NOTE TO USERS

KNOWLEDGE MANAGEMENT STRATEGIES AND FIRM PERFORMANCE

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by

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ABSTRACT

In the recent past, organizations and researchers have turned their attention to knowledge management (KM). Many disciplines have contributed to the growth and evolution of knowledge management. Consequently, KM has become a rich field of inquiry, and many disparate approaches and strategies have been suggested for managing knowledge. However, the effect of different KM strategies on firm performance is not known. This study examined the effect of different types of KM strategies on firm performance.

This study developed three different strategy types to manage knowledge and examined their effect on firm performance. The three types of KM strategies are: IT-centered KM strategy, capture-based KM strategy and learning-based KM strategy. Further, this study conceptualized two types of performance: short-term performance and long-term performance. The study linked the three KM strategies to short-term and long-term performance by integrating the insights from the literatures on Organizational Learning and Knowledge Management. It argued that IT-centered KM strategies in isolation yield neither short-term nor long-term performance benefits, capture-based KM strategies yield short-term performance and learning-based KM strategies yield long-term performance. These three strategies are complementary and yield better performance benefits when used simultaneously.

This document explains the research model and its empirical testing in a sample of firms from Canada. The study used a combination of survey and interview methods to understand knowledge management strategies and their effect on firm performance. The findings of this study suggest that learning-based KM strategies yield long-term performance whereas a combination of IT-centered and capture-based KM strategies yields short-term performance. Combining the survey and interview data, this study provides insights into the nature of the three KM strategies and their effect on firm performance.

This is the first research study that has integrated the literatures on Organizational Learning and Knowledge Management to comprehensively examine the relationship between KM strategies and firm performance. Consequently, this study extends the research and practice of knowledge management by explaining which knowledge management strategies influence firm performance and why.

Key Words: *Knowledge Management, Knowledge Management Strategies, Knowledge Strategies, Organizational Learning, Long-term Performance, Canada, Survey Research, PLS.*

DEDICATION

To my best friend and toughest critic ....

Sunita

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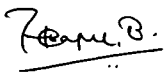

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CHAPTER 1. INTRODUCTION

Knowledge has increasingly been viewed as a source of competitive advantage (Grant, 1996a, 1996b; Spender, 1996). Not surprisingly, organizations have turned their attention to knowledge management (KM). According to one estimate, global corporate spending on KM services will increase from US$4.2 billion in 2003 to US$8.9 billion by 2006 (IDCGroup, 2002). However, companies that have invested in knowledge management have not realized the benefits they expected (KPMG, 2000). Some scholars argue that shifting the focus of organizational KM efforts from technology, to people and processes, is important for effectively and beneficially managing knowledge (Davenport & Prusak, 1999; McDermott, 1999). Some others assert that knowledge is a strategic imperative and, therefore, firms must develop strategies for managing knowledge (Bierly & Chakrabarti, 1996; Zack, 1999a).

Although the notion of strategically managing knowledge is intuitively appealing, no research evidence exists to support the contention that strategic management of organizational knowledge will yield performance benefits. Further, it is also not known what different strategies can be adopted to manage organizational knowledge. Accordingly, this study examined the broader question of knowledge management strategies and their effect on firm performance. In particular, this study examined two different, but related, questions: *(i) what are the different strategies to manage knowledge in an organization? (ii) what is the effect of different KM strategies on firm performance?*

To explore the research questions, this study drew upon the literature on Organizational Learning and Knowledge Management to develop three distinct types of knowledge management strategies: information technology-centered strategy, capture-based strategy, and learning-based strategy. Information technology (IT)-centered strategies arise when firms view knowledge as an *object* to be managed with IT infrastructure such as intranet, databases and shareware. Capture-based strategies arise when firms consider knowledge to be a *resource* to be exploited through repetitive use.

Learning-based strategies arise when firms believe that knowledge is a *process* and emphasize interactions between people to facilitate knowledge creation and sharing.

This study conceptualized performance as two distinct constructs: short-term performance and long-term performance; with the former referring to goal attainment reflected in financial and market performance of a firm and the latter referring to organizational processes such as innovation, employee satisfaction and leadership. This study hypothesized and examined the individual and combined effects of the three KM strategies on short-term and long-term firm performance. Based on the analysis of survey and interview data, this study finds that each of the KM strategies affects a different dimension of firm performance. The learning-based KM strategy influences the long-term performance of a firm. The IT-centered KM strategy and capture-based KM strategy complement each other to yield short-term performance benefits. Further, the study found that these three strategies are based on different, and perhaps contradictory, assumptions about knowledge management. The IT-centered KM strategy and capture-based KM strategy share similar assumptions about knowledge management. They both emphasize using the knowledge of employees to extract benefit for the firm. In contrast, the learning-based KM strategy emphasizes a mutual relationship between employees and organization. Therefore, IT-centered and capture-based KM strategies have the potential to counteract the learning processes and thus the benefits that firms can derive from a learning-based strategy.

This study contributes to KM research by:

- Integrating the insights from organizational knowledge and organizational learning literatures to infuse theoretical rigor to the Knowledge Management literature and open fresh avenues for research inquiry
- Distinguishing between three types of KM strategies and examining their effect on firm performance, and
- Infusing a process orientation into Knowledge Management to shift attention to learning issues from the current focus on technology and systems.

This study contributes to KM practice by

- Clarifying KM content and practices to guide KM efforts
- Informing which KM strategies must be employed to achieve organizational objectives, and
- Providing insights about the various actions in the sphere of KM that yield short-term and long-term performance.

The thesis is organized into seven chapters. Chapter 1 provides an overview of the research question. Chapter 2 provides a review of the literature on knowledge management and develops the concept of knowledge management strategy. Chapter 3 develops three knowledge management strategies and proposes a model linking them with short-term and long-term firm performance. Chapter 4 presents the methodology used to test the research model. Chapter 5 presents the analysis and results. Chapter 6 discusses the study findings, including implications for research and practice, study limitations and future research directions. Finally, Chapter 7 offers a few concluding remarks.

CHAPTER 2. LITERATURE REVIEW

This chapter presents a review of the relevant background literature that helps to understand the research question. The first section describes the evolution of knowledge management and the perspectives through which major disciplines have approached knowledge management. The second section defines the concept of knowledge management and compares and contrasts it with other related concepts such as dynamic capabilities and absorptive capacity. The third section discusses the notion of knowledge management strategy and contrasts it with knowledge management.

2.1 Evolution of Knowledge Management

The expression, 'knowledge management', has been used in the literature for over a decade now. Its evolution has been traced by many scholars (Ponzi, 2002; Wiig, 1997). The doctoral dissertation of Ponzi (2002) traced the evolution and intellectual development of knowledge management in a very comprehensive manner by using bibliometric techniques. According to Ponzi (2002), knowledge management was born in the early 1990s and grew very slowly until 1995. The KM literature grew exponentially from 1996 through 1999; it contracted in 2000, only to rebound in the following year. The evolution of KM suggests that it has lived longer than a 'fad' and has followed the cycle of a 'management fashion' (Ponzi, 2002).

During the early formation of KM research (1991-1995), computer science and the business strategy literature played a principal part; with computer science contributing a major share and business strategy contributing a minor share (Ponzi, 2002). The computer science literature viewed knowledge as an 'object' that can be managed better with the help of IT (Ponzi, 2002). The business strategy literature featured a few authors (Hedlund, 1994; Nonaka, 1994) but they were responsible for repositioning KM as a 'social process' rather than an 'IT-driven concept' (Ponzi, 2002).

During the expansion phase (1996-1999), the KM literature grew at an exponential rate and the disciplinary breadth increased from three disciplines (computer science, business, and library and information sciences) in 1995, to thirteen disciplines in 1999. The literature published in the popular press, that is un-refereed articles, grew by 1,425 percent during this period while the academic literature grew by 674 percent (Ponzi, 2002). The most prolific publication sources during this period were computer-related popular press publications which emphasized IT tools for managing knowledge: Information Week, Computer World, CIO, Infoworld, and Computer Reseller News. However, the five most commonly cited publications (i.e., Argyris & Schon, 1978; Nonaka, 1994; Nonaka & Takeuchi, 1995; Polanyi, 1966; Senge, 1990) originated from the organizational science literature, which emphasized the process aspects of knowledge management. In the context of KM, this period marked a shift from 'IT as databases' to 'IT as a communication and collaborative technology' (Ponzi, 2002).

In the year 2000, the KM literature contracted by about 20 percent. The decreased interest in KM in the popular press was attributable to two factors: KM investments were not yielding returns and the dot-com bubble had burst. However, the academic literature continued to grow at a steady rate (Ponzi, 2002).

Besides Ponzi (2002), several other researchers have noted the exponential growth in the literature that falls broadly under the umbrella of 'knowledge management' (Crossan & Guatto, 1996). Commenting on the KM literature, Vera and Crossan (2003) noted the prevalence of an IT perspective in KM and suggest that KM can be better understood by contrasting it with 'organizational knowledge' and 'organizational learning'. The observations of Vera and Crossan (2003) are similar to the observations of Ponzi (2002) who noted that the IT perspective was prevalent in the popular press and an organization science perspective was common in academic literature. In order to better understand the viewpoints forwarded by these streams, the following few paragraphs discuss knowledge management from the perspectives of IT, organizational knowledge and organizational learning.

2.1.1 Knowledge management - An information technology perspective

The literature on KM in the IT discipline viewed knowledge as an object that information technology could manage (Ponzi, 2002). Viewing knowledge as an object is similar to viewing it as a physical item that can be bought and placed wherever it is required. In other words, this perspective viewed knowledge as information that has the qualities of an object, for example, easy mobility. As a result, this perspective suggested that KM is closely linked to the management of information technology and prescribed the following tools and solutions for managing knowledge: intranets, data warehousing/knowledge repositories, groupware/shareware, document management systems and decision support systems (Ruggles, 1998).

The IT literature and developments in technology have had a major impact on knowledge management practices. For example, Gray (2002) identified the following as KM practices: co-location, communities of practice, electronic discussion groups, e-mail, instant messaging, intranets, knowledge maps, knowledge repositories, mentoring, printed publications, telephones, and training (Gray, 2002). It may be noted that at least half of these 12 practices rests on IT infrastructure. These KM practices point to the impact that IT has on the manner in which KM has been viewed by organizations.

2.1.2 Knowledge management - An organizational knowledge perspective

In contrast to the IT perspective on KM, which is mostly practitioner-driven, the literature on Organizational Knowledge has stronger research foundations (Vera & Crossan, 2003). Rooted in the resource-based view of the firm (Barney, 1986, 1991) and the knowledge-based view of the firm (Grant, 1996a, 1996b; Kogut & Zander, 1996; Spender, 1996), this research views knowledge as a key firm resource that can provide competitive advantage. In particular, the knowledge-based view asserts that firms exist because they are superior mechanisms to markets for integrating and transferring

knowledge (Kogut & Zander, 1992). Consequently, much of the research in this stream has emphasized the need to exploit knowledge available in the organization.

The research on organizational knowledge has also examined epistemological and ontological questions related to knowledge. Knowledge has been defined by researchers in many different ways; from *what is known* to *what provides insight*. Among the most commonly found definitions are: (i) knowledge is a justified true belief (Nonaka, 1994:15), (ii) knowledge is a justified personal belief that increases an individual's capacity to take effective action (Alavi & Leidner, 1999:109), (iii) knowledge is a fluid mix of framed experiences, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information (Davenport & Prusak, 1999:5), and (iv) knowledge is information whose validity has been established through tests of proof (Liebeskind, 1996:94).

Despite the vibrant research in the stream of organizational knowledge, this body of work is mainly concerned with 'understanding the nature of knowledge as an asset or a stock' and has 'a more static view of knowledge' (Vera & Crossan, 2003:128). On the other hand, the field of Organizational Learning takes a dynamic view of knowledge and is concerned with how knowledge changes. Simply put, Organizational Learning research asserts that learning is a process that creates and develops knowledge (an outcome), which influences further learning (Vera & Crossan, 2003).

2.1.3 Knowledge management - An organizational learning perspective

Organizational learning has received increased attention from researchers and practitioners alike as a means of addressing how firms respond to rapidly changing environments (Crossan & Guatto, 1996). Many researchers suggest that the only sustainable competitive advantage may be an organization's ability to learn faster than its competitors (DeGeus, 1988; Stata, 1989). Several research models and frameworks explain how learning occurs at the individual, group and organizational level. Notable

among the organizational learning models are: single-loop and double-loop learning (Argyris & Schon, 1978), exploitation–exploration (March, 1991), and information acquisition, information distribution, information interpretation, and organizational memory (Huber, 1991).

More recent research in organizational learning, such as the 4I framework of organizational learning proposed by Crossan, Lane and White (1999) integrated previous work on organizational learning. According to the 4I framework, organizational learning occurs across three levels of the organization: individual, group and organization. These three levels of organizational learning are linked by four broad categories of social and psychological processes: *intuiting, interpreting, integrating and institutionalizing* (4Is). These processes (4Is) link the three levels of analysis through the feed-forward and feed-back loops of learning. Feed-forward learning refers to how individual learning feeds forward into group learning and learning at the organizational level (e.g. changes to structure, systems, products, strategy, procedures and culture). Feed-back learning refers to whether and how the learning that is embedded in the organization (e.g. systems, structure, and strategy) affects individual and group learning (Crossan, Lane & White, 1999). In short, organizational learning occurs when knowledgeable individuals freely interact in groups and such groups in the organization openly interact with each other.

2.2 Knowledge Management – Understanding and Definition

Despite the voluminous literature on KM, there is no readily accepted definition of knowledge management (Earl, 2001). Some of the definitions found in the literature are presented in Table 2.1, along with a brief comment on the focus of each definition.

Table 2.1. Definitions of Knowledge Management

Author	Definition	Focus
Bassi, 1997	KM is 'the process of creating, capturing, and using knowledge to enhance organizational performance' (p.26).	Comprehensive; belief that knowledge can confer competitive advantage is less pronounced.
Duhon, 1998	KM is 'a combination of *technology* supporting a strategy for sharing and using both the brain power resident within an organization's employees and internal and external information found in 'information containers' (primarily documents). The goal of KM is to simultaneously manage data, information, and explicit knowledge while leveraging the information resident in peoples' heads (tacit knowledge) through a combination of *technology* and *management practices*' (p.9).	Broad definition but primary focus on technology and explicit knowledge. Secondary focus on management practices for tacit knowledge.
Gray, 2002	'KM practices are tools and approaches used to improve individuals' ability to access knowledge that is held by others in an organization' (p.10).	Access to knowledge held by other employees.
Knapp, 1998	KM is 'a set of processes for *transferring intellectual capital (IC) to value* - processes such as innovation and knowledge creation, knowledge acquisition, organization, application, sharing, and replenishment' (p.3).	Broad definition; all processes aimed at generating value from IC could be KM. Primary focus on exploiting people's knowledge and skills.
Liebowitz & Wilcox, 1997	KM is the 'ability of organizations to manage, store, value, and distribute knowledge' (Preface).	Technology-driven KM.
O'Dell & Grayson, 1998	'The process of identifying, capturing, and leveraging knowledge to help the company compete' (p.154).	Focus on exploiting the existing knowledge.
O'Leary, 1998b	KM is 'the formal management of knowledge for facilitating creation, access and reuse of knowledge, typically using advanced technology' (p.34).	Technology-driven KM; primary focus on access and reuse.
Spek & Spijkervet, 1997	KM is 'the explicit control and management of knowledge within an organization aimed at achieving the company's objectives' (p.43).	Belief that knowledge can confer competitive advantage is less pronounced.
Wiig, 1997	The objectives of KM are '(a) to make the enterprise act as intelligently as possible to secure its viability and overall success, and (b) to otherwise realize the best value of its knowledge assets' (p.1).	Broad objectives, yet focus is on exploiting the existing knowledge.

The existing definitions of KM indicate the following: (a) the definitions mainly highlight the information processing aspects of knowledge management, such as capture, refinement, storage, retrieval and distribution; (b) most of the definitions have been proposed by practitioners and consultants writing for the popular press. Although researchers in the organization science stream, initially Nonaka and Hedlund and later others, have used the phrase 'knowledge management', they have not defined it; (c) most of the definitions focus on managing the knowledge already existing within the organization but do not consider the importance of knowledge creation, which is the source of competitive advantage (Nonaka, 1994); and (d) most of the definitions focus on making the knowledge available but pay little attention to developing the capabilities that are needed to utilize the available knowledge, which determines the extent to which a firm benefits from its knowledge (Haas & Hansen, 2005). In short, each of the existing definitions of knowledge management focuses on a limited aspect of organizational knowledge management.

The existing definitions of knowledge management might have focused on a limited domain because they have been forwarded from different perspectives. Armed with high power computing and communication tools, the information technology discipline viewed KM as a technical activity of providing IT, which stores the information. Scholars in the Organizational Knowledge literature viewed knowledge as an asset and emphasized the need to leverage it. The research in Organizational Learning pointed to the importance of learning processes that create knowledge. However, no effort has been made to integrate these different perspectives. Perhaps, this is one of the reasons why much of the literature on KM has taken an IT approach and even viewed knowledge as an asset (Davenport, Long & Beers, 1998), but the much needed focus on processes has been missing (McDermott, 1999; Ruggles, 1998). This research combines the insights from various perspectives and adopts the following definition of KM: '*Knowledge management is a set of practices and processes to acquire and apply knowledge to facilitate organizational operations*'.

In the definition of KM adopted in this study, the phrase 'process of acquiring' is used to reflect the 'process of acquiring knowledge and creating knowledge'. Therefore, it includes the acquisition of existing knowledge from within and outside the firm boundaries. Further, it also includes the process of creating new knowledge. The phrase 'applying' is used to reflect activities such as capturing, storing, accessing and transferring knowledge that may be necessary before knowledge can be applied to fulfil organizational requirements.

In contrast to the existing definitions, the definition used here underscores the following: (a) KM is a process and practice rather than a system that contains knowledge; (b) KM is not merely about identifying/creating, capturing, storing and retrieving knowledge but also includes the application of knowledge; and (c) unlike other definitions which assume that KM automatically leads to improved organizational performance, the definition here clearly states the need to gear KM to improve organizational operations. In other words, KM does not automatically yield performance benefits.

The definition of KM adopted in this study integrates various approaches to KM. First, it shifts attention beyond the role of IT and emphasizes the process and practice components of KM. Second, it places an equal emphasis on creating and using knowledge. Finally, by infusing a process focus into both the knowledge creation and knowledge utilization components of KM, it highlights the importance of learning as a means of managing knowledge. In the next few paragraphs, the definition of KM presented in this study is compared and contrasted with related notions of 'absorptive capacity' and 'dynamic capabilities'.

2.2.1 Knowledge management, absorptive capacity and dynamic capabilities

For about a decade, absorptive capacity has been viewed as the ability of firms to identify, acquire and assimilate new knowledge from outside sources (Cohen &

Levinthal, 1990). In contrast, dynamic capabilities are the organizational routines and processes that enable organizational change and evolution (Eisenhardt & Martin, 2000; Teece, Pisano & Shuen, 1997; Zollo & Winter, 2002). In other words, absorptive capacity had an external focus whereas dynamic capabilities had an internal focus. However, recently efforts have been made to integrate these two notions. Accordingly, absorptive capacity has been proposed as an antecedent of dynamic capability that influences competitive advantage (Zahra & George, 2002). Absorptive capacity has been defined as 'a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability' (Zahra & George, 2002:186).

The definition of KM presented in this study is similar to the notion of absorptive capacity in terms of its emphasis on acquiring and applying knowledge. However, there are some important differences as well. First, KM is concerned with applying knowledge to improve organizational performance whereas absorptive capacity produces a dynamic organizational capability, which in turn influences performance. This distinction reflects the nature of KM and dynamic capabilities and the different manners in which they create and sustain competitive advantage. Researchers assert that dynamic capabilities create and sustain competitive advantage through change and adaptation (Teece *et al.*, 1997). The KM definition here does not presuppose change and adaptation as a prerequisite for competitive advantage because capabilities can exist and improve performance even without environmental adaptation (Zollo & Winter, 2002). This argument is further clarified in the next chapter where KM is linked to both the short-term and long-term performance of firms. Second, KM is concerned equally with knowledge creation and knowledge acquisition, whereas absorptive capacity is concerned largely with acquiring knowledge from outside the firm boundaries and assimilating it. Third, KM is a set of practices and processes aimed at knowledge acquisition and application, whereas absorptive capacity is a set of routines and processes. The former highlights the practice and action that are associated with knowledge management and emphasizes application of knowledge. In other words, KM refers to visible and direct practices. In contrast, absorptive capacity emphasizes the routines and processes, which are not necessarily

direct, visible and known. The routines and processes that constitute absorptive capacity are tacit and form the fabric that facilitates several organizational actions such as innovation and adaptation. Relatively speaking, KM is more action and practice oriented, whereas absorptive capacity is more capability and process oriented. KM is an activity that is consciously managed whereas absorptive capacity is a construct that is inferred through firm actions. Finally, absorptive capacity is determined by the existing knowledge base of the company that identifies external knowledge and acquires it and the social integration mechanisms that assimilate it (Zahra & George, 2002). In contrast, KM does not rest on existing knowledge but tries to expand the existing knowledge base. In other words, absorptive capacity is limited by existing knowledge bases whereas KM tries to expand the existing knowledge base. These differences are summarized in Table 2.2.

Table 2.2. Distinction Between KM and Absorptive Capacity

Atribute	Knowledge Management	Absorptive Capacity
Source of knowledge	Largely internal	Largely external
Managerial challenges	Creating and applying knowledge	Acquiring and assimilating external knowledge
Role of existing knowledge	Expands existing knowledge	Limited by existing knowledge
Mechanism through which performance is affected	Improved organizational operations and innovations	Environmental adaptation
Orientation	Practice and managerial action	Tacit capabilities
Nature of knowing	Direct and visible	Indirect and inferred
Consequences	Performance (long-term and short-term)	Dynamic capabilities and adaptation
Antecedents	Unknown; managerial actions	Existing knowledge base, prior experience, social integration mechanisms

Despite the differences between the notions of knowledge management and absorptive capacity, they have a lot in common. Both are concerned with managing organizational knowledge to gain competitive advantage. Both consider knowledge to be a source of competitive advantage and emphasize knowledge and its utilization. Consequently, KM can be broadly viewed as a firm's efforts to enhance its absorptive capacity. Many scholars have argued that absorptive capacity yields competitive

advantage (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Lane, Salk & Lyles, 2001; Zahra & George, 2002). Similarly, many have also argued that strategic management of knowledge yields performance benefits (Davenport & Prusak, 1999; Zack, 1999a). Accordingly, the next section is aimed at understanding the notion of strategic management of knowledge.

2.3 Knowledge Management Strategies

Many scholars have argued that knowledge management can provide performance benefits (Grant, 1996a, 1996b; Hedlund, 1994; Spender, 1996). Consequently, much research has examined various aspects of knowledge. Empirical research has established the factors that contribute to knowledge stickiness (Simonin, 1999; Szulanski, 1996), the relative effectiveness of various KM tools in seeking knowledge (Olivera, 2000), the role of trust in sharing knowledge (Andrews & Delahaye, 2000), and the role of organizational structure in knowledge flows (Schulz, 2001). However, very little research has focused on the relationship between knowledge management strategies and firm performance. A notable exception to this was the study by Bierly & Chakrabarti (1996).

Studying the U.S. pharmaceutical industry, Bierly and Chakrabarti categorized firms into four generic knowledge strategy groups: innovators, loners, exploiters and explorers. They viewed knowledge strategy as a firm's collective responses to four strategic choices that shape and direct the organization's learning process: *internal vs. external learning, incremental vs. radical learning, slow vs. fast learning and broad vs. deep knowledge base*. These choices, either explicitly declared by the top management or implied by their actions, determine a firm's knowledge base (Bierly & Chakrabarti, 1996:123-124).

Bierly and Chakrabarti (1996) viewed knowledge strategy from a macro perspective and as a managerial choice. Other scholars (for example, Clarke, 1998; Zack, 1999a) have also viewed knowledge strategy from a macro perspective. These scholars

recommend that firms analyze the business environment to understand what knowledge is critical to competitive advantage. Then, firms should identify and address knowledge gaps (that is where the firm needs more of the crucial knowledge) and surpluses (that is where the firm has more of the crucial knowledge than it needs) (Zack, 1999a).

Knowledge strategy is, however, different from knowledge management strategy, as explained by Zack: 'Knowledge strategy is oriented towards understanding what knowledge is strategic and why. Knowledge management strategy guides and defines the processes and infrastructure (organizational and technological) for managing knowledge' (Zack, 2002:271). The notion of knowledge strategy relates to how a firm approaches its knowledge needs whereas KM strategy relates to how it approaches knowledge management as an activity.

The conceptual distinction between 'knowledge strategy' and 'knowledge management strategy' made by Zack (2002) is echoed in other works. For example, Earl (2001) recommends that firms must analyze and manage knowledge gaps with the help of three broad knowledge management strategies: technocratic, economic and behavioral. These three strategies are further subdivided into seven different strategies: technocratic (systems, cartographic and engineering), economic (commercial) and behavioral (organizational, spatial and strategic). These strategies differ in their focus, aim and critical success factors (Earl, 2001).

In line with the view that strategy is reflected in the actions of the firm (Mintzberg, Ahlstrand & Lampel, 1998) and can be clarified based on firm actions (Bierly & Chakrabarti, 1996), this research defines knowledge management strategy as *a theme that guides and defines a firm's knowledge management efforts*. Further, similar to the view held by Bierly and Chakrabarti (1996), these actions may or may not have been labeled as KM by an organization but together they reflect a firm's knowledge management strategy.

In summary, there is an important distinction between 'knowledge management' and 'knowledge management strategy': knowledge management is a set of practices and processes whereas knowledge management strategy is the orientation/philosophy or the common thread that guides various activities of KM. The content of KM can change depending on a particular firm's needs and business context but the common underlying theme, that is the knowledge management strategy remains the same.

2.4 Chapter Summary

The following key points summarize the discussion in this chapter.

- Knowledge management has evolved as a result of contributions from several fields, particularly information technology and organization science.
- Knowledge management has been approached by various disciplines and researchers in different ways:
    - IT research viewed knowledge as an object that can be managed by information technology.
    - Organizational Knowledge research viewed knowledge as a resource; exploiting this resource provides competitive advantage.
    - Organizational Learning research viewed knowledge as a process of knowing that is enabled through interactions in an organization.
- Knowledge management is 'a set of practices and processes to acquire and apply knowledge to facilitate organizational operations' while knowledge management strategy is 'a theme that guides and defines the practices and processes that constitute a firm's knowledge management efforts.'

CHAPTER 3. THEORY DEVELOPMENT AND HYPOTHESES

The purpose of this chapter is to theoretically develop different KM strategies and hypothesize how they affect firm performance. This chapter is divided into two sections. The first section develops the constructs of interest; the second section develops hypotheses linking those constructs.

3.1 Construct Development

Based on the views about the nature of knowledge and its management found in the literature, this section theoretically develops three types of strategies for managing knowledge: IT-centered, capture-based, and learning-based. In IT-centred KM strategy, the organization simply installs technological tools with an expectation that knowledge will get managed due to the availability of technology. In a capture-based KM strategy, the organization focuses on capturing knowledge through codifying and storing it in repositories so that the existing knowledge may be reused. Learning-based KM strategy asserts that learning is central to managing organizational knowledge. These three strategies are explained in this section, followed by a summary comparison that distinguishes each from the rest. Further, this section also develops the notion of performance by discussing two types of performance: short-term performance and long-term performance. Short-term performance is a measure of goal attainment while long-term performance is a measure of organizational processes that help firms in their long-term success and survival.

3.1.1 IT-centered KM strategy

The KM literature is dominated by the role of IT in managing knowledge. There is much anecdotal evidence that highlights the savings made by firms that employed IT solutions. In clarifying the boundaries of KM, organizational learning and organizational knowledge, Vera and Crossan (2003) suggest that KM is mainly concerned with

providing managers information technology solutions and prescriptions about how to proactively manage knowledge in organizations. The literature on KM mainly emphasizes IT and underscores the need to proactively manage knowledge but offers very little guidance about how to do it, except prescribing tools such as groupware, document management systems, email and internet. Not surprisingly, most organizations view KM as equivalent to providing technology infrastructure.

Information technology is considered to be one of the central drivers of knowledge management (Davenport & Prusak, 1999). Some scholars note that corporate efforts to manage knowledge is an important reason for the growth in adoption of technology tools such as intranets (Scott, 1998). Further, information systems planning methods have been deployed to implement knowledge management and to design its management processes (Gold, Malhotra & Segars, 2001; Kim, Yu & Lee, 2003).

The emphasis placed on IT in the KM literature and in practice has resulted in two types of KM activities: (i) those that are aimed at providing technology, and (ii) those that are aimed at codifying employee knowledge. This distinction is well articulated by Bassi (1997): 'In general, two types of activities fall under the rubric of knowledge management. The most common are efforts to facilitate the sharing of knowledge. Typically, they are technology-based, and they rely on interactive software, such as groupware. The other type of activity involves efforts to codify knowledge by documenting and appropriating individual knowledge' (p.26).

The efforts to provide technological tools gives rise to what can be termed as 'IT-centered KM strategy'. Firms that adopt such a strategy make investments in providing technological infrastructure with the expectation that employees will use the technology to share knowledge. Providing technological tools is a somewhat passive approach to knowledge management. So is appointing Chief Knowledge Officers (CKOs). Firms believe that providing technology and creating knowledge roles will ensure that knowledge gets managed. In other words, firms following this strategy approach KM in a tangible and visible manner, that is providing technology and creating a CKO position.

They do not, however, engage the organization in using those technologies or in creating and sharing knowledge. Accordingly, for the purposes of this research, IT-centered KM strategy has been defined as *'an emphasis on providing basic IT infrastructure and creating visible KM roles'.*

In IT-centered KM strategy, information technology is central to KM. Firms following such a strategy believe that knowledge can be managed by placing IT tools in an organization and relying on technology to deliver KM. The term technology is not only used to indicate the technological tools such as internet, intranets and collaboration software but also to reflect a mindset that knowledge can be managed through some known and tangible tools. These tools include computer hardware and software as well as hiring a Knowledge Manager or a Chief Knowledge Officer (CKO) – like technology that reveals itself once bought, once hired, the CKO is expected to reveal to the organization how to manage knowledge.

Research indicated that many organizations follow an IT-centered approach to knowledge management. A survey of 431 U.S. and European organizations indicated that both planned and implemented KM efforts were related to IT (Ruggles, 1998). The KM efforts implemented included: intranet, decision support tools and groupware. High priority KM activities planned were: mapping sources of internal expertise, creating networks of knowledge workers and establishing new knowledge roles (Ruggles, 1998).

In short, IT-centered KM strategy stems from the belief that organizational knowledge will be managed once technology is in place. As organizational members and the CKO use the technology, some general information will be collected, which is unlikely to be of any use to other organizational members in applying it to organizational operations. For example, the information will be what can be found on a company web site such as annual reports, policies and current events. An IT-centered KM strategy involves providing IT tools and creating KM roles. However, it does not involve actively codifying organizational knowledge and making it accessible to everyone in the

organization. These aspects are reflected in a capture-based strategy, as explained in the following section.

