Knowledge Governance: An Exploratory Study

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Abstract

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Knowledge governance is based on the organizational level mechanisms developed by management that determine how organizations develop and leverage knowledge as a strategic resource in order to accomplish change and innovation. Knowledge governance consists of strategic leadership practices based on determining firm direction by developing knowledge, that enable organizations to develop competencies as conditions change. A model of knowledge governance is proposed based on methods of developing knowledge (*rational/objective, learned, cognitive/creative*) across an organization's social system (*vertical, horizontal, external*). Knowledge Governance was assessed in relationship to an organization's context and activities based on strategic and organizational requirements of organizations facing different industry environments defined by types of discontinuous change (rate of technological change, and industry life cycle). Knowledge governance was also assessed in relationship to hypercompetitive conditions, organizational priorities based on developing knowledge as well as performance and innovation outcomes. It was found that organizations are governing their knowledge across a range of stakeholders but that some traditional patterns prevail, and that methods of knowledge governance varied such that *learned* methods were prevalent whereas *creative* methods were less common. As well, creative knowledge governance was found to be negatively associated with hypercompetitive conditions. Several types of knowledge governance were found to be associated with organizational priorities and outcomes. Significant differences of knowledge governance were found to be associated with different industry environments. The results of a questionnaire completed by 70 leaders of business units are significant yet exploratory. Future research is required.

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1 Introduction

Knowledge is transforming the world we live in daily. New technologies, sciences, and ideas are shaping the world we live, our understanding, and what we do. In business, knowledge has become a source of increasing returns, more important in generating revenue than physical assets, and essential to the valuation of companies based on their intangibles (Krafft & Ravix, 2008). Businesses today compete in a knowledge economy in which the success of the business, the industries and the nations rely on the ability to leverage knowledge as a resource (Drucker, 1999). This thesis addresses the way organizations leverage knowledge as a strategic resource by examining the concept of knowledge governance.

The following introductory sections define the stage for knowledge governance and why it is an important topic in today's economic and global context, as well as the scope of knowledge governance theory addressed in this thesis based on the types of businesses and knowledge studied.

1.1 Stage for Knowledge Governance

1.1.1 The Knowledge Economy

This section examines why it is economically important for organizations to leverage knowledge as a resource. Business organizations today are facing the challenge of competing in a knowledge economy – an economy in which economic and competitive

success rely on the ability to leverage knowledge as a strategic resource (Drucker, 1999; Van Clieaf, 2001).

The knowledge economy is predicated by several factors. The decline of industrialization as a basis for competitive advantage was a major catalyst of the knowledge economy. In the industrial era, success was the result of applied sciences in areas such as manufacturing, finance, and marketing (Senge, 1998). Economic progress was due in large part to the science of productivity based on optimizing manual work and operational activities (Drucker, 1999). The knowledge of individual workers was not considered a significant aspect of economic success (Drucker, 1999; Senge, 1998). Countries that developed and leveraged the science of productivity achieved significant advantage over their competitors (Drucker, 1999). However, as other nations adopted the science of productivity, they were able to achieve developed economies (Drucker, 1999). As competition increased and developing nations had the added advantage of lower manual worker wages, productivity was no longer the basis for competitive advantage in the marketplace (Drucker, 1999).

As the paradigms of industrial organization and manual worker productivity decreased in significance, the importance of knowledge worker productivity emerged (Drucker, 1999). In the knowledge economy, nations have transformed their economic potential without material resources by educating their populations (Senge, 1998), and by developing the social and technological infrastructure that enables them to participate in the global economy (World Bank, 2008). Productivity today depends on innovation – working 'smarter', not harder (Conference Board of Canada, 2008). Economic success is based on demographic and social parameters such as a talent pool capable of developing

new knowledge and local markets in which to test innovation (D. Foot, personal communication, April 28, 2009). It is measured through criteria such as the existence of knowledge employment sectors and investment in business innovation and education systems (Centre for International Competitiveness, 2008; Drucker, 1999). In these conditions, knowledge has become a significant natural resource providing an important source of value creation and competitive advantage for firms (Nonaka, 1994) and economic productivity for nations (Drucker, 1999; Senge, 1998). According to Drucker (1999):

> performance depends on the ability of the developed countries – and of every industry in it, of every company in it, of every institution in it – to raise the productivity of the knowledge worker and to raise it as fast as the developed countries have raised the productivity of the manual worker in the last hundred years (p. 93).

Accelerated by systems that enable 'efficient' sharing and access to knowledge, as well as the development of knowledge into a commodity, the knowledge economy has changed the competitive context and basis upon which organizations compete (Hidalgo & Albors, 2008). According to Nonaka (1994), while specific forms of knowledge creation such as "technical, product, strategic or organizational" (p. 14) innovation are important, competing in the knowledge economy "is not simply about pushing back the frontiers of knowledge; it is also about the more effective use and exploitation of all types of knowledge within all manners of economic activity" (Hidalgo & Albors, 2008, p. 114). It is these economic conditions that define the impetus for every organization to compete based on knowledge.

1.1.2 The Global Context

While economic conditions are driving the knowledge economy, the global context provides the premise for how organizations innovate and develop knowledge and consequently how they govern their knowledge. Global political, environmental, and demographic changes are fuelling the need for innovation and the development of knowledge.

For example, the American energy sector is seeking to reduce their reliance on fossil fuels by developing energy alternatives in order to reduce global warming as well as reliance on foreign allies (White House, 2009). The North American manufacturing sector, specifically car companies, are investing in R&D to engineer environmentally friendly products and processes as well as to avoid obsolescence. Firms across industries are redesigning their activities in order to reduce their carbon footprint (Guria, 2008). Demographic changes are changing the supply and demand for goods all over the world (Foot & Stoffman, 1996).

In addition to changes occurring in the world, global competitive conditions are the basis for strategic disruptions that are influencing the way organizations innovate and develop knowledge (Ireland & Hitt, 1999). Some of these conditions are: increased domestic and foreign competition; hyper-competition emphasizing innovation, market orientation, and operational efficiency; increased risks and uncertainties of acting on uncharted territory and in turbulent conditions; complexities of managing technological change as well as global markets; and convergence and re-structuring across industries and sectors (Hitt, Keats, & DeMarie, 1998; Tushman & O Reilly, 1996). Conditions such as these represent strategic discontinuities – departures from stable conditions and known

strategic parameters – in which organizations must compete based on their ability to innovate and develop knowledge (Fowler, King, Marsh, & Victor, 2000; Nonaka, 1991).

Finally, knowledge itself is also increasing, evolving and become obsolete more rapidly than ever (Davis & Botkin, 1994; Edmondson, 2008; Hedberg, 1981) due to our ability to share and access knowledge. Consequently, the development of new technologies, new sciences, and new areas of study are impacting, changing and moderating an organization's knowledge base and basis for creating value in the marketplace (Davis & Botkin, 1994; Edmondson, 2008). Organizations must be able to innovate and develop knowledge in a way that is at pace with the world – including replacing obsolete knowledge as knowledge of the world evolves (Davis & Botkin, 1994; Edmondson, 2008; Hedberg, 1981).

1.2 Scope of Knowledge Governance Theory

The following sections address the questions of which businesses should govern their knowledge, and which knowledge should be governed.

Knowledge is a prevalent part of our society. Knowledge is shaping the world in the form of new discoveries, technologies, sciences, products and services, and domains of knowledge. All types of social organization play an important role in the development of knowledge and influencing the world as a whole. For example, academic institutions develop knowledge based on research organizations, research agendas, and educational programs; governments develop knowledge based on emerging social, economic, political, technological and environmental conditions; not-for-profit organizations support the development of knowledge around their cause; and businesses are developing

new knowledge as a basis for competing in the conditions of their environment. While this thesis examines the basic parameters of knowledge, and of the social organization that underlies it, the emphasis is on knowledge in the domain of business.

1.2.1 The Knowledge Driven Organization

Our idea of the knowledge-based business may have started with businesses in industries whose sole purpose it was to create or leverage knowledge as a strategic resource – industries such as biotechnology, software companies, consulting or law firms (Miles, Sow, Mathews, Miles, & Coleman, 1997; Schreyogg & Geiger, 2007), industries in which employees possess specialized expertise, in which the activities of the organization are intellectual by nature, and in which the task of the organization is to solve problems through knowledge (Schreyogg & Geiger, 2007). The knowledge-based business has also been conceived as organizations that incorporate technological and scientific advances into their products and services (such as diapers that change colour, or clothes that adjust to temperature), or those driven to educate their customers in order to leverage the value of their products (Davis & Botkin, 1994). While these early conceptions of the knowledge-based business demonstrate the value of knowledge as a resource, it is evident today that knowledge-based business is not limited to specific industries, types of products or market approaches. As industrial organization no longer proffers a source of competitive advantage, few organizations will be able to remain immune to the discontinuities and demands of the knowledge economy (Drucker, 1999; Senge, 1998). Businesses and industries across the board are coping with an increase in the number of knowledge workers (Drucker, 1999; Quinn, Anderson, & Finkelstein,

1996) – particularly specialized groups with technical knowledge participating in the value creation process (Drucker, 1999). Knowledge workers are contributing to value creation processes in service-oriented and manufacturing industries alike, and in areas such as "R&D, process design, product design, logistics, marketing research, systems management, and technological innovation" (Quinn et al., 1996, p. 7). Today, knowledge pervades "all areas of organizational management from strategy to operations, human resources to technological systems, from economics and accounting, finance and marketing, ... [knowledge is an] aspect of all organizational work" (Davenport & Holsapple, 1996, p. 451). The knowledge-based business today is practically all businesses that can leverage knowledge as a strategic resource in the process of their activities, and as a basis for economic success and performance.

1.2.2 Knowledge Workers

Examining knowledge workers is important in determining who should participate in knowledge governance (i.e. executives or others) as well as whose knowledge should be governed (i.e. specialized competencies or others). Knowledge workers have become a large component of the work force in developed economies (Drucker, 1999). However, the definition of a knowledge worker is greatly varied and, as a result, organizations may have issues to resolve in determining how to govern their knowledge. Do organizations only govern those workers with specialized competence, technical expertise, education, or experience? Does an organization govern the knowledge of those who can create, distribute or apply knowledge, or those with the capacity to solve complex problems based on practical experience, or those with

technical skills that are valuable in the marketplace, or those with the education and certifications that can help an organization reach its objectives (Hammer, Leonard, & Davenport, 2004)? Each of these types of knowledge workers may be able to contribute to value creation processes. For example, specialized competence in accounting can create new insights on cash flow (Nonaka, 1991) or those with technical expertise can develop innovative solutions in their domain.

Differences in the actual knowledge of knowledge workers may be something to consider in the way an organization governs its knowledge. However, the emphasis should not be on the qualifications of the knowledge worker alone but in the way the knowledge of individuals and groups can contribute to the improvement of an organization's activities. People with experience and knowledge – regardless of their qualifications – have the potential for creating knowledge about an organization's activities.

> The best definition I have found for "knowledge worker" comes (unsurprisingly) from Drucker himself: "someone who knows more about his or her job than anyone else in the organization." By this definition, the manufacturing worker who diagnoses and solves production problems, the utility linesman who schedules his own day and the warehouse worker who evaluates vendor performance all perform knowledge work and must be considered at least in part to be knowledge workers. Such people are increasingly the norm rather than the exception; fewer and fewer workers perform routine tasks that do not draw upon accumulated knowledge and expertise. To paraphrase Richard Nixon, "We are all knowledge workers now." (Hammer et al., 2004, p. 14)

Creating knowledge is not a specialized activity, but the job of every worker (Nonaka, 1991). Knowledge workers may be the operational managers who understand the impact of a new product design on the manufacturing process (Carlile, 2002), or the secretary interacting with test subjects who notices differences between two test groups (Majchrzak, Logan, McCurdy, & Kirchmer, 2006), or the repairmen who develop knowledge of repairing machines based on their experience (Brown & Duguid, 1991), or the highly knowledgeable and experienced doctors who evaluate the work of other doctors and the operations of a hospital in order to recommend improvements (Drucker, 1999). Knowledge workers are instrumental in contributing to and improving the efficacy, quality, and innovativeness of activities in an organization (Hammer et al., 2004).

Even though we may conceive of knowledge in the form of abstract concepts, sciences, or routines, knowledge is based on human experience within a specific context – knowledge emerges from a living experience of the world (Gueldenberg & Helting, 2007). Even scientists first experience the world and then learn to conceptualize, hypothesize, and eventually test it (Spender, 1994). Repeated testing and verification can result in objective, structured, and more certain rules about the world (Spender, 1994). Consequently, the value of knowledge is not limited to a segregated group of workers but is very much defined by the ways in which an organization can leverage the knowledge and experience of its employees (from front line workers to executives).

1.3 Outline of Remainder of Thesis

Examining the concept of knowledge governance is both relevant and significant to organizations today. The economic and global conditions of their context, as well as the nature of their activities and the people who participate in and contribute to them are all factors that are the basis for the research presented in this thesis. The thesis proceeds in the following manner: Literature Review defines the concepts of knowledge and governance, and develops a theoretical premise for knowledge governance supported by practical examples; Research Model, based on the theoretical premise, establishes the main concepts assessed in the research; Research Methodology provides information on operationalization of the model and the methodology followed; Descriptive Data Analysis interprets the big picture of how organizations govern their knowledge; Results contains the analysis based on propositions; Discussion reviews the results and their significance; and Conclusion summarizes the implications of the research.

