing knowledge: Descriptive or constructive? Toward a model of research production. *Social Science Information* 16 (6): 669–696.

Knott, J., and A. Wildavsky. 1980. If dissemination is the solution, what is the problem? *Knowledge: Creation, Diffusion, Utilization* 1 (4): 537–578.

Knudsen, H. K., and P. M. Roman. 2004. Modeling the use of innovations in private treatment organizations: The role of absorptive capacity. *Journal of Substance Abuse Treatment* 26: 353–361.

Landry, R., N. Amara, and M. Lamari. 2001. Utilization of social science research knowledge in Canada. *Research Policy* 30: 333–349.

Landry, R., M. Lamari, and N. Amara. 2003. The extent and determinants of the utilization of university research in government agencies. *Public Administration Review* 63 (2): 192–205.

Lane, P., and M. Lubatkin. 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management Journal* 19 (5): 461–478.

Larsen, J., and P. Werner. 1981. Measuring utilization of mental health program consultation. In *Utilizing evaluation. Concepts and measurement techniques*, edited by J. A. Ciarlo, 77–96. Beverly Hills, CA: Sage.

Lee, R., and R. Staffeldt. 1977. Executive and legislative use of policy analysis in the state budgetary process: Survey results. *Policy Analysis* 3 (3): 395–406.

Lester, J. P. 1993. The utilization of policy analysis by state agency officials. *Knowledge: Creation, Diffusion, Utilization* 14 (3): 267–290.

Lester, J. P., and L. J. Wilds. 1990. The utilization of public policy analysis: A conceptual framework. *Evaluation and Program Planning* 13: 313–319.

Leung, P. 1992. Translation of knowledge into practice. In *NIDRR National CRP panel final report*, edited by Walcott and Associates. Washington, DC.

Levitt, B., and J. G. March. 1988. Organizational learning. *Annual Review of Sociology* 14: 319–340.

Lomas, J. 1990. Finding audiences, changing beliefs: The structure of research use in Canadian health policy. *Journal of Health Politics, Policy and Law* 15 (3): 525–541.

———. 1993. Diffusion, dissemination, and implementation: Who should do what? *Annals of the New York Academy of Sciences* 703 (1): 226–235.

———. 1997. Research and evidence-based decision-making. *Australian and New Zealand Journal of Public Health* 21 (5): 439–441.

———. 2000. Using "Linkage and Exchange" to move research into policy at a Canadian foundation. *Health Affairs* 19 (3): 236–240.

Machlup, F. 1980. *Knowledge and knowledge production.* Princeton, NJ: Princeton University Press.

MacLean, D. R. 1996. Positioning dissemination in public health policy. *Canadian Journal of Public Health* 87 (2): 40–43.

March, J., and H. Simon. 1958. *Organizations*. New York: Wiley.

Mohrman, S. A., C. B. Gibson, and A. M. Mohrman, Jr. 2001. Doing research that is useful to practice: A model and empirical exploration. *Academy of Management Journal* 44 (2): 357–375.

Morrison, J., and M. Weiser. 1994. A research framework for empirical studies in organizational memory. *Proceedings of the 29th annual Hawaii International Conference on System Sciences on System Sciences*, IEEE Computer Society Press.

Mowday, R. T. 1997. Presidential address: Reaffirming our scholarly values. *Academy of Management Review* 22: 335–345.

Mowday, R. T., and R. I. Sutton. 1993. Organizational behavior: Linking individual and groups to organizational contexts. *Annual Review of Psychology* 44: 195–229.

Mowery, D. C., J. E. Oxley, and B. S. Silverman. 1996. Strategic alliances and interfirm knowledge transfer. *Strategic Management Journal* 17: 77–91.

Nicolini, D., and M. Meznar. 1995. The social construction of organizational learning: Conceptual and practical issues in the field. *Human Relations* 48 (7): 727–746.

Nonaka, I. 1994. A dynamic theory of organizational learning creation. *Organization Science* 5 (1): 14–37.

Nunnally, J. C. 1967. *Psychometric theory*. New York: McGraw-Hill.

———. 1978. *Psychometric theory*. New York: McGraw-Hill.

Nyden, P., and W. Wiewel. 1992. Collaborative research: Harnessing the tensions between researchers and practitioners. *The American Sociologist* 23 (4): 43–55.

Oh, C. H. 1997. Issues for new thinking of knowledge utilization: Introductory remarks. *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization* 10 (3): 3–10.

———. 2000. Science and Politics: A view from an information utilization perspective. Paper presented at the International Political Science Association World Congress, Quebec City, Canada, July 29–August 1.

Oh, C. H., and R. F. Rich. 1996. Explaining use of information in public policymaking. *Knowledge and Policy* 9 (1): 3–35.

Orlandi, M. A. 1996. Health promotion technology transfer: Organizational perspectives. *Canadian Journal of Public Health* 87 (2): 28–33.

Paradice, D. B., and J. F. Courtney. 1989. Organizational knowledge management. *Information Resources Management Journal* 2 (3): 1–13.