3.1.2 Capture-based KM strategy

The proponents of the knowledge-based view of the firm (KBV) (Conner & Prahalad, 1996; Grant, 1996a, 1996b; Liebeskind, 1996; Spender, 1996) suggest that firms exist because they are superior to markets in managing knowledge. The KBV asserts that firms substitute superior knowledge of one individual for the inferior knowledge of another, through mechanisms such as instructions, directions and routines (Conner & Prahalad, 1996). The KBV suggests that knowledge is an intangible asset that poses difficulties in appropriation and protection. However, firms manage to appropriate and protect knowledge through incentive alignment, employment contracts and by reordering rewards over time and between knowledge creators (Liebeskind, 1996). Consequently, firms try to 'capture the knowledge of specialists in knowledge bases which other specialists or qualified people can use' (Earl, 2001:218). Such efforts give rise to capture-based KM strategy, defined as: *an emphasis on codifying organizational knowledge for storage in repositories and on protecting organizational knowledge from leakages and misappropriation.*

The capture-based KM strategy views knowledge as an entity separate from the people who create and use it. Consequently, firms following this strategy store documents in repositories from where they can be easily retrieved (Davenport *et al.*, 1998). Davenport and his colleagues found three basic types of repositories: '(1) external knowledge, for example, competitive intelligence; (2) structured internal knowledge, such as research reports, product-oriented marketing materials, and techniques and methods; and (3) informal internal knowledge, like discussion databases full of know-how' (Davenport *et al.*, 1998:45). The structured internal knowledge is usually codified knowledge, often available in printed or printable form and stored in the repositories. The informal internal knowledge is stored by capturing conversations on discussion boards

and email systems. The repositories containing the informal internal knowledge try to capture the tacit experience and learning of employees. However, what gets captured is only the explicit component of employees' knowledge and experience. The tacit components of employee knowledge are unraveled only through social interactions (Nonaka, 1994).

The essence of a capture-based KM strategy is in capturing and storing relevant knowledge of employees. It is possible to manage a repository without IT tools. For example, a collection of research reports, presentations and articles can be stored and retrieved in an old-fashioned library-like manner without the aid of IT tools. However, such visualization and management is impractical given the prevalence of IT systems in every aspect of organizational life. Therefore, IT tools have an important role to play in a capture-based strategy. However, the capture-based strategy and IT-centered strategies are different. The primary focus of the former is capturing, storing and retrieving knowledge whereas the primary focus of the latter is merely providing IT tools. Although, theoretically speaking, the IT tools are not required for capture, the presence of IT tools is a necessary condition in the reality of organizational life. The IT infrastructure, however, is not a sufficient condition for capture; the efforts to capture, store and retrieve are the sufficient conditions for a capture-based strategy.

Firms that employ a capture-based strategy view KM as a tool to exploit their existing knowledge. Such firms have the following objectives for managing knowledge: capturing lessons learned, avoiding repeating mistakes and capturing expertise before it leaves (Davenport *et al.*, 1998). These objectives suggest that firms realize the importance of employees and the knowledge they carry. For example, Bruce Power, a Canadian independent power generator, implemented KM because it realized that about 50 percent of its staff were going to retire in a few years (Hilson, 2003).

In short, the capture-based strategy emphasizes codifying organizational knowledge and storing it in repositories. The stored knowledge is made accessible to other organizational members. The capture-based KM strategy does not, however,

manage tacit knowledge because tacit dimensions of knowledge are revealed only in social interactions. The aspect of social interactions and tacit knowledge transfer are reflected in the learning-based KM strategy.

3.1.3 Learning-based KM strategy

It is difficult to manage knowledge with the help of databases and protection systems because knowledge is not only explicit, but also tacit (Polanyi, 1966). Further, knowledge is not only a resource, as viewed by the capture-based KM strategy, but a process of knowing (Nonaka, 1994; Spender, 1996; Zack, 1999a). The literature on organizational learning has emphasized that learning is a process that creates knowledge (Vera & Crossan, 2003). The belief that learning is a means to create and manage knowledge is central to a learning-based KM strategy, defined in this study as *an emphasis on organizational learning that occurs through a two-way interaction between individuals, groups and the organization.*

The 4I framework of Crossan et al. (1999) suggests that learning occurs through four social and psychological processes: intuition, interpretation, integration and institutionalization (4Is). The 4Is are connected through feed-forward and feed-back flows in the 4I framework. In order for the feed-forward flow to occur, learning at the individual level (intuition) must travel through the group and organizational level (interpretation and integration) to become institutionalized learning at the organizational level. It is such institutionalized learning (or knowledge) embedded in the systems, strategy and processes of an organization that helps firms to exploit organizational knowledge (Crossan *et al.*, 1999). In other words, knowledge creation is very important for knowledge exploitation to occur.

For the feed-forward and feed-back flows to occur, certain facilitating conditions must be present. These conditions are represented in the Strategic Learning Assessment Map (SLAM), which is an operationalization of the 4I framework (Bontis, Crossan &

Hulland, 2002). According to SLAM, high learning stocks at the individual, group and organizational levels are necessary for organizational learning. Further, organizational support in the form of an open culture, tolerance for errors, sharing of ideas, critical examination of ideas presented by individuals, and transfer of learning from one group to another are some of the factors that influence feed-forward and feed-back flows (Bontis *et al.*, 2002).

The process of organizational knowledge creation has also been explained by Nonaka (1994) in his framework of Socialization-Externalization-Combination-Internalization. According to Nonaka, individual tacit knowledge gets externalized in a social context and moves to the level of organizational knowledge through combination and internalization. Meaningful conversations are central to creating and transferring knowledge (Crossan, 2003a, 2003b). Enabling such interactions is an integral part of a learning-based KM strategy. Therefore, the firms that follow a learning-based KM strategy define the objectives of KM in an overarching manner: leverage knowledge of the entire firm, share experiences, improve development process and embed knowledge in strategy (Davenport *et al.*, 1998).

In short, learning-based strategy focuses on creating organizational processes that help individuals to share knowledge in a group. Further, groups are encouraged to interact with each other to share their solutions. By defining the objectives of KM in an overarching manner, learning-based strategy enables people to look beyond what is known and create new solutions to organizational problems. Accordingly, there is a focus on knowledge creation. Also, high interactions between organizational members facilitate the transfer of both tacit and codified knowledge.

3.1.4 Distinguishing among the three KM strategies

The KM strategies explained in the preceding paragraphs can be distinguished from each other on a variety of factors such as the role of technology, beliefs about KM,

type of knowledge managed, and the component of KM that each of the strategies emphasizes. These distinctions are presented in Table 3.1 and explained in the following paragraphs.

Table 3.1. Distinctions Among the Three KM Strategies

	IT-Centered KM Strategy	Capture-based KM Strategy	Learning-based KM Strategy
Belief about how knowledge can be managed	Technology will manage knowledge	Capturing knowledge will create value	Creating knowledge through learning will manage knowledge.
Type of technology	Basic/ General	Advanced/ Specific	Not important; no specific technologies needed.
Role of technology	Central	Strong enabler (in practice)	Moderate to weak enabler.
Type of knowledge	Information	Codified knowledge	Tacit knowledge.
Focus of KM	Visibility	Knowledge utilization through access	Knowledge creation and transfer through interactions.
Role of people	Passive	One-way input into technology	Dynamic with two-way interactions across people.
Managerial challenge	Finding latest and useful IT tools	Motivating employees to share knowledge	Fostering a learning culture.
Definition of KM objectives	Unclear; Provide IT infrastructure to manage knowledge	Capture employee knowledge before they leave; Avoid repeating mistakes	Share experiences; embed learning into firm's strategic orientation
Level of awareness about KM	None	Knowledge sharing through contribution to repositories is important	Knowledge sharing is a social process
Direction of knowledge flow	Unknown	One-way: From employees to organization	Two-way: From employees to organization and vice versa

The IT-centered KM strategy merely focuses on placing basic IT tools in the organization with no active and focused effort at managing knowledge. It believes that once IT tools are in place, employees will interact using those tools, which automatically leads to knowledge management. The capture-based KM strategy believes that the knowledge held by employees is an invaluable resource, which the organization may lose

when they leave. Therefore, it focuses on codifying the knowledge of employees and capturing it in knowledge repositories and other organizational systems. Finally, the learning-based strategy believes that knowledgeable employees are the key for knowledge management. Knowledge is created and shared when employees are provided with a 'space' to express their ideas. Therefore, the learning-based KM strategy emphasizes interactions between/among people and developing people to ultimately benefit the company.

Although technology may be common to all three strategies, the type of technology employed and its role varies with each strategy. The IT-centered KM strategy employs basic technologies such as internet, intranets, computers and communication software. In IT-centered strategy, technology is central to KM. In capture-based strategy, technology plays an important role but the emphasis is more on codifying knowledge and exploiting it. For a capture-based strategy, IT tools offer a useful means for storing and retrieving codified knowledge. The technology employed differs and includes refined software and hardware to index, store and retrieve knowledge. In a learning-based strategy, the emphasis is on interactions and processes. As a result, technology will not play any important role but it will be used to the extent that it can facilitate interactions between people.

In IT-centered strategy, the focus on knowledge is very limited. An active effort to capture knowledge is missing in IT-centered strategy. Capture-based strategy focuses on explicit knowledge (or codifiable knowledge) but does not focus on tacit knowledge. Moreover, it focuses only on capturing existing knowledge but does not aim to create new knowledge. Learning-based strategy emphasizes the tacit dimension of knowledge and knowledge creation.

Firms following the IT-centered strategy view IT as a solution to KM and believe that knowledge will be managed if IT and a CKO are in place. Firms pursuing a capture-based strategy believe that knowledge resides with employees, whose expertise must be made available to all organizational members by codifying and capturing it. In contrast,

learning-based strategy stems from the belief that existing organizational knowledge is limited in its ability to solve organizational problems and that learning is a means to create and transfer knowledge.

Each of the three KM strategies focuses on a different component of KM. Therefore, although conceptually different from each other, these three strategies are not mutually exclusive. These strategies could complement each other in managing the different dimensions of knowledge and providing performance benefits.

3.1.5 Long-term and short-term performance

Organizational performance is 'a topic with voluminous literature spanning several disciplines but with little agreement on basic definitions and approaches' (Kanter & Brinkerhoff, 1981:321). Although profit-oriented organizations are said to have immediate tests of their performance in the form of profits and market measures, models that recognize the complexity of the performance construct differentiate 'at least three different kinds of performance: (i) *task effectiveness or goal attainment*, including output, results, efficiency, etc; (ii) *appropriate organizational structure and process*, including organizational characteristics, member satisfaction, motivation, communication links, internal conflict resolution, absence of strain between subgroups, etc; and (iii) *environmental adaptation*, including flexibility in the face of change, resource acquisition, longer-term adaptation and survival' (Kanter & Brinkerhoff, 1981:322).

Financial measures are the most frequently used measures of performance in strategy research. However, their validity is questionable because they are accounting measures and are subject to influence by managers, accountants and accounting methods (Kaplan, 1984). Further, each of these measures only captures a part of the performance. For example, return on sales (ROS) measures cost effectiveness but does not offer any information about the rate of return on capital invested (Kaplan, 1984). Moreover, accounting and economic measures do not examine the role of knowledge, technology and innovation, elements that are critical to the survival of modern organizations (Kaplan,

1984). Therefore, financial measures that indicate short-term performance of an organization must be supplemented with 'long-term performance measures such as product innovation, product leadership, employee skills and morale, or customer loyalty' (Kaplan, 1984:407).

Some researchers consider financial measures averaged over a period of three to five years to be an indicator of long-term performance (Kumar & Sopariwala, 1992), but these measures too are subject to biases because they are derived from accounting measures. In order to overcome the problems with accounting measures, some researchers suggest using market measures of performance such as Tobin's *q* or its equivalent 'Market Value Added' (MVA) (Baliga, Moyer & Rao, 1996). However, Tobin's *q* and MVA are subject to market fluctuations and are influenced by non-firm factors. Also, the value of intangibles is either undervalued or overvalued by the market. Therefore, in order to derive a better picture of performance, it is advisable to use 'less precise and more ambiguous performance measures' (Kaplan, 1984:415). Accordingly, this study considered both financial and non-financial measures. Financial measures correspond to the 'outputs' whereas non-financial measures correspond to 'organizational processes' and 'adaptation', as discussed by Kanter and Brinkerhoff (1981).

In line with Kanter and Brinkerhoff (1981) and Kaplan (1984), for the purposes of this research, short-term performance is: '*goal attainment, reflected in the current financial and market performance of a firm relative to competition*' while long-term performance is: '*organizational processes such as innovation, employee satisfaction, leadership, etc. that ensure long-term success and survival of a firm*'.

The discussion in this section has focused on developing the constructs of interest and defining them. Table 3.2 presents the definitions of all the key constructs in the study.

Table 3.2. Definitions of Key Constructs

Construct	Definition
Capture-based KM strategy	An emphasis on codifying organizational knowledge for storage in repositories and on protecting organizational knowledge from leakages and misappropriation.
IT-centered KM strategy	An emphasis on providing basic IT infrastructure and creating visible KM roles.
KM strategy	A theme that guides and defines a firm's knowledge management efforts.
Knowledge management	A set of practices and processes to acquire and apply knowledge to facilitate organizational operations.
Learning-based KM strategy	An emphasis on organizational learning that occurs through a two-way interaction between individuals, groups and organization.
Long-term performance	Organizational processes such as innovation, employee satisfaction, leadership, etc. that ensure long-term success and survival of a firm.
Short-term performance	Goal attainment, reflected in the current financial and market performance of a firm relative to competition.

3.2 Hypotheses

This section presents the relationships between the three KM strategies and performance.

3.2.1 IT-centered KM strategy and performance

Much of the KM literature emphasizes the role of IT in managing organizational knowledge. However, investments in IT alone do not result in knowledge management. IT tools such as intranets, internet, databases and communication tools remain passive components unless they are used by people. Without use, knowledge can neither be stored in the databases nor exchanged through networks. Noting this, some KM researchers suggest that information technology can only inspire knowledge management but cannot deliver it because effective knowledge management requires emphasis on technology, people and processes (Davenport, 1997; McDermott, 1999; Ruggles, 1998).

When an organization creates KM roles in a symbolic manner, organizational members view KM as a ritual being conducted to meet obligations such as pressures to be seen as a professional or modern organization. Consequently, the CKO or Knowledge Manager will not be in a position to further knowledge management. As the actions taken in pursuit of IT-centered KM strategy do not help in either acquiring or applying knowledge, such actions typically enhance costs with no returns. However, decreasing IT costs mean that such costs are unlikely to be a substantial portion of a firm's costs to affect its performance.

The argument that a mere focus on technology is inadequate to manage knowledge and thus yield performance benefits has been made by many researchers (Davenport, 1997; McDermott, 1999). Some researchers in Management Information Systems (MIS) suggest that knowledge management provides performance benefits only when it is leveraged properly (Alavi & Leidner, 2001). A few other MIS researchers argue that IT can provide performance benefits only if it is supported by organizational processes (Kettinger, Grover, Guha & Segards, 1994).

In summary, KM is yet another IT solution for an IT-centered KM strategy. Therefore, the organizations that follow such a strategy implement IT systems as KM and make one or more organizational members responsible for KM. These actions, however, do not provide any performance benefit for firms because IT-centered strategy merely focuses on making the infrastructure available and does not develop systems and processes to use the knowledge. Therefore, this study hypothesized:

H1: IT-centered KM strategy will not be positively associated with short-term or long-term performance of an organization.

3.2.2 Capture-based KM strategy and performance

Firms that emphasize capturing employee knowledge create repositories to accumulate, refine, manage and distribute the explicit knowledge (Zack, 1999). Such

explicit knowledge is easy to transfer and communicate (Szulanski, 1996). Accordingly, knowledge captured in databases easily flows across the organization (Schulz, 2001). The employees can use such knowledge to manage organizational operations such as answering the questions of customer or suppliers, improving product development, and improving manufacturing (Davenport *et al.*, 1998).

Developing new knowledge is not only difficult but also costly. By making the knowledge available to everyone, the organization avoids the costs of re-creating knowledge in different departments and at various points in time (Schulz, 2001). In other words, the organization makes full use of the knowledge once it has been created.

A firm that exploits its knowledge gains performance advantage. Research has established that firms that have prior experience with joint ventures perform better when they set up international joint ventures because they use prior experience to manage new ventures better (Barkema, Shenkar, Vermeulen & Bell, 1997). Similarly, firms that have prior experience in a foreign country make use of their knowledge about foreign sites, culture and institutions to better perform when they set up new businesses in that country (Barkema, Bell & Pennings, 1996). Further, past alliance experience has been found to help firms not only in forming new alliances but also in achieving performance benefits through them (Gulati, 1999; Powell, Koput & SmithDoerr, 1996).

In addition to utilization, capture-based KM strategy protects the knowledge that the firm possesses. Firms try to protect existing knowledge resources, particularly by ensuring intellectual property rights, that is managing trademarks, copyrights and patents (Kettinger *et al.*, 1994). In addition, firms also attempt to stop leakages and spillages of knowledge so that knowledge does not reach competitors. Firms do so with the help of confidentiality clauses and non-disclosure agreements with employees and others who come across such knowledge.

By emphasizing knowledge capture and utilization, firms benefit in three ways: first, performance will be enhanced through improved access to expert knowledge.

Second, costs of re-creating knowledge are avoided. Third, knowledge is not misappropriated (or only appropriated within firm boundaries). These three activities provide a firm with performance benefits. However, these performance benefits will only be short-term in nature because the value of knowledge decreases over a period of time due to changes in the technological and business environments (Darr, Argote & Epple, 1995; Luo & Peng, 1999). Therefore, this study hypothesized:

H2a: Capture-based KM strategy will be positively associated with short-term performance.

The KM activities guided by capture-based strategy facilitate exploitation of existing knowledge. However, these are different from the feed-back flow which is a component of learning. Feed-back flow refers to how the knowledge embedded in organizational systems, processes, strategy and culture informs group and individual level learning. Capture-based strategy merely focuses on capturing knowledge in KM systems and no efforts are made to ingrain the knowledge into organizational systems, procedures, and so forth so that it can inform group and individual level learning. Accordingly, the exploitation that a firm can achieve with a capture-based KM strategy is limited.

Although exploiting current knowledge is important for an organization's success and prosperity, exploitation alone will not provide a firm with long-term success because when knowledge is readily available, it cripples development of knowledge assets by hindering experimentation and exploration (March, 1991; Schulz, 2001). Consequently, firms will not be able make product and process innovations that are necessary for long-term success (Danneels, 2002). Simultaneously, competitors will learn vicariously and dilute the advantage that the firm initially enjoyed (Barnett & Hansen, 1996; Ingram & Baum, 1997)

The organizational learning literature notes the tendency of firms to focus only on exploitation and refers to it as 'learning myopia' or 'exploitation trap' (Levinthal & March, 1993). Researchers suggest that firms need to maintain a tension between exploitation and exploration to ensure strategic renewal (March, 1991).

Empirical research in organizational learning has examined the concept of learning traps and noted their negative effect on performance. For example, it has been found that prior experience is helpful to firms but could also affect a firm's ability to learn new technologies and improve (Tripsas & Gavetti, 2000). Further, innovations by older firms have been found to influence the technology much less than the innovations by younger firms because the new innovations made by older firms are built mostly on their own past innovations (Sorensen & Stuart, 2000). Similarly, Vermeulen and Barkema (2001) found that firms that continuously set up greenfields to exploit their existing knowledge tend to fail (Vermeulen & Barkema, 2001). Another research study found that routines inhibit new learning and thus are detrimental to long-term performance (Schulz, 1998).

In summary, by exclusively emphasizing capture and usage of existing knowledge, firms employing a capture-based strategy cripple their capability for creating new knowledge. As a result, firms lose their ability to make the product and process innovations necessary for renewal. Moreover, competitors learn vicariously and dilute the initial advantages that the knowledge bestowed on the company. Therefore, this study hypothesized:

H2b: Capture-based KM strategy will not be positively associated with long-term performance.

3.2.3 Learning-based KM strategy and performance

Learning-based strategy allows individuals to participate freely in groups, to experiment and to make mistakes in the process. In contrast to capture-based strategy, which focuses only on capture and protection of explicit knowledge, learning-based strategy enables employees to freely share their knowledge and contribute to group and organizational knowledge – thus eliminating a central problem in managing knowledge, that is how to motivate employees to share knowledge (Davenport & Prusak, 1999).

As individuals share knowledge, it gets interpreted and integrated at the group level (Crossan *et al.*, 1999). By creating appropriate strategy, culture and reward systems, the learning-based strategy facilitates the process of institutionalizing group level knowledge. Such institutionalized knowledge further informs groups and individuals in their future knowledge creation (Crossan *et al.*, 1999). In short, learning-based strategy creates new knowledge by involving individuals and groups in a process of dialogue.

The creation of new knowledge enhances the absorptive capacity of a firm (Cohen & Levinthal, 1990; Zahra & George, 2002). In the words of Schendel, 'the capacity to develop organizational capability may be more important in creating competitive advantage than the specific knowledge gained' (Schendel, 1996:6). The capacity created by learning-based KM strategy will play a vital role in yielding performance. Further, the learning processes that help in knowledge creation also aid in leveraging the knowledge, which is more important for firm performance than the knowledge itself (Alavi & Leidner, 2001).

Learning-based strategy creates conditions such as openness and tolerance that facilitate knowledge creation. Those conditions are important not only for new knowledge creation but also for adopting and applying existing knowledge from within and outside firm boundaries (Pisano, Bohmer & Edmondson, 2001). In other words, learning-based strategy helps firms to better exploit their existing knowledge.

Knowledge creation is a complex task that involves large investments in various resources (Schulz, 2001). At the same time, the returns are uncertain and have a longer gestation period (Danneels, 2002). Further, knowledge creation involves social and psychological processes that are difficult to manage and take a long time to establish.

In summary, by providing facilitating conditions and processes, the learning-based strategy enables knowledge sharing by employees thus triggering group and organizational learning. By including the knowledge that resides across organizational

levels, an organization-wide capacity is generated. Such capacity is not only important for knowledge creation but also for knowledge exploitation. These activities provide a firm with performance advantage. However, the performance advantage is only long-term because learning entails significant costs with uncertain returns. Therefore, this study hypothesized:

H3a: Learning-based KM strategy will be positively associated with long-term performance.

Learning-based KM strategy focuses on multiple levels of the organization and emphasizes the interaction between them. Its focus on knowledge capture and exploitation is limited because of the assumption that knowledge is transferred through social interactions. Consequently, efforts to codify knowledge are limited. Further, efforts to appropriate knowledge are also minimal and thus firms do not receive the benefit of exploitation.

While firms that employ a knowledge exploitation strategy are prone to fall into 'exploitation traps', firms that follow a knowledge creation strategy are likely to fall into 'exploration traps' (Levinthal & March, 1993). Firms focusing on knowledge creation expend the resources required for exploration but do not focus on exploitation. Therefore, they fail to convert their knowledge into performance. Empirical evidence also suggests that such firms are less successful than those who maintain a balance between exploration and exploitation (Bierly & Chakrabarti, 1996). Therefore, this study hypothesized:

H3b: Learning-based KM strategy will not be positively associated with short-term performance.

Given that each of the three KM strategies discussed above emphasize different components of knowledge management, these strategies are best seen as complementary, that is technology is a prerequisite for capture and capture facilitates learning. Similarly, learning processes become more effective when technological infrastructure facilitates the transmission of knowledge and communication between organizational members.

The complementary nature of the three strategies is best illustrated with the help of the VRIO framework (Barney, 1997).

The VRIO framework argues that the advantage that accrues to firms depends on the nature of resources in its possession. Resources are evaluated against three criteria: *value, rareness* and *inimitability*. If a firm does not possess resources that are valuable, rare or inimitable, it is at a competitive disadvantage. When a firm possesses resources that are valuable (but neither rare nor inimitable), it gains competitive parity. A firm that possess both *valuable* and *rare* (but imitable) resources gains *competitive advantage* but such advantage will remain *temporary* because competitors will soon acquire them. If a firm possesses resources that are *valuable, rare* and *inimitable*, then it gains *competitive advantage* but that advantage can be *sustained* only if the firm is *organized* to exploit the resources (Barney, 1997).

Applying VRIO framework, technological infrastructure is a valuable resource but is neither rare nor inimitable. Therefore, such resources do not provide a firm with competitive advantage. However, they do provide firm with competitive parity when the firm possesses them. Thus, the argument in Hypothesis 1 that IT-centered strategy does not benefit performance is in line with VRIO framework.

Capture-based strategy aims to maximize the value of organizational knowledge through codification and reuse. Knowledge captured and appropriated could be rare and valuable but it provides only a temporary competitive advantage because competitors will soon acquire similar knowledge. Even patents do not guarantee against imitation because patents place the technology in public domain, which could increase the risk of imitation to the firm and decrease the cost of imitation to competitors (Barney, 1997:159). Thus, Hypothesis 2 is in line with the VRIO framework. On the other hand, the ability to innovate is inimitable and thus provides sustainable competitive advantage (Barney, 1997:159). Inimitability depends on the unique historical conditions, causal ambiguity, and social complexity of the resource (Barney, 1997). The learning processes that create

knowledge meet these criteria and accordingly, improve long-term performance as outlined in Hypothesis 3.

When KM strategies complement each other, they provide a firm with superior performance and thus sustainable competitive advantage. According to the VRIO framework, a firm sustains competitive advantage when it is organized to exploit its valuable, rare and inimitable resources (Barney, 1997). As each of the three KM strategies focuses on a particular component of KM, firms are likely to achieve superior performance when all three are pursued together. The complementarities of these three KM strategies are explained in the following section.

3.2.4 Complementarity of KM strategies and performance

IT-centered KM strategy provides the basic IT infrastructure such as intranet, databases, email and instant messaging. These tools aid the capture of codified knowledge and its flow across the organization. As explained in Hypothesis 1, technology and information by themselves do not provide performance benefits. However, they provide performance benefits in combination with capture and learning-based strategies.

Information technology provides many tools that help a firm to capture knowledge. Once codified, knowledge can be treated as information and handled by IT tools. The IT tools can store data of large magnitude at relatively lower costs. Further, recent advancements in IT have made it easy to index and store information in databases as well as search for and retrieve the information. These IT tools help in making information accessible to all the employees in the organization. Consequently, when an organization complements a capture-based strategy with technology-centered KM strategy, it reaps much higher benefits from the capture of knowledge. Therefore, this study hypothesized:

H4a: The positive relationship between capture-based KM strategy and short-term performance will be stronger when capture-based KM strategy is complemented with IT-centered KM strategy.

Self-organizing behaviour in organizations is important for organizational performance (Wheatley & Kellner-Rogers, 1996). Information that flows to everyone in abundance in an unplanned, uncontrolled and even superfluous manner is one of the three essentials for self-organizing behaviour in organizations (Wheatley & Kellner-Rogers, 1996). While IT-centered KM strategy provides such information, learning-based KM strategy provides the other two essentials: identity and relationships. By communicating values and vision across the organization and by clarifying goals through open communication, the learning-based KM strategy paves the way for developing identity. Openness also increases accessibility of each employee to others and enhances relationships in the organization (Smith & Comer, 1994; Wheatley & Kellner-Rogers, 1996).

In addition to creating an identity and strengthening relationships, learning-based KM strategy also produces requisite variety to manage environmental complexity (Smith & Comer, 1994). The requisite variety thus created aids in product and process innovations to create a relentless pace of change (Brown & Eisenhardt, 1997). Such pace of change that strikes a balance between stability and change is at the heart of organizational growth (Brown & Eisenhardt, 1997; Stacey, 1995).

In short, IT-centered KM strategy helps learning-based KM strategy by complementing learning processes with technology and information. Together, these two strategies create the conditions necessary for innovation and change that are prerequisites for renewal. Therefore, this study hypothesized:

H4b: The positive relationship between learning-based KM strategy and long-term performance will be stronger when learning-based KM strategy is complemented with IT-centered KM strategy.

Capture-based strategy emphasizes explicit and codified knowledge and strives to appropriate it to gain performance benefits. As explained in Hypothesis 2, capture-based strategy by itself will be positively associated with short-term performance but will not have a significant association with long-term performance. Part of the reason why capture-based KM strategy does not lead to long-term performance is that it does not create conditions for individuals to share knowledge. Rather, it forces individuals to contribute to the knowledge repositories of the organization. As many KM researchers have noted, such an approach does not motivate employees to contribute knowledge because knowledge sharing is voluntary (Davenport & Prusak, 1999). Empirical research also points that benevolence, trust and relationships facilitate knowledge sharing by employees (Levin, Cross & Abrams, 2002) rather than the fiat of hierarchy.

Learning-based KM strategy focuses on tacit knowledge but its focus on explicit knowledge is limited. Also, it does not emphasize appropriation of knowledge and its protection. A capture-based KM strategy, with its focus on explicit knowledge and on appropriation, provides a useful complement to the process orientation of learning-based KM strategy.

Organizational learning research points to the usefulness of maintaining the tension between exploitation and exploration (March, 1991). Empirical evidence also suggests that firms that employ complementary strategies perform better than those that employ a single strategy. For example, firms that continuously set up greenfields to exploit their existing knowledge tend to fail whereas the firms that alternatively set up greenfields (denoting exploitation) and make acquisitions (denoting exploration) perform better. In other words, exploration and exploitation strengthen each other (Vermeulen & Barkema, 2001).

In summary, capture-based KM strategy and learning-based KM strategy complement each other. The former emphasizes appropriation of codified knowledge while the latter emphasizes tacit knowledge and knowledge creation. Accordingly, organizations that pursue them simultaneously benefit from the result orientation of a

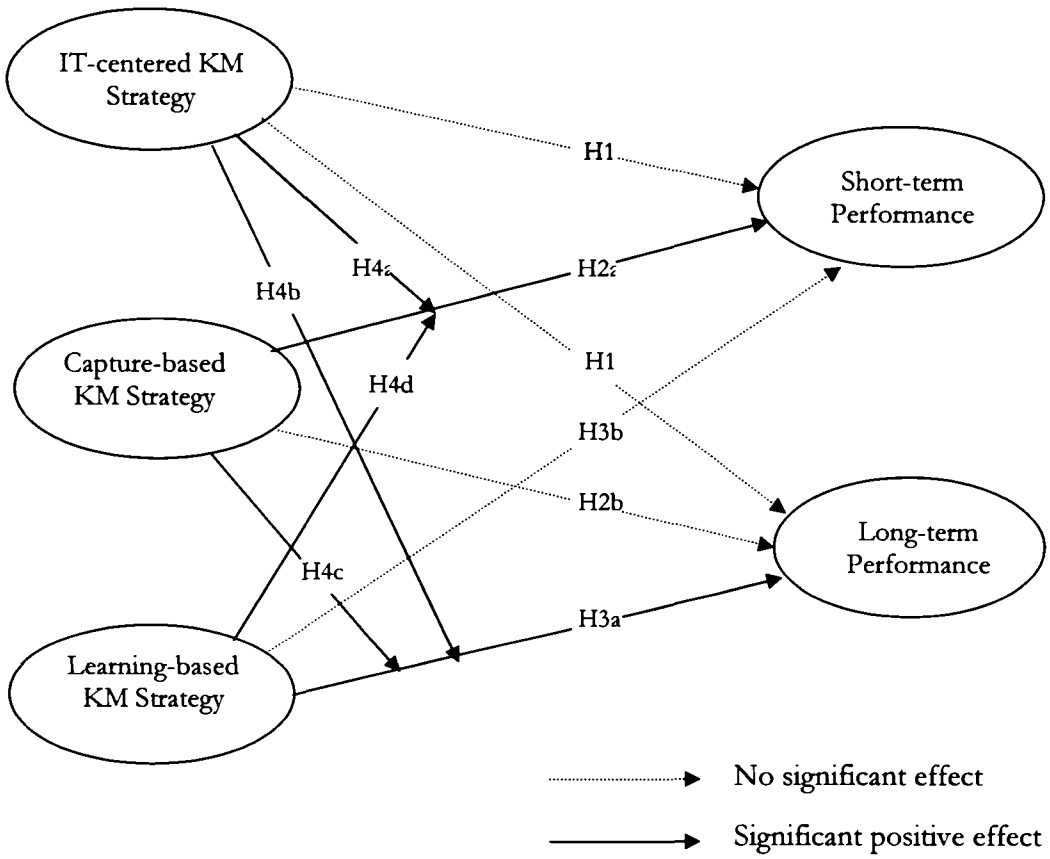
capture-based strategy and the process and adaptation orientation of a learning-based strategy. Therefore, this study hypothesized:

H4c: The positive relationship between learning-based KM strategy and long-term performance will be stronger when learning-based KM strategy is complemented with capture-based KM strategy.