2 Literature Review

The purpose of this chapter is to introduce and define the concepts of knowledge and governance that will be used and elaborated on throughout the process of theory building in the remainder of the literature review. Section 2.1 defines knowledge as a resource, as well as the way organizations compete based on their knowledge through competencies. The subsequent sections (2.2 to 2.8) address the concepts of governance and knowledge governance, and propose a theoretical premise for knowledge governance.

2.1 Knowledge

This section addresses how knowledge is defined as a resource. Different definitions emerged to help organizations conceive of knowledge as a resource. One definition was based on distinguishing knowledge from data and information, both of which represented important stages in the economic development of organizations (Davis & Botkin, 1994). While data and information are leveraged through technology, knowledge is based on human insights and understanding (Davis & Botkin, 1994). While this definition created an awareness of knowledge, it still left questions about how knowledge should be leveraged as a resource.

Knowledge is commonly defined as either tacit or explicit. Tacit knowledge is "highly personal" (p. 98) and represents our knowledge of the world that is hard to articulate (Nonaka, 1991). It includes skills and know-how developed over time by experts (Nonaka, 1991), as well as the way we simply understand the world through

experience that exists without explanation (Gueldenberg & Helting, 2007). On the other hand, explicit knowledge is "formal and systematic ... [and can be] easily communicated and shared" (Nonaka, 1991, p. 98). This distinction between tacit and explicit knowledge was the basis for defining types of knowledge processes through which organizations could leverage knowledge. While explicit knowledge is easily shared and leveraged through the use of technology, tacit knowledge required interpersonal interaction and communication (Zack, 1999). This distinction benefited organizations in the development of ways to leverage knowledge as a resource (Nonaka, 1991; Zack, 1999). Nonetheless, issues still remained with *how* organizations should leverage knowledge a resource. According to Foss, the theoretical issues not resolved by this distinction include how organizations develop knowledge from individual knowledge (as cited by Twynoiak, 2007). As well, according to Thompson and Walsham, tacit and explicit knowledge are actually complementary as opposed to substitutable (as cited by Twynoiak, 2007).

Another approach to defining knowledge is that knowledge is based on and developed through practice. The premise of this approach is that knowledge is the basis for our actions, "our knowing is in our action, ... [and that] our actions are based on our construction and understanding of the world" (Schreyögg & Geiger, 2007, p. 80). In this approach, we both apply and develop knowledge through "action and successful problem-solving" (Schreyögg & Geiger, 2007, p. 80). For example, we can apply our knowledge of engineering to solve an engineering problem, but in the process we also develop knowledge of how to solve engineering problems. This approach includes both tacit and explicit forms of knowledge such as "skillful behaviour, emotions, norms, routines, narratives, values, cognitions, etc." (Schreyögg & Geiger, 2007, p. 79). This

approach is consistent with the notion that the way individuals and groups utilize and develop knowledge to design products, meet the needs of customers, manufacture products, perform human resource functions or even meet the accounting requirements of organizations is the basis for how organizations compete.

2.1.1 Competencies

Current environmental conditions are such that firms can no longer set a course and simply hope to maintain it. As competitive conditions change, products are quick to lose their value, markets to evolve, and industries to transform (Fowler et al., 2000; Prahalad & Hamel, 1990). According to Shapiro and Varian, Encyclopedia Britannica failed when competitive conditions changed as a result of new technologies and distribution channels (as cited by Fowler et al., 2000). According to Baig, American Express lost their high prestige market when competitors offered credit cards with customer-oriented features (as cited by Fowler et al., 2000). And according to Bulkeley and Wilkes, Wang Laboratories lost their market when personal computers and software applications replaced their minicomputer word processing systems (as cited by Fowler et al., 2000).

These examples demonstrate that as conditions change, organizations have to develop new ways of competing. They do so by developing the knowledge and skills that enable them to compete based on changes in their environment. According to Hamel (1991),

> conceiving of the firm as a portfolio of core competencies and disciplines suggest that inter-firm competition as opposed to inter-product competition is essentially

> concerned with the acquisition of skills. In this view global competitiveness is largely a function of the firm's pace, efficiency and extent of knowledge accumulation. The traditional 'competitive strategy' paradigm (e.g., Porter, 1980) focuses on only the last few hundred yards of what may be a skill-building marathon. (p. 83)

Organizations effectively compete by developing superior competencies that are based on their integrated knowledge and skills (Fowler et al., 2000). They include both tacit and explicit knowledge and are based on the combined knowledge developed across social systems such as teams and networks (Fowler et al., 2000).

According to Bogner and Thomas, an organization's competencies are the knowledge and skills developed by an organization to "perform useful actions" (as cited by Fowler et al., 2000). For example, organizations such as Sony, 3M, Honda, and Canon developed their knowledge based on developing technological possibilities and market applications (Prahalad & Hamel, 1990). 3M developed their combined knowledge and skills in "substrates, coatings, and adhesives ...[into products such as] post-it notes, magnetic tape, photographic film, pressure sensitive tapes, and coated abrasives" (Prahalad & Hamel, 1990, p. 82). Casio developed knowledge and skills in "miniaturization, microprocessor design, material science, and ultrathin precision casting ... [into products such as] miniature-card calculators, pocket TVs, digital watches [and miniature radios]" (Prahalad & Hamel, 1990, p. 82). Honda developed their knowledge and skills of "engines and power trains ... [into] car, motorcycle, lawn mower, and generator businesses" (Prahalad & Hamel, 1990, p. 83). And Canon's knowledge and skills in "optics, imaging, and microprocessor controls ... [are the basis for products such

as] copiers, laser printers, cameras, and image scanners" (Prahalad & Hamel, 1990, p. 83).

While competencies are based on the knowledge and skill of an organization and evolve through a process of learning, they are not often described in a dynamic manner – i.e. based on the process through which they are developed as strategic resources of an organization (Krafft & Ravix, 2008).

2.2 Governance

Corporate governance is the "general system by which firms are owned and managed" (Krafft & Ravix, 2008, p. 79). Governance of knowledge plays an essential role in corporate governance. Corporate governance oversees the dedication of organizational resources towards the development of future economic returns (Krafft & Ravix, 2008). Organizations that compete in today's economy generate their revenue from the development of their knowledge (Krafft & Ravix, 2008). While early models of corporate governance were defined by agency problems and the control of managerial knowledge through incentives, corporate governance today is based on the managerial role in the control and development of innovative processes by which organizations compete. Knowledge governance is concerned with the development of knowledge through the creation and integration of an organization's diverse knowledge base (Krafft & Ravix, 2008). "The modern … corporation is thus defined as a nexus of different kinds of knowledge and competence articulated through different capabilities and learning processes" (Krafft & Ravix, 2008, p. 80). Knowledge governance is essential to the

"process of corporate development, i.e. a process that provides an effective coordination of interrelated resources and activities" (Krafft & Ravix, 2008, p. 80).

2.3 Knowledge Governance

Governing knowledge requires a paradigm shift. Knowledge workers are the means of production that enable organizations to compete based on knowledge (Drucker, 1999). Knowledge workers are the means by which organizations develop new technologies, deliver superior customer service, invent new market applications, or methods of manufacturing (Ireland & Hitt, 1999). Knowledge work can produce results such as innovative products, development of new markets, and improved methods and practices (Zack, 1999). According to Zack (1999), knowledge is the means by which an organization leverages conventional resources. The benefits of leveraging knowledge include value creation, innovation, and the efficacy of organizational activities (Hammer et al., 2004). Knowledge work can result in greater returns than limited traditional resources (Ireland & Hitt, 1999). Leveraging knowledge can also result in outcomes such as competitive advantage and staying power (Zack, 1999). The benefits of leveraging knowledge can have an impact on the financial performance of firms (Zack, 1999), and on a larger level, the economic performance of countries (Drucker, 1999). Knowledge workers can contribute more to the profitability of firms than other workers (Guthridge, Komm, & Lawson, 2008).

The challenge faced by organizations in governing knowledge is that productivity cannot be measured in traditional ways (Drucker, 1999). Outcomes may not be quantitatively measured or even predefined (Drucker, 1999). There are several other

challenges to governing knowledge as a strategic resource. Knowledge is divided across individuals and groups in an organization (Kogut & Zander, 1996). While organizations compete by leveraging the knowledge of specialized competences, individuals and groups within an organization are not often knowledgeable outside their domains of knowledge and areas of activity (Kogut & Zander, 1996). This poses specific governance problems in how organizations govern the knowledge of specialized competences and how they govern organizations across divided domains of knowledge (Drucker, 1999). Knowledge is also distributed across individuals and groups (Grant, 1996). Consequently, organizations need systems that enable them to develop knowledge across individuals and groups (Ireland & Hitt, 1999).

Knowledge workers must be autonomous (Drucker, 1999). The value they contribute to organizations is their ability to exercise judgment based on their knowledge (Drucker, 1999; Tsoukas, 2001). When tasks are predefined, organizations are not able to leverage contributions based on the knowledge of individuals and groups in an organization (Drucker, 1999), because knowledge is emergent (Tsoukas, 1996). Knowledge emerges in the process of practicing through the individuals and groups of an organization (Tsoukas, 1996). Consequently, in order to govern knowledge to develop superior marketing, product development, or manufacturing abilities, organizations must govern the way individuals and groups utilize their knowledge on behalf of organizations.

Governing knowledge workers requires a departure from traditional methods of strategic control (Simons, 1995). While organizations cannot govern knowledge by measuring results or pre-defining outcomes, they must inform knowledge workers how they should use their knowledge in the context of the organization (Simons, 1995). This

can be accomplished by systems that define the way members of an organization should and should not use their knowledge as well as systems that learn across participants of an organization (Simons, 1995).

2.3.1 Theoretical Premise for Knowledge Governance

The nature and extent of change occurring due to economic and global conditions are such that organizations require "innovative leadership practices" (p. 43) in order to compete effectively (Ireland & Hitt, 1999). Organizations are facing "revolutionary" (p. 44) conditions such that, as an organization's context changes, their knowledge must change, and organizations must develop knowledge to remain competitive (Ireland & Hitt, 1999). It is in these conditions that top down leadership practices – appropriate for addressing linear change and manageable amounts of uncertainty – are no longer effective (Ireland & Hitt, 1999). In order to prepare for the future based on changes occurring in the present, leaders today have to learn from others, as well as share leadership with other members of the organization, to develop the knowledge required to be competitive (Ireland & Hitt, 1999). In order to accomplish this, leaders have to build, share, and leverage the knowledge of the organization through the development of competencies. According to Ireland and Hitt (1999), "a firm's privately held knowledge is the foundation of its competitively valuable core competencies and is increasing in importance as a driver of strategic decisions and actions" (p. 49).

In business, leveraging knowledge as a strategic resource – whether driven by changes in the larger global context, competitive conditions, or in the base of knowledge that constitute organizations – has not only become a question of economic success but of

economic survival. (Fowler et al., 2000). Knowledge is the basis for developing competencies or capabilities[1] (Fowler et al., 2000; Grant, 1996, Kogut & Zander, 1996), and plays an instrumental role in organization's ability to execute their strategies, develop strategic opportunities (Zack, 1999), innovate (Dougherty, Borrelli, Munir, & O'Sullivan, 2000; Nonaka, 1994), create value (Dougherty et al., 2000), adapt to change (Fowler et al., 2000; Nonaka, 1991), and achieve competitive advantage (Grant, 1996; Vera & Crossan, 2003). However, how knowledge can be leveraged as a strategic resource in order to accomplish such objectives remains an important problem for practitioners (Carlile, 2002; Zack, 1999) and theoreticians alike (Foss, 2007). It is a problem that the theory and research in knowledge governance can help to address.

Knowledge governance constitutes the organizational level mechanisms determined by management that influence and direct the way knowledge processes occur in an organization (Foss, 2007). According to Grandori, such organizational level governance mechanisms can include "organization structure, job design, reward systems, information systems, standard operating procedures, accounting systems and other coordination mechanisms" (as cited by Foss, 2007, p. 30). According to Argote, knowledge processes through which organizations leverage value include knowledge creation, retention and sharing (as cited by Foss, 2007). While knowledge-based resources such as capabilities are well recognized as the basis for competitive advantage,

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[1] Following the precedent set in Fowler et al. (2000), the terms competencies and capabilities will be used interchangeably from this point forward. According to the authors, this approach is "consistent with general usage and much of the strategy literature (e.g. Hamel, 1994; Henderson and Cockburn, 1994; Iansiti and Clark, 1994; Barney, 1995)" (p. 359).

Foss (2007) proposes that certain gaps in the literature can be addressed by knowledge governance research. Specifically, Foss (2007) suggests those features of formal organization that determine how capabilities are developed, as well as descriptions of the micro-foundations of capabilities that result in competitive advantage, can be contributions made by knowledge governance research. These interests are the main pretense for the research presented in this thesis.