Pelz, D. C., and J. A. Horsley. 1981. Measuring utilization of nursing research. In *Utilizing evaluation*, edited by J. A. Ciarlo. Beverly Hills, CA: Sage.

Pondy, L. R., and I. I. Mitroff. 1979. Beyond open systems models of organization. In *Research in organizational behavior,* vol. 1, edited by B. Staw, 3–39. Greenwich, CT: JAI Press.

Prahalad, C. K., and G. Hamel. 1990. The core competence of the corporation. *Harvard Business Review* 68: 79–91.

Rich, R. F. 1979. The pursuit of knowledge. *Knowledge: Creation, Diffusion, Utilization* 1: 6–30.

———. 1991. Knowledge creation, dissemination, and utilization. *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization* 12 (3): 319–337.

———. 1997. Measuring knowledge utilization process and outcomes. *Knowledge and Policy*: *The International Journal of Knowledge Transfer and Utilization* 10(3): 3–10.

Rich, R. F., and C. H. Oh. 1993. The utilization of policy research. In *Encyclopedia of policy studies*, edited by S. Nagel. New York: Marcel Dekkar.

———. 2000. Rationality and use of information in policy decisions: A search for alternatives. *Science Communication* 22: 173–211.

Sabatier, P. 1978. The acquisition and utilization of technical information by administrative agencies. *Administrative Science Quarterly* 23: 396–417.

Sandelands, L., and R. Stablein. 1987. The concept of organizational mind. *Research in the Sociology of Organizations* 5: 135–161.

Schein, E. 1985. *Organizational culture and leadership*. San Francisco: Jossey-Bass.

Schneider, S. C., and R. Angelmar. 1993. Cognition in organizational analysis: Who's minding the store? *Organizational Studies* 14 (3): 347–374.

Scott's Government Index. 2001. Don Mills, Ontario: Southam Information Products.

Senge, P. 1990. *The fifth discipline: The art and practice of the learning organization*. New York: Bantam Doubleday.

Shrivastava, P. 1983. A typology of organizational learning systems. *Journal of Management Studies* 20 (1): 7–28.

Silverside, A. 1997. Dissemination of research results to clinicians an art in itself. *Canadian Medical Association Journal* 156 (12): 1746–1747.

Stein, E. W., and V. Zwass. 1995. Actualizing organizational memory with information technology. *Information Systems Research* 6 (2): 85–117.

Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal* 17: 27–43.

Teece, D. J., G. Pisano, and A. Shuen. 1990. Firm capabilities, resources and the concept of strategy. Consortium on Competitiveness and Cooperation. Working Paper, No. 90-9, Center for Research in Management, University of California, Berkeley.

Tuomi, I. 1996. The communicative view on organizational memory: Power and ambiguity in knowledge creation systems. *Proceedings of the Hawaii International Conference on System Sciences* 3: 147–155.

Tushman, M. L., and D. A. Nadler. 1978. Information processing as an integrative concept in organizational design. *Academy of Management Review* 3 (3): 613–624.

Unrau, Y., and J. McDonald. 1995. *The frequency, nature, and impact of faculty influence on policy external to the University of Calgary*. The University of Calgary, Calgary.

Webber, D. J. 1987. Legislators' use of policy information. *American Behavioral Scientist* 30: 612–631.

Weick, K., and F. Westley. 1996. Organizational learning: Affirming an oxymoron. In *Handbook of organizational studies*, edited by S. Clegg, C. Hardy, and W. Nord. Thousand Oaks, CA: Sage.

Weick, K. E. 1969. *The social psychology of organizing*. Menlo Park, CA, London: Addison-Wesley.

———. 1979. *The social psychology of organizing*. Reading, MA: Addison-Wesley.

Whiteman, D. 1985. The fate of policy analysis in congressional decision-making: Three types of use in committees. *Western Political Quarterly* 38: 294–311.

Yanow, D. 2000. Seeing organizational learning: A cultural view. *Organization* 7 (2): 247–268.

Yin, R. K., and G. B. Moore. 1988. Lessons on the utilization of research from nine case experiences in the natural hazards field. *Knowledge in Society: The International Journal of Knowledge Transfer* 1 (3): 25–44.

Zahra, S., and G. George. 2002. Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review* 27 (2): 185–203.

Omar Belkhodja is an assistant professor in the Department of Management and Marketing at Virginia State University. He received his PhD in the Faculty of Business at Laval University in Quebec City.

Nabil Amara is an assistant professor in the Department of Management of the Faculty of Business at Laval University in Quebec City. He is currently a codirector of CHSRF/CIHR Chair on Transfer of Knowledge and Innovation.

Réjean Landry is the holder of a Chair on Knowledge Transfer and Innovation and professor in the Department of Management of the Faculty of Business at Laval University in Quebec City.

Mathieu Ouimet is an assistant professor in the Department of Political Science of the Faculty of Social Sciences at Laval University in Quebec City.