H4d: The positive relationship between capture-based KM strategy and short-term performance will be stronger when capture-based KM strategy is complemented with learning-based KM strategy.

The theoretical relationships presented in Hypotheses 1 to 4 are depicted in Figure 3.1.

Figure 3.1. Hypotheses and Model



3.3 Chapter Summary

The following key points summarize the discussion in this chapter.

- Based on the perspectives prevalent in the literature on knowledge and its management, three different KM strategies can be identified.
    - IT-centered KM strategy purely emphasizes technology.
    - Capture-based KM strategy emphasizes codification of knowledge, its availability and reuse.
    - Learning-based KM strategy emphasizes social interactions to create and share knowledge.
- IT-centered KM strategy does not focus on managing knowledge and therefore, does not yield any performance benefits. However, it acts as an enabler and strengthens the relationship between other two KM strategies and performance.
- Capture-based KM strategy focuses exclusively on using existing knowledge and benefits in the short-term but discourages and stunts a firm's capacity to innovate and succeed in the long run.
- Learning-based KM strategy focuses only on knowledge creation and benefits in the long-term but is unlikely to yield short-term performance given the costs and uncertainties associated with learning.
- Knowledge is a complex and multi-dimensional construct. Each of the three KM strategies emphasize only a part of knowledge management. Therefore, together they yield better performance.

CHAPTER 4. RESEARCH METHODOLOGY

This chapter presents the methodology adopted for the study. The study used a combination of survey, interview and archival data collection methods in large Canadian companies across various industrial sectors. The questionnaire items were developed and validated following the guidelines in the existing research (Anderson & Gerbing, 1991; Hinkin, 1995; Nunnally, 1978; O'Reilly, Chatman & Caldwell, 1991). In order to accommodate the preferences of respondents and enhance response rate, both paper and web versions were developed and administered following the Tailored Design Method (Dillman, 2000). Each potential respondent was contacted several times through mail, telephone and email to persuade them to participate in the study. The following sections present the research methodology in detail.

4.1 Choice of Research method

This study hypothesized variation in the KM strategies that firms employ and the differential impact of those strategies on performance. Therefore, it is best suited for a cross-sectional, survey-based method because data can be collected from a large number of organizations across industries in a systematic manner. The proposed variations in KM strategies can only be seen in a large sample. Further, the survey method is least susceptible to researcher biases in data collection, analysis and interpretation.

Methods that were considered not suitable include archival data analysis, experiments and case studies. Analysis of archival data has been used in previous studies of knowledge management (Bierly & Chakrabarti, 1996). However, archival data on organizational processes that lead to learning is not available. Experimentation is another possible method but generalizability of findings from experiments is an issue. Interviews provide rich data that can be helpful in better understanding the relationships proposed in this model, particularly because KM is a recent phenomenon and its effect on performance may not follow the expected and familiar paths. However, an interview

method precludes obtaining a larger sample and thus sacrifices the internal and external validity of the findings. Therefore, a combination of the survey, interview and archival data collection methods were used in this study to ensure both internal and external validity. A survey was the primary method to collect data on the study constructs. The interviews were used to seek richer detail and understand the context for better interpreting the study findings. Finally, the archival data were used as an additional measure for the construct short-term performance as well as to measure control variables. Further, the archival data on firm characteristics for both respondents and non-respondents were used to examine survey response bias.

4.2 Sample

To test the theoretical model proposed in this study, it was important to capture a range of knowledge management strategies in the sample. In other words, the study was required to be conducted in a context where both knowledge management strategies and variations in them could be captured. Prior research suggested that large firms, particularly those in the knowledge-intensive sectors were making efforts to systematically manage knowledge (Davenport *et al.*, 1998; Knapp, 1998; O'Leary, 1998a).

There is no unanimous, clear-cut definition of the knowledge-intensive industry. However, according to the Organization for Economic Co-operation and Development (OECD), the concept refers to those industries that are relatively intensive in their inputs of technology and/or human capital: 'firms with high technology investments; high-technology industries; firms with more highly skilled labor and associated productivity gains' (OECD 1996:7). As such, the knowledge-intensive industries include firms in high-tech and communications, pharmaceutical and biotechnology, and chemicals. According to the CompuStat database, a database commonly used in management research, there were a total of 1547 companies listed on the Canadian stock exchanges. The total number of Canadian companies in the four knowledge-intensive industries

selected was 252. Assuming a response rate in the range of 20 percent, which is common for survey research, only 50 firms would have been available to be studied. A sample size of 50 would not have been enough to conduct statistical analysis. Assuming that the effect of the knowledge management strategies would be medium, a sample size of 76 is required to conduct multivariate analysis involving three independent variables so that rejection of null hypothesis can be made with a confidence of .05 and power of .80 (Cohen, 1992). The required sample size increases to 108 if the same analysis is performed with a confidence of .01 (Cohen, 1992).

In addition to not yielding adequate data points, conducting a survey only in the knowledge-intensive sectors limits the generalizability of the study findings. Therefore, 500 Canadian firms across industries were targeted for this study, which was, assuming a response rate of 20 percent, expected to yield about 100 responses. Firm size was an important criteria for this research because 'intensive and face-to-face interaction between people' could compensate for the presence of many formal systems, including KM systems, in small firms. Following the U.S. Small Business Administration, several researchers in the past have used a threshold of 100 employees to categorize firms into small and large firms. Data on the number of employees was missing for the majority of companies in the CompuStat database. Sales revenue is a variable that is frequently used as an approximation of size. Therefore, the option of using sales revenue as a sampling criteria was explored. The correlation between number of employees and sales revenue was .838. Therefore, it was felt reasonable to assume that companies that had a large sales revenue also had a large number of employees. Accordingly, the largest 500 firms based on sales revenue were identified and targeted for data collection.

4.3 Choice of Respondent

Although multiple respondents would provide a better approximation of the organization, at times, a key informant approach may be the only feasible method to obtain responses for organizational level data (Huber & Power, 1985; Parkhe, 1993).

Moreover, there are disadvantages to using multiple respondents. These disadvantages include (i) cost, (ii) low response rate as organizations may find it daunting to provide multiple responses, (iii) the possibility that organizations will send a single response instead of multiple responses as requested, and (iv) response variation undermining the validity of the data and making it difficult to analyze.

In order to understand research trends in the choice of respondents, an electronic search was performed on survey-based research published in *Strategic Management Journal*, a premium outlet for strategy research (Tahai & Meyer, 1999). Of the 18 studies retrieved (published during 1996-2003 that used organizational level constructs), 15 studies used a single respondent as the key informant. Of the three studies that used multiple respondents, one study completely omitted the additional responses and used the responses of Chief Executive Officer only (Garg, Walters & Priem, 2003) while another partly omitted the additional responses (Nicholls-Nixon & Woo, 2003). Only one study managed to employ and use multiple responses in the analysis (Sharma & Vredenburg, 1998).

In addition to the practical considerations discussed above that make the multiple respondent approach unfeasible, its validity is also doubtful because it gives equal weight to the responses of the knowledgeable key informant and others in the organization. Therefore, it was decided to use a single respondent as the informant on behalf of the organization. As senior executives are most likely to be knowledgeable about the strategies and performance data, the choice of respondent for this study was: '*the senior-most executive responsible for knowledge management (or learning) in the organization*'. In several cases, strategies are not explicitly stated but are followed tacitly. In such cases, a firm may not have an identified executive responsible for knowledge management or learning. Therefore, in cases where the firms did not have an identified executive for knowledge and/or learning management, any senior executive in the areas of human resource management, information technology, strategy or similar function was asked to respond.

4.4 Measure Development and Validation

This section presents the various steps taken to develop items to measure the study constructs and the exercises through which they were validated.

4.4.1 Development of measures

In order to ensure that the items adequately represent the conceptual domain of the constructs (Nunnally, 1978), the initial items used to measure various constructs were developed based on prior research (Bontis *et al.*, 2002; Davenport *et al.*, 1998; Gray, 2002; Ruggles, 1998; Spanos & Lioukas, 2001; Zack, 1999b). Following the trend in strategy research (Frost, Birkinshaw & Ensign, 2002; Kale, Singh & Perlmutter, 2000; Sharma & Vredenburg, 1998; Subramaniam & Venkatraman, 2001; Tsang, 2002), the items were designed to use seven point Likert-type scales. A seven point scale better captures the variance in the study constructs. Measurement of the constructs is briefly discussed in the following paragraphs. A list of the initial items, the exercises conducted to validate them and the list of final items are provided in the following sections.

Long-term Performance has been operationalized with items that capture both organizational processes and adaptation capabilities (Kanter & Brinkerhoff, 1981). Some of the items were borrowed from prior research (Bontis *et al.*, 2002), while others were developed based on the theoretical exposition of long-term performance (Kanter & Brinkerhoff, 1981; Kaplan, 1984; Kaplan & Norton, 1992). In the past, researchers have used financial measures as a measure of long-term performance, particularly when archival data has been used over a long period of time. However, this being a dissertation research, it was not feasible to use a time lag of five years post data collection. Further, the expression 'long-term performance' has been used here to indicate organizational processes that yield long-term performance rather than actual performance over a longer time period. Therefore, the items selected to measure long-term performance reflected

employee satisfaction, capability to secure future performance, ability to respond to changes, capable leadership and ability to meet customer needs in future.

The measure of Short-term Performance has been adapted from Spanos and Lioukas (2001). This is a perceptual measure of performance that asks respondents to rate their company's performance vis-à-vis competition over a period of three years. In agreement with Kaplan (1984), Spanos and Lioukas (2001) argue that 'objective' measures of performance are unreliable and incomparable across industries. Further, they also provide ample research evidence to assert that 'subjective assessments of business performance obtained by senior manager correlate strongly, albeit not perfectly with objective measures' (Spanos & Lioukas, 2001:933).

In a slight modification to the performance measure of Spanos and Lioukas (2001), respondents in this research have been asked to rate performance by considering firm performance in the latest financial year. Given that some researchers have used performance over a period of three to five years as a measure of long-term performance, it was reasonable to avoid a time frame of three years to distinguish short-term performance from long-term performance.

In addition to the perceptual measure, short-term performance was operationalized as actual financial performance in the current financial year. Accordingly, three accounting measures were used: Return on Assets (ROA), Return on Capital (ROC) and Return on Equity (ROE).

IT-centered KM Strategy was operationalized using items developed from theoretical exposition on KM practices (Davenport *et al.*, 1998; Gray, 2002; Ruggles, 1998). Together, these items captured the extent to which a firm has invested in technological infrastructure as a KM tool. Further, the measure also captured whether a firm had identified one or more individuals as responsible for implementing KM initiatives.

Capture-based KM Strategy was operationalized using items developed based on the theoretical exposition of similar notions in the literature (Davenport *et al.*, 1998; Kettinger *et al.*, 1994; Zack, 1999b). Together, these items captured the extent to which a firm has invested in capturing knowledge, classifying it, storing it and making it accessible to everyone in the organization. Further, this measure captures the investments made to protect a firm's intellectual property.

Learning-based KM Strategy was operationalized using items adapted from Bontis et. al. (2002). Together, these items capture the extent to which employees and groups in the organization freely interact among and between themselves and learn from each other.

Prior research indicated that firm characteristics influence performance. Large firms usually have higher performance (Tsai, 2001; Tsang, 2002). Similarly, past performance affects current performance (Greve, 1998). Therefore, this study controlled for size and past performance. In line with prior research in the field, firm size was measured using asset size and sales revenue (Tsai, 2001); past performance was measured as net profit in the previous year.

4.4.2 Validation of items

The items were validated by two exercises. First, the items, along with construct definitions, were provided to 18 doctoral students with experience in management research. The length of their doctoral training ranged from one year to four years; their areas of training included strategic management, marketing, information systems, finance and organizational behavior. Of the 18 doctoral students, eight had experience in strategic management research. The students were asked to screen the items for the following criteria: (a) generality – the item could apply to most firms independent of the technology, product, industry, size or country; (b) discriminability – uniqueness of each item; (c) readability – ease of understanding; and (d) nonreundancy – one item could not

be substituted for another. Items were finalized following this exercise (O'Reilly *et al.*, 1991). A copy of the validation exercise is placed in *Appendix A*.

Using students for item validation exercise was appropriate because it was a cognitive task that required intellectual ability rather than work experience (Hinkin, 1995). Based on the suggestions made by the students, several items were modified and a few items were deleted. A summary of the changes made to the items following the exercise are presented in *Appendix B*.

In the second step, the finalized items were given to five researchers and five practitioners familiar with knowledge management and survey method. A copy of this exercise is placed in *Appendix C*. The items included in this exercise pertained to constructs from the current study as well as another study on external knowledge management. These researchers and practitioners were drawn from Asia, Europe and North America. They were provided with the definitions of the constructs and asked to assign each item to the construct that it measures. In this exercise, it was possible that the placement of items may influence their assignment in some manner. In order to avoid that, all the items were randomly listed so that the order of items was different for each judge.

The assignments made by the participants of the exercise were used to compute two measures proposed by Anderson & Gerbing (1991) to establish the substantive validity of each measurement item, that is 'the extent to which that measure is judged to be reflective of, or theoretically linked to, some construct of interest' (Anderson & Gerbing, 1991:731). The two measures that reflect the substantive validity of items are: (a) Substantive Validity Coefficient (SVC), defined as [(number of judges who assigned the item to its intended construct – highest number of judges who assigned the item to any other construct in the set) / (total number of judges)] (Anderson & Gerbing, 1991), and (b) Proportion of Substantive Agreement (PSA), measured as [(the number of judges who assigned item to its intended construct) / (total number of judges)]. An item with higher PSA reflects the construct better than an item with lower PSA. Items with SVC of

0.5 and above reflect the construct in a statistically significant manner (Anderson & Gerbing, 1991).

Besides providing data for computing PSA and SVC, the validation exercise provided an opportunity to revisit the constructs and items because the participants provided very helpful additional feedback. For example, some of the participants expressed doubts on whether items like 'KM software' and 'electronic databases' would be understood similarly by all the participants. Table 4.1 presents the items with their PSA and SVC values and the decision made following validation exercise.

Table 4.1. Item Validation Exercise – PSA and SVC Values of Items

	Item	PSA	SVC	Comment
	IT-Centered KMS			
T1	My organization believes that implementing IT-based KM tools is important for managing knowledge.	0.8	0.8	Retained.
T2	My organization uses technology as the primary means for managing knowledge.	0.8	0.8	Retained.
T3	KM systems and processes in my organization include Knowledge Management Software.	0.8	0.8	Dropped; participants may not uniformly understand it.
T4	KM systems and processes in my organization include electronic databases.	0.8	0.6	Dropped; participants may not uniformly understand it.
T5	KM systems and processes in my organization include Intranet/ Internet.	0.8	0.6	Split into two items and completely reworded, internet to capture 'IT' and intranet to capture 'capture'.
T6	KM systems and processes in my organization include Groupware/ Shareware, i.e. technology to help people collaborate online.	0.8	0.6	Retained but item was modified to omit 'shareware'.
T7	KM systems and processes in my organization include Document Management Systems.	0.7	0.3	Dropped, low SVC; participants may not uniformly understand.
T8	KM systems and processes in my organization include positions such as Knowledge Manager/Chief Knowledge Officer.	0.3	0.3	Dropped, low SVC.

	Item	PSA	SVC	Comment
	Capture-based KMS			
C1	My organization emphasizes codifying and capturing employees' knowledge.	0.8	0.8	Retained.
C2	My organization believes that KM helps to retain knowledge especially when critical employees leave.	0.7	0.7	Retained.
C3	My organization protects work-in-process such as drawings, designs and plans.	0.6	0.6	Dropped; the item reflects 'protection', which may interfere with 'capture'.
C4	My organization uses non-disclosure and confidentiality agreements to prevent knowledge leakages.	0.6	0.6	Dropped; the item reflects 'protection', which may interfere with 'capture'.
C5	KM systems and processes in my organization include specialists to refine, index and store employees' knowledge.	0.6	0.3	Dropped; low SVC.
C6	My organization manages intellectual property rights to maximize the value from organizational knowledge.	0.6	0.4	Dropped; the item reflects 'protection', which may interfere with 'capture'.
C7	My organization stores customer complaints and feedback for potential future usage.	0.5	0.0	Retained; five assigned it correctly; five others assigned to another construct not part of this study.
C8	KM systems and processes in my organization include storing and retrieving knowledge with the help of technology and systems.	0.4	-0.3	Dropped; low SVC.

	Item	PSA	SVC	Comment
	Learning-based KMS			
L1	In my organization, good solutions developed by one group are easily adopted by other groups.	0.8	0.8	Retained.
L2	My organization emphasizes learning as a means to manage knowledge.	0.8	0.8	Retained.
L3	People in my organization acquire new knowledge in interactions with other organizational members.	0.8	0.8	Retained.
L4	In my organization, employees freely share their ideas and experiences with others.	0.6	0.6	Retained.
L5	In my organization, policies and procedures are in place to facilitate knowledge exchange between individuals and groups.	0.6	0.6	Retained.
L6	In my organization, recommendations by groups based on accumulated experience are often adopted by the organization.	0.6	0.6	Retained.
L7	In my organization, relevant information easily moves from individual to organization.	0.5	0.3	Retained because the item reflects an important component of organizational learning. Two judges assigned it to 'capture strategy', rest did not assign.
L8	In my organization, employees have input into the critical decisions made by management.	0.4	0.4	Retained because two-way knowledge flow is an important component of learning-based KM strategy.
L9	In my organization, the right people are involved in groups and committees to address organizational issues.	0.4	0.4	Dropped; low SVC; several researchers questioned its interpretation.
L10	In my organization, employees are current and knowledgeable about their work.	0.3	-0.1	Retained because having knowledgeable employees is a key element of learning-based KM strategy.
L11	In my organization, organizational goals are communicated throughout the organization.	0.2	-0.1	Dropped; low SVC; may capture any communication
L12	In my organization, reward systems recognize the contribution made by individuals and groups.	0.2	-0.1	Dropped; low SVC; may capture any contribution, not necessarily knowledge.

	Item	PSA	SVC	Comment
	Long-term Performance			
P1	My organization can meet customers' future needs.	0.8	0.8	Retained.
P2	My organization has the potential to be successful in the face of technological and environmental changes.	0.8	0.8	Retained.
P3	My organization's leadership is capable and driven.	0.8	.0.8	Retained.
P4	Employees in my organization are motivated to strive for better performance.	0.7	0.7	Retained.
P5	My organization has the capabilities to secure its future performance.	0.7	0.7	Retained.
P6	My organization is capable of rapidly commercializing new innovations.	0.7	0.7	Retained.
P7	My organization has the ability to adapt quickly to unanticipated changes.	0.7	0.5	Retained.
P8	Employees in my organization are satisfied.	0.6	0.4	Retained.
P9	My organization's customers are loyal.	0.5	0.5	Retained.
P10	My organization has the ability to continuously identify new business opportunities.	0.5	0.3	Retained.
P11	Employees in my organization continuously improve systems and processes.	0.2	-0.3	Dropped; five judges assigned to 'learning-based strategy'.

The study constructs and the items to measure them were purified based on the above mentioned exercises. As presented in chapter 3, the IT-centered KM strategy construct incorporated the aspect of 'creating KM roles'. The item intended to capture this aspect was dropped due to low SVC. Further, the capture-based KM strategy construct incorporated 'protection of knowledge'. The key item reflecting protection was 'managing intellectual property rights', which was dropped due to low SVC. Doubts were also expressed by participants if the capture and protection components are part of the same knowledge management strategy, particularly given that the latter is managed by intellectual capital managers rather than knowledge managers. Accordingly, the items reflecting protection were dropped. A list of the constructs and the items that were intended to be used for measuring them are presented in Table 4.2.

Table 4.2. Study Constructs, Definitions and Items

INFORMATION TECHNOLOGY-CENTERED KM STRATEGY **An emphasis on providing basic IT infrastructure**	**Strongly Disagree**			**Neither agree Nor disagree**			**Strongly Agree**
My organization believes that implementing IT-based KM tools is important for managing knowledge.	1	2	3	4	5	6	7
My organization uses technology as the primary means for managing knowledge.	1	2	3	4	5	6	7
Knowledge management systems and processes in my organization include …..	1	2	3	4	5	6	7
Internet access to all employees.	1	2	3	4	5	6	7
Instant messaging to exchange short messages in real-time.	1	2	3	4	5	6	7
Groupware, i.e. computer applications to help people collaborate online.	1	2	3	4	5	6	7
CAPTURE-BASED KM STRATEGY **An emphasis on codifying organizational knowledge for storage in repositories**	**Strongly Disagree**			**Neither agree Nor disagree**			**Strongly Agree**
My organization …..							
Emphasizes codifying and capturing employees' knowledge in documents.	1	2	3	4	5	6	7
Stores customer complaints and feedback for future use.	1	2	3	4	5	6	7
Believes that KM helps to retain knowledge in the company, especially when critical employees leave.	1	2	3	4	5	6	7
Knowledge management systems and processes in my organization include using an intranet to store information needed by employees.	1	2	3	4	5	6	7
LEARNING-BASED KM STRATEGY **An emphasis on organizational learning that occurs through a two-way interaction between individuals, groups, and organization.**	**Strongly Disagree**			**Neither agree Nor disagree**			**Strongly Agree**
My organization emphasizes learning as a means to manage knowledge.	1	2	3	4	5	6	7
Good solutions developed by one group/ unit in my organization are easily adopted by other groups/ units.	1	2	3	4	5	6	7
Relevant information/ ideas easily move from individual to organization.	1	2	3	4	5	6	7
Policies and procedures are in place to facilitate knowledge exchange between individuals and groups in my company.	1	2	3	4	5	6	7
Recommendations made by groups based on prior experience are often adopted by my organization.	1	2	3	4	5	6	7
Employees in my organization have input into the critical decisions made by management.	1	2	3	4	5	6	7
Employees in my organization are current and knowledgeable about their work.	1	2	3	4	5	6	7

Employees freely share their ideas and experiences with others in my organization.	1	2	3	4	5	6	7
People in my organization acquire new knowledge in interactions with other organizational members.	1	2	3	4	5	6	7
SHORT-TERM PERFORMANCE ***Goal attainment, reflected in the current financial and market performance of a firm relative to competition.***	**Much below the average**			**At Par**			**Much above the average**
Market share is	1	2	3	4	5	6	7
Growth in market share is	1	2	3	4	5	6	7
Sales volume is	1	2	3	4	5	6	7
Growth in sales volume is	1	2	3	4	5	6	7
Profit margin is	1	2	3	4	5	6	7
Net profits are	1	2	3	4	5	6	7
Return on Capital is	1	2	3	4	5	6	7
LONG-TERM PERFORMANCE ***Organizational processes such as innovation, employee satisfaction, leadership, etc. that ensure long-term success and survival of a firm.***	**Strongly Disagree**			**Neither agree Nor disagree**			**Strongly Agree**
My organization has the ability to adapt quickly to unanticipated changes.	1	2	3	4	5	6	7
Employees in my organization are satisfied.	1	2	3	4	5	6	7
My organization is capable of rapidly commercializing new innovations.	1	2	3	4	5	6	7
Employees in my organization are motivated to strive for better performance.	1	2	3	4	5	6	7
My organization has the potential to be successful in the face of technological and environmental changes.	1	2	3	4	5	6	7
My organization has the ability to continuously identify new business opportunities.	1	2	3	4	5	6	7
My organization can meet customers' future needs.	1	2	3	4	5	6	7
My organization has the capabilities to ensure its future performance.	1	2	3	4	5	6	7
My organization's leadership is capable and driven.	1	2	3	4	5	6	7
My organization's customers are loyal.	1	2	3	4	5	6	7

4.5 Survey Administration

The items finalized following the validation exercise were placed in a survey format. This survey was also used to collect data on constructs that were part of an additional study. The survey was also used to enlist participants for collecting interview data.

Several precautions were taken to make the survey friendly and non-threatening to the potential respondents. For example, information pertaining to the company and the individual was placed at the end of the survey so that individuals felt more comfortable revealing it after engaging with the survey for about 10-15 minutes. Survey instructions clearly indicated that the survey was completely voluntary. Finally, simple and easy language was used to the extent possible.

The survey instrument was pre-tested on five persons. One of these persons was a Chief Information Officer of a large corporation. Of the remaining four, two were MBA students and two were PhD students in business administration. These four students had corporate experience ranging from 5 years to 10 years and had occupied middle and senior management positions in large companies. The pre-test was aimed at finding out the following: (i) whether the language was clear and understandable, (ii) whether the survey was difficult to understand or complete, (iii) whether any of the questions were offensive and unfriendly, and (iv) the time taken to complete the survey. The final survey questionnaire was developed by taking the suggestions and comments made by the participants in the pre-test.

In order to have a wider appeal, it was felt important to use both a mail and a web survey. Using a web version was particularly important because the potential respondents were Knowledge Managers who use and prefer technology. Therefore, a web version of the survey was developed in accordance with the principles suggested by Dillman (2000). Further, the online version was examined and completed by a professor who had considerable experience in conducting web surveys. The professor made extensive comments on the design of online version which were taken into account in preparing the final version. The final version of the online survey was hosted on the server of Richard Ivey School of Business (www.ivey.uwo.ca/phd/hbapuji/startsurvey.asp) at The University of Western Ontario. The data was accessible only to the researcher and no one else. Participants used a common username and password to complete the survey. Further, each company was assigned a unique code which the respondents had to enter before their responses could be registered with the system. These measures restricted the

access only to the companies in the sample and prevented random visitors accessing the site (searching the web for material on knowledge management) from responding to the survey.

The 500 identified firms were contacted through several means and asked for a response, as explained below:

- The survey was mailed to the contact person (obtained from CompuStat) in each company with a covering letter explaining the purpose of the study and its importance. The contact person was either a CEO or a senior executive in functions such as finance, accounting and legal. The contact person was requested to forward the survey to the senior-most executive responsible for knowledge/learning management in the company. A sample letter and survey are placed in *Appendix D*. A total of seven responses were received; 43 surveys were returned undelivered as the companies were no longer available at the given address.
- Six weeks later, a second letter was sent along with a copy of the survey to the 450 non-respondents. This wave resulted in an additional 26 responses. Further, some of the companies had refused to participate citing that 'knowledge management is not an area of focus' for them and that they 'do not have knowledge management'.
- The issue of low response was discussed with two researchers who had experience in conducting surveys in Canada. They suggested that contacting the companies by phone would enhance the response rate. Also, phone would allow the researcher to further explain the nature of the survey and the choice of respondent, especially as the current study focused on a new area not familiar to several companies.
- All the non-respondent companies, about 400, were contacted by telephone to discuss the survey and obtain an email address or fax number for the potential respondent. A total of 58 companies could not be contacted because of insufficient contact information or no response even after repeated trials. The potential respondents were sent an email or fax asking them to respond to the

survey. This exercise yielded an additional 15 responses, taking the total number of responses to 48.

- The potential respondents, about 350, were sent another email and/or were contacted by phone after a gap of four weeks. At the end of this exercise, an additional 17 responses were received, taking the total responses to 65. Approximately 100 companies refused to participate.
- After a gap of about eight weeks, which included the Christmas and New Year holiday season, about 200 potential respondents were contacted by telephone again.

Overall, the survey was mailed two times to the target companies. Each company was called on an average three times to identify a suitable respondent, explain the survey to that person, and remind that person to complete the survey. Further, two emails were sent to each of the potential respondents; one to provide details on accessing the online survey and another to follow-up.

Besides the above, several other measures were taken to obtain responses. First, alumni of the Ivey Business School working in the sample companies were identified and contacted to either respond to the survey on behalf of their company (if they were the appropriate respondents) or to encourage suitable persons in their companies to respond. Second, personal contacts within the sample companies were enlisted to encourage the potential respondents to participate in the survey. Finally, leaders of a group of KM professionals in Vancouver, Canada, called Knowledge Management Community of Practice (KMC) were contacted and asked to encourage their members, who were part of the study sample, to participate in the study.

4.6 Response Rate

At the end of the data collection period, a total of 92 responses were received. As a percentage of the sampling population (500), the response rate is 18.4 percent.

Accounting for the undeliverable surveys (23) and the companies that could not be contacted over telephone (35), the response rate is 20.8 percent. Out of the 92 responses received, four surveys were unusable due to missing data on several variables, thus decreasing the number of usable responses to 88. The number of responses received and the response rate, although not very high, were in line with the response rates for survey research in strategic management (For example, Frost *et al.*, 2002; Kotabe, Martin & Domoto, 2003; Subramaniam & Venkatraman, 2001). More importantly, the number of usable responses (88) was sufficient to capture the phenomenon of interest with a power of 0.8 and confidence of .05 (Cohen, 1992).

4.7 Interviews

Knowledge Management is a relatively new area and companies are grappling to understand how to approach it. Further, it is not yet known what specific benefits arise out of KM. Although the survey instrument was developed based on the existing literature, given the newness of the topic, it is highly possible that the survey instrument and the study constructs might not have fully captured the phenomenon. Therefore, in order to gain additional insights into the research question and to triangulate the findings, semi-structured interviews were conducted for ten percent of the respondent companies, that is nine companies. Each of the interviews lasted approximately an hour and covered a range of issues pertaining to knowledge management. A sample interview protocol is presented in *Appendix E.* Details of the companies interviewed are presented in Table 4.3.

Table 4.3. Characteristics of Interview Companies

Sl. No.	Company Name	Industry	Location	Interviewee	Sales in latest FY (in Million CAD)	No. of Employees
1.	LoTech	Food Manufacturing	Ontario	VP-Leadership Development	5,042	18,000
2.	HydroTech	Environment	Ontario	Intellectual Program Manager	113	350
3.	PhotoTech	Information Technology	British Columbia	Project Manager, Worldwide Knowledge	3,000	4,400
4.	ConsTech	High-tech	British Columbia	Director, Enterprise KM	845	4,200
5.	MeasureTech	Wholesale	Ontario	President & CEO	1,400	3,000
6.	FuelTech	High-tech	British Columbia	KM Specialist	167	1,100
7.	WoodTech	Wholesale	British Columbia	Manager - HR	1,000	500
8.	GameTech	Information Technology	British Columbia	Director, KM	155	900
9.	SoftDev	Information Technology	British Columbia	HR & KM Specialist	60	400

4.8 Archival Data

In order to supplement the data on short-term performance, information on the financial performance of the responding companies was obtained from the databases of Financial Post and the annual reports of the companies. The annual reports were accessed through several sources such as company websites, Canada NewsWire reports and regulatory filings. The data obtained included ROA, ROC and ROE. Further, data on total assets, sales revenue and net profit in the previous year were collected to use as a control variable in the analysis.