Where this research approach departs from the definition of knowledge governance proposed by Foss (2007) is the premise that knowledge governance is the basis for influencing and directing knowledge processes. While knowledge processes are an important basis for leveraging knowledge, the approach taken in this research is based on practice. It is proposed that competencies are based on superior or distinctive ways of developing an organization's knowledge (Fowler et al., 2000; Ireland & Hitt, 1999) and that organizations develop knowledge through practice (Carlile, 2002). Consequently, the organizational level mechanisms and micro-foundations of competencies defined in this thesis are based on practice as opposed to the way knowledge processes occur in an organization.

Borrowing from the literature on organizational learning, a premise for the organizational level mechanisms that develop knowledge as a basis for accomplishing change and governing the competencies of an organization is proposed. The premise is constructed from both theoretical precedents in organizational learning as well as from the grounded theory and case study examples of Dougherty et al. (2000). The development of the theory proceeds in the following manner: the first two sections examine the parameters of developing knowledge in organizations – including the

methods used to develop knowledge, as well as the distributed aspects of developing knowledge – in order to establish the framework for assessing knowledge governance; the following sections define the process of developing knowledge and how organizations accomplish this process, and govern their knowledge in order to accomplish change and innovation; the final section examines how the process defined by the previous sections is the basis for developing an organization's competencies.

2.4 Methods of Change

Organizational change can be driven by many sources and come in many forms. Organizational change can be driven by changes in knowledge, strategic conditions, and the world (Ireland & Hitt, 1999). Change can be internally driven by innovation or externally motivated based on changes in environmental conditions (Senge, 1990). Change can be the result of reactions to environmental conditions or based on the proactive shaping of markets and industries (Tushman & O'Reilly, 1996). Regardless of the basis for organizational change, it can be accomplished through a process of organizational learning (Vera & Crossan, 2003). The process of organizational learning can vary substantially in organizations (Hedberg, 1981; Huber, 1991). Organizational learning can occur through processes as diverse as importing new knowledge, experimentation, interpretation and enactment of organizational strategies, and knowledge sharing and distribution across an organization (Huber, 1991).

As opposed to looking at organizational learning as the result of diverse processes within an organization, another way of approaching organizational learning is by conceiving of organizations "as cohesive units that act purposely and learn from their

actions" (Hedberg, 1981, p. 6). Here we examine this paradigm through theory and practice, and define the process of organizational learning based on the concept of developing knowledge.

Early models of organizational learning were focused on specific methods of developing knowledge by organizations. In the stimulus-response paradigm of organizational learning, the pretext was that organizations learned as a result of feedback from their actions (Hedberg, 1981). On the other hand, prescriptive approaches such as double-loop learning and systems thinking focused on uncovering hidden assumptions and mental maps of managers. In these methods, the focus was on reasoning about errors or inter-relationships in the context of organizational activities (Argyris, 1977; Senge, 1990). Some limitations of early views of organizational learning were: the emphasis on specific methods of developing knowledge to the exclusion of others (Hedberg, 1981); and the basis on abstract concepts of how to develop knowledge (Elkjaer, 2003). For example, the feedback method of learning did not include the possibility of learning based on developing new innovations or even simply copying ideas (Hedberg, 1981). The concepts of hidden assumptions, mental maps and systems thinking can be considered abstractions of actual management practices (Elkjaer, 2003).

Nonetheless, an important contribution of these approaches was the concept of organizations as learning systems that develop theories of action (Hedberg, 1981). Specifically, organizations can be defined as learning systems that develop theories of action based on their knowledge of action-outcome relationships (Duncan & Weiss, 1979; Hedberg, 1981; Shrivastava, 1983). Theories of action are the hypothesis of how an organization will compete, and the knowledge organizations develop are the premise for

an organizations actions (Hedberg, 1981). In more practical terms, organizations are systems that develop knowledge about how to act in order to accomplish their objectives. For example, organizations might develop knowledge based on business opportunities in an industry, product-market opportunities in a location, or even knowledge of operational and production methods. Organizations are systems that develop knowledge by mapping their environments and determining how to accomplish their objectives (Hedberg, 1981).

Utilizing Campbell's theory of variation, selection, and retention, Hedberg (1981) developed an expanded stimulus response diagram of learning that describes how organizations developed theories of action based on the context of their activities. While one level of the organization developed theories of action by selecting and interpreting stimuli from the real world, another level implemented them or assembled responses to the stimuli (Hedberg, 1981). In stable conditions these two systems could be managed separately. An organization could determine what actions to pursue based on established forms of knowledge such as industry standards, prediction models, scientific methods of analysis and operational conventions (Bogner & Barr, 2000). Leaders could determine what industries and markets an organization should compete in, the products they should sell, how they should compete, and the way they should operate. While an organization's theories of action can be influenced by feedback from the systems that implement them, organizational methods of developing knowledge, i.e. through independent systems, prevented this from happening in practice (Dougherty et al., 2000).

As organizations encountered environmental instability, they could no longer rely on established forms of knowledge as a basis for determining how to act (Bogner & Barr, 2000; Ireland & Hitt, 1999). As markets, technologies, and competitors changed

organizations had to develop new knowledge as a basis for their theories of actions. Organizations had to develop knowledge about their industry, their market, how to develop products, and how to operate based on a new set of conditions. An organization's operational activities, or systems that are used to implement theories of actions, became an important source of stimuli and knowledge about markets, technologies, operating methods, etc. The role of leaders changed as a result. The role of leaders was no longer to be solely responsible for developing and administering institutional knowledge that determined how an organization acts in its environment (Ireland & Hitt, 1999). Leaders have to participate in and assure that their organizations develop the knowledge they require to compete in their conditions (Ireland & Hitt, 1999).

Organizations today can determine how to compete by developing knowledge through areas of activity such as their technologies and markets, as well as institutional criteria for acting such as operational standards and financial controls (Dougherty et al., 2000). However, as organizations face environmental change, developing new theories of action may not always be easy. According to Christensen, when McKinsey & Co predicted the market for cellular phones in the 1980s, they projected a worldwide market of 900 000 subscribers and over a decade later there were that number of new subscribers every three days (as cited by Govindarajan & Trimble, 2004). Conditions may be uncertain and predictable models upon which to base a profit may not exist (Govindarajan & Trimble, 2004). While organizations may want to act with complete certainty, developing a theory of action in emerging and uncertain conditions can be completely different than in mature and well-defined conditions (Govindarajan & Trimble, 2004). Organizations acting in uncertain conditions cannot always focus on

developing knowledge based on predictable outcomes, but might develop knowledge based on unknowns, developing a new premise, exploratory models, iterative reviews, monitoring the progressing of conditions, or based on emerging information and indicators (Govindarajan & Trimble, 2004).

Aristotle observed that not all knowledge requires the same amount of certainty or precision and that an educated man should be able to judge what is appropriate (Gueldenberg & Helting, 2007). Consequently, organizations can differ in the ways they develop knowledge as the basis for their theories of action. Theories of action are based on different methods of developing knowledge. Some organizations develop their theories of action by creating new knowledge, while others do so by developing knowledge and experience from their activities, and still others simply base themselves on established and objective forms knowledge (Dougherty et al., 2000).

In their case study research, Dougherty et al. (2000) provide several examples of how different organizations develop knowledge in order to accomplish the development of a new product. In one example provided by the authors, a new markets and innovation team at a textile company invents a new product concept through a process of collaboration between diverse areas of knowledge such as "yarn, weaving, and chemical engineering" (Dougherty et al., 2000, p. 332). They pursue this theory of action (the product concept) by contacting potential customers about the product and thus evaluating the market potential (Dougherty et al., 2000). Finally, they implement their theory of action by bringing their manufacturing engineers to the customers and articulating the product requirements (Dougherty et al., 2000). The way the organization in this example developed knowledge as a basis for their theory of action is very exploratory. In the

words of the market analyst on the team, "we did a screen and it looked like a very good idea" (Dougherty et al., 2000, p. 332). There were no pre-defined requirements for the product, they created new knowledge through a social process of incorporating "information, insight, and ideas" into a product concept (Dougherty et al., 2000, p. 322). The process was also very experimental – the organization didn't develop knowledge based on pre-determined outcomes. The outcomes in the form of market potential were unknown at the time of development and were only determined afterwards. Nonetheless, this organization successfully developed a theory of action through a very direct and interactive way of creating knowledge about its products and customers.

In contrast, another manager at this organization determines how they should develop new products by developing knowledge about the market potential and technological possibilities for manufacturing a "new raw material" (Dougherty et al., 2000). The difference is that the way the manager develops knowledge is not based on the practical activity of developing a product but based on interpreting the potential opportunity in terms of knowledge about markets and technology. While this process is still based on exploring possibilities based on the business potential of a new opportunity, it is not experimental and based on a different method of developing knowledge.

In a third example, an office and electronic equipment company determines how they should develop new products by integrating the knowledge and experience of different functions in the form of standards (Dougherty et al., 2000). In this organization, the development of integrated knowledge in the form of standards enables functions to work together (Dougherty et al., 2000). New designs by engineering have to meet the standards before proceeding to manufacturing (Dougherty et al., 2000). In the words of

an engineer, "I know what happens when you move an unready design into the factory – there is chaos all around." (Dougherty et al., 2000, p. 333). Engineering and manufacturing departments even collaborate to make sure new designs meet the standards (Dougherty et al., 2000). In this example, the organization has developed a theory of action about the development of products, based on their knowledge and experience across different functions.

In a consumer durables company, they determine how to develop a new product based on operational standards and functional knowledge. Consequently, they have a very limited process of developing new products. In the words of an engineer, "there are frustrations and constraints the technology people feel, because we can change (products) to meet performance needs and features, but we are constrained by manufacturing" (Dougherty et al., 2000, p. 333). As well, research and development at this organization are not based on market knowledge or business requirements. This organization's theories of action for its activities are based on operational standards and functional knowledge.

At a transportation and shipping organization, they determine how to develop new products based on market knowledge in the form of 'size' and 'cost' of market segments (Dougherty et al., 2000). Product development in this organization is limited by operational measures because they lack knowledge of actual customers (Dougherty et al., 2000). In the words of a marketing manager, "we are finding it hard to get our arms around thousands of customers" (Dougherty et al., 2000, p. 334). In this example, the organization's theory of action about the development of products is based on operational knowledge of its markets.

In the case study based research in Dougherty et al. (2000), the authors reveal distinct differences in the ways firms determine how to develop a new product. They develop different theories of action based on different methods of developing knowledge as a means of accomplishing their objectives. While one organization develops a new product based on a very experimental, collaborative and subjective method of developing knowledge, another develops standards by integrating the knowledge and experience of different functions, and yet others base product development on operational standards. Each method of developing knowledge is based on a different theory of action of how to compete, the first is based on creating value through innovation, the second based on creating value through the knowledge of an organization, and the third is based on accomplishing operational efficiency.

Theories of action can be developed through objective methods of developing knowledge such as rigorous market analysis, or through creative methods of hypothesizing about and exploring the possibilities of a new innovation or technology. The responsibility of a business is to determine how best to accomplish their objectives. While organizations can determine how to act based on objective and established forms of knowledge, the market is the ultimate judge (Tushman & O Reilly, 1996). IBM and Sears are both examples of organizations that were driven by internal standards but as conditions changed, they lacked an adequate premise for acting in new conditions (Tushman & O Reilly, 1996). Both organizations lost their leadership standing due to bureaucratic cultures that prevented the development of new knowledge (Tushman & O Reilly, 1996).

Theories of action must evolve over time. As conditions change, organizations have to develop new theories of action in order to remain competitive (Hedberg, 1981). For example, Detroit automakers once used the theory of action that style was more important than quality (Senge, 1992). However, as foreign competition entered their market, their market changed and quality became important (Senge, 1992). Consequently, their theory of action that selling stylish cars was the basis for a profitable strategy was no longer valid. As action-outcome relationships change, organizational theories of action also have to evolve.

Organizations that are able to change their theories of action by developing new knowledge about how to compete – as opposed to relying on historical, functional or internal standards – will be able to innovate, accomplish change, as well as leverage the value of knowledge. Different conditions require different types of theories of action.

Organizations have to determine the appropriate way to develop a theory of action in the conditions they face, i.e. whether it should be based on predictable financial returns or simply the potential of future returns. For example, they must determine whether they should be creating knowledge, learning from experience, and/or relying on operational controls.

2.5 Distributed Knowledge

An organization's knowledge consists of a distributed system – it is distributed across individuals and groups, it evolves over time and cannot be known or possessed by one person (Tsoukas, 1996). Consequently, organizations have to function as social systems in order to develop knowledge (Child & Heavens, 1999). The following

paragraphs describe the manner in which organizations function as social systems that develop and leverage the value of knowledge.

Knowledge is distributed between three dimensions of social practice: organizational knowledge in the form of rules and routines; the knowledge of individuals and groups based on their specialized competencies and experiences; and knowledge that is created and emerges through situations (Tsoukas, 1996). Organizations develop knowledge by negotiating the differences between these three dimensions of social practice. For example, an organization can develop knowledge about its products from its engineers, or knowledge about its markets from its sales people (Dougherty et al., 2000). As well, new insights or innovations developed through the course of organizational activities can be the basis for product innovation, new market applications, or new methods of operating (Dougherty et al., 2000). Important opportunities for organizations to develop knowledge exist in the differences between formal organizational knowledge, actual knowledge and experience of members of the organization, and knowledge created in the process of solving problems are (Brown & Duguid, 1991).