The databases of Compustat were used to collect data on firm, location and industry characteristics. The data on firm characteristics included ROA, ROE, ROC, sales and employees. Data on firm location included the province where the firm operated; data on industry included industry description. These data were used to examine non-response bias and verify the representativeness of the sample.

4.9 Statistical Analysis

Partial least squares (PLS) method was used to analyze the relationships proposed in this study. PLS is similar to structural equation models and other covariance structure analysis techniques in that it combines data and theory to simultaneously estimate paths and loadings (Hulland, 1999). PLS permits multiple dependent variables or latent variables as well as multiple levels of measurement. In a model where multiple relationships exist, it is better to use structural equation models (Kale *et al.*, 2000). In early stages of research, it is particularly advisable to use PLS as it makes use of both theory and data. PLS also allows researchers to test for the reliability and validity of measurement items in addition to developing models that test hypotheses (Barclay, Higgins & Thompson, 1995). Finally, PLS is preferred over other structural equation models because it 'makes minimal demands about measurement scales, sample size, and the distribution of residuals' (Fornell & Bookstein, 1982:449) .

4.10 Chapter Summary

The following key points summarize the discussion in this chapter.

- This study has been conducted in large public Canadian companies across several industries using a combination of survey, interview and archival data collection methods.
- This study has developed scales for the study constructs following a multi-staged approach and administered the paper and web questionnaires to receive a total of 92 responses.
- In order to gain additional insights into the phenomenon and to triangulate the findings, the study included semi-structured interviews with 10 percent of the respondent firms.

CHAPTER 5. ANALYSIS AND RESULTS

This chapter presents the statistical analysis conducted on the data and the findings from the analysis. Section one presents the various analyses conducted to examine the non-response bias. Section two presents the analyses on reliability and validity. Section three presents the analyses conducted to test the hypotheses. Section four presents the results of some post-hoc analyses to better understand the results. Finally, section five presents the findings from interview data.

5.1 Examining for Biases

In a survey method of data collection, several biases can affect the data. These include non-response bias, common method bias and respondent bias. Non-response bias affects the randomness of the sample and thus the generalizability of the findings. Common method bias affects the data when the data on independent and dependent variables is collected from the same source. Respondent bias reflects the tendency of respondents to answer the questions in a particular manner owing to their demographic characteristics. These biases and the tests conducted to examine their existence are presented in the following sections.

5.1.1 Non-response bias

Three different tests were conducted to examine the non-response bias in this study. First, the characteristics of the respondent and sample firms were examined to see if the respondent firms were similar to the sample or not. This test will reveal if the respondents are representative of the sample or not and if any particular group of potential respondent has been over-represented or under-represented due to study design or implementation. Second, the characteristics of the respondent and non-respondent

firms were examined to see if there is any significant difference between them on characteristics such as performance (Return on Assets, Return on Equity and Return on Investment) and size (Sales Revenue and Number of Employees). This test reveals if the respondents and non-respondents are similar to each other or not. Third, the performance and size characteristics of the firms were examined to see if any significant differences existed between the firms that (i) responded, (ii) refused to participate, (iii) could not be adequately contacted, and (iv) did not provide a clear answer. This test is important because approximately 12 percent of the targeted sample could not be contacted; the surveys mailed to them were returned and their phone numbers were not working. Each of the three types of analyses is presented in the following paragraphs.

5.1.1.a Characteristics of respondent and sample firms

All the firms in the sample and the respondent firms were categorized according to their industry using single-digit SIC codes and the province where their headquarters were located. These categorizations are presented in Tables 5.1 and 5.2 respectively.

Table 5.1. Industry Characteristics of Respondents and Sample

Industry	Number of responses	Percentage of responses	Number of firms in sample	Percentage of sample
Metals & Mining	14	16.1	77	15.4
Forest products	13	14.8	85	17.0
Machinery	27	30.7	105	21.0
Transportation & Communication	9	10.2	58	11.6
Wholesale	9	10.2	58	11.6
Financial Services	9	10.2	60	12.0
Professional Services	6	6.8	46	9.2
Other Services	1	1.1	11	2.2
Total	88	100.0	500	100.0

As Table 5.1 shows, the percentage of responses belonging to each SIC code was similar to the percentage of sample firms that belonged to the same SIC code. A Chi-square test indicated that the sample contained the expected number of responses from each industry category (*Chi-square = 0.47; p = 0.99*).

Table 5.2. Lodation of Respondents and Sample

Location	Number of responses	Percentage of responses	Number of firms in sample	Percentage of sample
Alberta	13	14.8	79	15.8
British Columbia	11	12.5	52	10.4
Manitoba	2	2.3	15	3.0
New Brunswick	0	0	1	.2
Newfoundland	0	0	5	1.0
Nova Scotia	1	1.1	6	1.2
Ontario	45	51.1	230	46.0
Quebec	14	15.9	97	19.4
Saskatchewan	1	1.1	3	.6
Others	1	1.1	12	2.4
Total	88	100.0	500	100.0

Table 5.2 shows that the percentage of responses belonging to each province was similar to the percentage of sample firms that belonged to the same province. A Chi-square test indicated that the sample contained the expected number of responses from each province (*Chi-square = 0.88; p = 0.99*).

5.1.1.b Characteristics of respondent and non-respondent firms

In order to examine if the respondent and non-respondent firms differed in any significant manner from each other, t-tests were conducted on the performance and size of the firms. The results of these tests are presented in Table 5.3.

Table 5.3. Characteristics of Respondent vs. Non-respondent Firms

Group Statistics

Characteristic	Status	N	Mean	Standard Deviation	Standard Error of Mean
Return on Assets	Non-respondent	412	-1.18	19.92	.981
	Respondent	87	.62	9.21	.99
Return on Equity	Non-respondent	409	.44	68.85	3.40
	Respondent	87	-14.16	228.24	24.47
Return on Investment	Non-respondent	412	-2.59	60.81	2.99
	Respondent	87	8.69	48.47	5.19
Sales (In MM)	Non-respondent	413	1503.46	3745.24	184.29
	Respondent	87	2516.13	4566.22	489.55
Employees (In '000s)	Non-respondent	159	7.94	19.44	1.54
	Respondent	33	12.92	17.58	3.06

		Levene's Test for Equality of Variances		t-test for equality of means						
									95% Confidence Interval of the Difference	
Item	Condition	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Return on Assets	Equal variances assumed	4.13	.043	-.824	497	.410	-1.80	2.18	-6.09	2.49
	Equal variances not assumed			-1.29	282.07	**.197**	-1.80	1.39	-4.54	.94
Return on Equity	Equal variances assumed	5.02	.03	1.09	494	.278	14.60	13.45	-11.8	41.03
	Equal variances not assumed			.59	89.35	**.556**	14.60	24.71	-34.49	63.69
Return on Investment	Equal variances assumed	.78	.38	-1.63	497	**.105**	-11.29	6.94	-24.94	2.35
	Equal variances not assumed			-1.88	149.21	.062	-11.29	5.99	-23.15	.558
Sales (In MM)	Equal variances assumed	6.13	.01	-2.20	498	.028	-1012.7	459.99	-1916.4	-108.91
	Equal variances not assumed			-1.94	111.63	**.055**	-1012.7	523.09	-2049.1	23.81
Number of Employees (In '000s)	Equal variances assumed	1.57	.21	-1.36	190	**.176**	-4.98	3.66	-12.198	2.24
	Equal variances not assumed			-1.45	49.66	.15	-4.98	3.43	-11.86	1.91

The relevant *p* values for each of the firm characteristic are indicated in bold. As the results indicated, the responding and non-responding firms do not significantly differ with respect to performance (return on assets, return on equity, return on investment) and size (number of employees). Although not significant at $p < 0.05$, the revenue difference between responding and non-responding firms is marginally significant ($p = 0.055$), that is responding firms have larger revenues. This pattern is understandable because firms that are large are likely to have a formalized system or be aware of knowledge management. In contrast, firms that are small may lack a knowledge management system and/or not be aware of knowledge management. Overall, the results presented in Table

5.3 indicated that the sample was not affected by non-response bias (Olk & Young, 1997; Subramaniam & Venkatraman, 2001).

5.1.1.c Differences between respondents and categories of non-respondents

In order to further ascertain if there were any differences between the respondents and non-respondents, the latter were categorized into three groups: those that explicitly refused to participate in the survey, those that did not give a clear answer but never participated and those that could not be adequately contacted.

A two-way MANOVA was conducted on four variables (return on assets, return on equity, return on investment and sales) and results are presented in Table 5.4.

Table 5.4. Characteristics of Respondents vs. Categories of Non-respondents

Multivariate Tests

Test Statistic	Value	F	Hypothesis df	Error df	Sig.
Wilks' Lambda	.94	2.48	12.00	1294.06	**.003**

Tests of Between-Subjects Effects

Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Return on Assets	5526.89	3	1842.29	5.68	**.001**
Return on Equity	57386.85	3	19128.95	1.48	.220
Return on Investment	26077.35	3	8692.45	2.53	.057
Sales-Net 12MM	91330843.85	3	30443614.62	1.98	.115

Multiple Comparisons (Bonferroni) on Return on Assets

Category	Rest of the Categories	Mean Difference	Std. Error	Significance
Received	Inadequate Contact	8.15	2.72	**.017**
	Refused	-1.88	2.56	1.00
	No clear answer	.79	2.31	1.00

As per the results of multivariate tests, the four groups of firms significantly differ from each other ($p=0.003$) on at least one variable. The test of between subject effects

suggests that the firms differ significantly ($p = 0.001$) on the variable Return on Assets. The post-hoc tests (Bonferroni) reveal that the difference between the responding firms and the firms that could not be adequately contacted is significant at $p=0.017$. This value, however, is more than the Bonferroni adjusted value of 0.0125 (that is 0.05/number of variables). Therefore, the null hypothesis of no difference cannot be rejected. In other words, the firms that responded do not significantly differ from the firms that did not respond, irrespective of the reason and nature of non-response. More importantly, the firms that could not be contacted are no different from the firms that responded.

5.1.2 Common method bias

The possibility of common method bias was examined using Harman's single-factor test (Podsakoff & Organ, 1986). This test is based on the premise that if common method bias is a concern, the data will yield one single factor and that factor will account for most of the variance in the data. Examining the possibility for common method variance with the help of Harman's single-factor test is quite common in strategy research (Kotabe *et al.*, 2003).

A principal component analysis conducted on the data using a varimax rotation yielded nine factors with eigen values greater than one. These nine factors together explained 72.83 percent of the variance. The first factor explained 28.06 percent variance and the next three factors explained 11.77 percent, 7.55 percent, and 5.47 percent of variance. These results indicate that a single factor did not explain the majority of variance in the data. Therefore, common method bias was not an issue of concern. Although the analysis yielded nine factors as opposed to five constructs used in the study, it is not a cause for concern because the constructs are multi-dimensional and exploratory factor analysis maximizes the number of constructs examined. For example, the measure of short-term performance yielded two separate factors because the construct reflected both market and financial performance of a firm.

In order to eliminate common method bias and enhance the robustness of the study findings, short-term performance was also measured using objective accounting data on firm performance, that is Return on Assets (ROA), Return on Investment (ROI), and Return on Equity (ROE). This data was collected from the annual reports of the respondent companies. Using data from multiple sources for short-term performance reduces the concerns on common method bias.

In addition to the above, the study included an examination of whether any bias existed in the data due to the method of survey data collection, that is mail survey versus online survey. An omnibus MANOVA test on the items capturing two randomly selected constructs (that is, 'capture-based strategy' and 'long-term performance') indicated that the responses on these items did not differ across online and mail survey methods. Table 5.5 presents the results of the test.

Table 5.5. Differences in Mail and Online Survey Methods

Responses on 'capture-based strategy' and 'long-term performance'

Test Statistic	Value	F	Hypothes is df	Error df	Sig.
Wilks' Lambda	.84	.88	16.00	74.00	.599

Finally, a test was conducted to examine if early and late respondents differed in their responses to the items capturing two randomly selected constructs (that is, 'capture-based strategy' and 'long-term performance'). An omnibus MANOVA test indicated that the responses on these items did not differ across early and late respondents. Table 5.6 presents the results of the test.

Table 5.6. Differences Between Early and Late Respondents

Responses on 'capture-based strategy' and 'long-term performance'

Test Statistic	Value	F	Hypothes is df	Error df	Sig.
Wilks' Lambda	.88	.620	16.00	74.00	.585

5.1.3 Respondent bias

In order to examine if the responses to survey items were influenced by the demographic characteristics of respondents, tests were conducted to see if the education level and managerial level of the respondents affected the responses. As part of the data collection, respondents were asked to indicate their education and management level. The education level of respondents was categorized into 'Non-university', 'Bachelor', 'Masters' and 'PhD'. The management level of the respondents was categorized into 'Non-managerial', 'Junior Management', 'Middle Management' and 'Senior Management'. The items capturing 'learning-based knowledge management strategy' and 'short-term performance' were randomly picked and subjected to an omnibus MANOVA test. The test results presented in Tables 5.7 and 5.8 indicated that the survey responses were not influenced by management and education level of the respondents.

Table 5.7. Respondent Bias - Education Level

Responses on 'learning-based strategy'

Test Statistic	Value	F	Hypothesis df	Error df	Sig.
Wilks' Lambda	.78	1.06	20.00	272.91	.389

Responses on 'short-term performance'

Test Statistic	Value	F	Hypothesis df	Error df	Sig.
Wilks' Lambda	.79	.67	28.00	279.05	.896

Table 5.8. Respondent Bias - Management Level

Responses on 'learning-based strategy'

Test Statistic	Value	F	Hypothesis df	Error df	Sig.
Wilks' Lambda	.80	1.24	15.00	221.25	.244

Responses on 'short-term performance'

Test Statistic	Value	F	Hypothesis df	Error df	Sig.
Wilks' Lambda	.80	.84	21.00	218.78	.665

In sum, the analyses presented in this section indicated that the respondent firms were representative of the sample. The analysis also indicated that the study was not affected by common method bias, method of survey administration, or time of response. Finally, the survey responses were not affected by the education and management levels of the respondents.

5.2 Construct Validation

Construct validation involves specifying the domain of observables, consistency among the items used to specify the domain, and the relationships among constructs (Nunnally, 1978). As discussed in Chapter 4, the questionnaire items were developed based on prior research and validated using a two-stage process, which ensured that the items represented the relevant conceptual domain. This section discusses the reliability and validity of the constructs. This study used PLS to examine the reliability and validity of the constructs.

5.2.1 Reliability

Construct reliability was assessed with the help of two mechanisms: (i) the first mechanism was to examine the loadings of the items on their respective constructs. In order to be reliable, each item must load at 0.7 or more on its respective construct as this implies that there is more shared variance between the construct and the item. As loadings are correlations, it means that more than 50 percent of the variance in the item is attributable to the construct (Hulland, 1999); (ii) The second mechanism was to examine composite reliability or Fornell and Larcker's (1981) internal consistency measure, computed as [(sum of loadings)^2 / ((sum of loadings)^2+ (sum of (1 – loading^2)))]. The measure of composite reliability should be over 0.7 to verify the reliability of the construct. The measure of internal consistency is a better approximation of reliability than Cronbach's alpha because the latter assumes that all indicators are equally weighted,

whereas the former assumes that the parameter estimates are correct and uses the weights accordingly (Chin, 1998).

Reliability analysis of the constructs is presented in Table 5.9. Some items had a loading of less than 0.7 on their intended constructs. Each of them is discussed and corrective actions taken to enhance the reliability of the constructs is explained in the following paragraphs. In taking the corrective actions, it is understood that 'the key issue for consistent estimation of the true "population" effect is in obtaining reliable estimates of the underlying construct' (Chin, Marcolin & Newsted, 2003: supplemental material pg. 10). As suggested by Chin et. al., (2003), this is achieved by 'increasing the reliability of the indicators at a given number of indicators (e.g., two indicators with a 0.80 loading yields equivalent construct reliability to 8 indicators at 0.50 loadings). Or, in other words, a couple of good quality measures are as good as many less reliable measures' (Chin *et al.*, 2003:supplemental material pg. 10).

Table 5.9. Reliability Analysis – Initial

Construct / Indicator	Loading	Loading Square	1 - Loading Square	Internal Consistency
IT-Centered KM Strategy				
Believes IT	0.776	0.603	0.397	
Uses IT	0.759	0.576	0.424	
Internet	**0.373**	0.139	0.861	
Instant Messaging	**0.523**	0.273	0.727	
Groupware	**0.597**	0.356	0.644	
Sum	3.028	1.947	3.053	***0.750***
Capture-based KM Strategy				
Storage of K on intranet	0.755	0.569	0.431	
Emphasize codification	**0.387**	0.150	0.850	
Store customer complaints	**0.610**	0.371	0.629	
Believes K can be retained	0.712	0.507	0.493	
Sum	2.463	1.598	2.402	***0.716***
Learning-based KM Strategy				
Emphasizes learning	**0.620**	0.385	0.615	
Solutions adopted	**0.698**	0.487	0.513	
Ideas move from individual to org.	0.729	0.531	0.469	
Policies for knowledge exchange	**0.580**	0.336	0.664	
Recommendations adopted	**0.665**	0.442	0.558	
Employee input to critical decisions	0.738	0.545	0.455	
Employees knowledgeable	0.797	0.635	0.365	

Construct – Indicator	Loading	Loading Square	1 - Loading Square	Internal Consistency
Employees share ideas, experience	0.781	0.610	0.390	
Acquire knowledge in interactions	0.775	0.600	0.400	
Sum	6.382	4.571	4.429	***0.902***
Short-term Performance Accounting Measures				
ROA	0.955	0.911	0.089	
ROE	0.973	0.946	0.054	
ROC	0.953	0.907	0.093	
Sum	2.880	2.764	0.236	***0.972***
Short-term Performance Perceptual Measures				
Market share	**0.480**	0.230	0.770	
Growth in market share	**0.478**	0.229	0.771	
Sales volume	**0.435**	0.189	0.811	
Growth in sales volume	**0.582**	0.339	0.661	
Profit margin	0.894	0.799	0.201	
Net profits	0.963	0.926	0.074	
Return on capital	0.932	0.868	0.132	
Sum	4.763	3.581	3.419	***0.869***
Long-term Performance				
Adapt to unanticipated changes	**0.674**	0.454	0.546	
Employees satisfied	**0.597**	0.356	0.644	
Commercializes innovations	**0.689**	0.474	0.526	
Employees motivated to perform	0.853	0.728	0.272	
Potential to succeed in changes	0.825	0.680	0.320	
Identify new opportunities	0.818	0.668	0.332	
Meet customers' future needs	0.739	0.546	0.454	
Capabilities for future performance	0.866	0.749	0.251	
Capable and driven leadership	0.807	0.650	0.350	
Loyal customers	**0.363**	0.132	0.868	
Sum	7.229	5.439	4.561	***0.920***
Control Variable				
Sales	0.871	0.758	0.242	
Net Income	0.972	0.946	0.054	
Assets	0.886	0.785	0.215	
Sum	2.729	2.489	0.511	***0.936***

The construct 'IT-centered KM strategy' had an internal consistency of 0.75, which was acceptable but three of its items loaded at less than 0.7. Therefore, each of the items was examined in order to enhance the reliability. The IT-centered strategy construct aimed to capture the extent to which a firm believes that technology is central to managing knowledge and uses technology to manage knowledge. The component of 'belief' was captured by the item 'organization believes that implementing IT-based KM

tools is important for KM'. The component of 'usage' was captured by the item 'organization uses technology as the primary means for KM'. The other three items were 'internet', 'instant messaging' and 'groupware'. These items were designed to capture the specific usage of technology. It appears that these items did not load on to the construct significantly because organizations may have had different perceptions about the extent to which these technologies were used for managing knowledge. Given the various general applications that these technologies have, the items might have meant different things to different people and therefore, may not have been associated with knowledge management as such. Accordingly, these three items were dropped from subsequent analyses.

The construct 'Capture-based KM Strategy' had an internal consistency of 0.716, which was acceptable but two of its items loaded at less than 0.7. This construct aimed to capture the extent to which a firm believes that knowledge of employees can be captured and stored so that it is reusable. The items 'storing information on intranet' and 'belief that KM retains knowledge even when critical employees leave' capture the belief and actions underlying a capture-based strategy. Therefore, these two items were retained. The other two items pertain to 'emphasizing codification' and 'storing customer complaints'. They reflect the construct but appear to have captured other dimensions as well. Therefore, these items were dropped from subsequent analyses.

Dropping items to enhance statistical properties would compromise the richness of the construct, particularly where only a few items were used to measure the construct. Therefore, efforts were made to retain items that loaded at over .5. For example, items instant messaging (loading of .523), groupware (loading of .597) and store customer complaints (loading of .610) were each omitted in a step by step manner to examine if they could be retained. Although these items improved their loadings, the overall statistical properties of the construct were not satisfactory, that is the average variance extracted was less than 0.5. Therefore, these items were completely dropped from the analysis.

The construct 'Learning-based KM Strategy' had an internal consistency of 0.902 but four of its items loaded at less than 0.7. These four items 'emphasize learning', 'adoption of solutions of other groups', 'policies to facilitate knowledge exchange' and 'adoption of recommendations by other groups' appear to emphasize the systemic components related to exploiting the knowledge existing in the organization. In contrast, the items that loaded over 0.7 reflect the extent to which the KM efforts are centered around people and their interaction, which is the essence of a learning-based KM strategy. Therefore, in order to enhance the reliability of the construct, the items loading at less than 0.7 were dropped from the subsequent analysis.

The construct 'Short-term Performance Accounting Measures' had an acceptable internal consistency (0.972). All its items loaded at over 0.7. The construct 'Short-term Performance Perceptual Measure' had an acceptable internal consistency (0.869) but four of its items loaded at less than 0.7. These items pertained to 'market performance', that is sales, market share and the growth in sales and market share. In contrast, the items that loaded at over 0.7 pertain to 'accounting performance'. In order to sharpen the construct and maintain its reliability, the items loading at less than 0.7 were excluded from subsequent analyses.

The construct 'Long-term Performance' had an acceptable internal consistency (.920). Six of its ten items loaded at over 0.7 while four loaded at less than 0.7. These four items (i.e. 'ability to adapt to unanticipated changes', 'capable of commercializing innovations' 'employees are satisfied', and 'customers are loyal') were excluded from subsequent analysis because these items were general in nature.

The items used to capture and control the effect of organizational size and past performance loaded at over 0.7. The control variable had an internal consistency of 0.936. Therefore, all the three items were retained.

A subsequent analysis was performed on the selected items and the results are presented in Table 5.10. One of the items measuring learning-based KM strategy, that is

'ideas move from individual to organization', loaded at less than 0.7. It was dropped from the subsequent analysis. All the constructs exhibit adequate reliability with internal consistency values over 0.75 whereas all the items exhibit adequate reliability with their respective loading at over 0.75.

Table 5.10. Reliability Analysis – Refined

Construct Indicator	Loading	Loading Square	1 - Loading Square	Internal Consistency
IT-centered KM Strategy				
Believes IT	0.922	0.850	0.150	
Uses IT	0.752	0.565	0.435	
Sum	1.674	1.415	0.585	***0.827***
Capture-based KM Strategy				
Believes K can be retained	0.799	0.638	0.362	
Storage of K on intranet	0.760	0.578	0.422	
Sum	1.559	1.216	0.784	***0.756***
Learning-based KM Strategy				
Ideas move from individual to org.	**0.676**	0.457	0.543	
Employee input to critical decisions	0.767	0.589	0.411	
Employees knowledgeable	0.837	0.701	0.299	
Employees share ideas, experience	0.822	0.675	0.325	
Acquire knowledge in interactions	0.833	0.693	0.307	
Sum	3.935	3.115	1.885	***0.892***
Short-term Performance Accounting Measures				
ROA	0.954	0.910	0.090	
ROE	0.975	0.950	0.050	
ROC	0.950	0.902	0.098	
Sum	2.879	2.762	0.238	***0.972***
Short-term Performance Perceptual Measures				
Profit margin	0.910	0.829	0.171	
Net profits	0.971	0.942	0.058	
Return on capital	0.946	0.894	0.106	
Sum	2.827	2.665	0.335	***0.960***
Long-term Performance				
Employees motivated to perform	0.864	0.747	0.253	
Potential to succeed in changes	0.851	0.724	0.276	
Identify new opportunities	0.840	0.706	0.294	
Meet customers' future needs	0.754	0.569	0.431	
Capabilities for future performance	0.893	0.798	0.202	
Capable and driven leadership	0.821	0.674	0.326	
Sum	5.024	4.217	1.783	***0.934***
Control Variable				
Sales	0.871	0.759	0.241	
Net Income	0.973	0.946	0.054	
Assets	0.884	0.782	0.218	
Sum	2.728	2.487	0.513	***0.936***

5.2.2 Convergent validity

Convergent validity of all the constructs was examined using the measure of Average Variance Extracted (AVE), that is the average variance shared between a construct and its items (Fornell & Larcker, 1981). A construct with an AVE of over 0.5 is expected to have adequate convergent validity. The AVE of each of the study constructs is presented in Table 5.11. The AVE of each construct was over 0.5 with the lowest AVE being .608 and highest at .924. Therefore, convergent validity of the study constructs was verified.

Table 5.11. Convergent Validity of Constructs

Sl. No.	Construct	Average Variance Extracted
1.	IT-Centered KM Strategy	.708
2.	Capture-based KM Strategy	.608
3.	Learning-based KM Strategy	.697
4.	Short-term Performance Accounting Measures	.924
5.	Short-term Performance Perceptual Measures	.891
6.	Long-term Performance	.703
7.	Control Variables	.828

5.2.3 Discriminant validity

Researchers using PLS establish the discriminant validity of the constructs with the help of construct correlations and the measure of AVE. In order to exhibit discriminant validity, average variance extracted should be greater than the variance shared between the construct and other constructs in the model (that is the squared correlation between two constructs). This is demonstrated in a correlation matrix which includes the correlations between the constructs in the off-diagonal elements and the square roots of the average variance extracted for each construct along the diagonal. As presented in Table 5.12, the square root of AVE for each construct is higher than its correlation with the remaining constructs. Therefore, the study constructs exhibit adequate discriminant validity.

Table 5.12. Discriminant Validity – 1: Construct Correlations and AVEs

Sl. No.	Construct	1	2	3	4	5	6	7
1.	IT-Centered KM Strategy	***0.841***						
2.	Capture-based KM Strategy	0.402	***0.780***					
3.	Learning-based KM Strategy	0.243	0.389	***0.835***				
4.	Short-term Perf. Accounting Measure	0.040	0.104	0.072	***0.961***			
5.	Short-term Perf. Perceptual Measure	0.117	0.103	0.088	0.382	***0.944***		
6.	Long-term Performance	0.228	0.452	0.707	0.090	0.314	***0.838***	
7.	Control Variables	0.140	0.053	-0.125	0.174	0.234	0.086	***0.910***

As Table 5.12 reveals, the correlation between the accounting measure of short-term performance and perceptual measure of short-term performance is .382. Although this correlation is high, these two measures are simultaneously used in the path analysis, instead of using only one measure. It is expected that the paths leading from the independent variables to both these measures will be similar.

The construct validity can also be verified by examining the loading and cross-loadings of items, that is, whether the items load higher on constructs other than their intended constructs. Table 5.13 presents the loadings and cross-loadings of the items.

Table 5.13. Discriminant Validity – 2: Item Loadings and Cross-loadings

	ITS	CBS	LBS	STP_FIN	STP_PER	LTP	CNTRLS
Believes IT		0.40	0.18	0.09	0.14	0.22	0.15
Uses IT		0.25	0.26	-0.03	0.05	0.16	0.07
Believes knowledge can be retained	0.45		0.32	-0.05	0.10	0.36	0.00
Storage of knowledge on intranet	0.19		0.29	0.20	0.07	0.35	0.08
Ideas move from individual to org.	0.28	0.40		0.19	0.09	0.53	-0.16
Employee input to critical decisions	0.15	0.38		-0.04	0.04	0.64	-0.17
Employees knowledgeable	0.15	0.18		0.10	0.03	0.54	-0.17
Employees share ideas, experience	0.24	0.34		0.01	0.13	0.64	0.05
ROA	-0.03	0.11	0.06		0.35	0.07	0.08
ROE	0.08	0.10	0.03		0.41	0.08	0.26
ROC	0.06	0.09	0.12		0.35	0.11	0.13
Profit margin	0.04	0.05	0.04	0.30		0.25	0.13
Net profits	0.11	0.15	0.08	0.38		0.30	0.26
Return on capital	0.16	0.09	0.11	0.40		0.33	0.24
Employees motivated to perform	0.19	0.35	0.68	0.12	0.21		0.10
Potential to succeed in changes	0.22	0.45	0.68	0.09	0.28		0.14
Identify new opportunities	0.19	0.31	0.54	0.03	0.34		0.07
Meet customers' future needs	0.08	0.35	0.48	0.16	0.21		0.03

	ITS	CBS	LBS	STP_FIN	STP_PER	LTP	CNTRLS
Capabilities for future performance	0.22	0.38	0.58	0.03	0.28		0.04
Capable and driven leadership	0.24	0.43	0.56	0.02	0.29		0.04
Sales	0.10	0.06	-0.08	0.11	0.19	0.09	
Net Income	0.17	0.06	-0.12	0.26	0.28	0.09	
Assets	0.07	0.00	-0.16	0.06	0.14	0.04	

As presented in Table 5.13, the items load much higher on their intended constructs than on the other study constructs. Items pertaining to 'learning-based KM strategy' load high on 'long-term performance' and vice versa. However, these cross-loadings are less than 0.7, indicating that the cross-loadings share less than 50 percent of the variance with constructs on which they cross-loaded. Further, an examination of the items reveals that the items in one construct are not related to the items in the other. Therefore, the cross-loadings appear to be occurring due to the nature of the data and the relationship between these constructs, rather than due to the items of 'learning-based KM strategy' capturing 'long-term performance' and vice versa. Consequently, the discriminant validity of the study constructs is verified.

Yet another method to verify the discriminant validity of two constructs is to construct a confidence interval for the correlation between them and examine if it includes 1 (Anderson & Gerbing, 1982). The 99% confidence interval for the correlation between learning-based KM strategy and long-term performance was 0.55 – 0.83. As this interval does not include 1, it can be inferred that the two constructs are distinct from each other.

5.3 Hypothesis Testing

The hypotheses presented in Chapter 3 were tested using PLS, which provides beta coefficients that can be interpreted in the same manner as the OLS regression coefficients. As Hypothesis 4 predicted the combined effect of different strategies, the relevant constructs were generated using the product-indicator approach (Chin *et al.*, 2003), which involved standardizing the items to avoid multicollinearity and computing the interaction term by multiplying each item of one construct with all the items of the

other. For example, if construct A has two items (A1, A2) and construct B has three items (B1, B2, B3), their interaction term A*B will have six items (A1*B1, A1*B2, A1*B3, A2*B1, A2*B2, A2*B3).

Using PLS, the study hypotheses were tested by examining the direction, size and significance of the paths from independent variables to dependent variables. Significance of the paths was examined using Bootstrapping technique that generated 500 sub-samples from the data. The study used two measures of short-term performance, that is perceptual data and accounting data. As presented in Table 5.12, these two are correlated at 0.382. In order to ensure the robustness of the findings, these two different data are used as two different dependent variables, both measuring short-term performance. Results of the analysis are presented in Figure 5.1.

The hypothesized model explained a variance of 15.8 percent in short-term performance (accounting measure), 13.9 percent in short-term performance (perceptual measure), and 62.3 percent in long-term performance. The control variable that reflected the size and past performance effects of the firms had a significant effect on both the measures of short-term performance. The control variable explained approximately 3.5 percent of the variance (square of β = .188) in the accounting measure and 6.65 percent variance (square of β = .258) in the perceptual measure.

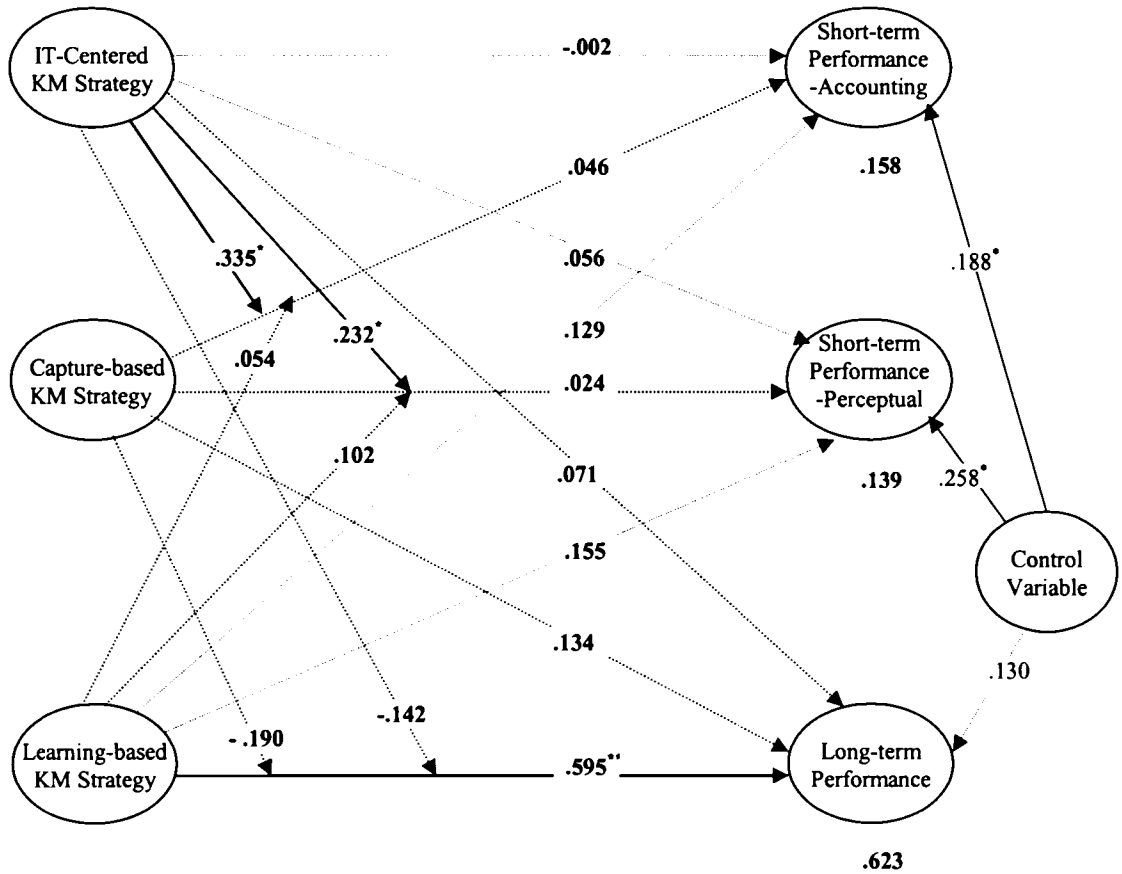
As presented in Figure 5.1, the path between IT-centered KM strategy and short-term performance (β = -.002; β = .056) was not significant. Also, the path between IT-centered KM strategy and long-term performance (β = .071) was not significant, indicating that IT-centered KM strategy has no significant effect on firm performance. This provided support for H1.

The path between capture-based KM strategy and short-term performance (β = .046, β = .024) was positive but not significant. Although the relationship is in the expected direction, it was not significant and provides no support for H2a. The path

between capture-based KM strategy and long-term performance (β = .134) was not significant, providing support for H2b.

The path between learning-based KM strategy and long-term performance (β = .595) was positive and significant at $p < 0.001$. This provides strong support for H3a. The path between learning-based KM strategy and short-term performance (β = .129, β = .155) was not significant, providing support for H3b.

Figure 5.1. PLS Path Analysis



*p < 0.05, **p < 0.01, ***p < 0.001
(Two-tailed significance)

Hypothesis 4a predicted that IT-centered KM strategy strengthens the positive relationship between capture-based KM strategy and short-term performance. The path coefficients (β = .232, β = .335) were positive and significant at $p < 0.05$ suggesting that IT-centered KM strategy complements capture-based KM strategy. This provides support for H4a.

Hypothesis 4b predicted that IT-centered KM strategy strengthens the positive relationship between learning-based KM strategy and long-term performance. The path coefficient (β = -.142) was not significant. Further, the direction of relationship was negative indicating that IT-centered KM strategy may weaken the positive relationship between learning-based KM strategy and long-term performance. Therefore, H4b was not supported.

Hypothesis 4c predicted that capture-based KM strategy strengthens the positive relationship between learning-based KM strategy and long-term performance. The path coefficient (β = -.190) was not significant but negative, indicating that capture-based KM strategy may weaken the positive relationship between learning-based KM strategy and long-term performance. Therefore, H4c was not supported.

Hypothesis 4d predicted that learning-based KM strategy strengthens the positive relationship between capture-based KM strategy and short-term performance. The path coefficients (β = .054, β = .102) were large and positive but not significant. Therefore, H4d was not supported.

The results from the above analysis are summarized in Table 5.14. Overall, the results indicate that learning-based KM strategy has a significant positive effect on long-term performance. Individually, IT-centered KM strategy and capture-based KM strategy do not have a significant positive effect on short-term performance but together they have a significant positive effect on short-term performance. Learning-based KM strategy has a non-significant positive effect on short-term performance and complements the capture-

based KM strategy in yielding short-term performance. In contrast, capture-based KM strategy dilutes, although not significantly, the effect of learning-based KM strategy on long-term performance. Similarly, IT-centered KM strategy dilutes the effect, but not significantly, of learning-based KM strategy on long-term performance. These results are discussed at length in Chapter 6, along with the findings from the interview data, which are briefly analyzed in section 5.5. The following section presents some post hoc analyses to examine the robustness of the findings from survey data analysis.

Table 5.14. Summary of Results

	Hypothesized Relationship	Hyp. Direction	β and t	Support?
H1.	IT-Centered KM Strategy → Short-term Performance	Non significant	-.002 (t = 0.02) .056 (t = 0.39)	Supported.
H1.	IT-Centered KM Strategy → Long-term Performance	Non significant	.071 (t = 0.75)	Supported.
H2a.	Capture-based KM Strategy → Short-term Performance	Significant Positive	.046 (t = 0.27) .024 (t = 0.20)	Not supported.
H2b.	Capture-based KM Strategy→ Long-term Performance	Non significant	.134 (t = 1.56)	Supported.
H3a.	Learning-based KM Strategy → Short-term Performance	Non significant	.129 (t = 1.19) .155 (t = 1.32)	Supported.
H3b.	Learning-based KM Strategy → Long-term Performance	Significant Positive	.595*** (t = 7.05)	Supported (p < 0.001).
H4a.	IT-Centered KM Strategy * Capture-based KM Strategy → Short-term Performance	Significant Positive	.335* (t = 2.32)* .232* (t = 2.19)	Supported (p < 0.05).
H4b.	IT-Centered KM Strategy * Learning-based KM Strategy → Long-term Performance	Significant Positive	- .142 (t = 0.88)	Not supported.
H4c.	Capture-based KM Strategy * Learning-based KM Strategy → Long-term Performance	Significant Positive	- .190 (t = 1.47)	Not supported.
H4d.	Learning-based KM Strategy * Capture-based KM Strategy → Short-term Performance	Significant Positive	.054 (t = 0.46) .102 (t = 0.74)	Not supported.

5.4 Post-hoc Analysis

The results above provided strong support for the hypothesis that learning-based KM strategy has a significant positive effect on long-term performance whereas a combination of IT-centered and capture-based KM strategy has a significant positive effect on short-term performance. These results remained consistent even when the items earlier dropped from the analysis due to low loadings were included. Further, these results remained robust to the nature of the definition of constructs, i.e. both formative and reflective. It is possible that the components of strategies such as IT-centered KM strategy and capture-based KM strategy may not co-vary with each other, thereby making

these constructs formative rather than reflective. In order to examine this aspect, a subsequent analysis was performed by treating them as formative constructs. The results remained consistent.

Although a positive relationship was hypothesized between capture-based KM strategy and short-term performance, no significant effect was found. This raised several methodological and theoretical questions: (i) whether the study had enough power to capture the effect if it existed, (ii) whether these relationships are robust or, dependent on some organizational and environmental conditions, and (iii) what explains short-term performance? Each of these questions is addressed in the following paragraphs.

5.4.1 Power

In the absence of prior studies in the literature, it was difficult to estimate the effect of an independent variable such as KM strategy on firm performance. Therefore, one could begin with the assumption that the effect may be moderate. If the effect size was moderate, a sample size of 76 was adequate to capture it with a confidence of 0.05 and power of 0.8 when using a multivariate analysis (Cohen, 1992). The sample size in this study is 88, which is more than the sample size needed to capture a moderate effect.

The power of a study to capture an effect and thus confidently reject a null hypothesis also depends on the statistical analysis used. This study used PLS, which needs a sample size that is ten times the largest number of paths that are directed at a construct (Chin *et al.*, 2003). In this study, the largest number of paths was six, which implies that the sample size required to capture an effect was 60. Given that the sample size in this study was 88, it is reasonable to expect that any effect present may have been captured.

Although the current study has adequate sample size, it is difficult to conclusively suggest that the effects, particularly the interaction effects, did not exist. For example, Chin et. al., (2003) suggest that 'appropriate detection of interaction terms require sample sizes of 100 – 150 and 4 or more indicators for each predictor and moderator constructs' (Chin *et al.*, 2003:203). It is possible that the effects, particularly the interaction effects, might have been very small and thus not captured by the current study. Therefore, the interactions effects, although some of them are not significant, will be used in a small manner in interpreting and discussing the overall results in Chapter 6.

5.4.2 Robustness of the findings

This study has only hypothesized the individual and joint effects of KM strategies on performance. Several variables might have an effect on this relationship. For example, researchers suggest that the nature of industry and industry environment has an effect on the extent to which firms can acquire and exploit knowledge (DeCarolis & Deeds, 1999). Further, exit and entry of employee has an impact on the learning that occurs in an organization (Carley, 1992). As part of the study, data were collected on these variables so that their effect on the hypothesized relationships could be examined and controlled for.

The effect of industry was measured using the 'environmental technological sophistication' scale developed by Covin, Slevin, and Heeley (2003). The items in this scale pertain to the extent which the respondent firm's principal industry was characterized by 'heavy investments in R&D', 'frequent product and process technology changes', 'usage of new/advanced process or product technologies', 'succeeding through superior technical personnel' and 'succeeding through process or product patents' (Covin, Slevin & Heeley, 2001).

The effect of 'environmental technological sophistication' was negligible, that is it did not have any direct effect on short-term performance – financial measure (β = -.14,

t = 1.35), short-term performance – perceptual measure (β = .185, t = 1.51), and long-term performance (β = .144, t = 1.54). Further, the relationships presented in Figure 5.1 did not change. Also, the product terms of 'environmental technological sophistication' and the three KM strategies were not significant. As none of the paths were significant, the results suggest that environmental technological sophistication does not influence the relationship between KM strategies and performance.

The entry and exit of employees was measured with items that asked the respondents to rate 'employee turnover' and 'employment growth' of their company with respect to industry. The effect of employee turnover was negligible as the paths representing the main effect of these variables, as well as the interaction terms involving KM strategies and employee turnover, were not significant.

The effect of employment growth on performance was significantly positive, that is employment growth had a direct effect on short-term performance – financial measure (β = .172, t = 1.53), short-term performance – perceptual measure (β = .396**, t = 3.63), and long-term performance (β = .174*, t = 2.19). However, the product terms of employment growth and the three KM strategies did not have significant paths to performance variables. The results suggest that employment growth in general has a positive association with performance but does not influence the relationship between KM strategies and performance.

Overall, the analyses presented in this section suggest that the variables 'environmental technological sophistication', 'employment growth' and 'employee turnover' do not affect the relationships found in this study. As the inclusion of these variables in the analysis amounts to controlling for their effects, it may be inferred that the results presented in Figure 5.1 and Table 5.14 are robust across different industries and companies with differing rates of employee exit and entry.

5.4.3 Long-term performance as a predictor of short-term performance

Findings from this study suggest that learning-based KM strategy strongly and significantly influences long-term performance whereas a combination of IT-centered and capture-based KM strategies significantly influences short-term performance. The question of firm performance is important for strategy research. Further, strategy research aims to provide prescriptions that guide managerial action. Therefore, a comprehensive understanding of the relationships between KM strategies and performance requires that the relationship between short-term and long-term performance be explained. More importantly, managerial prescriptions need to encompass both short-term and long-term performance. Therefore, the following paragraphs present some further analysis that explains how short-term performance can be indirectly achieved.

In this study, short-term performance was conceptualized as goal attainment, reflected in current firm performance. In contrast, long-term performance was conceptualized as the organizational processes that ensure long-term success and survival of a firm. Further, this study argued that learning-based KM strategy develops the organizational processes that yield long-term performance. It is possible that the same capabilities engendered by the learning-based KM strategy also influence goal attainment, that is short-term performance. In other words, it is possible that learning-based KM strategy indirectly yields short-term performance, that is through long-term performance processes. In order to examine if KM strategies indirectly affect short-term firm performance, a path was added from long-term performance to short-term performance. The results of this path analysis are presented in Table 5.15.

Table 5.15. Indirect Effect of KM Strategies on Short-term Performance

	Hypothesized Relationship	β and t	β and t with LP → SP path
H1.	IT-Centered KM Strategy → Short-term Performance	-.002 (t = 0.02) .056 (t = 0.39)	-.001 (t = 0.02) .043 (t = 0.39)
H1.	IT-Centered KM Strategy → Long-term Performance	.071 (t = 0.75)	.073 (t = 0.75)
H2a.	Capture-based KM Strategy → Short-term Performance	.046 (t = 0.27) .024 (t = 0.20)	.051 (t = 0.27) -.062 (t = 0.20)
H2b.	Capture-based KM Strategy→ Long-term Performance	.134 (t = 1.56)	.133 (t = 1.56)
H3a.	Learning-based KM Strategy → Short-term Performance	.129 (t = 1.19) .155 (t = 1.32)	.152 (t = 1.26) -.155 (t = 0.97)
H3b.	Learning-based KM Strategy → Long-term Performance	.595*** (t = 7.05)	.595*** (t = 7.20)
H4a.	IT-Centered KM Strategy * Capture-based KM Strategy → Short-term Performance	.335* (t = 2.32) .232* (t = 2.19)	.338* (t = 2.15) .188* (t = 1.73)
H4b.	IT-Centered KM Strategy * Learning-based KM Strategy → Long-term Performance	- .142 (t = 0.88)	- .145 (t = 0.89)
H4c.	Capture-based KM Strategy * Learning-based KM Strategy → Long-term Performance	- .190 (t = 1.47)	- .189 (t = 1.52)
H4d.	Learning-based KM Strategy * Capture-based KM Strategy → Short-term Performance	.054 (t = 0.46) .102 (t = 0.74)	.045 (t = 0.38) .232 (t = 1.73)
Exploratory Path			
	Long-term Performance → Short-term Performance		- . 039 (t = 0.30) .538** (t = 2.98)

As presented in Table 5.15 above, adding a path from long-term performance to short-term performance did not alter the study results. However, the path from long-term performance to short-term performance – perceptual measure was significant ($\beta = .538^{**}$, $t = 2.98$). As the paths from KM strategies to short-term performance were not initially significant, the path from long-term performance to short-term performance does not represent a mediation (Fiske, Kenny & Taylor, 1982). However, it indicates an indirect effect of KM strategies on short-term performance. In particular, the results indicate that learning-based KM strategy has an indirect effect of .32, that is .595 * .538 (β of path from learning-based KM strategy to long-term performance * β of path from long-term performance to short-term performance). Consequently, it may be concluded that learning-based KM strategy has an indirect positive effect on the short-term performance of a firm. In other words, learning-based KM strategy not only yields long-term performance but also yields short-term performance in an indirect manner.

This analysis provided further evidence to the discriminant validity of learning-based KM strategy and long-term performance, which were correlated at 0.707. If these two constructs were measuring the same phenomenon, then their effect on short-term performance would have been similar. However, this analysis indicated that learning-based strategy has no significant association with short-term performance whereas long-term performance has a significant association thereby indicating that these two constructs are different from each other.

It may be noted that this analysis does not rule out the possibility that a third variable may be influencing both learning-based strategy and long-term performance. Although such a possibility cannot be ruled out, no such theoretical construct could be visualized. More importantly, the existence of such a construct does not affect the validity of the constructs in this study and the relationships among them.

5.5 Analysis of Interview Data

In order to triangulate the results from the survey data analysis and to add richness to the data, interviews were conducted with nine companies. Each interview lasted for approximately one hour and was transcribed by a person who was unconnected with this research. Of the nine, eight interviewees agreed to record the interview; one person declined. The interviews resulted in a total of 125 pages (single-spaced) of transcribed text. This data was analyzed to uncover the common themes around the application and benefits of knowledge management. A summary of the analysis is presented in a table form in *Appendix F*. The interview data is extensively used in discussing the study findings in Chapter 6. The following paragraphs briefly present some broad observations, based on the interview data, about KM strategies and performance.

Two of the nine firms interviewed (MeasureTech and WoodTech) appear to follow the IT-centered strategy. These firms approach KM in a very hands-off manner. MeasureTech believes that providing information on computers enables each person, each branch, and each region to monitor their performance. WoodTech believes that

linking the branches with computers would let the information flow and bring uniformity in the organization. Both these firms have done fairly well. Part of the reason behind these companies doing well is in the nature of their business: commodities distribution. They both have low employee turnover and operate in a fairly stable industry (building products). They both believe that it is important to 'play the margins' by knowing that 'faucet is price sensitive but not solder' because the 'plumber is not going to drive across the street to save 50 cents'. More importantly, both the firms are operating in mature markets with employees who are knowledgeable about 'when to sell and when to buy'.

The activities discussed by four firms (GameTech, ConsTech, PhotoTech and FuelTech) reflect a capture-based strategy of trying to codify the knowledge of employees and store it in 'knowledge repositories'. In the words of a GameTech interviewee, their efforts are to 'get people into the habit of sharing written documents or images that would be useful for other people without a whole lot of massaging'. The efforts at PhotoTech were to capture the knowledge of employees in repositories so that it can be used to grow their product services business. The efforts at ConsTech were to store experience with different clients so that other consultants could access that experience and be more efficient the next time. FuelTech believes that providing computers and placing manuals on their web portal will facilitate usage of the content.

Of the four firms that followed capture-based strategy, three have been making losses for the last few years. However, only PhotoTech has faced severe crisis, largely because it faced patent litigations. Both ConsTech and FuelTech appear to be resilient enough to bear the losses. The reasons behind this resilience appear to be different: ConsTech does not have the overheads that a manufacturing firm has; FuelTech has been innovating and has the support of few major automotive companies, which have invested money in the company; GameTech has been doing well and is a subsidiary of a U.S. company. It is in a growing industry and an attractive market and in the words of one of the interviewees 'is so much larger than its closest competitor'.

The firms HydroTech, SoftDev and LoTech appear to follow a learning-based strategy. HydroTech believes in having few nodes/mentors in the organization who put 'people with ideas together and let the magic happen'. None of the three interviewees claimed that 'knowledge management' is their primary activity. Two of them were in the HR function while one is in 'intellectual property management'. However, all the three companies do similar things. Both HydroTech and SoftDev conduct 'lunch and learn' sessions and focus on developing a culture where knowledge is shared and knowledge sharing is appreciated. Perhaps due to the constraints of its size, LoTech focuses on leadership development and has a well-oiled machinery to develop employees with the expectation that they contribute to the future of the company. In other words, companies like LoTech are putting people first and developing them while expecting them to contribute, which makes for a two-way interaction. Consequently, the firms that follow learning-based strategy have performed well and are expected to continue to do so.

When asked about the benefits of their KM efforts, the firms following a learning-based strategy mentioned aspects like 'employee satisfaction', 'would have come out of crisis quicker', 'develop common knowledge-base', 'better employees', 'lower turnover', 'common goals and vision' and 'motivated employees'. These aspects reflect long-term performance. In contrast, firms following capture-based strategy mention 'difficult to quantify', 'number of hits', 'access to knowledge', 'better search', 'information in small chunks', 'retain knowledge' and 'lessons learnt are not lost'. These aspects reflect using the existing knowledge and the short-term performance benefits associated with it. The firms that followed an IT-centered strategy suggest that they benefit because 'everyone knows where they stand' and 'computer connectivity brings transparency'. These aspects do not have any apparent link to performance.

In summary, the interviews provided insights into the issues surrounding knowledge management and its relationship with performance. Interview data broadly support the relationships hypothesized in this study. However, the data also suggest that capture-based strategy needs time to influence performance. More importantly, interviewees suggested that capture-based strategy could interfere with learning-based

strategy by sending contradictory signals about the philosophy of knowledge management. These insights are used in discussing the results in Chapter 6.

5.6 Chapter Summary

The following key points summarize the discussion in this chapter.

- The data collected did not show any evidence of non-response bias, sample selection-bias or data collection method bias.
- The scales developed for the study exhibit the desired statistical properties.
- The results offer mixed support for the study hypotheses. As expected, learning-based strategy had a significantly positive effect on long-term performance. Further, capture-based strategy and IT-centered strategy complement each other to provide short-term performance benefits. Also as hypothesized, IT-centered strategy has no effect on short-term or long-term performance and capture-based strategy has no significant effect on long-term performance.
- Post-hoc analyses suggested that the results are robust across different industry and firm conditions. Post-hoc analysis also revealed that learning-based KM strategy has an indirect positive effect on short-term performance.
- The interview data indicated that firms manage their knowledge by following the broad themes outlined in this study and benefit in the direction hypothesized.

CHAPTER 6. DISCUSSION

This chapter discusses the results of this study. Section one explains the results by integrating findings from the survey and interview data analysis. Section two presents the limitations of the study and section three presents implications for research and practice. Finally, section four presents avenues for future research.

6.1 Study Findings

This section discusses the results of the study by combining survey and interview data analysis. First, the relationship between each of the three KM strategies and performance is explained. Second, the combined influence of the three KM strategies on firm performance is explained. Finally, all the results are integrated and placed in perspective to explain the nature of KM strategies and their effect on performance.

The hypotheses in this study were of two different types: non-directional hypotheses and directional hypotheses. The non-directional hypotheses are discussed by examining the following: (i) whether the path coefficients are non-significant, (ii) whether the study had adequate power, and (iii) whether interview data supports or contradicts the hypotheses in any manner. The directional hypotheses are discussed by examining the following: (i) whether the path coefficient is in the expected direction and significant, (ii) if the coefficient is non-significant, whether the study has adequate power to detect the effect if it existed, and (iii) whether interview data supports or contradicts the hypotheses in any manner.

A summary of the analysis with respect to each hypotheses and the conclusion arrived at is presented in Table 6.1. The question of power was discussed in section 5.4.1, where it was indicated that this study had sufficient power to capture main effects but its power to detect interactional effects was unknown. Accordingly, the results are

interpreted in the following paragraphs by considering the appropriate parameters for evaluating them.

Table 6.1. Hypothesis Type, Criteria and Conclusion

Hyp. No.	Hypothesized Relationship	Path Coefficient		Power?	Interview Data	Conclusion
		Direction	Significance			
Non-directional Hypotheses – Non-significant Effect Hypothesized						
H1.	IT-Centered KM Strategy → Short-term Performance	Positive	Not Significant	Adequate	Support	Hypothesis received support.
H1.	IT-Centered KM Strategy → Long-term Performance	Positive	Not Significant	Adequate	Support	Hypothesis received support.
H2b.	Capture-based KM Strategy→ Long-term Performance	Positive	Not Significant	Adequate	Support	Hypothesis received support.
H3b.	Learning-based KM Strategy → Short-term Performance	Positive	Not Significant	Adequate	Support	Hypothesis received support.
Directional Hypotheses – Significant Positive Effect Hypothesized						
H2a.	Capture-based KM Strategy → Short-term Performance	Positive	Not Significant	Adequate	Not clear	Hypothesis did not receive support.
H3a.	Learning-based KM Strategy → Long-term Performance	Positive	Significant at $p < 0.001$	Adequate	Support	Hypothesis received support.
Moderation Hypotheses – Significant Positive Effect Hypothesized						
H4a.	IT-Centered KM Strategy * Capture-based KM Strategy → Short-term Performance	Positive	Significant at $p < 0.05$	Not sure	Support	Hypothesis received support.
H4b.	IT-Centered KM Strategy * Learning-based KM Strategy → Long-term Performance	Negative	Not Significant	Not sure	Not clear	Effect, although not significant, is in the opposite direction.
H4c.	Capture-based KM Strategy * Learning-based KM Strategy → Long-term Performance	Negative	Not Significant	Not sure	Support	Effect in the opposite direction; interview data supports it.
H4d.	Learning-based KM Strategy * Capture-based KM Strategy → Short-term Performance	Positive	Not Significant	Not sure	Support	Hypothesis did not receive support, but interview data supports hypothesis.

6.1.1 IT-centered KM strategy and performance (H1)

This study proposed that IT-centered KM strategy does not have any significant effect on short-term or long-term performance (H1). The path coefficient of the IT-centered KM strategy and short-term performance was -.002 (t = 0.02) for the accounting measure and .056 (t =.39) for the perceptual measure. The coefficient for the path IT-centered KM strategy and long-term performance was .071 (t = 0.75). These coefficients suggested that it is unlikely that IT-centered KM strategy has any effect on performance.

Although the power of this study to detect a small effect is not known, given that this study used two different measures for short-term performance and one measure for long-term performance, it is highly likely that study would have captured an effect if it existed.

Several interviewees suggested that the role of technology in knowledge management, and thus in performance, is limited. In the words of the ConsTech interviewee, 'technology comes last – it's simply an enabler'. This viewpoint is shared by the interviewee from SoftDev: 'knowledge management is not about technology; ... the technology piece is easy'.

The interview data suggests that IT-centered strategy is unlikely to provide any short-term or long-term performance benefits because the activities that are implemented either lack focus or have a misplaced focus. A firm improves its performance by focusing on the mechanisms that deliver performance. Instead of focusing on knowledge, which engenders performance, IT systems focus directly on performance and targets. As IT systems do not focus on the mechanisms that result in performance, IT-centered KM strategy does not affect performance. This is evident from the interviews of MeasureTech and WoodTech:

> "We have one online system for Canada. So our big server's in ..... here. It is a live system so that all the branches know what their profit is hour by hour, day by day. So they know what their benchmarks are, what their targets are, and their budgets, and they can see exactly how the margin is moving, or not moving".

> "As we move into this new computer system and this new computer environment, it's going to be more transparent. So people are going to be knowing what's happening down in California, what's happening out on Nova Scotia. That information will be flowing a lot smoother than it is now"

These comments above suggest that the companies were expecting that computers would enable information flow, focus employees on performance, and create transparency and uniformity. However, such expectations by themselves do not yield any

results. More importantly, as the IT investments do not focus on managing the knowledge, they do not yield performance benefits. Researchers in the past have suggested that investments in IT by themselves do not directly influence performance, but facilitate business processes, which in turn enhance firm performance (Brynjolfsson & Hitt, 2000; Tanriverdi, 2005). Therefore, the non-significant and small coefficients in the statistical analysis are in line with the existing literature and appear to be more a true portrayal of the relationship than an artifact of lack of statistical power.

6.1.2 Capture-based KM strategy and performance (H2)

This study hypothesized that capture-based KM strategy will have a positive effect on short-term performance because it promotes usage of existing knowledge (H2a). However, consistent usage of known solutions blunts a firm's ability to generate new ideas and create new solutions. Therefore, capture-based KM strategy will have no effect on long-term performance (H2b).

The path coefficients from capture-based KM strategy to short-term performance measures were positive but not significant ($\beta = .046$, $t = 0.27$ and $\beta = .024$, $t = 0.20$). This study may not have found a significant result on this relationship because it did not consider some important theoretical factors. Alternatively, the relationship may not have been found due to inadequate time-lag. These issues are discussed in the following paragraphs.

The study hypothesized a positive relationship between capture-based KM strategy and short-term performance based on the premise that the knowledge captured will be used. More importantly, it was premised on the assumption that the costs of capturing knowledge are lower than the benefits of using it. If the firm spends vast resources on capturing knowledge and only part of it is used by employees, the knowledge management efforts are unlikely to yield performance benefits. However, interviewees suggested that this may not necessarily be the case.

Knowledge repositories have an initial high usage, which drops quickly. The firm invests more to make it easy for employees to use the repository but falls into a vicious circle of more resources and lower usage. This is well reflected in the following statement.

> "With the databases, the initial quantifiable measure is good but then it's going to have a quick rush and then it drops. And so, you know, if usage drops down within a month or two and you are struggling to try and figure out how to bring it back up to that initial rush then it's not the same. That's when you get caught in having fancier upgrades and fancier functions and features when the number of users is not increasing according to the number of features you add and you get to a point where people are only using 20 percent of what is useful on the site and you are just spending money on technology for technology's sake and so it's quite easy to get into that kind of a vicious circle".

Employees may not use the repositories after the initial stage because they do not find the information they are looking for or they do not find it easily. These reasons reflect the challenges that firms face in capturing knowledge and making it accessible. For example, the interviewee from ConsTech mentioned that capturing knowledge and providing access are the biggest challenges the firm faced:

> "Emails and all the tacit knowledge (that flows through emails of employees) not being captured is one (challenge); dealing with experts (so that they document and post their knowledge on the intranet) is the other; and the third one is really tightening up the process for the repository and the taxonomy and getting people to actually send stuff to the library. There's still tons of good knowledge sitting on people's C drives, we leave it behind at client sites. We need a better way of doing that".