In traditional organizational models, leaders were primarily responsible for developing an organization's knowledge (Ireland & Hitt, 1999). However, according to Senge (1990), "in an increasingly dynamic, interdependent, and unpredictable world, it is no longer possible for anyone to 'figure it all out at the top.' The old model, 'the top thinks and the local acts,' must now give way to integrating thinking and acting at all levels" (p. 7). Over time, knowledge has become progressively more distributed across organizations as they continue to evolve based on the knowledge of specialized competences (Grant, 1996). Organizational structures have flattened to develop

knowledge closer to technologies, markets and emerging conditions in an organization's environment (Miles et al., 1997). External stakeholders such as suppliers, customers, partners, and even competitors have also become important participants in organizational activities (Child & Heavens, 1999; Ireland & Hitt, 1999). The challenge facing organizations today is not only that developing knowledge has become increasingly distributed and specialized but also that individual decision makers are limited by their specialized knowledge (Miles et al., 1997). While organizations can leverage knowledge by developing an increasingly distributed system, their ability to function as social systems to create knowledge has become increasingly important.

Typically, organizations develop knowledge through specialized areas of practice – specialized competences and groups that are organized around specific activities (Carlile, 2002). Knowledge is embedded in practice – in the experience and know-how of those who practice, and often set in specific ways of doing things developed through practice (Carlile, 2002). For example, executives, engineers, and operations are three groups in an organization that each have their own knowledge and set of shared assumptions about how to act (Schein, 1996). The nature of specialized distributed knowledge is such that individuals and groups in an organization "know different things, and know those things differently" (Dougherty, 1992, p. 187). While engineers, manufacturing, and production people all develop knowledge about products, their knowledge of products is remarkably different (Carlile, 2002). Engineers' knowledge is based on developing functionality; manufacturing's knowledge is based on assembly methods, while production's knowledge is based on operational processes and controls (Carlile, 2002).

Organizational activities are interrelated and interdependent (Duncan & Weiss, 1979). The market an organization selects will influence the products it develops and vice versa. Manufacturing must assemble products designed by engineers and engineers must design products that can be manufactured. R&D must develop research based on the needs of its business, and business must develop activities based on its research. The way organizations develop knowledge across a distributed social system is an important means by which organizations create and leverage knowledge as a resource. For example, different groups in an organization develop distinctly different knowledge about an organizations market (Dougherty, 1992). An executive has knowledge of an organization's market position based on their competition and industry, a sales person has knowledge of their customers, and a product developer has knowledge of an organization's value proposition (Dougherty, 1992). By developing insights across domains of knowledge, organizations can create new knowledge about their market (Dougherty, 1992). For example, an organization can develop new knowledge about their market position or value proposition based on actual knowledge of their customers.

Within domains of knowledge it can be easy to develop knowledge because members share common culture, language, methods and tools (Carlile, 2002). However, communicating and developing knowledge across domains of knowledge can be a significant challenge (Carlile, 2002; Kogut & Zander, 1996). Traditionally, one of the ways organizations have addressed this challenge is by developing a common syntax through which to communicate across domains of knowledge (Carlile, 2002). While syntax establishes parameters for communication, it doesn't enable knowledge to be developed across domains of knowledge (Carlile, 2002). For example, if engineers and

manufacturers only communicate based on standards of operations, it doesn't enable new knowledge to be developed based on design possibilities or manufacturing methods (Dougherty et al., 2000).

Alternatively, organizations have addressed this challenge through a semantic approach to communicating across domains of knowledge (Carlile, 2002). This approach acknowledges differences between domains of knowledge and the emphasis is on making communicating and knowledge explicit and developing "mutual understanding" across domains of knowledge according to Nonaka (as cited by Carlile, 2002, p. 444). However, this approach also has its limitations because knowledge is developed through practice, i.e. based on solving problems in a context of activity (Carlile, 2002). Making knowledge explicit does not develop new knowledge about practice (Carlile, 2002). For example, when a customer identifies a problem with a product, the organization must still develop knowledge through its practices about how to resolve the problem.

Consider what happens when a manufacturing engineer tries to make explicit the assembly issues for a new design concept – "they [the design engineers] don't realize that the OVRV, with its high part count and 3,000,000-a-year volume, is going to be a completely different beast to deal with" (Carlile, 2002, p. 443). Making knowledge explicit is not the basis for developing new knowledge. In order for an organization to develop new knowledge, engineers must develop new knowledge of how to design their concept based on the manufacturing issues, as demonstrated by the same case:

> when Mick (manufacturing engineer) presented his concerns about assembly and scrap rates, suggesting the move to subassemblies to deal with them, the design engineers had a hard time … Mick's subassembly proposal … demanded changes

> that could certainly affect the functional flows that are so critical to the OVRV's current performance. (Carlile, 2002, p. 450)

In order for organizations to develop new knowledge, a process is required based on sharing knowledge and formulating a new basis for their actions. Identifying the assembly issues and design changes "supported a process where the group could define a shared problem with the OVRV and begin transforming their knowledge (the current design) and accommodating new knowledge (four subassemblies with snap-fit holes and clips)" (Carlile, 2002, p. 451).

According to Weick, "the outcome of learning is the acquisition of a new competence: an ability to apply new knowledge to enhance the performance of an existing activity or task" (as cited by Child & Heavens, 2001, p. 307). Organizations can develop new knowledge about their activities through their social system. While previously the emphasis on leveraging knowledge as a distributed resource has often been based on sharing, transferring, or communicating knowledge, these activities don't necessarily result in developing new knowledge through the organization (Carlile, 2002). Practices are "invested in" specific ways of knowing the world. However, they can develop new knowledge based on insights from distributed domains of knowledge (Carlile, 2002). For example, engineers can design products based on established parameters and standards, however, the introduction of new manufacturing possibilities and innovations can be the basis for changing the way products are developed (Dougherty et al., 2000). Market knowledge based on users can lead to new product development methods (Dougherty et al., 2000). IT knowledge can change the way an organization operates and develops competitive advantage. Organizations develop

knowledge by sharing insights across domains of knowledge and developing new methods of acting.

According to Fleck, "collective" enterprise is not simply accumulative but is a manifestation of "social form" (as cited by Dougherty, 1992, p. 182). He cites the example of syphilis to demonstrate how social systems are the means by which knowledge is developed. According to Fleck, syphilis was misdiagnosed as a virus for 400 years, and treated independently by priests, physicians, astrologers, etc. (as cited by Dougherty, 1992). However, social pressure for a blood test changed the incorrect immunology that the disease was a virus, and consequently developments from chemistry, medicine, and laboratories contributed to uncover the actual cause (Fleck as cited by Dougherty, 1992). Through insights that emerged from different domains of knowledge, the social system collectively developed new knowledge about the disease (Fleck as cited by Dougherty, 1992). In other words, collective activity of organizations is not simply the result of the cumulative knowledge of individuals and groups, but emerges from the social system (Dougherty, 1992).

Organizations develop knowledge through practice based on specialized domains of competence (Carlile, 2002). Organizations often address the distributed nature of knowledge based on sharing, transferring, and communicating knowledge across an organization (Carlile, 2002). However, organizations can also leverage knowledge as social systems that develop new knowledge of how to practice across domains of distributed knowledge. Knowledge is distributed and can be developed across relationships between hierarchal levels of an organization (Child & Heavens, 2001; Van Cauwenberg & Cool, 1982), functional groups (Carlile, 2002; Dougherty et al., 2000),

and even customers, suppliers, partners, and competitors (Ireland & Hitt, 1999). Developing new knowledge of how to practice across different domains is the basis for leveraging the value of distributed knowledge. When one area of organization develops new ways of practicing through the insights of other domains of knowledge, it results in a new social form and new means of competing for the organization (Dougherty, 1992).

2.6 Developing Knowledge

The previous sections defined the parameters of developing knowledge in organizations – i.e. the methods of developing knowledge as the basis for an organization's hypothesis of how to compete in their context, as well as the distributed nature of developing knowledge. This section seeks to define the process of how knowledge is developed based on both theory and practice.

Previous models of how organizations create knowledge have been based on the conversion between tacit and explicit forms of knowledge (Nonaka, 1991). For example, converting tacit knowledge of how to bake bread into explicit knowledge of how to develop a bread-making machine (Nonaka, 1991). However the approach taken here is not based on the distinction between tacit and explicit knowledge. In practice, these two types of knowledge can be considered to be complementary (Tywoniak, 2007). For example, engineers solve problems based on their explicit knowledge of engineering – i.e. based on laws of physics and conventions of design, as well as their tacit knowledge of how to solve engineering problems. In the process, they may also develop both explicit and tacit forms of knowledge such as new methods of engineering and new tacit knowledge of how to solve problems. The complementary nature of knowledge can be

applied at the organizational level as well. For example, an organization might develop both tacit and explicit organizational knowledge through the process of socializing its members with lead users, acquiring a tacit understanding of a new market, and also by articulating market requirements (Dougherty et al., 2000).

The purpose of the following discussion is to establish the premise of how knowledge is developed in practice, and consequently how organizations govern their knowledge. Two distinct schools of thought in organizational learning literature, based on individual and social learning theories, are compared (Elkjaer, 2003). Using the precedent established by Elkjaer (2003), the following discussion assesses each one as a premise for determining how organizations develop knowledge.

One side of organizational learning literature proposes that individual learning is the basis for organizational learning (Shrivastava, 1983; Hedberg, 1981). Due to limitations in communication, it can be said that individual learning certainly does not always result in organizational learning and that organizations also know far less than their collective membership (Hedberg, 1981). However, evaluating the issues with individual learning theory as a premise for how organizations develop knowledge reveals the limitations of individuals (including leaders) as agents of organizational learning.

Individual learning theory proposes that individuals develop abstract mental models of the world, through internal cognitive processes and an objective separation between individual and context (Elkjaer, 2003). There are several challenges with this theory as a premise for how organizations develop knowledge. Firstly, human knowledge is experiential and not abstract (Elkjaer, 2003; Gueldenberg & Helting, 2007). While we can come to articulate some of what we know, it is still based on our experience, and not

simply based on objectifying the world separate from the experience of it (Gueldenberg & Helting, 2007). Secondly, individual perception is limited and consequently their capacity for abstraction is limited. Limitations of individual perception would prevent them from independently developing complete concepts of markets, products, operational methods, etc. Thirdly, the complexity of conditions and situations faced by organizations are a challenge for an individual with respect to developing causal reasoning and knowledge (Ireland & Hitt, 1999). For these reasons, it is proposed that individual learning is not a good premise for how organizations develop knowledge or learn.

Social learning theory provides a different premise of how organizations learn and how they develop knowledge. Social learning is based on the way an organization's members construct knowledge across social relationships and through the organization's context (Elkjaer, 2003). According to social learning theory, knowledge is developed through practice based on discovering why, how, when, where and what to do in a context of activity (Elkjaer, 2003). Social learning is a culturally mediated process, influenced by knowledge that has been embedded in an organization's shared culture (Elkjaer, 2003).

Social learning theory establishes a practical premise of how organizations develop knowledge. When organizations develop knowledge about their activities they do so through a social and cultural process. Organizations can develop knowledge through a process of social sensemaking based on "developing a common or shared understanding ... of an emerging customer need or of how a material might deliver a certain level of performance" (Dougherty et al., 2000, p. 323).

Developing knowledge is culturally mediated process because social systems use existing ways of knowing the world – such as existing techniques, concepts and sciences – as well as new information in order to interpret the context (Elkjaer, 2003). For example, organizations might define new markets based on their existing knowledge about markets, or develop a new market application for an existing technology (Dougherty et al., 2000). When an organization solves a new engineering problem, they use what they know about engineering problems, and create new knowledge based on the problem (Carlile, 2002). In the same vein, the precedents used to define a new theory culturally mediate academic papers.

Culture plays a big role in developing knowledge. Existing knowledge embedded in an organization's culture can prevent new knowledge from emerging. According to Tushman and Anderson, 'competency sets' can prevent technological change, while Desphande and Zaltman state that market knowledge can prevent new market research from emerging, and Henderson and Clark claim 'knowledge infrastructures' prevent new product knowledge from emerging (as cited by Dougherty et al., 2000). When RCA, a semiconductor firm, decided to enter the transistor technology market, they had the "marketing, technological and financial resources" (Tushman & O Reilly, 1996, p. 10) to support their decision. However, their existing culture prevented them from succeeding at the new business (Tushman & O Reilly, 1996).

According to social learning theory, organizations members determine how to be practitioners and form their identity based on the process of developing knowledge about the world (Elkjaer, 2003). Identity and knowledge are interrelated through experience (Elkjaer, 2003). Knowledge is based on our experiences of the world (Elkjaer, 2003).

According to Elkjaer (2003), " there are no universal cognitive structures of knowledge of the world" (p. 46). We develop knowledge based on our experiences (Elkjaer, 2003). For example, the law of gravity was developed in part based on the experience of a falling apple. Likewise, an organization's identity, based on its collective knowledge, is developed through the combined experiences of organization members in the specific context of the organization.

An organization's identity is not simply based on what they do (the products they sell, or the markets they compete in), but their knowledge of how to compete in their context of activity. For example, Amazon.com's identity was based on being a customer company as opposed to a product company (Fowler et al., 2000); British Airways' identity was based on being a service business instead of the transportation business (Tushman & O Reilly, 1996); a tobacco company's identity can be based on packaging and promotion (Kogut & Zander, 1996); a Detroit carmaker's identity can be based on making stylish cars and money (Senge, 1992). An organization's identity is the basis on which organizations differentiate themselves and determine how to compete in the world. Consequently, social learning occurs through a process of a social group coming to understand the world based on their experiences and is the means by which both knowledge is developed and identity formation occurs (Elkjaer, 2003).

Organizations vary in the way they form their identity and develop knowledge across social relationships and through their context. While some organizations emphasize cultural and historical knowledge, others develop knowledge through their context, utilizing the "situation of innovation" (p. 335) to discover when, where, why and how to act (Dougherty et al., 2000). Social learning theory can also be supported by

specific instances of how organizations develop knowledge. The following examples are based on the case studies by Dougherty et al. (2000), and describe different ways organizations form their identity and develop knowledge.

At a textile company, they created knowledge about how to develop a textile into a product by chemist, manufacturer, researcher and manager discovering how to practice at a customer plant. They utilized the context of innovation as an opportunity to determine how to practice, creating knowledge through the participation of several domains of expertise. The organization also used product development activities as a basis for developing organizational knowledge about quality, delivery and cost of products, in order to guide organizational actions. (Dougherty et al., 2000)

At a manufacturing company, they used the customer location as a context of innovation for creating new knowledge about their market. The organization determines how to practice by discovering insights pertaining to design assumptions, product features, and cost when their engineers visit the customer location. In this case, the organization develops market knowledge based on customer requirements for their new product and is also able to create knowledge about market analysis and product design through this process. (Dougherty et al., 2000)

Other organizations use cultural and historical knowledge as a basis for determining how to practice. When a new opportunity presents itself, they evaluate the opportunity based on what they already know and are not able to create new knowledge by discovering how to act (Dougherty et al., 2000). They develop new products based on existing operational standards and financial requirements for their business (Dougherty et

al., 2000). They are also not able to develop market knowledge as a basis for developing new knowledge about their products.

The previous examples describe different ways that companies develop knowledge through social processes based on discovering why, how, and where to act within their context. Innovative companies are able to develop insights from the context of innovation and incorporate them into their theories of action while non-innovative companies are not, using culturally and historically established forms of knowledge (Dougherty et al., 2000). As organizational conditions change, organizations must compete by developing knowledge about their context. They must discover how a technology can be developed into a successful product application, or how their markets are evolving and what new opportunities are emerging. Consequently, the process of social learning as a means of developing knowledge plays an important role in determining how an organization should compete.

Social learning theory helps us to understand how organizations develop knowledge. It establishes the relationship between the ontological and epistemological aspects of learning (Elkjaer, 2003). Knowledge cannot be separated from or distinguished from the experiences of the people that develop it (Elkjaer, 2003). Social learning theory establishes the relationship between identity and knowledge (Elkjaer, 2003), and the way that organizations differentiate themselves by developing knowledge. The following sections describe how the process of social learning is accomplished in organizations and how identity serves as a mechanism for the development of an organization's competencies.

2.7 Governance Mechanisms

The previous sections defined the parameters of developing knowledge in organizations, as well as the process through which developing knowledge occurs. Organizations are constituted by many social relationships across which knowledge is developed (Fowler et al., 2000). However, not all these relationships determine how an organization competes and generates revenue based on its knowledge. This section is meant to examine the managerial role in the development of innovative processes and knowledge that are the basis for how organizations compete and generate revenue.

In stable conditions managers developed knowledge on behalf of the organization that determined how they would compete and generate revenue (Ireland & Hitt, 1999; Krafft & Ravix, 2008). In conditions of environmental instability organizations require "innovative leadership practices" (p. 43) that enable them to determine firm direction by developing knowledge across the stakeholders of an organization (Ireland & Hitt, 1999). According to Foss, one of the shortcomings of "knowledge-based theories of firm ... [has been in the failure to define] the build-up from individual to organizational knowledge" (as cited by Tywoniak, 2007, p. 54). Effectively, one of the theoretical challenges of developing a theory of knowledge governance was to define organizational level mechanisms shaped by managers that are the basis for developing 'organizational knowledge' (Foss, 2007). The literature of organizational learning allows us to examine this question, and determine how organizations can govern the development of organizational knowledge.

Organizational learning has traditionally been the base of literature that defines the process of change (Vera & Crossan, 2003). Organizational learning and knowledge

management have generally been considered distinct areas of study (Vera & Crossan, 2003). Organizational learning has been focused on the process of change, development and evolution within organizations; knowledge management has been preoccupied with leveraging knowledge as a resource through processes of creation, retention, transfer, etc. (Vera & Crossan, 2003). Vera and Crossan (2003) proposed that organizational learning could be understood as a change in an organization's knowledge. Organizational learning occurs when organizational cognitive structures or behaviour changes (Vera and Crossan, 2003). Organizations change their cognitive structures when they change their knowledge about the world (Vera & Crossan, 2003). When organizations change their behaviour they also change their knowledge because actions are based on knowledge even if unarticulated (Vera & Crossan, 2003). In effect, organizational learning can be defined as a change in knowledge (Vera & Crossan, 2003).

Shrivastava (1983) investigated how organizations change their knowledge. According to Shrivastava (1983), organizational learning is institutionalized through mechanisms that "acquire, communicate, and interpret organizationally relevant knowledge" (p. 17) as the basis for determining organizational decisions and activities. Organizations vary in their development of mechanisms that learn and effectively develop knowledge on behalf of organizations. In his research, Shrivastava (1983) proposed a typology of learning systems based on the ways that organizations develop knowledge as a basis for their decisions and actions of: one-man institutions, mythological learning systems, information-seeking cultures, participative learning systems, formal management systems, and bureaucratic learning systems. According to Shrivastava (1983), organizational mechanisms vary in their methods of developing

knowledge and the nature of social participation. They can differ in their cultural and historical approach to developing knowledge, from very objective and formal, such as objective forecasting, analysis and control systems, to very subjective and informal, such as TMT committees, information networks, and decision approval processes (Shrivastava, 1983). These systems also vary in the ability to learn (Shrivastava, 1983). For example, bureaucratic systems could only learn incrementally, and actions were therefore very limited - whereas, participatory systems enabled organizations to innovate (Shrivastava, 1983).

Consequently, it is proposed that organizations govern their knowledge through organizational level mechanisms that develop and institutionalize knowledge into their decisions and actions. These governance mechanisms are the basis for the development of organizational knowledge that determines how organizations compete and generate revenue from their knowledge. The managerial role in the development of organizational level mechanisms is that organizations develop (and institutionalize) knowledge based on emerging conditions in their actions and decisions, in order to accomplish innovation and change. The following examples from the case studies by Dougherty et al. (2000) depict how developing knowledge based on emerging conditions determines an organization's capacity for innovation and change (Dougherty et al., 2000).

At an office and electronic equipment company, product development activities were based on delivery dates and designing solutions to a unique sets of product requirements. This approach required major redesign every time conditions changed, such as customers requiring new features or a new product being developed. The organization improved the effectiveness of its product development activities by

developing knowledge based on product interfaces, families, and technologies from what it was learning about its customers, requirements and technologies. (Dougherty et al., 2000)

At a textile company, the organization paid attention to industry evolution, future market needs, competitors, and technological change as a basis for determining its activities. While the organization recognized the unknowns and uncertainty of the future, they developed knowledge in a very practical way based on understanding whether customers would still need their product in the future, and how machines and technology were changing for both their organization as well as their customers. (Dougherty et al., 2000)

On the other hand, organizations that did not develop knowledge based on emerging conditions, and left the development of knowledge to individuals and groups, struggled to accomplish innovation and change. While these organizations developed strategic priorities and objectives, they were not accomplished because individual and group activities were based on responding to immediate requirements. They lacked information to accomplish organizational objectives. Organizations that based their actions on existing ways of doing things were not able to develop new opportunities. (Dougherty et al., 2000)

While individuals and groups have the capacity to create knowledge on behalf of the organization, it is organizational level mechanisms that develop knowledge based on emerging conditions that determine an organization's capacity for innovation and change (Dougherty et al., 2000). For example, an organization might develop knowledge based on an emerging technological innovation, based on potential strategic opportunities,

market applications, or technological alternatives (Dougherty et al., 2000). Also, new insights from organizational activities can be the basis for improving existing practices (Dougherty et al., 2000). Whether driven by external changes or internal opportunities, organizations can accomplish innovation and change by developing mechanisms that develop and institutionalize knowledge in their actions and decisions.

Traditionally, organizations have leveraged knowledge through experts and domains of specialized competence (Kogut & Zander, 1996). Leadership would set the strategic direction and leave it up to functional groups and experts to develop the knowledge to implement it (Miles et al., 1997). This was an effective method of leveraging knowledge in conditions that were known, stable and predictable (Ireland & Hitt, 1999). Organizations could develop knowledge based on solving "well-defined problems" (Nonaka, 1994). However, in today's competitive conditions this is not sufficient to accomplish innovation and change. Even when they possess the knowledge and resources, or leaders select a strategic direction, they require mechanisms that enable them to innovate and change.

When GTE, a multi-billion-dollar telecom, electronics and semi-conductor company, wanted to participate in the emerging information technology industry, they failed. Even though they determined which technologies to pursue they neglected to learn and develop the knowledge required to support their decision (Prahalad & Hamel, 1990). When RCA, a semiconductor firm, decided to enter the transistor technology market, they had the "marketing, technological and financial resources" (p. 10) to support their decision (Tushman & O Reilly, 1996). However, their existing culture and knowledge prevented them from changing (Tushman & O Reilly, 1996). When OPCO decided to

develop a software system that processed credit card transaction over their data networks, they failed because they did not develop the market and technology knowledge that were required (Dougherty et al., 2000). The ability to develop innovative new ideas or knowledge does not result in the ability to realize their value in the marketplace if it isn't institutionalized in an organization's decisions and actions (Tushman & O Reilly, 1996). In the watch industry, Swiss watchmakers had invented quartz technology before the Japanese, however, Seiko were the ones to bring the technology marketplace (Tushman & O Reilly, 1996).

While some organizations have organizational level mechanisms that develop knowledge based on emerging conditions, others leave development of knowledge to individuals and groups and consequently limit their capacity for innovation and change (Dougherty et al., 2000). The ability of an organization to develop knowledge based on emerging conditions determines their ability to innovate and change (Dougherty et al., 2000). The knowledge an organization develops about its activities – i.e. its customers, products, technologies, etc. determines their ability to compete and perform (Zack, 1999). Consequently, organizational level mechanisms that develop knowledge are the basis for how organizations compete and perform. Knowledge governance is accomplished through the managerial role in participating in and developing mechanisms that develop and institutionalize knowledge based on emerging conditions in order to accomplish innovation and change.

2.8 Organizational Identity

This section discusses how identity governs an organization's knowledge based on theory and practice. As defined in the preceding sections, identity is determined by an organization's collective knowledge about how to practice (Elkjaer, 2003). According to Kogut and Zander (1996), firms are communities that create and transfer knowledge based on their identities. Identity serves as a governance mechanism both influencing and directing the integrated knowledge of individuals and groups and consequently determines the development of an organization's competencies. According to the authors, identity consequently establishes the value of the firm versus the market, based on their ability to develop knowledge (Kogut & Zander, 1996).

The concept of identity as governance mechanism has been previously disputed in the literature. According to Grandori (2001), identity doesn't unequivocally establish an organization's ability to develop and leverage knowledge. Furthermore, the concept of identity as the premise for a knowledge-developing community is undermined by an organization's ability to transfer and develop knowledge across external relationships with more facility than internal relationships (Grandori, 2001). While the intention of the argument is well founded, it assumes that organizations have equal identities and that organizational identities are internally determined. However, considering that an organization's identity is determined by their collective knowledge, organizations can significantly vary in their ability to develop knowledge based on the nature of their identities. Some organizations may develop collective knowledge to support their activities whereas others may lack collective knowledge about their practices (Dougherty et al., 2000). Organizations can also differentiate themselves and determine their ability

to compete based on their identities. As well, organizational identities can be equally defined by an organization's external relationships as well as through internal ones. The following discussion is based on how identity determined by an organization's collective knowledge does act as governance mechanism to the development of an organization's competencies.

According to Kogut and Zander (1996), an organization's identity determines how individuals across distributed domains of knowledge use and develop knowledge on behalf of that organization. Identity provides the "higher order principles ... [and] organizing knowledge" (p. 503) that structures communication, coordination, and learning across distributed bases of knowledge (Kogut & Zander, 1996). While identity is developed through organizational level mechanisms for developing and institutionalizing knowledge, competencies are based on the combined knowledge and skills of an organization. Knowledge workers are the means of production for organizations (Drucker, 1999), enabling them to perform useful actions such as develop new technologies, deliver superior customer service, or create exceptional marketing campaigns (Fowler et al., 2000). The way knowledge workers in an organization practice or use their knowledge is determined by the collective knowledge of the organization – it is determined by identity (Kogut & Zander, 1996). Whether an organization's members create new solutions or simply fulfill operational requirements of the organization is determined by the organization's identity. For example, the members of Amazon.com develop knowledge about how to create a superior customer service, while the members of Walmart develop knowledge based on how to reduce costs and improve operational efficiency.