> "There are three aspects to (ensuring good) access. Number one is the physical access, (which is difficult because the company is in a hired building where network security could be an issue. Also, the employees work from different client locations where they may not have adequate access). Number two, I think, search has got to be really good and yield high quality results first time, no matter what they ask for. So you've got to have that really robust search because people will go away if they don't get it on the first few hits. So we are constantly looking for ways to get the search theorem in – we've got to build a thesaurus because terminology changes in our business all the time. What got tagged six months ago you wouldn't tag it that way today. But I don't want to go back and tag things (again). So I've got to deal with that. And then the third one....you got to have response time. It's got to be available all the time no matter when, people are doing stuff late at night, we've got four time zones we work in across the continent that I can't have it (the intranet) go down. And it's got to be, you know, quick response or people will go away"

The interview data presented above highlights the challenges firms face in capturing knowledge and making it available to employees, which affect the extent to which firms can benefit from a capture-based strategy. It is possible that this study did not find a significant positive relationship between capture-based KM strategy and short-term performance because it did not consider how effectively the knowledge was captured and how much of the captured knowledge was utilized.

Some of the interviewees suggested that it was difficult to ascertain when the effect of captured knowledge can be seen on performance. It may be seen immediately, that is within the first or second quarter after a particular knowledge repository was implemented. Or, it may be visible after the content in the repositories and their usage has stabilized. In order to capture the effect of capture-based strategy on performance, it is important to know the time lag. For this study, the perceptual data on short-term performance and capture-based strategy were collected at the same time. The performance data that used accounting measures pertained to the year 2004, which is the same year in which the majority of survey data was collected. In other words, the time lag between dependent and independent variables is marginal. As a result of not having appropriate time lags, the effect was perhaps not captured.

The path from capture-based strategy to long-term performance had a coefficient of .134 (t = 1.56). This coefficient was not significant and thus supported the arguments made in H2b. During the interviews, when asked about the performance benefits, firms following a capture-based strategy mentioned aspects like 'number of hits', 'better search', 'information in small chunks' and 'retain knowledge'. They did not, however, mention long-term performance aspects like employee satisfaction, better response time and better understanding of the job. In short, both the survey data and interview data suggest that capture-based strategy has no significant effect on long-term performance.

In sum, as hypothesized, the capture-based KM strategy does not have a significant effect on long-term performance. However, its effect on short-term

performance is unclear because this study did not consider the factors that were unearthed during the interview stage. Further, it is not known what the appropriate time lag is between capture-based KM strategy and short-term performance. In the absence of clear knowledge, the study used marginal time lag; researching and using a more appropriate time lag would likely yield different results.

6.1.3 Learning-based KM strategy and performance (H3)

This study proposed that learning-based strategy has a positive effect on long-term performance. The large path coefficient (β = .595) and its significance ($p < 0.001$) support this assertion. This result suggests that firms that develop learning interactions among individuals and groups benefit by creating new solutions for organizational problems. These firms create new solutions by making concrete efforts to develop a common identity (Kogut & Zander, 1996) and a common knowledge base (Demsetz, 1991), as explained in the following paragraphs.

Firms that follow a learning-based strategy offer courses such as 'SoftDev Essentials' and 'Hydro101' that familiarize every employee in the organization with the basic technology and processes of the company. The interviewee from SoftDev explained about her company's program, referred to as SoftDev Essentials.

> "SoftDev essentials ... that's teaching everybody, bringing everybody up to speed on minimum skill set, knowledge level about the company, about the products, about the corporate staff, about how we do business, all that. So everybody from the receptionist to the VP – they are all going to have the same training. That's SoftDev-essentials".

The development of a common knowledge base helps employees to understand their role in the company as well as the role of others in the whole organization. As a result, employees develop a common identity. Consequently, they contribute by performing their own roles effectively and by helping their peers to perform their roles effectively. This is best reflected in the following words:

> "our VP of sales just did a very good session on how to sell SoftDev Product. It's called '*What it's like to sell SoftDevil*'. Because we've got a team of sales people of course and they are selling all day long but most of us – there's 350 people– so 330 of us don't know anything about how to sell the product and what it's like to go out there and present, and to close deals and everything. So they taught us what they do and how they rely on the rest of us to get their job done".

In addition to developing a common knowledge base and a common identity, the firms that follow a learning-based KM strategy foster a culture in which ideas are freely expressed. As pointed out by HydroTech, they 'take even the wackiest of ideas' and pursue it to see if it has any potential. In the process they 'tolerate mistakes' and bring out the full potential of the employees. Encouraging new ideas and tolerating mistakes produces a diversity of thought and knowledge.

In sum, the firms that follow a learning-based KM strategy foster a common identity and develop a common knowledge base while simultaneously encouraging diversity of thought and knowledge. These aspects are necessary for knowledge creation. Common knowledge and diversity develop the absorptive capacity of the firm (Cohen & Levinthal, 1990) and identity helps to bring ideas together and apply them in a focused manner to create new knowledge (Kogut & Zander, 1996; Nonaka, 1994). Consequently, the firm derives performance benefits by creating and exploiting new knowledge (Zahra & George, 2002).

Prior research suggested that firms benefit by facilitating processes that create and exploit knowledge. However, it did not discuss the possibility of learning processes resulting in indirect benefits such as high employee satisfaction and low employee turnover. These aspects were brought out during the interviews. For example, LoTech suggests that their initiatives attracted the best talent and decreased turnover, even though their firm and industry are not attractive. In the words of the interviewee from LoTech:

> "Our compensation strategy is not to be a leader. Our compensation strategy is to be about the 75th percentile. So we don't pay the best. We are also not a very attractive industry – .... (*the concerns regarding confidentiality prevent from reporting more details on the industry*). So we are not necessarily very attractive either. The proposition we put in front of our employees is I think much richer. Meaningful work.... the proposition to employees is intriguing work, meaningful, like we have the most diverse job set that I've seen in any company. We are the leading edge researcher that's non-

> governmental in the country. We've got every discipline that you can imagine. So that's compelling, the kind of richness of the work that they can get at (LoTech) is compelling. But I think what's more compelling to young people today is they see the possibility, and we sell the possibility, that you can build a career here. Your career can be multi-faceted, you can become a black-belt, you can build a career in marketing or finance or HR but you might also, at some point, have a spin in sales, have a spin in manufacturing. So you can see this diversity of work and I think that's compelling for people".

The indirect benefits of a learning-based strategy are best summed up by the interviewee from SoftDev:

> "Many (benefits). I think it's making people happier to be here. So job satisfaction is higher. I think the company is able to move forward faster. We're making progress faster because people are working together towards a common goal. So it's just kind of common sense ... how to run an organization – you know, if you were at the top of the organization, how you would want to see it running. So we see a lot of benefits that way".

In short, this study confirms the argument commonly found in the literature that learning enhances performance. However, this study highlights that learning processes also yield several indirect benefits such as high employee satisfaction, low employee turnover, common vision and better working relationships.

The path from learning-based strategy to short-term performance had a coefficient of .129 (t = 1.19) for accounting measure and .155 (t = 1.32) for perceptual measure. These coefficients are not significant and thus support the arguments made in H3b. Although learning-based KM strategy does not significantly influence short-term performance in a direct manner, as presented in Section 5.4.3, it appears to significantly influence short-term performance in an indirect manner by enhancing organizational processes that yield long-term performance.

None of the interviewees suggested any short-term benefits while discussing their learning initiatives. They explained the benefits in terms of 'employee satisfaction', 'common vision' and 'shared goals'. In the words of one interviewee,

> "You hear people saying I want to know what the return on investment is on training, I go right back at them and I say, you got to ask that question,

> you don't have the belief it works. It's a leap of faith. And then, yeah, you can demonstrate over time how it pays back".

The above views are echoed by another interviewee who suggested that the results from learning-based strategy take a long time to materialize but are more satisfying:

> "I think if you go from the soft (learning) side, when you do *finally* get some results, big or small, the satisfaction levels are higher"

Overall, the data from survey and interviews suggests that the benefits of the learning-based KM strategy are realized after a long period of time.

6.1.4 Complementarities of KM strategies (H4)

The study found support for hypothesis H4a that the IT-centered strategy and capture-based strategy complement each other to provide a short-term performance advantage. Firms using a combination of capture-based KM strategy and IT-centered KM strategy derive benefits by decreasing the costs of learning and by reusing the solutions that worked in the past. In other words, they benefit by emphasizing the exploitation component (March, 1991). Although none of the companies interviewed have measured the extent of benefits received from capturing knowledge in databases and making it available to employees by using technology, there is anecdotal evidence. For example, one interviewee said:

> "We have got a huge customer group and they are the main users of the knowledge-base. There are about 60 people in that group. And person A solves the problem and puts it in the knowledge-base and it cuts the troubleshooting time significantly (next time). We saw that already. So that's a tangible benefit. And ... sometimes they save about half a day's work because they were led in the right direction".

As pointed out by the interviewee from ConsTech, a successful knowledge repository needs a sophisticated search algorithm, continuous access and fast response times. These aspects are ensured by having a high focus on technology. Therefore, firms that complement capture-based KM strategy with high-powered and sophisticated IT tools derive benefits in the form of short-term performance.

Contrary to hypothesis H4b and H4c, combining learning-based strategy with IT-centered strategy or capture-based strategy appears to have a negative effect on long-term performance of a company. Although these relationships are not significant, these results indicate that IT-centered and capture-based strategies may not complement learning-based strategy to provide stronger long-term benefits. A possible reason is that the IT-centered and capture-based strategies dilute the effect of learning-based strategy on long-term performance. This possibility is reflected in the words of one interviewee from GameTech:

> "I don't know if it's just in this industry or not but egos play a big part. And if you can sort of feed that ego and make it appear at least that it's more about sharing their knowledge and less about the company mining what's in their brain, people are going to be more willing to take the time".

The above comments indicate that the underlying beliefs that prompt capture and technology are likely to send a negative signal to employees. When capture is emphasized, it sends a negative signal to employees that the company is 'mining what is in their brain'. This raises concerns in the minds of employees about the possibility that others might reap the rewards of their work. Further, this concern could raise doubts about the security of their own jobs.

Pure learning-based KM strategies develop employees and provide them with a space for expressing their ideas and thoughts. The learning-based strategy is based on the assumption that when employees are developed they pay back to the company over a period of time through better leadership and effective management. This assumption emphasizes the mutually beneficial nature of the KM efforts. However, when capture-based elements are present alongside the learning-based KM strategy, they may interfere with the positive atmosphere that is engendered by a learning-based strategy. Put together, the message from capture and learning-based strategy could become 'learn and document' as opposed to 'learn and perform'. With the former, employees might get an impression that the firm views them as machines that are capable of learning and

articulating. The latter might give an impression that the firm sees employees as indispensable to the firm and thus invests in their development to ensure performance.

The IT-centered strategy emphasizes components such as computers and instant messaging, that is communication through technology rather than face-to-face. Consequently, the benefits of interaction that exist in a face-to-face interaction are not fully realized and employees may learn things incorrectly or inadequately. Research suggest that performance declines when lessons that are inadequately or inappropriately learned are applied (Haleblian & Finkelstein, 1999). In other words, the results from the survey data analysis and interviews suggest that IT-centered strategy and capture-based strategy may not complement learning-based strategy.

Hypothesis H4d suggested that learning-based KM strategy complements capture-based KM strategy and strengthens its relationship with short-term performance. The path coefficient on this relationship is positive but not significant. Although the coefficient is in the expected direction, its non-significance indicates that learning-based KM strategy may not significantly complement capture-based strategy. It is possible that the effect may be small and could not be captured by this study. However, the coefficient is positive and in the expected direction indicating that, unlike IT-based and capture-based strategies that negatively affect the benefits of learning-based strategy, the learning-based strategy may not negatively affect the relationship between capture-based strategy and performance. These aspects are discussed further in the following section, which integrates the findings from survey and interview data analysis to present a comprehensive picture of the relationship between KM strategies and firm performance.

6.1.5 Results in perspective

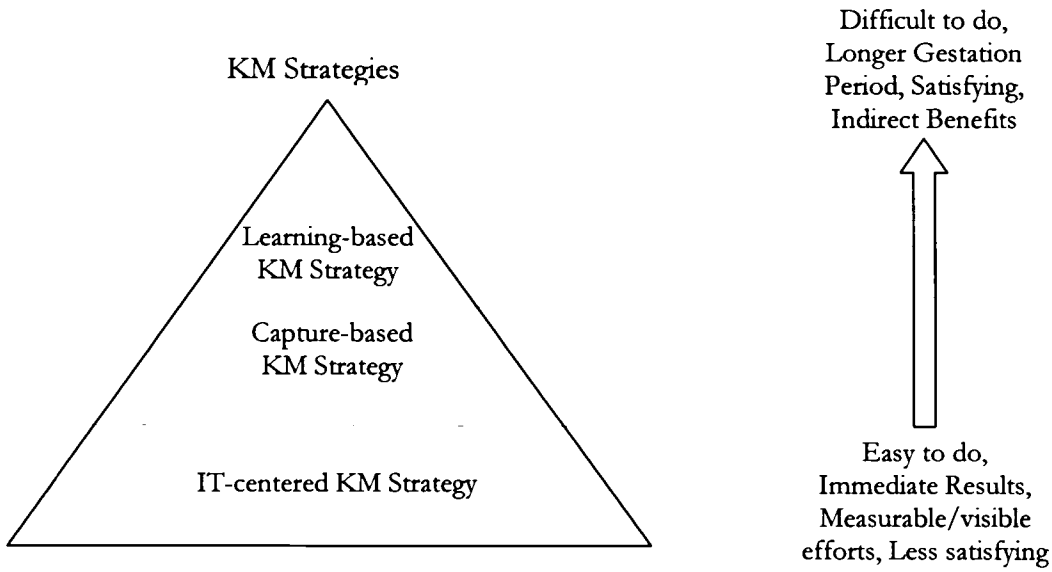
The findings from survey data analysis strongly support the argument that learning-based strategy positively influences long-term performance. Also, the survey data analysis shows that a combination of capture-based and IT-centered KM strategies

positively influences short-term performance. Further, the analysis shows that both IT-centered KM strategy and capture-based KM strategy have no significant effect on performance. Post-hoc analysis of the survey data suggests that these relationships are robust under different industry and company conditions. The findings from interview data analysis lend general support to the study hypotheses.

Integrating the results of the survey data with interview data reveals several key insights about the nature of the three different KM strategies conceptualized in the study. First, the three strategies are somewhat hierarchical in nature. Second, the three strategies have a hierarchical effect on performance. Third, the three strategies are based on different assumptions about the nature of knowledge management. Finally, the different assumptions are not completely complementary. Each of these aspects is discussed in the following paragraphs.

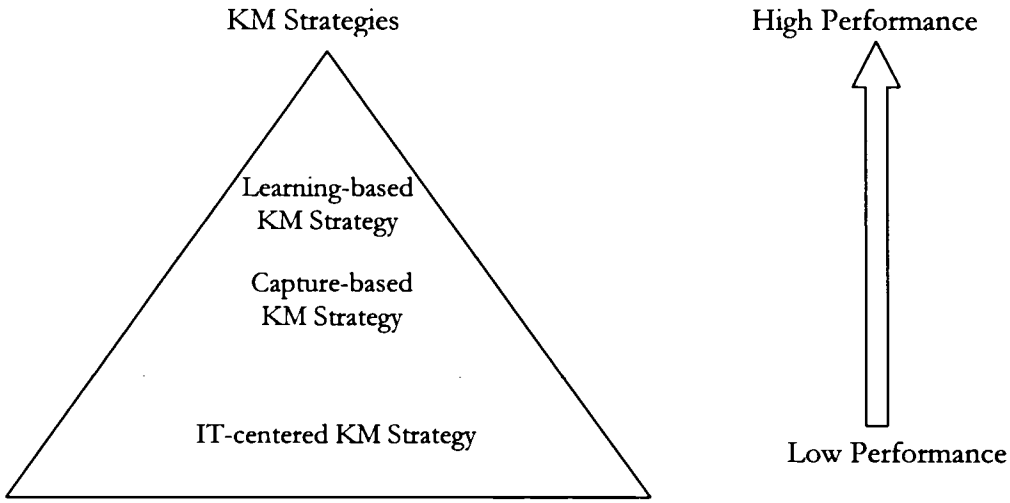
Several of the interviewees suggested that IT is just an 'enabler', an 'easy piece'. They also expressed that capture-based strategy creates several challenges for capturing tacit knowledge and making it available to employees. Some of the challenges of capture and access can be met by having highly sophisticated IT tools. Efforts to implement an IT-centered KM strategy or a capture-based KM strategy are visible and their outcomes can be easily measured in terms of technologies placed in the organization, number of hits to the content in repositories and number of contributions to the repository. Both the IT-centered and capture-based KM strategies can be implemented by a small group of people without the involvement of the entire organization. For example, PhotoTech implemented a large scale KM project without the active support of the top leadership of the organization. Not surprisingly, it was one of the first projects to be axed when the company faced crisis. In contrast, the learning-based strategy is tough to implement without involving the entire organization. The efforts to generate learning processes are difficult to undertake, require the involvement of everyone in the organization and take a long time to fructify. The outcomes of a learning-based strategy are not visible, but only felt. For organizations, they are a leap of faith. Figure 6.1 presents the hierarchical nature of the three KM strategies.

Figure 6.1. Hierarchical Nature of KM Strategies



In addition to being hierarchical in nature, the three KM strategies also have a hierarchical effect on firm performance. As the findings from survey and interview data analysis suggest, the IT-centered KM strategy has no effect on performance, and learning-based KM strategy has a very high positive effect on performance, and capture-based KM strategy has some positive effect on performance. As the interviewees pointed out, IT is just an enabler and the benefits of capturing are difficult to realize. In contrast, the benefits from a learning-based strategy are multifaceted. The hierarchical effect of the three KM strategies on performance is presented in Figure 6.2.

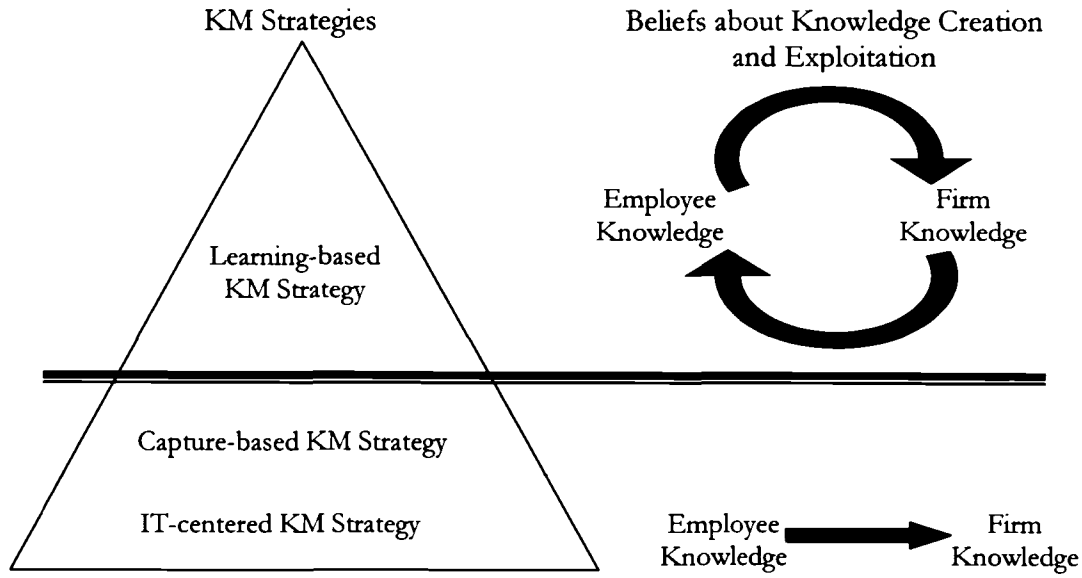
Figure 6.2. Hierarchical Effect of KM strategies on Firm Performance



As hypothesized in the study, the three KM strategies are based on different assumptions about the nature of knowledge and how to manage it. However, in contrast to the conceptualization in the study, the three strategies do not appear to be completely compatible with each other. Particularly, there seems to be a divide between the learning-based KM strategy and the other two strategies. The two strategies of IT-centered and capture-based appear to be instrumental in nature, that is there is a clear expectation about the outcomes and consequence of efforts made as part of these strategies. The IT-centered KM strategy installs IT tools in the organization expecting that 'information will flow'. The IT tools are placed in an organization for a specifiable purpose or towards a goal that serves the organization. The capture-based KM strategy encourages employees to codify their knowledge and store it in the repositories so that the same may be retained within the organizational systems rather than in the minds of employees. The efforts that form a capture-based KM strategy also have a specifiable purpose. In other words, both the IT-centered and capture-based KM strategies believe that knowledge management will bring the knowledge of employees into open and make it the firm's knowledge. The flow of knowledge is one way: from employees to the organization. In contrast, the flow of knowledge is two way in the learning-based KM strategy: from employees to firm and vice-versa. The learning-based KM strategy is not instrumental in nature but aims to

achieve performance by emphasizing a two-way and mutual relationship between employees and firm. The mutual relationship strategy implies that both the parties contribute to each other whereas the instrumental strategy implies that organization expects employees to contribute to its success. These arguments are presented in Figure 6.3.

Figure 6.3: Assumptions of KM strategies



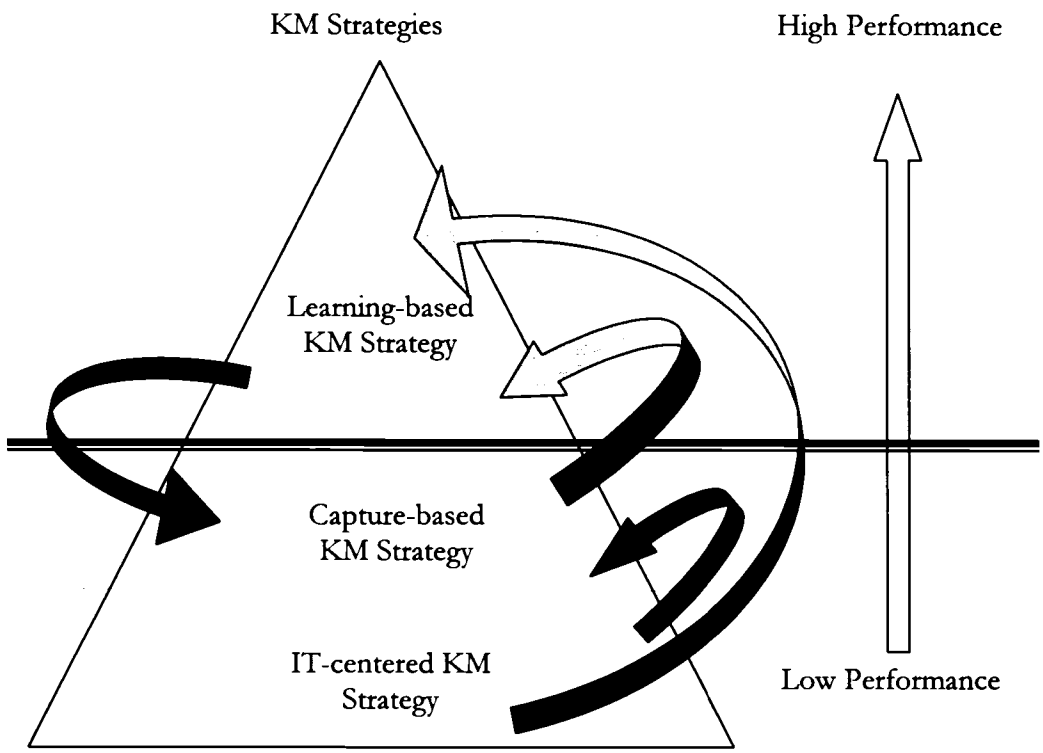
The dark line depicted in Figure 6.3 illustrates the divide that exists between the three strategies. Both the IT-centered KM strategy and capture-based KM strategy emanate from the same belief that employees hold the knowledge and their knowledge must be extracted to turn it into firm knowledge. In contrast, the learning-based strategy emphasizes that both employee knowledge and firm knowledge contribute to each other. Consequently, the learning-based KM strategy considers employees as partners in knowledge management and emphasizes contribution from both sides.

The strategies that emanate from similar beliefs, that is IT-centered and capture-based strategies, complement each other. As a result, their combined effect on firm performance is better than their individual effects. The IT tools complement the capture efforts by providing better storage, indexing and retrieval mechanisms. As a result, together they have a positive effect on firm performance. The combined positive effect

was evident in the survey data analysis as well as the interview data. This effect is shown by a dark arrow from IT-centered KM strategy to capture-based KM strategy in Figure 6.4.

As depicted in Figure 6.4, the strategies that have an instrumental orientation (IT-centered and capture-based strategies) negatively influence the effect of learning-based strategy on performance. This is illustrated by the shaded arrows in the figure that cross the dividing line. This effect was evident in the survey data analysis in the form of negative path coefficients. Although these path coefficients are not significant, the interview data suggests that the presence of capture-based strategy sends a negative message to the employees and discourages them from sharing knowledge.

Figure 6.4: Complementarities among KM Strategies and Firm Performance



The learning-based KM strategy emphasizes a mutually beneficial relationship between the employees and organization. Therefore, its presence is likely to facilitate knowledge sharing by employees, but this is hampered by the messages sent by a capture-based strategy. Similarly, the presence of IT tools could increase computer-based interactions and reduce the rich, face-to-face social interactions necessary for knowledge sharing and creation. In other words, the lower order KM strategies set in motion processes that counteract the performance benefits of a learning-based KM strategy. As a result, the lower order strategies dilute the performance benefits that are derived from learning-based KM strategy. However, the reverse does not appear to be true, that is learning-based strategies do not negatively influence the effect of capture-based strategies on performance. This may be because learning-based strategies counteract some of the negative messages that may be sent by the capture-based KM strategy. The positive path coefficient of the interaction term of learning-based and capture-based KM strategies with short-term performance is not significant. However, the interview data suggests that there may be a positive effect on the short-term performance of the firm from combining learning processes with capture strategies.

In figures 6.1 to 6.4, the three KM strategies are placed in a pyramidal fashion, only to indicate the extent to which they differ in terms of the degree of difficulty in implementation and in their association with firm performance. This depiction does not mean to suggest that the presence of a lower-rung strategy is a necessary precondition for the presence of a higher-run strategy. In other words, the depiction is not meant to portray the dependence of one strategy over the others. The three strategies may be related to each other and one could complement the other as found out in the study, but they are not dependent on each other.

In summary, the study found that learning-based KM strategy has a significantly positive effect on long-term performance and the combination of capture-based KM strategy and IT-centered KM strategy has a significant positive effect on short-term performance. Several researchers have argued that focusing on technology and on capturing does not yield benefits from knowledge management (Davenport, 1997;

McDermott, 1999). This study not only found support for their assertions, but also found that capture-based KM strategies send negative messages to employees about the intent and purpose of knowledge management, thereby affecting the knowledge-sharing culture in an organization.

Prior research suggested that organizational learning processes yield performance benefits by managing exploration and exploitation in an organization. This study found evidence for the same. More importantly, this study found that learning processes have the potential to yield performance benefits by enhancing job satisfaction, developing a common identity and generating a common vision and shared goals. Consequently, this study points to the multifaceted benefits that organizations can derive by implementing a learning-based KM strategy.

This study generated several key insights about the nature of KM strategies, their interaction with each other and their effect on firm performance. The study found that the three KM strategies emanate from different assumptions, which are not complementary to each other. The IT-centered and capture-based KM strategies complement each other to provide performance benefits. However, they are not complementary to learning-based strategy. More particularly, the capture-based and IT-centered KM strategies have the potential to negatively affect the relationship between learning-based KM strategy and long-term performance. However, a combination of capture-based and learning-based KM strategies has the potential to yield short-term performance.

This study has generated some interesting insights about the different KM strategies and their effect on firm performance. These results are, however, better appreciated in the context of the limitations of the study, which are discussed in the following section.

6.2 Limitations

This study has several limitations, which must be considered in order to better understand the implications of study findings. These limitations are discussed in this section. The limitations that threaten the internal validity of the study are discussed first, followed by a discussion of the limitations that threaten external validity of the findings.

6.2.1 Threats to internal validity

Internal validity concerns measurement and analytical issues, that is whether the study appropriately measured the study constructs and whether the statistical conclusions arrived at are valid or not. Each of these aspects is discussed in the following paragraphs.

6.2.1.1 Measurement

The study used organizational level constructs but collected data from individuals who were expected to be knowledgeable about the organization as a whole. In particular, this study used 'the senior most executive responsible for knowledge and learning management' as the key respondent. Some researchers in the past have argued that using a single informant introduces measurement error and reduces the reliability of construct measurement (Gerhart, Wright, McMahan & Snell, 2000). Others have suggested that the error depends on firm size, sample size, respondent characteristics and ambiguity of items (Huselid & Becker, 2000). This study has controlled for firm size and used a large sample. The unambiguousness of the items was ensured through the multi-stage validation process. As presented in section 5.1.3, respondent bias did not affect the data. However, it is not known whether measurement errors have crept into the study because it measured organizational level constructs with responses from a single informant.

The study used several indicators to measure IT-centered and capture-based KM strategies. However, construct reliability and validity issues forced the omission of a few

items. Consequently, only two items each were used to measure IT-centered and capture-based strategy. In other words, the richness of the construct was compromised in favor of statistical properties and examination of relationships. As a result, the finer details concerning what constitutes IT-centered and capture-based strategy could not be ascertained. Accordingly, the study is limited in its ability to explicate the content of the KM strategies and thus, in its ability to generate prescriptions about knowledge management.

The study collected data using a single method for a majority of its variables, which introduces common method bias. Although Harman's single factor test indicated that common method bias did not exist in the data, using multiple data sources would have enhanced the confidence on construct validity. In order to alleviate this concern, this study used data from multiple sources on short-term performance. The data on long-term performance could not be gathered from archival databases because it would have been available only after five to ten years. Further, this study used the interview method to collect data. Notwithstanding these efforts, it is not known if relying on survey data has affected the results in any manner.

The study was conducted across industries to enhance its external validity. However, firms differ in the extent to which they formally manage knowledge. Firms in high-tech industries have made vast efforts to manage knowledge and may have benefited in a manner that was not captured in this study. Although post-hoc analysis revealed that industry and firm conditions did not affect the results, it is not known if the results will be similar in a sample of only high-tech companies.

This study used a sample of 88 firms, which is sufficient to detect moderately sized effects. In the absence of prior empirical research on this topic, it was difficult to speculate about whether the effect of KM strategies was small or large. If the effects were very small, this study may not have captured them. Further, the study may not have appropriately captured the interaction effects, which require a sample in the range of 150 to confidently detect the effects (Chin *et al.*, 2003).

The time lag between the independent and dependent variables in this study was marginal. As pointed out by several interviewees, the effect of capture-based KM strategies could either be seen immediately or after the content in the repositories was stabilized. In other words, having theoretically sound time lags was important to capture the effect of KM strategies. As this study did not have adequate time lags, its results could not make a definitive statement about the relationship between various KM strategies and firms performance.

The two constructs 'learning-based KM strategy' and 'long-term performance' are correlated at 0.707 in this study. As explained in section 5.2.3, these two constructs exhibit discriminant validity. Further, the measurement items for these constructs were developed using a multi-stage procedure which included several experts assigning the items to the constructs that they measure. Therefore, this high correlation is more likely due to the strong relationship between learning-based strategy and long-term performance rather than due to measuring the same construct. However, there is a possibility that these two constructs are dimensions of an overarching construct or may have been engendered by another construct. The possibility that the two constructs are part of another construct can be ruled out because they both have a different effect on short-term performance. If both learning-based strategy and long-term performance are dimensions of another construct, then they should have the same effect on other constructs. However, this study found that learning-based strategy has no significant effect on short-term performance, whereas long-term performance has a significant effect on short-term performance. The possibility that these two constructs may have been engendered by another third construct exists, but is out of the scope of this study. Therefore, this study is limited in its ability to explain the phenomenon of knowledge management strategies and performance to the extent that it has not considered other variables that may potentially effect both KM strategies and firm performance.

Finally, it is possible that short-term performance may actually be a reflection of the long-term performance in case of the companies that initiated KM strategies earlier than others. In other words, given the cross-sectional nature of the study, it was difficult

to distinguish if a particular firm's short-term performance was indeed a reflection of its long-term performance processes. An effort was made in this study to collect information on when the firms began their KM efforts. However, the majority of respondents did not provide this data. As a result, it could not be used in the study to clearly delineate the short-term performance from long-term performance. Therefore, this study is limited in its ability to clearly distinguish short-term performance from long-term performance by introducing the element of time.

6.2.2 Threats to external validity

The issue of external validity refers to the applicability of the study findings to a larger population of organizations. This study is set in Canada and used large public companies. Its applicability to non-Canadian firms as well as small and private firms is not known. As one of the interviewees with corporate experience in Asia and North America pointed out, the workforce in Asian counties is very much different from the work force in North America. Employee perceptions differ based on the socio-cultural context. Therefore, the applicability of this study's findings to firms in a non-Canadian context is not known.

6.3 Study Implications

Despite the limitations discussed above, the current study makes useful contributions to the research and practice of strategic management, particularly knowledge management. These contributions are discussed in the following paragraphs.

6.3.1 Contributions to research

By drawing from multiple research streams, this study developed three different KM strategies and explained their effect on the short-term and long-term performance of

firms. Knowledge Management is a fairly recent phenomenon, which received much attention from practitioners and researchers alike. The effect of knowledge management on firm performance has received some research attention in the recent past. For example, researchers have found that knowledge management enhances dynamic capabilities (Sher & Lee, 2004) and innovativeness (Darroch & McNaughton, 2003) of a firm. Further, researchers found that knowledge management enablers and knowledge creation processes have a positive effect on organizational creativity and performance (Lee & Bhoi, 2003). Also, researchers have found that firms that use focused codification and tacitness as knowledge management strategies perform better than those that lack focus (Schulz & Jobe, 2001). However, literature lacked a study that comprehensively mapped the field of knowledge management strategies and examined their effect on firm performance. This study is the first to theoretically develop different knowledge management strategies and consider their effect on firm performance. Both knowledge management and performance are complex phenomenon. By developing multiple knowledge management strategies and examining their effect on two different types of performance, this study suggested that different KM strategies affect different types of firm performance. Accordingly, this study not only generated useful insights about the relationship between KM strategies and firm performance, but also infused much needed theoretical and empirical rigor into the KM literature.

This study integrated the insights from the organizational knowledge and learning literatures to develop KM strategies. Several researchers in the past have called for integrating these streams of research (Lyles & Easterby-Smith, 2003; Vera & Crossan, 2003). Also, several scholars have called for a shift in the focus of knowledge management practice from technology and systems to learning and processes (Davenport & Prusak, 1999; McDermott, 1999). This study not only used insights from Organizational Knowledge and Organizational Learning literatures, but also approached knowledge management from a learning perspective. In the recent past, researchers have adopted a learning perspective to examine the knowledge sourcing behavior of individuals and its effect on their performance (Gray & Meister, 2004, forthcoming). Gray and Meister found that learning orientation of employees is an important antecedent

to both knowledge sourcing and its outcomes (Gray & Meister, 2004). Further, they found that different methods of knowledge sourcing yield different kind of performance outcomes (Gray & Meister, forthcoming). This study lends further support to the findings of Gray and Meister by examining the phenomenon at the organizational level and emphasizing the important of learning processes as well as the differential effect of various KM strategies on firm performance. Consequently, this study opens several fresh avenues for research and provides an impetus to approaching knowledge management through learning.

Prior research in Organizational Learning suggested that organizational learning processes yield firm performance by exploiting organizational knowledge. This study suggests that organizational learning processes also affect performance by enhancing employee satisfaction and developing shared vision and common goals.

The strategic management research revolves around the central question of how to achieve superior and lasting firm performance (Schendel, 1991). The KBV research suggests that knowledge is a resource and firm performance depends on it. The organizational learning perspective argues that a firm achieves superior performance from its ability to learn and thus create and exploit new knowledge. By using the insights from both the KBV and learning perspectives, this study argued that resources (employee and organizational knowledge) provide short-term performance benefits whereas capabilities (to learn, to create knowledge and to exploit it) provide long-term performance. Consequently, this study raises the possibility of viewing resources and capabilities as complementary to each other in providing short-term and long-term performance benefits.

This study developed three types of knowledge management strategies and developed scales for measuring them. These scales are a useful contribution to management research. The scale for learning-based KM strategy can be used by Organizational Learning researchers to measure the processes and practices of organizational learning. The scales on KM strategies can be used by scholars interested in

examining the phenomenon of knowledge management. Further, this study also developed a scale for measuring long-term performance using organizational processes. This scale will prove useful for conducting strategy research involving long-term performance variables without having to wait for a long period to collect performance data to test the relationships.

Finally, several scholars in the past have called for empirical research on organizational learning (Huber, 1991), particularly large scale research employing survey methods (Vince, Sutcliffe & Olivera, 2002). Also, several scholars have pointed to the challenges in measuring and conducting empirical research on organizational learning (Lyles & Easterby-Smith, 2003). This study has made a step in the direction of facing such challenges and added to the growing body of empirical research in organizational learning.

6.3.2 Implications for practice

As several interviewees pointed out, 'it is difficult to measure the returns from knowledge management'. Investments in knowledge management are a 'leap of faith', as one interviewee put. The results of this study suggest that organizations need not approach knowledge management merely based on 'faith'. Findings from this study suggest that firms can and do benefit from knowledge management, provided they adopt an appropriate strategy. Based on this study, the following guidelines can be provided to the practitioners of knowledge management.

- Knowledge management must be approached in a strategic manner. It is important to think of the reasons behind knowledge management efforts. If managers are interested in codifying and capturing the knowledge of individual employees, the firm may receive a short-term performance benefit. However, such strategies yield very little benefits in the long-term. If the firm believes that developing employees is a key element of knowledge

management and follows a learning strategy, the firm will benefit in the long term.

- IT and capture-based strategies hamper knowledge management. During the interviews, it was found that KM practitioners believe that they can begin knowledge management in their companies by first focusing on technology and knowledge capture. They believe that these strategies will yield visible and tangible results, which may be used for initiating more meaningful activities that create and manage knowledge in the organization. This study suggests that such an approach may not work because by using technology and databases first, the organization sends the signal that it is interested in capturing the knowledge. This signal interferes with the noble intentions behind any learning processes that may be introduced at a later stage. Therefore, managers interested in a sustainable knowledge management need to consider the negative implications of beginning KM with an IT or capture strategy.
- Subtle initiation is the key. From the interview data, it was apparent that firms that were successful at knowledge management were those that began their KM efforts with pure learning and idea-sharing kind of activities. These activities had no apparent and direct link to performance benefits. More importantly, such activities were not viewed as Knowledge Management efforts. As an interviewee pointed out, 'knowledge management is about people and attitudes'. Therefore, efforts at knowledge management are best initiated subtly as learning processes.

6.4 Directions for Future Research

This study opens several fresh avenues for research. These avenues can be categorized into (i) internal knowledge management, (ii) external knowledge management, (iii) socio-psychological processes that affect knowledge management, (iv)

organizational learning, and (iv) firm performance. Each of these is discussed in the following paragraphs.

6.4.1 Managing internal knowledge

This study found that firms implement different strategies to manage knowledge and that different strategies have varied effects on firm performance. Future research could examine if firms follow a trajectory of KM strategies and whether different trajectories affect firm performance differently. More specifically, further studies could examine if firms begin with one type of KM strategy and then transition to other. For example, firms could begin with IT-centered strategy thinking that they need IT infrastructure to initiate knowledge management and then move to learning-based KM strategy through capture-based KM strategy. Given the different consequences that each of these KM strategies has, finding a right trajectory is important.

6.4.2 Managing external knowledge

Much of the research on knowledge management has focused on creating and managing internal knowledge, that is knowledge residing within organizational boundaries. Very little research attention has been paid to the strategies for managing external knowledge. Several researchers have pointed out that both internal and external knowledge are important for a firm's success and need to be researched (Bierly & Chakrabarti, 1996; Uzzi & Lancaster, 2003). The literature suggests that the extent to which firms acquire and use external knowledge is dependent on their absorptive capacity (Cohen & Levinthal, 1990). However, the research has not examined what different strategies could be adopted by firms for acquiring external knowledge. In the words of one interviewee:

> "One thing that we are working on and that we don't have a good solution for is trying to figure out how to bring in outside knowledge. I am trying to figure out how to bring in external knowledge in a targeted fashion. Now we can do a bit

> of that – there are professional organizations that fit in some of these areas and they have websites, newsletters, all online. So you can at least put in links to those so when you go here (to internal knowledge base) it'll say if you can't find what you want, here are three organizations that we know, that we participate in, that may have useful information"

As the comments above indicate, firms realize the importance of using external knowledge but do not know how to acquire it. Just as several firms have approached internal knowledge management from the IT and capture perspective, they were also trying to bring codified knowledge into companies. For example, HydroTech monitors all the patents that are granted in their technology area and sends that information to its scientists. If the results of this study are any indication, such an approach may not work because capturing knowledge in databases alone does not help firm performance. Therefore, it is important that research attention be diverted to understanding what strategies are useful to manage external knowledge.

6.4.3 Knowledge management and socio-psychological processes

As several interviewees pointed out, knowledge management is affected by how people engage in it. If employees feel that the organization is 'out to drain the knowledge out of their brains', they are unlikely to engage in it. Instead, they are likely to sabotage the initiatives. The personality type of employees seems to influence knowledge management and its outcomes, as the following remarks reveal:

> "If you start with the human side then things take longer. The change management is greater especially if you are in a company where mainly people are introverted. May be it's different if you are talking to a dance company for instance, where people are usually extroverted but high-tech companies, if you want to start with the soft side of KM then it would take longer".

> "As with a lot of high-tech companies, we tend to have very, very bright software engineers who are very introverted. That's kind of a general statement but it's kind of true, right? So, they tend not to communicate beyond their own workgroup – naturally, they are not extroverted people, right? So we've got an extra challenge that way. And what I find they like to do is have short sessions or bulletin board type things where they can kind of, you know, they are not speaking

> in front of people too often or having to run a big meeting or something like that. So I find those kind of techniques work better in our company".

Besides the personality type of employees, their reaction to knowledge management is also important. In the words of interviewees:

> "I hear it quite a bit from people that ... we're different. We're young, we're fast, our industry's different, we run differently, we're different, right? And they're almost offended if I say well, you're not. I see the same problem here that I'd do anywhere else. You are information overloaded, you're overusing technology, you implement something that you don't use, right? To me the KM challenges are very similar in this company as other companies, whether small or large, and I've worked in both. So people are offended if I tell it like it is".

> "We only hire people with small egos... those that leave the egos at the door because ego hurts knowledge sharing and innovation".

Some firms, however, seem to realize the limitations of individual psychological orientations and build that into their knowledge management efforts. As one interviewee mentioned:

> "I think there's a certain amount of ego-stroking that happens. So if somebody's asked to speak, it's like 'oh, I'm considered an expert' and that is going well in our company. You know, if I encourage somebody 'hey, you know what, you know this part of the product really well. Do you want to speak?' and they go 'oh, okay' and they feel really good about themselves. You know, when you kind of stroke somebody's ego like that, it helps".

As the comments from the interviewees suggest, it is important to know how the personalities of organizational members influence knowledge management. More importantly, firms need to know how such factors can be integrated into their knowledge management programs. Research attention on this problem will shed useful light on knowledge management.

6.4.4 Organizational learning

Prior research highlighted the benefits that firms derive from organizational learning. It was thought that these benefits arose primarily due to better utilization of the learning and experience of firms. This study raised the possibility that organizational

learning processes could influence firm performance by generating employee satisfaction, shared vision and common goals. Future research could further explore this possibility and examine the various mechanisms through which organizational learning influences firm performance.

6.4.5 Performance

This study conceptualized performance as short-term performance (reflecting goal attainment) and long-term performance (reflecting organizational processes) and found that different firm strategies affect different types of performance. Further, this study found that strategies that benefit short-term performance may not have a positive effect on long-term performance and vice versa. Given that performance is a complex phenomenon, future research could examine performance by incorporating its multiple dimensions. Much of the research in strategic management uses short-term performance measures to examine the effect of several strategies, which by their definition and nature have a long-term effect. Therefore, examining the effect of firm strategies on both short-term and long-term performance provides a better understanding of the relationship between strategies and performance. More importantly, such research generates useful prescriptions for managerial action.

6.5 Chapter Summary

The following key points summarize the discussion in this chapter.

- The three knowledge management strategies (IT-centered strategy, capture-based strategy and learning-based strategy) are hierarchical in nature and have a hierarchical effect on firm performance. More specifically, the learning-based strategy positively affects long-term performance whereas a combination of IT and capture based strategies affects short-term performance.
- The IT-centered strategy and capture-based strategy share similar beliefs and complement each other to yield performance benefits. However, they do not

complement the learning-based strategy because of the differences in their assumptions.

- This study has several limitations that pose threats to its internal and external validity. However, these limitations do not affect the interpretation of the results.
- The findings from this study contribute to our understanding of knowledge management and performance thereby enriching the literature on knowledge management, organizational learning and strategic management.

CHAPTER 7. CONCLUSION

This study examined the relationship between knowledge management strategies and firm performance. By delineating three different types of knowledge management strategies, this study sought to shed light on strategic knowledge management. Further, this study provided research evidence to suggest that knowledge management provides performance benefits to companies. This study found that learning-based KM strategy provides long-term performance benefits whereas a combination of IT-centered and capture-based KM strategies enhance short-term performance.

This study raised several issues that help us to better understand knowledge management strategies and their effect on firm performance. More particularly, this study suggested that learning-based KM strategy has the potential to impact performance, not only by creating and exploiting knowledge, but also by improving employee satisfaction and developing a shared vision that helps employees to better perform their roles. Further, this study suggests that capture-based strategy may not provide performance benefits because employees react negatively to organizational efforts to capture their knowledge in repositories. Finally, this study pointed to the need to implement complementary strategies.

This study provided insights into different knowledge management strategies and their differential effect on firm performance. By integrating the insights from organizational knowledge and organizational learning literatures, this study added much needed rigor and process orientation to knowledge management research. Through its findings and observations, this study raised several questions that need to be addressed so that research can unravel knowledge management and provide guidelines to practice. Continued research attention to these aspects will go a long way in helping firms to achieve competitive advantage through knowledge and learning, which are perhaps the only resources that provide competitive advantage in an increasingly globalizing and competitive world (DeGeus, 1988; Grant, 1996a).

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Appendix A

Item Validation Exercise - 1

The following pages list a number of constructs along with the items that I intend to use to capture the construct. Please screen the items and assess whether each of the item meets the following criteria or not:

(i) Generality – whether the item applies to most firms independent of the technology, product, industry, size, or country,
(ii) Discriminability – whether the item is unique and different from rest of the items,
(iii) Readability – whether the item is easy to understand, and
(iv) Non-redundancy – whether the item could not be substituted for another.

Following are the definitions of some relevant constructs:

Knowledge "Information whose validity has been established through tests of proof".
Knowledge Management (KM) "A set of practices and processes to acquire and apply knowledge to facilitate organizational operations".
K.M. Strategy "A theme that guides and defines a firm's knowledge management efforts"
Learning "The process that creates and develops knowledge".

Item Validation Exercise - 1

The following table contains seven constructs (in bold) along with their definitions (in quotes) and the items that are proposed to be used for capturing the construct. Please read the definition of each construct and assess each of its items against the criteria listed. If you think that an item does not fit a particular criteria, please place a (X) in the respective box. Finally, please provide any additional comments and suggestions that you may have in the space at the end of the table.

A	**IT-centered KM Strategy** "An emphasis on basic IT infrastructure and symbolic KM roles".				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
	Knowledge management systems & processes in my organization include ...				
A1	Electronic databases.				
A2	Knowledge Manager/Chief Knowledge Officer.				
A3	Document Management Systems.				
A4	Groupware/Shareware – technology to help people collaborate online.				
A5	Knowledge Management Software.				
A6	Intranet.				
A7	My organization uses technology as the primary means for managing knowledge.				
A8	My organization believes that buying KM tools is important for managing knowledge.				
B	**Capture-based KM Strategy** "An emphasis on codifying organizational knowledge for storage in repositories and on protecting organizational knowledge from leakages and misappropriation".				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
	Knowledge management systems & processes in my organization include ...				
B1	Managing trademarks, copyrights and patents.				
B2	Experts who capture and store employees' knowledge.				
B3	Non-disclosure and confidentiality agreements to stop knowledge leakages.				
B4	Storing and retrieving knowledge with the help of technology and systems.				
B5	My organization emphasizes codifying and capturing employees' knowledge.				
B6	My organization manages intellectual property rights to maximize value from organizational knowledge.				
B7	My organization stores customer complaints and feedback to use it in future operations.				
B8	My organization believes that KM helps to retain knowledge even when some critical employees leave.				
B9	My organization encourages employees to use knowledge already existing in the organization.				

C	**Learning-based KM Strategy** "An emphasis on organizational learning that occurs through a two-way interaction between individuals, groups, and organization".				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
	In my organization				
C1	Individuals are current and knowledgeable about their work.				
C2	The right people are involved in groups to address the issues.				
C3	Employees have input into the critical decisions made by management.				
C4	Recommendations by groups are adopted by the organization.				
C5	Relevant information easily moves from individual to organization.				
C6	Solutions developed by one group are easily adopted by other groups.				
C7	Policies and procedures aid individuals to enhance their knowledge and skills.				
C8	Reward systems recognize the contribution made by groups.				
C9	Organizational goals are communicated throughout the organization.				
C10	Individuals freely share their ideas and experiences with others.				
C11	My organization emphasizes learning as a means to manage knowledge.				
C12	People in my organization acquire new knowledge in interactions with other organizational members.				
C13	My organization believes that knowledge management is a strategic business activity.				
D	**Absorption Strategy** "An emphasis on identifying and acquiring knowledge from external sources"				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
D1	My organization closely follows the industry developments reported in the media.				
D2	My organization hires individuals who have worked in the past for its competitors.				
D3	My organization gains knowledge by sending employees to attend trade and professional meetings.				
D4	My organization emphasizes the need to acquire knowledge from external sources.				
D5	My organization has systems and resources to acquire new knowledge from outside sources.				
E	**Participation Strategy** "An emphasis on learning new knowledge through active interaction with external agencies such as suppliers, customers, competitors and research institutions"				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
E1	My organization regularly communicates product improvements to customers.				
E2	My organization actively participates with other organizations to shape technology and				

	standards.				
E3	My organization participates in exercises for benchmarking, experience sharing, etc.				
E4	My organization encourages employees to share experiences with suppliers and other business partners.				
E5	My organization believes that knowledge from outside can be acquired by participating with other organizations on common activities.				
F	**Knowledge Intensity** "Importance of knowledge to a firm's business operations"				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
F1	In our business, expertise can be developed only over a long period of time.				
F2	In our industry, knowledge is the key to an organization's success.				
F3	Technology changes very fast in our industry.				
F4	In our business, what worked yesterday is unlikely to work tomorrow.				
G	**Long-term Performance** "Organizational processes and adaptation capabilities such as innovation, employee satisfaction, leadership, etc. that ensure long-term success and survival of a firm"				
		Generality	**Discrimin ability**	**Readability**	**Non-redundancy**
G1	Employees in my organization are motivated				
G2	Our organization has the potential to be successful in the face of technological and environmental changes.				
G3	Our organization can meet customers' future needs.				
G4	Our organization's future performance is secure.				
G5	Our organization has the ability to adapt quickly to unanticipated changes.				
G6	Our organization is capable of rapidly commercializing new innovations.				
G7	Our organization identifies new business opportunities.				
G8	Employees in our organization continuously improve systems and processes.				
G9	Our organization's leadership is capable and driven.				
G10	Employees in our organization are satisfied.				
G11	Our customers are loyal.				

If you have any suggestions or comments, please provide them below:

_____

_____

_____

Name of the participant:_____

Thanks very much ... !

Item Validation Exercise – 1 : Summary of changes

Note: Highlighted portions of the items indicate the places where changes have been made.

	Construct and Items	New Item Change
A	**IT-centered KM Strategy** "An emphasis on basic IT infrastructure and symbolic KM roles"	
A1	Electronic databases.	No change
A2	Knowledge Manager/Chief Knowledge Officer.	**Positions such as** Knowledge Manager/Chief Knowledge Officer.
A3	Document Management Systems.	No change
A4	Groupware/Shareware – technology to help people collaborate online.	No change
A5	Knowledge Management Software.	No change
A6	Intranet.	No change
A7	My organization uses technology as the primary means for managing knowledge.	No change
A8	My organization believes that buying KM tools is important for managing knowledge.	My organization believes that **implementing IT-based** KM tools is important for managing knowledge.
B	**Capture-based KM Strategy** "An emphasis on codifying organizational knowledge for storage in repositories and on protecting organizational knowledge from leakages and misappropriation".	
B1	Managing trademarks, copyrights and patents.	Deleted, as the item is similar to B6
B2	Experts who capture and store employees' knowledge.	**Specialists to refine, index and** store employees' knowledge.
B3	Non-disclosure and confidentiality agreements to stop knowledge leakages.	**My organization uses** non-disclosure and confidentiality agreements to **prevent** knowledge leakages.
B4	Storing and retrieving knowledge with the help of technology and systems.	No change
B5	My organization emphasizes codifying and capturing employees' knowledge.	No change
B6	My organization manages intellectual property rights to maximize value from organizational knowledge.	No change
B7	My organization stores customer complaints and feedback to use it in future operations.	My organization stores customer complaints and **feedback for potential future usage.**
B8	My organization believes that KM helps to retain knowledge even when some critical employees leave.	My organization believes that KM helps to retain knowledge **especially when critical employees** leave.
B9	My organization encourages employees to use knowledge already existing in the organization.	No change
C	**Learning-based KM Strategy** "An emphasis on organizational learning that occurs through a two-way interaction between individuals, groups, and organization".	
C1	Individuals are current and knowledgeable about their work.	Deleted because there is no element of interaction in this item.
C2	The right people are involved in groups to address the issues.	**Only the most qualified people are involved in groups to solve organizational problems.**

	Construct and Items	New Item Change
C3	Employees have input into the critical decisions made by management.	**The management takes into account the input of employees when making critical decisions.**
C4	Recommendations by groups are adopted by the organization.	Recommendations by groups **based on accumulated experience are often adopted** by the organization.
C5	Relevant information easily moves from individual to organization.	No change
C6	Solutions developed by one group are easily adopted by other groups.	**Good** solutions developed by one group are easily adopted by other groups.
C7	Policies and procedures aid individuals to enhance their knowledge and skills.	Policies and procedures **are in place to facilitate knowledge exchange between individuals and groups**.
C8	Reward systems recognize the contribution made by groups.	Reward systems recognize the contribution made by **individuals and groups**.
C9	Organizational goals are communicated throughout the organization.	No change
C10	Individuals freely share their ideas and experiences with others.	No change
C11	My organization emphasizes learning as a means to manage knowledge.	No change
C12	People in my organization acquire new knowledge in interactions with other organizational members.	No change
C13	My organization believes that knowledge management is a strategic business activity.	Deleted because this belief may not be particular to LKMS. About a third of the participants have clearly mentioned this point.
D	**Long-term Performance** "Organizational processes and adaptation capabilities such as innovation, employee satisfaction, leadership, etc. that ensure long-term success and survival of a firm"	
D1	Employees in my organization are motivated	Employees in my organization are motivated **to strive for better performance**.
D2	Our organization has the potential to be successful in the face of technological and environmental changes.	No change
D3	Our organization can meet customers' future needs.	No change
D4	Our organization's future performance is secure.	Our **organization has the capabilities to secure its** future performance.
D5	Our organization has the ability to adapt quickly to unanticipated changes.	No change
D6	Our organization is capable of rapidly commercializing new innovations.	No change
D7	Our organization identifies new business opportunities.	No change
D8	Employees in our organization continuously improve systems and processes.	Employees in **my** organization continuously improve systems and processes.
D9	Our organization's leadership is capable and driven.	**My** organization's leadership is capable and driven.
D10	Employees in our organization are satisfied.	No change
D11	Our customers are loyal.	**My organization's** customers are loyal.

[redacted]

Item Validation Exercise - 2

The following pages list 55 items that are proposed to be used to capture seven constructs. These seven constructs are part of a research study that examines the relationship between knowledge management strategies and firm performance. Listed below are the seven study constructs and their definitions. Please assign (by placing an '**X**' in the relevant box) each of the 55 items to the construct that the item captures best. In the context of this exercise, an item captures a construct if (i) it reflects the construct or is a dimension of the construct or (ii) it causes or leads to that construct. If you think that an item does not capture any of the constructs, please do not assign it to any construct. If an item belongs to more than one construct, please assign it to all the constructs that it belongs to.

Study Constructs - Definitions

Internal KM Strategies

Capture-based KM Strategy "An emphasis on codifying organizational knowledge for storage in repositories and on protecting organizational knowledge from leakages and misappropriation".

IT-centered KM Strategy "An emphasis on basic IT infrastructure and symbolic KM roles".

Learning-based KM Strategy "An emphasis on organizational learning that occurs through learning at individual, group, and organizational levels and a flow of learning between the levels".

External KM Strategies

Acquisition Strategy "An emphasis on identifying and acquiring external knowledge from public domains through arms-length scanning and monitoring"

Participation Strategy "An emphasis on identifying and acquiring external knowledge through active interaction with agencies such as suppliers, customers, competitors and research institutions"

Knowledge Criticality "Importance of knowledge to a firm's business operations and success"

Long-term Performance "Organizational processes and adaptation capabilities such as innovation, employee satisfaction, leadership, etc. that ensure long-term success and survival of a firm"

Background Constructs - Definitions

Knowledge Management (KM) "A set of practices and processes to acquire and apply knowledge to facilitate organizational operations".
K.M. Strategy "A theme that guides and defines a firm's knowledge management efforts"

Item Validation Exercise

Item No.	Item	Acquisition Strategy	Capture-based KMS	IT-centered KMS	Knowledge Criticality	Learning-based KMS	Long-term Performance	Participation Strategy
1.	In my organization, employees are current and knowledgeable about their work.							
2.	KM systems & processes in my organization include storing and retrieving knowledge with the help of technology and systems.							
3.	People in my organization acquire new knowledge in interactions with other organizational members.							
4.	Employees in my organization are motivated to strive for better performance.							
5.	My organization protects work-in-process such as drawings, designs, and plans.							
6.	My organization participates in industry-wide exercises such as benchmarking, experience sharing, and collaboration.							
7.	Employees in my organization continuously improve systems and processes.							
8.	My organization can meet customers' future needs.							
9.	My organization encourages employees to share experiences with suppliers and other business partners.							
10.	My organization's customers are loyal.							
11.	My organization has systems and procedures to acquire new knowledge from outside sources.							
12.	My organization has the ability to adapt quickly to unanticipated changes.							
13.	My organization emphasizes learning as a means to manage knowledge.							
14.	My organization regularly communicates with customers about product and/or process improvements.							
15.	In my organization, policies and procedures are in place to facilitate knowledge exchange between individuals and groups.							
16.	My organization believes that knowledge from outside can be best acquired by participating with other							

Item No.	Item	Acquisition Strategy	Capture-based KMS	IT-centered KMS	Knowledge Criticality	Learning-based KMS	Long-term Performance	Participation Strategy
	organizations on common/ collaborative activities.							
17.	In my organization, recommendations by groups based on accumulated experience are often adopted by the organization.							
18.	My organization gains knowledge by sending employees to attend events such as trade and professional meetings and industry conferences.							
19.	Employees in my organization are satisfied.							
20.	My organization uses non-disclosure and confidentiality agreements to prevent knowledge leakages.							
21.	My organization's leadership is capable and driven.							
22.	My organization believes that KM helps to retain knowledge especially when critical employees leave.							
23.	My organization actively participates with other organizations to shape technology and standards.							
24.	In my organization, reward systems recognize the contribution made by individuals and groups.							
25.	In our industry, very few organizations possess the critical knowledge needed for success.							
26.	KM systems and processes in my organization include electronic databases.							
27.	In my organization, employees freely share their ideas and experiences with others.							
28.	My organization has the ability to continuously identify new business opportunities.							
29.	KM systems and processes in my organization include Document Management Systems.							
30.	My organization uses technology as the primary means for managing knowledge.							
31.	Technology changes very fast in our industry.							
32.	In my organization, good solutions developed by one group are easily adopted by other groups.							

Item No.	Item	Acquisition Strategy	Capture-based KMS	IT-centered KMS	Knowledge Criticality	Learning-based KMS	Long-term Performance	Participation Strategy
33.	KM systems and processes in my organization include Groupware/ Shareware, i.e. technology to help people collaborate online.							
34.	In our business, firms can develop expertise only over a long period of time.							
35.	My organization stores customer complaints and feedback for potential future usage.							
36.	My organization emphasizes the need to acquire knowledge from external sources.							
37.	My organization purposefully hires knowledgeable individuals who have worked in the past for its competitors.							
38.	KM systems & processes in my organization include specialists to refine, index and store employees' knowledge.							
39.	My organization closely follows the industry developments through mechanisms such as media, internet and informal contacts.							
40.	KM systems and processes in my organization include Intranet/ Internet.							
41.	My organization is capable of rapidly commercializing new innovations.							
42.	My organization believes that implementing IT-based KM tools is important for managing knowledge.							
43.	In my organization, the right people are involved in groups and committees to address organizational issues.							
44.	In our industry, knowledge is a key success factor for organizations.							
45.	KM systems and processes in my organization include Knowledge Management Software.							
46.	In my organization, relevant information easily moves from individual to organization.							
47.	My organization has the capabilities to secure its future performance.							
48.	In our business, what worked in the past is unlikely to work in the future.							
49.	My organization has the potential to be successful in the face of technological and environmental changes.							

Item No.	Item	Acquisition Strategy	Capture-based KMS	IT-centered KMS	Knowledge Criticality	Learning-based KMS	Long-term Performance	Participation Strategy
50.	KM systems and processes in my organization include positions such as Knowledge Manager/Chief Knowledge Officer.							
51.	My organization manages intellectual property rights to maximize the value from organizational knowledge.							
52.	In our industry, new products and services account for a majority of the revenues of companies.							
53.	In my organization, organizational goals are communicated throughout the organization.							
54.	In my organization, employees have input into the critical decision made by management.							
55.	My organization emphasizes codifying and capturing employees' knowledge.							

..... Thanks very much for your time and cooperation

[redacted]

Communication to Companies

May 18, 2004

To

Sub: International Survey on Knowledge Management Strategies

Knowledge management has become an important activity for modern organizations. It is estimated that global corporate spending on knowledge management services will increase from US$4.2 billion in 2003 to US$8.9 billion by 2006. In order to reap benefits from knowledge management, it is important to approach it in a strategic manner. It is even more important to know which knowledge management strategies help organizations to reap larger benefits for a longer period of time.