According to Kusunoki et al. (1998), competencies are composed of "multilayered knowledge" (p. 699). They consist of knowledge developed locally by individuals and groups in specific practices, the connected knowledge development activities of an organization, and the processes of developing knowledge between individuals and groups in an organization (Kusunoki et al., 1998). It is proposed that these dimensions consist of the microfoundations of an organization's competencies that are determined by the organization's identity. Based on the premise that identity structures communication, coordination, and learning across distributed bases of knowledge, the following examples describe how identity governs the microfoundations of an organization's competencies.

The case study examples by Dougherty et al. (2000) illustrate the way that an organization's identity – i.e. their collective knowledge – determines how individuals and groups in the organization develop knowledge.

In the example of the textile company that invented a new product concept through collaboration between different domains of knowledge (Dougherty et al., 2000), the product concept established the collective knowledge of the organization that determined how other functions developed knowledge. The product concept essentially determined the competencies developed by manufacturing and other production plants as they developed knowledge about how to manufacture and produce the new product.

When an office equipment company developed collective knowledge about their market, it determined how the organization's engineers developed products for that market (Dougherty et al., 2000). When they also developed collective knowledge about their product evolution and technology, it also determined the way engineers in that

organization developed products (Dougherty et al., 2000). Both of these types of collective knowledge determine the product development competencies of the organization.

On the other hand, the collective knowledge of a consumer durables company based on the operational standards of manufacturing also determines how engineers develop products (Dougherty et al., 2000). The operational standards of manufacturing limit the innovation possible by engineering and also determine the competencies developed by the organization (Dougherty et al., 2000).

Identity also enables organizations to leverage the combined knowledge and skills of its members by serving as a coordination mechanism (Kogut & Zander, 1996). In the previous examples, identity determined the knowledge developed by individuals and groups, but also enabled them to work together based on their shared expectations (Kogut & Zander, 1996). Manufacturing and production functions of the textile company both developed knowledge based on the shared expectations established by the product concept. Similarly, the operational standards of the consumer durables company provide the shared expectations that coordinate the activities of engineering and manufacturing functions.

Finally, identity enables organizations to develop knowledge across domains of knowledge through dialogue (Kogut & Zander, 1996). For example, an organization that designs and manufactures valves, developed collective knowledge in the form of functionality requirements for a new product through a collaboration between executives, marketing and sales, and customers (Carlile, 2002). Based on the requirements for the new product, different groups in the organization developed knowledge through their

own practices (Carlile, 2002). Designers developed knowledge based on functionality, manufacturers developed knowledge based on assembly, and production developed knowledge based on production process (Carlile, 2002). However, they can also develop knowledge through dialogue between functions based on how the organization can accomplish the functionality requirements of the new product. Manufacturing and engineering can discuss how design of functionality impacts the production process or how the assembly requirements might impact functionality (Carlile, 2002). For example, "how the current design makes 'scrap rates' high ... or how going to subassemblies might undermine the OVRV's current functional capability" (Carlile, 2002, p. 450). Consequently, identity determines how organizations develop knowledge through dialogue.

Not only does identity, in the form of an organization's collective knowledge, direct the knowledge developed by individuals and groups in the organization, it is also normative (Kogut & Zander, 1996). Identity influences the way individuals and groups develop knowledge through values and by establishing rules of exclusion (Kogut & Zander, 1996). Organizations may focus on or emphasize developing certain types of knowledge and not others. An organization may emphasize the knowledge of specific functions or based on specific performance criteria. For example, General Radio had an engineering dominant culture for many years, emphasizing the knowledge of that function as opposed to others (Tushman & O Reilly, 1996). A product-driven organization may have trouble getting their "arms around ... [their] thousands of customers" (Dougherty et al., 2000, p. 334). The identity of a product-driven organization may not be based on market knowledge required to understand customers. One manager

aptly describes how the identity of the organization influences the knowledge they develop, "We are a manufacturing company, we really are, and our focus is on what assets do we need to do business. That shades our thinking." (Dougherty et al., 2000, p. 332).

Organizational identity can also influence the knowledge developed by an organization by ruling "out potentially interesting avenues for innovation and creativity" (Kogut & Zander, 1996, p. 502). An organization whose collective knowledge is based on operational standards rules out innovation. An engineer describes, "manufacturing still dominates. There are frustrations and constraints the technology people feel, because we can change (products) to meet performance needs and features, but we are constrained by manufacturing" (Dougherty et al., 2000, p. 333). Identity can also limit the exploration of new opportunities as it does in this organization: "A bureaucratic mindset predominated. ... Strategic planning, a highly formal and ritualized process, was more of an exercise designed to perpetuate the existing status quo, rather than a platform to challenge strategic assumptions and rethink business methodology" (Lei et al., 1999, p. 25).

Organizations that develop and institutionalize knowledge based on emerging conditions will be able to develop the competencies required as conditions change. For example, when NCE, a technology and computer firm, anticipated the convergence of the computing, communication, and semi-conductors industries, they created collective knowledge about the emerging conditions (Prahalad & Hamel, 1990). They developed knowledge about the "technological and market evolution" of this convergence through a committee of managers responsible for the firm's new direction, and through strategic alliances with external partners that had competencies in the technologies they were

interested in developing (Prahalad & Hamel, 1990). Consequently, the development of collective knowledge through their social system was the basis for the organization's ability to develop the competencies required to compete in the emerging parameters of the marketplace (Prahalad & Hamel, 1990).

Organizations can develop collective knowledge based on different domains of knowledge such as manufacturing, marketing or engineering, as in the examples described throughout this thesis. However, an organization's collective knowledge directs and influences how individuals and groups across different domains develop knowledge in their own practices on behalf of the organization. Consequently, it is proposed that the process through which organizations develop their identity, or in other words, their collective knowledge of how to practice, is the process through which they govern their competencies. An organization's identity is based on theories of action, developed across distributed bases of knowledge, through a process of social learning, and institutionalized in the decisions and actions of an organization as described in the preceding sections. This process constitutes the organizational level mechanism that determines how organizations compete by developing competencies. An organization's ability to develop innovative or distinctive competencies that are the basis for achieving competitive advantage is determined by the organizational level mechanism for developing and institutionalizing knowledge.

3 Research Model

Based on the premise proposed in the literature review, this chapter defines a research model in order to assess how knowledge governance varies in relation to the conditions of the context, strategic activities, social context of the organization, and outcomes.

3.1 Knowledge Governance

Assessing knowledge governance required the development of a conceptual model based on the theoretical premises devised from the literature (Webster & Watson, 2002). ***Knowledge governance (KG)*** *is the organizational process of developing knowledge across relationships as the basis for formulating their actions and decisions. Knowledge governance is the mechanism through which organizations determine how to compete, accomplish change, and govern their competencies.*

Conceptualizing how organizations govern their knowledge can be based on the methods they use to develop knowledge as the basis for their theories of action, as well as the distributed bases of knowledge across which organizations develop knowledge and determine how to practice.

3.2 Knowledge Governance Methods

Knowledge governance is the method by which organizations accomplish change. The typology of strategic change developed by Rajagopalan and Spreitzer (1997) was selected as an appropriate model for defining how organizations govern their knowledge.

Their typology provides an appropriate model for knowledge governance for several reasons. It reflects practical dimensions of how organizations develop knowledge as the basis for determining their theories of action in real organizational settings, based on the case study research in Dougherty et al. (2000). The typology is also based on a "comprehensive review of the strategic change literature" (p. 48) and consequently is based on a complete classification of different methods by which organizations formulate change (Rajagopalan & Spreitzer, 1997). The typology is also based on an established model of strategic management that describes methods by which organizations develop their strategic actions (Chaffee, 1985). Rajagopalan and Spreitzer's (1997) typology (rational, learning and cognitive KG) is defined in the following three subsections.

3.2.1 Rational Knowledge Governance

In the rational perspective of strategic change, change is based on a "sequential, planned search for optimal solutions for well-defined problems based on previously defined firm objectives" (Rajagopalan & Spreitzer, 1997, p. 50). In this method of strategic change, the environment can be objectively defined, and choices are rational and based on economic performance (Rajagopalan & Spreitzer, 1997).

In the rational method of knowledge governance, the basis for action is objectively determined through well-established knowledge such as standards of operations, financial performance, industry structure, diagnostic controls, and statistical models, as described in the following example:

> We looked at zones, and the (particular) shipping market, and the customer willingness to trade up, and at who used this service now. I do the market

> research, price willingness, market need, and I do a costing model to see if it is feasible. We have cross-functional people and we give them the specs and say build me a costing model. We look at fixed costs, use of equipment, freight, fuel, people, and labor usage. So the strategic cost people do the cost and benefits, the IS people make sure the system is in place for billing and customer support, engineering develops an operations plan. (Dougherty et al., 2000, p. 337)

3.2.2 Learning Knowledge Governance

In the learning perspective of strategic change, change is based on the accumulation of experience in a context of activity (Rajagopalan & Spreitzer, 1997). In this method of strategic change, the context is considered to be uncertain and dynamic and as a consequence, organizations must develop knowledge through experience, and by taking actions that enable them to gain experience (Rajagopalan & Spreitzer, 1997).

In the learning method of knowledge governance, the basis for action is the actual knowledge and experience of organizational members, as described in the following example:

> We are building a platform. This approach is more complicated, but the payback is better. We won't have to redesign the feeder, and the whole technology is the driver. We are trying to get all the interfaces defined, literally, and all decisions for development made on the same schedule so it can all come together. We are trying to make it all happen together. This requires different thinking than the old way. Now, there is a concerted effort to think things through — who are the

> customers, and what are the requirements, and what do we need to do with the technology. (Dougherty et al., 2000, p. 339)

3.2.3 Cognitive Knowledge Governance

In the cognitive perspective of strategic change, change occurs through the development of cognition of organizational members (Rajagopalan & Spreitzer, 1997). This method of strategic change occurs through a process of organizational members making sense of and developing new interpretations of information and an organization's conditions (Rajagopalan & Spreitzer, 1997).

In the cognitive method of knowledge governance, the basis for action is creating new interpretations by making sense of emerging events and information, connecting ideas and exploring circumstances (Dougherty et al., 2000), as described in the following example:

> My macro view does include uses but also the competition. We include competitor issues and manufacturing issues and you must include an understanding of the direction of the marketplace. There are whole industries that didn't exist 10 years ago, like the ABC industry. That is a big area. We sell fabric to the guy who put rubber on it who then sells it to the ABC maker. A belt going around like that has tremendous electrostatic, so we need to make yarn that dissipates the static, so we put metal in it. The question is what kind of fabric will the ABC makers need ... or will they displace us and engineer our fabric out of their product? We can't be clear cut on the future, but in some parts of the organization they can be more clear cut. ... Most of the long range thinking is in

> manufacturing capability, what will it be? We are selling a product component to a manufacturing company, and there are multiple layers of the technology, the kinds of machines we use and the kinds of machines the customers use. (Dougherty et al., 2000, p. 340)

3.3 Knowledge Governance Structures

Knowledge governance is the process through which organizations develop knowledge and determine how to practice across distributed bases of knowledge. To define how organizations determine how to practice across distributed bases of knowledge, the relationship structures that compose the social systems of organizational learning as described by Child and Heavens (2001) were used. These relationship structures were selected because they define the essential elements of an organization's social system through which they develop knowledge, as discussed in the literature review. What follows are the definitions of the three relationship structures of Child and Heavens (2001).

3.3.1 Vertical Knowledge Governance

Developing knowledge across vertical relationships occurs between top executives or those who are responsible for an organization's direction, business leaders or those who are responsible for specialized and functional knowledge of an organization, and those directly involved in operational activities of an organization (Child & Heavens, 2001; Van Cauwenberg & Cool, 1982). The way organizations develop knowledge across vertical relationships determines their ability to develop new firm directions based on

distributed knowledge, specifically by leveraging the value of specialized knowledge such as the contribution of a function to an organizations actions (i.e. IT), and the value of knowledge based on and created in organizational context (Child & Heavens, 2001; Van Cauwenberg & Cool, 1982).

Vertical knowledge governance is the process of developing knowledge about how to practice across levels of an organization's hierarchy such as top executives, business unit leaders, and business unit lines.

3.3.2 Horizontal Knowledge Governance

Developing knowledge across internal relationships is also an important opportunity to innovate through integrating functional and specialized knowledge of an organization (Child & Heavens, 2001). Organizations can leverage the natural relationships between areas of activity, such as marketing, product development, and manufacturing in order to change the way an organization knows. One of the most prevalent and significant areas where that occurs is in the relationship between market and technology knowledge (Dougherty et al., 2000). According to Dougherty et al. (2000), "research shows the more deeply people merge deep knowledge of technological possibilities with detailed knowledge of application contexts – linking knowledge of customer needs, market opportunities, market opportunities, technologies, and operational constraints – the more successfully they develop new products" (p. 321).

Horizontal knowledge governance is the process of developing knowledge about how to practice across relationships with other (internal) units of the organization.

3.3.3 External Knowledge Governance

Learning across external relationships is an important opportunity for an organization to develop knowledge about the context on which it acts (Child & Heavens, 2001). Organizations can develop knowledge about its market, industry, and social contexts through relationships with customers, suppliers, competitors, and partners (Child & Heavens, 2001; Ireland & Hitt, 1999). Furthermore, external knowledge governance is an opportunity to develop knowledge by leveraging external relationships and consequently decreases the requirements on developing knowledge internally. For example, NCE developed alliances with firms that had technological competencies in order to develop the knowledge required to compete in the communications and computing industry (Prahalad & Hamel, 1990).

External knowledge governance is the process of developing knowledge about how to practice across external relationships with customers, suppliers, competitors, and partners.

3.4 Research Model

Based on the premise established in the literature review, propositions to assess knowledge governance in relationship to context, activities, organization, and outcomes will be developed in this section.

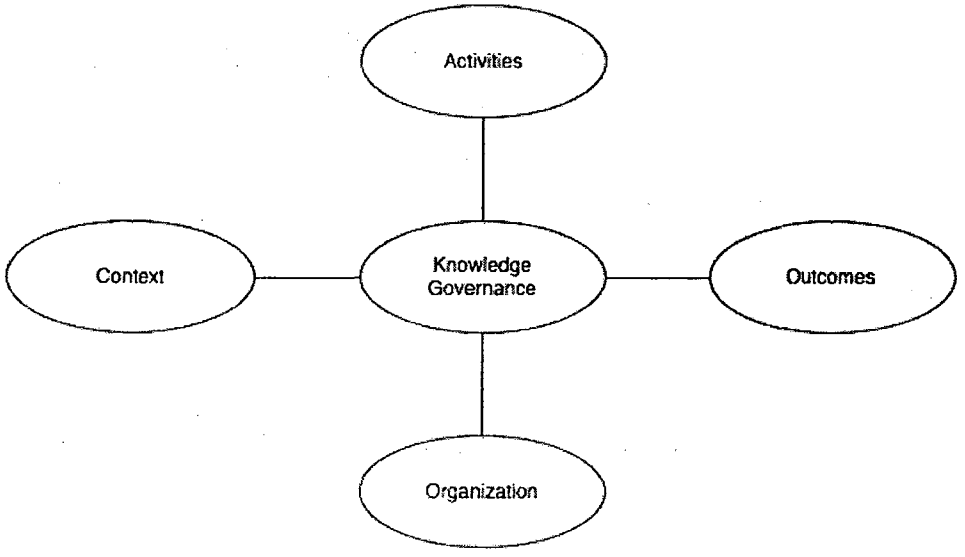

Figure 1 – Assessment of Knowledge Governance Research Model

An organization's *context* is based on the environmental conditions in which an organization competes (Hedberg, 1981). The parameters of an organization's context can include their market conditions, technologies, regulatory requirements etc (Bogner & Barr, 2000; Folwer et al., 2000). Organizations develop knowledge based on how to compete in their context – i.e. theories of action (Hedberg, 1981). As conditions change, knowledge becomes obsolete (Hedberg, 1981), and organizations have to develop new knowledge in order to determine how to compete (Ireland and Hitt, 1999). Different conditions require that organizations utilize different methods of developing knowledge –

in stable conditions organizations can use established knowledge whereas in emerging conditions organizations may have to create new knowledge (Govindarajan & Trimble, 2004).

An organization's *activities* consist of what an organization actually does to compete in their environment. Organizational strategies are based on a range of activities that enable them to compete, including product development, marketing, administration, operations, etc. An organization's activities can vary based on what they do that is unique, where they act, how they act, and what the process of acting entails (Hambrick & Fredrickson, 2001). In different conditions organizations develop different activities, or different ways of competing – for example, in conditions of technological change, organizations may develop activities based on product innovation, whereas in mature industries organizations may develop activities based on operational efficiency (Lei & Slocum, 2005).

Organizations determine how they will compete and the way they will develop knowledge. According to Kogut and Zander (1996) an organization's identity is not determined by their technology or industry but by the social context of the organization. Consequently, organizations can vary based on their priorities related to developing knowledge. Some organizations may prioritize innovation, whereas others may prioritize operational efficiency.

Organizations develop knowledge of how to act, based on accomplishing specific *outcomes* (Govindarajan & Trimble, 2004). An organization's outcomes can be financial as well as based on accomplishing objectives such as strategic innovation or operational efficiency (Govindarajan & Trimble, 2004).

The following discussion is based on the development of the proposed research model (see Figure 1), and how each of the aforementioned dimensions are related to knowledge governance.

3.5 Context

Organizations develop knowledge based on the conditions of their context (Dougherty et al., 2000; Elkjaer, 2003; Hedberg, 1981). This section examines how environmental conditions influence the way organizations govern their knowledge. Knowledge governance will vary based on the emerging conditions of an organizations context. Specifically, it is proposed that the extent of hypercompetitive change as well as the types of discontinuous change can both influence the way an organization governs its knowledge.

Proposition 1:

Knowledge governance will vary based on the conditions of an organization's context.

3.5.1 Hypercompetitive Conditions

Hypercompetitive conditions caused by rapidly occurring discontinuous change such as major technological shifts, government regulatory, or aggressive new rivals can impact the way an organization develops knowledge about its context. Hypercompetitive conditions are such that existing knowledge and experience are no longer valid methods of determining how to act and organizations have to create knowledge based on emerging conditions (Bogner & Barr, 2000).

Proposition 2:

Creative methods of knowledge governance will be positively associated with greater hypercompetitive change.

3.5.2 Industry Ecosystems

Strategic discontinuities are departures from stable conditions and known strategic parameters – in which organizations compete by innovating and developing new knowledge (Fowler, King, Marsh, & Victor, 2000; Nonaka, 1991). Two types of discontinuous change that are common to different industries are based on industry evolution and technological change (Lei & Slocum, 2005; Tushman & O Reilly, 1996). It is proposed that these two types of discontinuous change will influence how organizations govern their knowledge.

Industry evolution occurs through three different phases of organizational growth based on innovation, differentiation, and cost efficiency (Tushman & O Reilly, 1996). The authors cite Apple as an example of an organization that entered the marketplace based on the premise of product innovation, evolved to compete in a broader market based on product differentiation and through the development of administrative infrastructure, and finally learned to compete based on cost, quality and efficiency as competitors flooded the marketplace (Tushman & O Reilly, 1996).

Technological change, on the other hand, evolves through a process of new technologies being introduced, developed, and established in the marketplace. When technological change occurs, competing technologies rally for market position, as was the case between BETA and VHS technologies. Once a technology becomes the standard,

competition shifts to price and functionality. The cycle repeats every time a new technology is introduced.

These types of discontinuous change require that organizations adapt by developing different methods of competing based on different competencies (Lei & Slocum, 2005; Tushman & O Reilly, 1996).

Lei and Slocum (2005) propose a quadrant of industry environments based on growth and mature stages of the industry life cycle, and low and high rates of technological change (see Figure 2). As industry conditions change, organizations "must be able to learn, develop, and adjust their core competencies" (p. 35) in response to the conditions of their industry (Lei & Slocum, 2005).

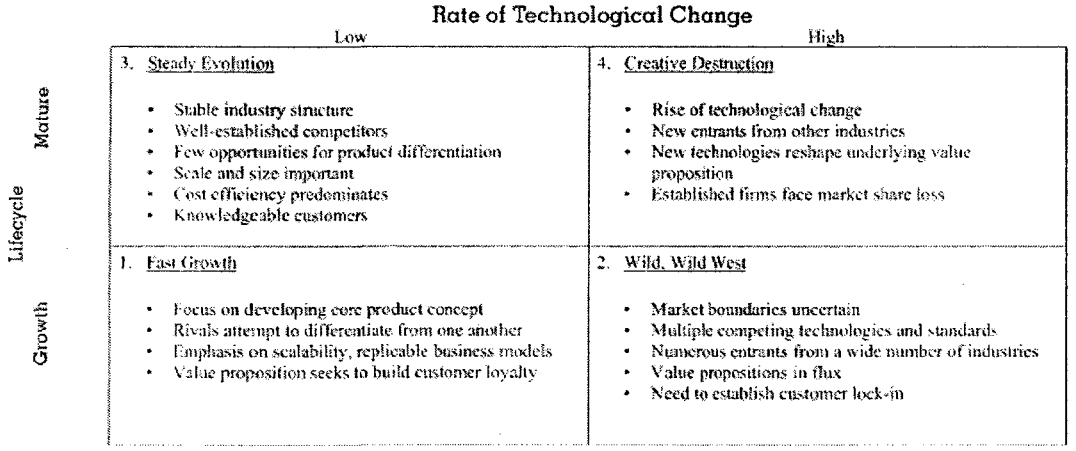

Figure 2 – Industry Ecosystems. From Lei & Slocum (2005, p. 33).

According to Lei and Slocum (2005), organizations in each section of the quadrant compete based on different strategic and organizational requirements.

Strategic requirements consist of the activities organizations develop to compete in a particular industry environment. Organizational requirements are based on the way organizations learn and develop their competencies in order to accomplish the strategic

requirements of their industry environment. Lei and Slocum (2005) propose strategic archetypes of organizations in each type of industry environment based on their particular organizational requirements, and strategic requirements (see Figure 3). Based on the definitions of strategic archetypes proposed by Lei and Slocum (2005), propositions of how organizations govern their knowledge in relation to industry environments and strategic requirements are developed and presented here.

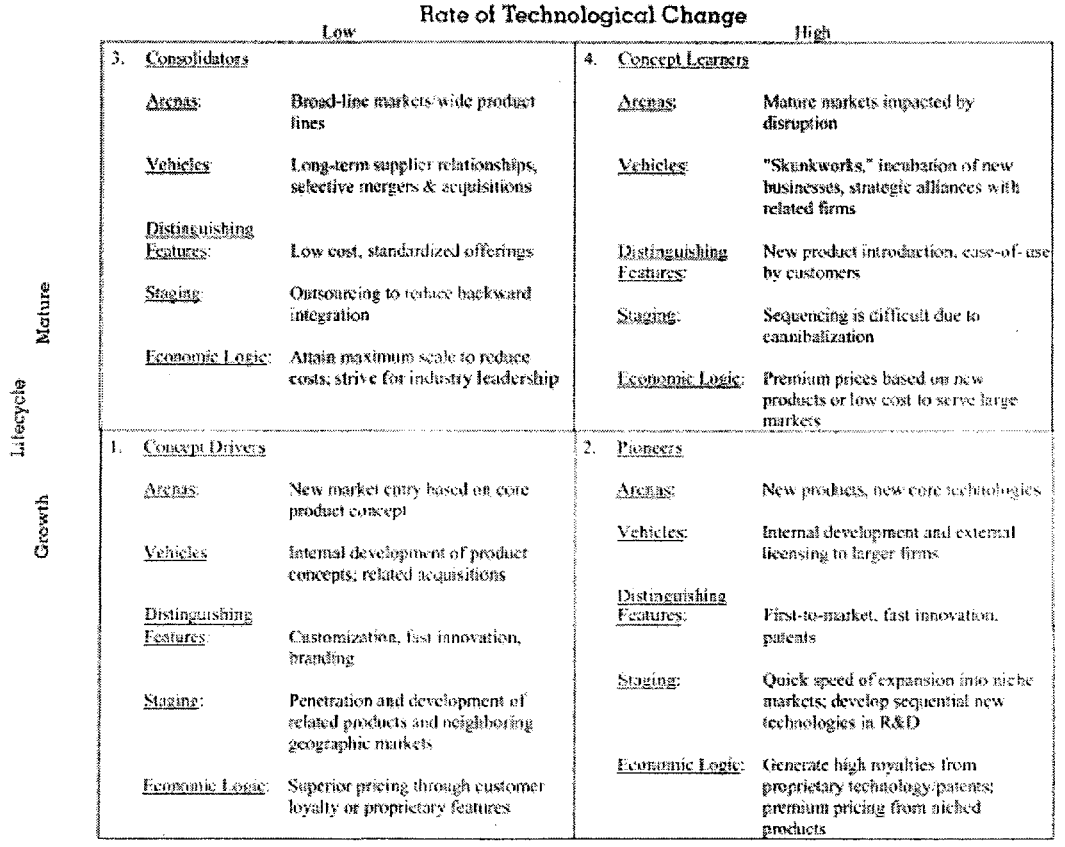

Figure 3 – Archetypes and Strategies. From Lei & Slocum (2005, p. 36).

3.5.2.1 Concept Drivers

Concept drivers are archetypes of organizations competing in fast growth conditions – in other words, in the growth phase of the industry life cycle and a low rate

of technological change (Lei & Slocum, 2005). They compete by developing a well-differentiated and well-branded product concept that can be sold across multiple markets (Lei & Slocum, 2005). Their activities are based on highly developed market research and R&D and centralized operations such as HR, merchandising, accounting, and logistics (Lei & Slocum, 2005). They focus on developing proprietary technologies that enable them to achieve customer loyalty (Lei & Slocum, 2005). They evolve by developing products and markets related to their core product concept, through a process of innovation, experimentation and even acquisition (Lei & Slocum).