My name is Hari Bapuji. I am a Ph.D. student at the Richard Ivey School of Business, The University of Western Ontario. As part of my dissertation, I am conducting a research study to shed light on knowledge and learning management strategies and their role in providing competitive advantage to large Canadian companies. I am writing this letter to invite your participation in this project. The results of my study will have important implications for companies whose performance depends on knowledge management. A complimentary copy of the results will be made available to all participants.

If you would like to participate in this study, the attached questionnaire must be filled by the senior-most executive responsible for managing knowledge (or learning) in your organization. The questionnaire will take approximately 20 minutes to complete.

Web-based Survey

If you prefer to complete the questionnaire on the web, please send me an email at *hbapuji@ivey.uwo.ca*. I will provide the URL along with the authentication for you to access and complete the questionnaire. If you opt to complete the survey on the web, no identifying information will be captured.

All data collected in the study will be aggregated to understand the relationship between knowledge management, learning and performance. Only aggregate data and results will be shared with the academic and practitioner communities. In appreciation of your participation, I can share an executive summary of the study results with you.

Confidentiality, Privacy and Risks

This study is being conducted in accordance with the procedures established by the office of research ethics. Completion of the questionnaire and returning it (in the attached self-addressed and postage paid envelope) is evidence of your consent to participate. There is no need to communicate your explicit consent.

Your organization is assured of complete confidentiality; none of your organization's responses will be identified as belonging to it, and no identifying information will be shared with anyone. The records created as part of your participation in this study will be stored in a locked cabinet and destroyed upon completion of the study.

There are no known risks to participating in this study and your participation is completely voluntary. Your company will not be informed about your decision to participate or not. You may refuse to participate, refuse to answer any question or withdraw from the study at any time with no effect on your employment status. None of your responses will be identified as belonging to you and no identifying information will be shared with your company and/or any external entity associated with this study.

Contact for further information

If you have any questions, please feel free to contact: Professor Mary Crossan, Richard Ivey School of Business, The University of Western Ontario, London, Ontario, Phone: 519-661-3217 email: mcrossan@ivey.uwo.ca.

If you have any questions about your rights as a research participant, please feel free to contact the Director, Office of Research Ethics, The University of Western Ontario at 519 661-3036 or ethics@uwo.ca.

Yours sincerely,

Hari Bapuji
PhD Candidate

Please pass-on this letter to the senior-most executive responsible for knowledge management (or learning) in your organization.

Richard Ivey School of Business
The University of Western Ontario

IVEY

International Survey on Knowledge Management Strategies

This survey is aimed at understanding the knowledge management (KM) strategies employed by organizations across different cultures. There are no correct or incorrect answers. Please respond to all the items in the survey by circling the appropriate number. Thank you for your participation.

A. Items in this section are about your organization's approach to knowledge management.

My organization	**Strongly Disagree**			**Neither agree Nor disagree**			**Strongly Agree**
1. Actively collaborates with other organizations to shape technology and standards.	1	2	3	4	5	6	7
2. Gains knowledge by participating with other organizations in common/ collaborative activities.	1	2	3	4	5	6	7
3. Emphasizes the need to scan the environment for new knowledge.	1	2	3	4	5	6	7
4. Emphasizes codifying and capturing employees' knowledge in documents.	1	2	3	4	5	6	7
5. Has systems and procedures to identify new knowledge from outside sources.	1	2	3	4	5	6	7
6. Stores customer complaints and feedback for future use.	1	2	3	4	5	6	7
7. Purposefully hires knowledgeable individuals who have worked in the past for our competitors.	1	2	3	4	5	6	7
8. Encourages employees to share experiences with suppliers and other business partners.	1	2	3	4	5	6	7
9. Uses non-disclosure and confidentiality agreements to prevent knowledge leakages.	1	2	3	4	5	6	7
10. Closely follows industry developments through mechanisms such as media, internet and informal contacts.	1	2	3	4	5	6	7
11. Believes that implementing IT-based KM tools is important for managing knowledge.	1	2	3	4	5	6	7
12. Protects work-in-process such as drawings, designs, and plans.	1	2	3	4	5	6	7
13. Believes that KM helps to retain knowledge in the company, especially when critical employees leave.	1	2	3	4	5	6	7
14. Participates in industry-wide exercises such as benchmarking, experience sharing, and collaboration.	1	2	3	4	5	6	7
15. Regularly communicates with customers about products and/or process improvements.	1	2	3	4	5	6	7
16. Emphasizes learning as a means to manage knowledge.	1	2	3	4	5	6	7
17. Uses technology as the primary means for managing knowledge.	1	2	3	4	5	6	7
18. Manages intellectual property rights to maximize the value from organizational knowledge.	1	2	3	4	5	6	7

B. Items in this section pertain to your overall observations about your organization.

	Strongly Disagree			Neither agree Nor disagree			Strongly Agree
1. Good solutions developed by one group/ unit in my organization are easily adopted by other groups/ units.	1	2	3	4	5	6	7
2. Relevant information/ ideas easily move from individual to organization.	1	2	3	4	5	6	7
3. My organization has the ability to adapt quickly to unanticipated changes.	1	2	3	4	5	6	7
4. Employees in my organization are satisfied.	1	2	3	4	5	6	7
5. My organization is capable of rapidly commercializing new innovations.	1	2	3	4	5	6	7
6. Policies and procedures are in place to facilitate knowledge exchange between individuals and groups in my company.	1	2	3	4	5	6	7
7. Employees in my organization are motivated to strive for better performance.	1	2	3	4	5	6	7
8. My organization has the potential to be successful in the face of technological and environmental changes.	1	2	3	4	5	6	7
9. My organization has the ability to continuously identify new business opportunities.	1	2	3	4	5	6	7
10. My organization can meet customers' future needs.	1	2	3	4	5	6	7
11. My organization has the capabilities to ensure its future performance.	1	2	3	4	5	6	7
12. My organization's leadership is capable and driven.	1	2	3	4	5	6	7
13. Recommendations made by groups based on prior experience are often adopted by my organization.	1	2	3	4	5	6	7
14. Employees in my organization have input into the critical decisions made by management.	1	2	3	4	5	6	7
15. Employees in my organization are current and knowledgeable about their work.	1	2	3	4	5	6	7
16. My organization's customers are loyal.	1	2	3	4	5	6	7
17. Employees freely share their ideas and experiences with others in my organization.	1	2	3	4	5	6	7
18. People in my organization acquire new knowledge in interactions with other organizational members.	1	2	3	4	5	6	7

C. Items in this section relate to your organization's principal industry.

My organization's principal industry is characterized by...	Strongly Disagree			Neither agree Nor disagree			Strongly Agree
1. Heavy investments in R&D.	1	2	3	4	5	6	7
2. Frequent product technology changes.	1	2	3	4	5	6	7
3. Frequent process technology changes.	1	2	3	4	5	6	7
4. Usage of new/advanced process or product technologies. ...	1	2	3	4	5	6	7
5. Companies succeeding through superior technical personnel.	1	2	3	4	5	6	7
6. Companies succeeding through process or product patents.	1	2	3	4	5	6	7

D. Items in this section pertain to the extent to which various systems are used in your organization.

Knowledge management systems and processes in my organization include	**Not at all**			**To a moderate Extent**			**To a great Extent**
1. Designated executives for knowledge management.	1	2	3	4	5	6	7
2. Grouping employees in close physical proximity based on the similarities in their work.	1	2	3	4	5	6	7
3. Usage of e-mail for exchanging messages and files.	1	2	3	4	5	6	7
4. Instant messaging to exchange short messages in real-time.	1	2	3	4	5	6	7
5. Knowledge repositories containing best practices and effective solutions.	1	2	3	4	5	6	7
6. Groupware, i.e. computer applications to help people collaborate online.	1	2	3	4	5	6	7
7. Using an intranet to store information needed by employees.	1	2	3	4	5	6	7
8. Designated budget for knowledge management.	1	2	3	4	5	6	7
9. Identified people to champion KM in their groups/ divisions.	1	2	3	4	5	6	7
10. Research and development on KM.	1	2	3	4	5	6	7
11. Measuring the returns from KM.	1	2	3	4	5	6	7
12. 'Communities of practice' / 'Interest groups' sponsored by the company.	1	2	3	4	5	6	7
13. Mentoring of employees by more experienced employees.	1	2	3	4	5	6	7
14. Electronic discussion groups/ forums including bulletin boards for exchanging messages and files.	1	2	3	4	5	6	7
15. Internet access to all employees.	1	2	3	4	5	6	7
16. Knowledge maps/ Yellow pages to search employees by expertise/ skills.	1	2	3	4	5	6	7
17. Training to upgrade skills.	1	2	3	4	5	6	7
18. Telephone access to all employees.	1	2	3	4	5	6	7
19. Weblogs (Blogs) for thought publication by employees	1	2	3	4	5	6	7
20. Others (please specify)							

E. Items in this section pertain to your observations of your company's performance in the latest fiscal year.

Compared to other firms in the industry, my organization's	**Much below the average**			**Average**			**Much above the average**
1. Market share is	1	2	3	4	5	6	7
2. Growth in market share is	1	2	3	4	5	6	7
3. Sales volume is	1	2	3	4	5	6	7
4. Growth in sales volume is	1	2	3	4	5	6	7
5. Profit margin is	1	2	3	4	5	6	7
6. Net profits are	1	2	3	4	5	6	7
7. Return on Capital is	1	2	3	4	5	6	7
8. Employee turnover is	1	2	3	4	5	6	7
9. Growth in new employment is	1	2	3	4	5	6	7

F. This section pertains to a few specific details about your organization. This information will be used purely for aggregating responses during the statistical analysis.

1. Industry to which your company primarily belongs to: _____
2. Is your company organized in a divisional structure? [ ] Yes [ ] No
3. KM was first initiated by: [ ] The corporate headquarters [ ] One of the divisions/groups
4. Year in which your company began active KM efforts: _____
5. Primary responsibility for KM lies with: [ ] CEO/President's office [ ] KM Department
   [ ] Training/ HR Dept. [ ] I.T. Dept. [ ] Strategy/Planning Dept. [ ] Other
6. Primary responsibility for KM lies with an executive occupying a position at the level of:
   [ ] Junior Management [ ] Middle Management [ ] Senior Management
   [ ] Top Management [ ] Position Not clear [ ] Responsibility Not Clear
7. Year in which your company was incorporated: _____
8. Number of employees in your company: _____
9. Sales revenue in the latest fiscal year: _____ (Million CAD)
10. Approximate expenditure on Research & Development as a percentage of sales: _____%
11. Approximate expenditure on Knowledge Management as a percentage of sales: _____%
12. Approximate expenditure on Training & Development as a percentage of sales: _____%

G. This section pertains to a few personal details about you. This information will be used purely for aggregating responses during the statistical analysis.

1. Your position _____ (Title)
2. Your level in the company: [ ] Non-Managerial [ ] Junior Mgt. [ ] Middle Mgt. [ ] Senior Mgt.
3. Your tenure in the organization: Years
4. Your tenure in the current position: Years
5. Your total experience in KM: Years
6. Your highest academic/professional degree: (please specify)

~~~~~~~~~~~~~~~~ End of the Survey~~~~~~~~~~~~~~~~~~~~~~~~~

Would you like to receive an executive summary of the study findings? ( ) Yes ( ) No

Can we contact you at a future date for an interview? If yes, please provide your contact details:

Name: ..... Phone: ..... Email: .....

Thank you very much for your participation
~~~~~~~~~~~~~~~~

[redacted]

Interview Protocol

My name is Hari Bapuji. I am pursuing a PhD in strategic management from the Richard Ivey School of Business, University of Western Ontario. Thank you for this opportunity to follow-up on your survey response. I am researching the impact of knowledge and learning management strategies on the performance of large Canadian companies. I have collected quantitative data using survey. This interview is to understand, in a qualitative manner, more details about the topic. We are interested in knowing your and your company's experience with knowledge management. All information from this interview and this study will be highly confidential. We will publish only the aggregate results of the analysis.

From a research ethics standpoint, I am required to advise you that your interview is completely voluntary. You may refuse to answer any question or withdraw from the interview at any time with no adverse consequences. If you agree, I would like to record our conversation. Recording will help me to focus more on listening to you and understand instead of trying to take notes. Would it be okay if I record this interview?

Could you please take us through your company's experience in knowledge management, how it started, what you have done or do, what you plan to do, etc.

Following are the questions that will be used to prompt the interviewee so that all aspects are covered.

KM Strategies

1. As per your survey response, <*company name*> began its KM efforts in <the year>. Could you tell me a little bit about the circumstances in which it began?
2. Could you tell me a little bit about the people involved in KM?
3. Could you explain to me the different things that are done at <*company name*> to manage knowledge? What are the different things that are part of knowledge management? What kind of activities are construed as knowledge management?
4. What kind of initiatives does your company have to manage knowledge and learning? Could you please explain, as many of them as possible, to me?
5. Could you please tell us a little bit about the various KM systems used in <*company name*>? *Use survey response to prompt.*
6. How do the systems and procedures in your company help or hinder knowledge management? Please provide some examples.
7. What role does technology play in managing knowledge?
8. What role do people play in knowledge management?
9. Do employees freely share their knowledge? Whether organization explicitly supports it or is neutral about it.

Performance and KM → Performance relationship

10. Could you please tell how the knowledge and learning management initiatives in your company helped it improve its performance? Or if and how they hindered company performance? Please give some concrete examples.
11. Could you please give me some examples of what your company has gained (or could have gained) with knowledge management?
12. Do you think the approach that a firm takes to knowledge management has an effect on the kind of benefits that it can get?
13. Typically, companies doing KM devote time and resources to store the knowledge of employees so that it could be retrieved and used again. Some people argue that such storage will recycle the existing knowledge and only has a short-term effect. Do you think this is correct?
14. Some researchers say that in order to get performance over a longer period of time, we need to focus on people and their capabilities. But, people-centered KM is costly, risky, and takes time. So, it does not benefit a firm in the short-run. I was wondering it you think that is a correct argument or not?
15. Do you think there may be situations where recycling and reuse of knowledge could develop capabilities and focusing on people could help in the short-term as well?

Wrap-up

16. Is there anything additional that you would like to tell us about your company knowledge management and how it helps, or does not help, your company?

We have reached the end of the interview. Thank you very much for your time.

Interview Data Analysis

This table provides the following information: (i) some context about the company to understand its knowledge management efforts, (ii) various KM practices that the company has implemented, which reflect the KM strategy underlying the various KM activities (iii) the benefits received and challenges faced by the companies in managing knowledge, and (iv) comments that point to the study construct and relationships, including other variables that may affect the hypothesized relationships. Besides, the comments column also presents other information, not directly related to this study but useful to understand knowledge management.

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
HydroTech			
• Technology/ innovation is core to company's success • High use of patents; high appropriability regime • Tough and capable competition • Market is expanding; as this technology is displacing the old technology • Had problems with stock performance in the past but doing well now. • Recently bought by a large company that paid a high premium • Employs about 400 people, most located in HQ in a small city and has few sales offices outside Canada	• Knowledge nodes o Informal manner; people go to the node person when they have a new idea, who puts them in touch with people who can help to push it further. • Knowledge transfer sessions o Sessions once every two weeks; new ideas and work in progress, less technical details and more application o Course 101 about the technology that is core to the organization • Intellectual property management o Manage knowledge sharing between R&D and others; HQ and other offices o Patent filing process • Scanning the new patents granted and sent to all R&D personnel to keep them updated about the technology trends	***Benefits*** • Would have gotten out of the lean patch quicker as positive information too would have traveled • Induction of new employees is quicker • Develops a common knowledge base ***Challenges*** ❖ What knowledge to share and what knowledge to protect? ❖ Role of IPR; when to share, how to deal with employees coming in (with competitor knowledge) and leaving (with company knowledge)	• KM activities driven by a person handling intellectual property. Most focus on **learning-based** activities. Focus on codification and protection is very high but more to ensure the value from company knowledge is captured by the company rather than by the competitors. Successful company, financially doing well • Would like to o Develop an intranet that stores information and retrieves easily o Conduct post-mortem sessions where people can learn from mistakes/ failures

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
			• Attributes of knowledge nodes o Long tenure o Knowledgeable o Mentoring qualities o Openness to new ideas o Personal credibility o Pleasure in creating the magic o Intrinsically motivated
GameTech			
• Gaming industry, ideas and turning them into video games is critical to success • Larger than closest competitor; has resources to spare for a function like KM whose benefits are not immediately visible • 7 people in KM; Began in 2004 • Subsidiary of a US company • Employs 2000; located in B.C. • 'The company does not really need KM right now... it is a young company, there is no turnover, no huge retirements, layoffs'.	• Knowledge Website (Accessible to employees) o Sharing written documents/ images that can be easily reused by other employees o Post-mortems, lessons learned; no specific format for posting; not mandatory to post ,purely voluntary; no incentives for posting or not posting • KM Department o Provides no specific support to write and post, but supports in writing the documents if asked • In one of the departments o Face-to-face meetings (workshops involving people from different locations and project teams) before beginning development of software	***Benefits*** • Difficult to quantify • Face-to-face meetings generate better designs and better products • Employees can access the knowledge available within the company; it is difficult to know 'who knows what' in a large company. • 5000 hits to the knowledge site ***Challenges*** ❖ Impressing upon the need to contribute to knowledge web ❖ How to enthuse employees, who are 'introverts' to share ❖ Making content mission-critical so that everyone uses it in their day today work ❖ Information overload and information architecture	• **Focus on capture**; little focus on learning; doing fairly well; subsidiary of a US company. • Would like to do o Communities of practice o Blogs and discussions to the knowledge site o Standardize the document writing process • KM is not used for idea generation or knowledge creation; ideas are seen to occur to individuals who are proven in the industry and are in senior positions 'executives' pass down to 'project managers' who translate it for 'developers'. • Ideas from the bottom have to show in the work, i.e. if it works, other will use them.

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
		challenges.	• Change management; why change from what you use now to a new technology • Using technology is easier; visible and 'shows' results needed for next steps • Change taking place in traditional roles due to KM; for ex. the role of technical writer • The nature of workforce matters a lot
FuelTech			
• Fuel cell development industry • Organization has not made any profits; large sales; partnerships with auto majors • Employs 1000; of which 600 are in HQ • No formal, direct KM; Interviewee was hired to replace a corporate librarian; has a degree in library sciences; appears to do a myriad of things that can be termed as KM activities	• KM began as part of the process of transformation from R&D company to product development company • KM Tools o Configuration management; like document management but around product development; contains designs, procedures, policies that affect product development o Virtual space to trace document, files, etc. related to project; Used for scheduling product and project meetings o Company information; different departments have a page; Steering committee monitors the overall site o Information on closed projects is stored and indexed for future usage o Small libraries; corporate and department • KM type processes o Standardized naming of projects o Documents the lessons learned from	***Benefits*** • Lessons learned from closed projects are available when they need to be opened again when the time/technology/ resources are available • Hopefully, improved business processes, retain corporate knowledge, everyone knows what is happening and gets that information easily, brought people together	• General **focus on capture and codification**; not doing well; incurring losses. • Capturing employee knowledge is not a good idea because that knowledge will be outdated soon and may never be used in future.

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
	projects as part of ISO o Document product development processes; Access is restricted based on a need to know basis o Inventor reward program		
SoftDev			
• Software development company located in BC • Employs about 400 people • Went through a major reorganization of the top management recently; only 4 people report to CEO (as opposed to 10 before) • Employees seating was changed • Interviewee was hired to develop an e-business portal, which did not succeed. So, was asked to develop a repository of product information (KM); then moved to HR with a more learning focus.	• KM Tools o Browser-based database repository to house technical information about SoftDev products so that employees can go and get guidance on troubleshooting; Good for one year, is not used much now. o Part of the above database opened to customers now o MS Sharepoint; information on people, location, contact details, etc. o Bulletin Boards; just beginning; engineers find it easier to write there than talk in front of people • SoftDevU; University for learning o SoftDev Essentials for everyone from receptionist to VP; Information about the company, products, policies, etc. o Lunch-and-learn; invite internal and external speakers; once every two weeks. What is it to like to sell 'SoftDevil'; 30 min presentation and 30 min Q&A; Speaker is recognized 'gift certificate, thanks letter, goes into performance review, etc.'; Had one customer speak. o Workgroup Training; on functional areas with the help of external specialists. • Peer recognition program (running for 3 yrs.) o Employees nominate their colleague who	***Benefits*** • Employee satisfaction; learning enhanced communication; there are no silos now • Company moves forward faster; working toward a common goal; not sure if there was one before • Reduced troubleshooting time	• Driving KM from a HR perspective. Most **focus on learning-based activities**. Successful company, financially doing well • Champion of KM uses every opportunity to talk to senior managers about the need for KM; Uses exit interview data and data from individual experiences about how difficult it was to get information from others to solve a problem. • CEO stood up with the browser-based tool; top management does not push it by itself but will help surely help the interviewee to push learning initiatives.

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
	pleased them with their guidance/ help. A card is put in the common area and a draw held every quarter; Winner gets gifts. o Employee nominations are mentioned in the company newsletter.		
ConsTech			
• Technology consulting company, located in B.C., office in 15 locations • Senior management (about 100 people) decided to introduce KM to make better use of the knowledge that is there in the organization; about seven years ago (say 1998) • Interviewee became Director, KM when the intranet portal grew and a need was felt to better manage KM	• Internet portal; in its 5th release; has three major components o Internal; policy, information, documents, procedures, templates, etc. o Client-face; guidelines, tools, examples, whitepapers, client success stories, project profiles (how we won it, did it, who did it) o Document library; search functions, taxonomies, etc. o What's new; news, etc. o Content owners are identified; senior people, thought leaders; they provide direction and admin support manages the content o Consultants asked to place the good articles they read on the server; they are indexed and emails sent to those interested in that topic	***Benefits*** • Helps consultants by giving smaller chunks of information they need when they look for it • Helps new consultants understand the company • All the documents at different locations are indexed and abstracted; so, search in one place and get what is available across the company ***Challenges*** ❖ Consistency, discipline to share, finding timely information ❖ Managing redundant information available on various computers ❖ Getting Partners to stake ownership and spend time on KM ❖ Finding individual incentives for knowledge sharing because all work is done by teams ❖ Cataloguing emails that	• Very much **focused on capturing the knowledge** that is available in the organization and outside the organization. All the challenges mentioned are about capturing, getting people to contribute, indexing, retrieving, etc. Company has not been doing well; financial performance is well below the average; making losses

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
		contain lot of knowledge ❖ Putting boundaries on the applicability of content ❖ Getting external knowledge	
LoTech			
• Food processing industry; has 13 different companies under its corporate umbrella. • New old company; with a long history but a brand new management team • KM is more about focusing on learning processes than on knowledge capture, retrieval, etc. • Interviewee is VP-Leadership development; Company has two people with KM in their titles • KM began with a drive to connect the departments within the companies and to connect the companies themselves. • Standardization, uniformity are important; strong values drive the company • Large company with 18,000 employees and sales over CAD$ 5,000 Mn • KM is, at present, about 'defining the systems and the tools and the processes'.	• Culture and values o Strong culture that supports transparency and performance; Every manager can access his/her leadership review o Willing to wait for a long period to get returns but there must be a way to get returns; it's okay if they are not measurable but they must be seen/felt over long-term o Standardization; low-cost provider; o No quick solutions/ systems without due appreciation for existing systems • Leadership support o CEO calls himself 'Chief HR Officer' o Strong and decisive leadership that is interested in details; whether each employee completed the development plan for the quarter or not? o Leadership that is going to be there for 10-15 years. So, long-term focus is not compromised for short-term performance • HR Processes and systems o Leadership Review that tracks the performance of the individual, potential and the core values exhibited – pay is linked to the review o HRIS that can help to catalogue people skills and search for them o Not training but learning, which is the responsibility of the individual	***Benefits*** • Lower employee turnover • Better employees, who are motivated to continuously develop their experience base ***Challenges*** ❖ Connectivity between the companies is an issue ❖ Shift functional-orientation of people to business-orientation	• More **focus on learning** and less on technology and capturing. Large company, very successful and doing well financially • Quite a lot of support from the top management • More HR and learning processes than things known as KM practices (possibly because the interviewee is from HR but there is evidence to support that the company has a strong HR and learning focus)

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
	○ Runs an academy at a business school, where managers are offered educational programs ○ Educational reimbursement but there is no rewarding with EMBA for what one has done; may be for what one can do in the company • Portal that contains information useful to employees; policies, procedures, manuals, etc. and Livelink for six-sigma trainers that threads discussions, etc.		
PhotoTech			
• Company facing severe financial problems; recently bought over; witnessed several crises; wound up KM • Large company in a high-tech industry, located in B.C., employs over 4,000 and sales over 600 Million CAD • Interviewee left the company but agreed to share experiences • KM was initiated in the year 2000 to develop professional services business to offset the decline that a firm would witness due to shrinking market for its products, i.e. to expand the service contracts and other related solutions	• Large KM department with over 70 employees consisting of technical writers and knowledge content writers; focusing on content creation, capturing and disseminating knowledge • Company has an engineering focus. So, little effort to service the products that are already in the market. Engineers not ready for it as that is not challenging enough • Knowledge repository to help in troubleshooting product complaints • Yellow pages to find out who knows what	***Benefits*** • Beginning to measure, introduce metrics • Perhaps the services costs went down, but not measured • Improved employee satisfaction as KM let them know who they can approach for the information that they need ***Challenges*** ❖ No clarity between IT and KM; So, getting the support of IT function was difficult as IT viewed KM as information management ❖ No specific support from CEO ❖ Keeping KM alive when profits fell and everyone is focused on generating profits in the short-term	• **Capture-based strategy**; company financial performance is much below the average, incurring heavy losses. Faced severe crises and recently bought over. • KM was began to grow business for the long-term but when the short-term became really critical, KM was wound up. Perhaps KM was begun later than needed. • Shows the importance of support from other functions. Had a fairly large KM department but no real support from anywhere to pursue their mandate.

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
		❖ Most senior executives have a functional and geographic approach rather than an enterprise-wide approach ❖ Managing the preferences and biases that IT has. For example, IT prefers Microsoft products which were not suitable for KM ❖ Support from other functional groups was minimal	
MeasureTech			
• An old, old company; 100 years old; recently bought by a private investor, management team stayed on • Distribution business; three different companies, over 3000 employees, CAD$ 1.45 billion sales	• Manages benchmarking knowledge o Collects information on the financial and market performance of Canadian competitors from public sources and compares against them o Collaborated with competitors outside Canada to share data, compare notes; mutual exchange of information o Share own market performance data with suppliers and discuss, take feedback, etc. • Culture o Have an entrepreneurial approach at the branch level to compete with entrepreneurs o National approach for buying power, etc. o Measurement is the key; Achieve the best figure that is possible by any other company • HR processes o Bonuses linked to profits, cash flow, customer satisfaction and employee satisfaction o Training, one person coordinates, sessions	***Benefits*** • Measures let the employees focus on continuous improvement • Employees, branches, etc. know where they stand, where the company stands vis-à-vis competition. So, it is easy to understand/ improve	• No specific KM but believes in using the information to monitor performance; financially doing well • Decentralized company • Managing metrics is the key; Believes that information on metrics will help people to manage better, **similar to IT-centered strategy**.

Company Context	KM Activities / Strategy	Benefits and Challenges	Comments
	by senior managers – courses like Margin 101, FM 101, Marketing 101 • Intranet o Data on performance on each branch, region by hour, by day, by week, etc.		
WoodTech			
• Building products distribution company in B.C; employs about 500. • Witnessing a major change recently. Has a tough talking new Chairman who took over from the President who was a founder of the company. Chairman and VP-Finance, IT, Administration are driving the change to modernize the company • No HR Department till recently • Interviewee is a HR manager	• WoodTech pays employees to upgrade their skills by undertaking courses, attending seminars and workshops, etc. • Branches operate independently and there is little uniformity across the branches in policies and procedures. The recent drive includes connecting the branches and making the policies uniform and rational • Employees are knowledgeable and majority have been with the company for 10+ years; aging workforce, mostly 40+.	***Benefits*** • Most employees are with the company for long and know when to sell, when to buy and how to play margins – i,e, know how to do the commodity business ***Challenges*** The challenge faced is about bringing in the change in systems, policies and procedures.	• No specific KM but employees have skills to conduct business; have been doing for long • Fairly successful company, doing well financially • Believes that connecting computers across the organization improves organizational processes, **similar to IT-centered strategy**.

IVEY

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Use of Human Subjects – Ethics Approval Notice

Principal Investigator:	Mary Crossan	Review Number: 002/04 BREB
Protocol Title:	Examining the relationship between knowledge management strategies and performance	
Approval Date: March 9, 2004		End Date: March 9, 2005

This is to notify you that the Ivey School of Business Expedited Research Ethics Board (BREB) has granted expedited approval to the above named research study on the date noted above.

The BREB is a sub-REB of the University of Western Ontario's Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB), which is organized and operates according to the Tri-Council Policy Statement and the applicable laws and regulations of Ontario.

This approval shall remain valid until the end date noted above assuming timely and acceptable responses to the BREB's periodic requests for surveillance and monitoring information.

During the course of the research, no deviations from, or changes to, the protocol or consent form may be initiated without prior written approval from the BREB except when the change(s) involve only logistical or administrative aspects of the study. Subjects must receive a copy of the signed information/consent documentation.

Investigators must promptly also report to the BREB:

a) changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) all adverse and unexpected experiences or events that are both serious and unexpected;
c) new information that may adversely effect the safety of the subjects or the conduct of the study.

If these changes require a change to the information/consent documentation, and/or recruitment advertisement, the newly revised information must be submitted to this office for approval.

Members of the BREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to such studies when they are presented to the BREB.

Signature:_____
Paul W. Beamish
Associate Dean, Research
Chair, Business Expedited Research Ethics Board (BREB)

This is an official document. Please retain the original in your files.

CURRICULUM VITAE

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Education

2005 (Expected)	PhD	University of Western Ontario, Canada
1994	MBA	Indian Institute of Management Calcutta, India
1989	BE	Osmania University, India

Research Interests

- Knowledge Management and Organizational Learning

Selected Publications

- *Hari Bapuji*, Mary Crossan. 2005. Co-evolution of Social Capital and Knowledge: An Extension of Nahapiet and Ghoshal (1998) Framework. In KM Weaver (Ed.), *Proceedings of the 65th Annual Meeting of the Academy of Management (CD), ISSN 1543-8643*:
- *Hari Bapuji*, Mary Crossan. 2004. From questions to answers: Reviewing organizational learning research. *Management Learning,* 35(4):397-417.

Selected Conference Presentations

- *Hari Bapuji*, Mary Crossan. 2005. Examining the relationship between knowledge management strategies and firm performance. *Annual Conference of Strategic Management Society.* Paper nominated for '2005 SMS Best Conference Paper Prize'.
- *Hari Bapuji* and David Loree. 2004. External knowledge dynamics. *Annual Meeting of Academy of Management: New Orleans, U.S.*
- Charlene Nicholls-Nixon, *Hari Bapuji.* 2002. 'Formal structure vs. Deep structure? Exploring the link between management practices and growth of entrepreneurial ventures'. *Annual Conference of Strategic Management Society.*

Teaching

- Visiting Professor, *International Management Institute*, New Delhi (January 1998 – April 1998).

Service to Profession

- Ad hoc reviewer for Asia Pacific Journal of Management, AOM (2005, 2004, 2003), and ASAC (2005, 2004, 2002).

Industry Experience

- Over ten years of experience in human resource management and information technology in large corporations.

May 15, 2005