Concept drivers develop their competencies through a process of "fast innovation, creativity, and flexibility … [with significant emphasis on] fast communication and information flow across functions" (Lei & Slocum, 2005, p. 37). 'Internal development' is important to concept drivers in order to expand on their core product knowledge, as well as to leverage the "experience and tacit knowledge" (p. 37) of its members (Lei & Slocum, 2005).

It is proposed that concept drivers will:

(a) develop knowledge based on learned methods of knowledge governance – based on the knowledge and experience of its members;

(b) develop knowledge through a process of internal development – i.e. not based on external relationships;

(c) develop knowledge across horizontal relationships – i.e. across functions;

(d) develop knowledge based on objective methods of knowledge governance – i.e. based on a process of fast communication and information flow, using established syntax and methods of communicating across distributed domains of knowledge;

(e) develop knowledge based on a technologically stable context and therefore not based on creating new interpretations of an organization's context - i.e. not based on creative methods of knowledge governance.

3.5.2.2 Pioneers

Pioneers are archetypes of organizations competing in wild wild west conditions – or in other words in the growth phase of the industry life cycle as well as a fast rate of technological change (Lei & Slocum, 2005). Pioneers compete in uncertain and changing competitive and market conditions by developing innovative new products and technologies that cater to niche markets (Lei & Slocum, 2005). Their activities are based on R&D and the development of "deep" technological knowledge, "breakthrough" ideas, and "proprietary features" (Lei & Slocum, 2005, p. 37). Pioneers evolve by developing sequential new technologies and entering new niche markets (Lei & Slocum, 2005). They lack mass market supporting competencies such as marketing, manufacturing and distribution and máy develop partnerships or licensing agreements to bring their products to market (Lei & Slocum, 2005). Pioneers may be acquisition targets (Lei & Slocum, 2005).

Pioneers develop their competencies through a process of "fast learning, experimentation", and "internal debate" (Lei & Slocum, 2005, p. 38). The contexts of their organizations are 'organic', risk-taking and often lack administrative infrastructure (Lei & Slocum, 2005).

It is proposed that pioneers will:

(a) develop knowledge based on creative methods of knowledge governance – i.e. based on creating product and technological innovations;

(b) develop knowledge through unstructured and organic processes – i.e. not based on vertical, and horizontal relationships;

(c) develop knowledge based on developing product and technological breakthroughs and not on established knowledge or knowledge and experience of stakeholders – i.e. not based on objective and learned methods of knowledge governance;

(d) develop knowledge based on insular or internally driven methods of developing knowledge such as internal debate and experimentation - i.e. not through external relationships.

3.5.2.3 Consolidators

Consolidators are archetypes of organizations competing in steady evolution conditions, or in other words in the mature phase of their industry life cycle as well as a low rate of technological change (Lei & Slocum, 2005). They compete through cost leadership, standardized products and providing a wide product range to a broad market (Lei & Slocum, 2005). Their activities are based on developing cost and process efficiency, leveraging return on fixed costs, and minimizing capital expenditures (Lei & Slocum, 2005). They accomplish economies of scale and size through the development of long-term supplier relationships, outsourcing and the acquisition of other companies (Lei & Slocum, 2005). They support their activities with well-managed "marketing campaigns, distribution networks, and customer service" (Lei & Slocum, 2005, p. 38).

Consolidators develop their competencies through an organizational culture focused on operational efficiency and organizational objectives, as well as through the management of external relationships (Lei & Slocum, 2005). Their organizational contexts are typically "risk averse", "bureaucratic" and non-innovative – i.e. based on

reporting relationships results in slow "cautious" and "inflexible" decision-making (Lei & Slocum, 2005, p. 41).

It is proposed that consolidators will:

(a) develop knowledge through vertical methods of knowledge governance – i.e. based on bureaucratic processes emphasizing inflexible decision-making and actions determined across hierarchal relationships;

(b) develop knowledge based on objective methods of knowledge governance – such as operational standards and organizational objectives;

(c) develop knowledge based on non-innovative processes that don't incorporate insights from an organization's context or across functions – i.e. not through operational stakeholders or horizontal relationships;

(d) develop knowledge based on managing external stakeholders to meet their operational standards and requirements – i.e. not across external relationships.

3.5.2.4 Concept Learners

Concept learners are archetypes of organizations competing in creative destruction conditions, or in other words in the mature phase of the industry life cycle as well as a fast rate of technological change (Lei & Slocum, 2005). Concept learners compete by developing "new value propositions" (p. 39) for existing and established markets (Lei & Slocum, 2005). Concept learners' activities are focused on renewal of their core product concept based on learning new technologies or ways of serving customers (Lei & Slocum, 2005). They may evolve through exploring and experimenting with different new technologies in order to meet the needs of their market, and seeking learning alliances in order to reduce risk and gain industry insight (Lei & Slocum, 2005).

Their challenge is to balance and negotiate the decline of existing businesses with the emergence of new ones (Lei & Slocum, 2005).

Concept learners' organizational requirements are based on adapting to change by developing new knowledge and competencies and unlearning old ones (Lei & Slocum, 2005). Concept learners develop new competencies through a process of exploring new opportunities, "risk taking and knowledge sharing" (Lei & Slocum, 2005, p. 39). However, their organizational contexts require the ability to manage activities in both mature markets and emerging ones (Lei & Slocum, 2005).

It is proposed that concept learners will:

(a) develop knowledge based on creative methods of knowledge governance – i.e. based on developing technological innovation for mature markets or creating new knowledge about technologies and new interpretations of markets;

(b) develop knowledge through operational stakeholders – based on exploring and experimenting new technologies or ways of serving customers through an organizations context;

(c) develop knowledge based on objective and learned methods of knowledge governance – based on established knowledge from mature industry;

(d) develop knowledge based on learned and creative methods of external knowledge governance – i.e. based on developing competencies and innovations in collaboration with external stakeholder such as partners, suppliers, etc.

It is proposed that organizations will govern knowledge in a manner that is consistent with the organizational requirements of firms competing in their industry environment. Specifically, it is proposed that:

Proposition 3:

Organizations facing growth stage of industry life cycle and a low rate of technological change will govern their knowledge in the manner of concept drivers.

Proposition 4:

Organizations facing growth stage of industry life cycle and a high rate of technological change will govern their knowledge in the manner of pioneers.

Proposition 5:

Organizations facing mature stage of industry life cycle and a low rate of technological change will govern their knowledge in the manner of consolidators.

Proposition 6:

Organizations facing mature stage of industry life cycle and a high rate of technological change will govern their knowledge in the manner of concept learners.

3.6 Activities

Organizational requirements are the basis for accomplishing the activities as defined by the strategic requirements of each archetype (Lei & Slocum, 2005). Organizational requirements describe the way that organizations learn and develop competencies and consequently govern their knowledge in different industry environments. Accordingly, it is proposed that methods of knowledge governance associated with each strategic archetype as proposed above, will be associated with the strategic requirements of that archetype.

Proposition 7:

Methods of knowledge governance associated with concept drivers will be positively associated with the strategic requirements of concept drivers.

Proposition 8:

Methods of knowledge governance associated with pioneers will be positively associated with the strategic requirements of pioneers.

Proposition 9:

Methods of knowledge governance associated with consolidators will be positively associated with the strategic requirements of consolidators.

Proposition 10:

Methods of knowledge governance associated with concept learners will be positively associated with the strategic requirements of concept learners.

3.7 Organization

The way organizations govern their knowledge is based on organizational level mechanisms shaped by management. Organizational learning and the development of competencies are priorities that are related to the way organizations leverage their knowledge. Organizations learn or develop competencies based on the knowledge and experience of stakeholders and by their participation in creating new knowledge (Dougherty et al., 2000) On the other hand, organizational learning and development of competencies can be prevented by established and objective forms of knowledge. It is proposed that an organization's priorities related to organizational learning and competencies will be associated with methods of knowledge governance.

Proposition 11:

(a) Learned and cognitive methods of knowledge governance will be positively associated with priorities related to organizational learning and competency development;

(b) Objective methods of knowledge governance will be negatively associated with priorities related to organizational learning and competency development.

3.7.1 Organizational Learning

Organizations can have different priorities related to organizational learning. Two types of priorities that represent opposite but equally important paradigms of organizational learning are the exploration and creation of new knowledge, and the exploitation and improvement of what an organization already knows (March, 1991).

Organizational learning is also the means by which organizations change (Vera & Crossan, 2003). Consequently, organizations can develop priorities related to organizational learning based on adapting to external change or changing internal practices (Senge, 1990). In order to leverage knowledge, organizations that prioritize adapting to external changes will develop knowledge across external relationships (Child & Heavens, 2001). In contrast, organizations that prioritize changing internal practices will develop knowledge across internal stakeholders (Senge, 1990).

Proposition 12:

(a) Creative methods of knowledge governance will be positively associated to the prioritization of strategic innovation;

(b) Learned methods of knowledge governance will be positively associated to the prioritization of operational efficiency;

(c) External methods of knowledge governance will be positively associated to the prioritization of business adaptability;

(d) Internal methods of knowledge governance will be positively associated to the prioritization of changing internal practices.

3.7.2 Competencies

Organizations can vary in their prioritization of different competencies. The following propositions are based on assessing whether organizational priorities are associated with methods of knowledge governance.

3.7.2.1 Market Competencies

Market competencies are based on developing a wide range of knowledge related to an organization's customers. It includes developing knowledge about customer groups, needs, experiences, relationships, distribution channels, and market competition (Fowler et al., 2000). Marketing competencies play an important role in influencing an organization's competitiveness when knowledge is shared and developed across an organization (Fowler et al., 2000). When market knowledge is developed across vertical relationships it can influence an organization's competitive and industry position (Dougherty, 1992). When market knowledge is developed across functions, it can

improve the value proposition developed by the organization (Dougherty et al., 2000). When knowledge is developed with customers, it can improve an organization's understanding of their market (Dougherty et al., 2000).

Proposition 13:

The prioritization of marketing competencies will be positively associated with vertical, horizontal and customer types of knowledge governance.

3.7.2.2 Technology Competencies

Technological competencies are based on learning how technologies can be developed in order to create value for the organization (Fowler et al., 2000). According to Abernathy and Townsend, technological competencies can be based on developing knowledge through "scientific discovery, invention, development, innovation or broad application" (as cited by Fowler et al., 2000, p. 361). Technological competencies are based on leveraging specialized knowledge and experience to create new knowledge. They are also important to an organizations strategic direction and can benefit from leadership support (Fowler et al., 2000).

Proposition 14:

The prioritization of technological competencies will be positively associated with vertical and functional types of knowledge governance.

3.7.2.3 Architectural Competencies

Architectural competencies are based on integrating and developing knowledge across internal and external organizational relationships (Fowler et al., 2000). Architectural competencies enable organization to create new knowledge and innovate based on existing knowledge (Fowler et al., 2000). They shape the knowledge base of an

organization and are common in product development activities of an organization, based on the integration of market and technological knowledge (Fowler et al., 2000).

Proposition 15:

The prioritization of architectural competencies will be positively associated with horizontal and external types of knowledge governance.

3.8 Outcomes

The way organizations govern their knowledge can determine how organizations create value based on their knowledge, their capacity to innovate, and to accomplish competitive advantage. Learned and creative methods of knowledge governance enable organizations to create value from knowledge and innovate, whereas objective methods of knowledge governance can prevent innovation and leveraging knowledge as a strategic resource.

As well, governing knowledge across different stakeholders can also be the basis for creating value and innovation. For example, collaborating across functions, developing knowledge with customers, or based on the operational contexts and stakeholders of an organization are all important relationships through which organizations can develop knowledge.

Consequently, it becomes important to discern whether methods of knowledge governance are associated with significant differences in performance.

Proposition 16:

(a) Objective knowledge governance will be associated to lower performance.

(b) Learned and creative methods of knowledge governance will be associated to higher performance.

Organizations differ in the way they develop knowledge through a social and cultural process. Consequently, an organization's methods of knowledge governance may be complex. Organizations can create new knowledge by combining new insights with established forms of knowledge. On the other hand, non-innovative organizations can use established knowledge as a means of evaluating new information and insights (Dougherty et al., 2000). Consequently, an organization's ability to innovate and develop knowledge can vary based on the methods of knowledge governance that have the greatest influence in determining the organization's practices.

Proposition 17:

(a) Organizations in which objective methods of knowledge have the greatest influence in determining business unit actions will be associated to lower performance.

(b) Organizations in which learned or creative methods of knowledge have the greatest influence in determining business unit actions will be associated to higher performance.

4 Research Methodology

This chapter defines the operationalization of constructs presented in the research model as well as the methodology followed by the proposed research.

4.1 Operationalization

The research described in this thesis was exploratory and existing instruments were not found to test the proposed model. Nonetheless, the literature provided a sufficient level of conceptualization to support the development of the model into constructs that could be used to assess knowledge governance.

4.1.1 Knowledge Governance

Based on the proposed framework for knowledge governance, KG can be assessed along two dimensions – social relationships across which organizations develop theories of action, and the different ways in which organizations formulate their actions.

Instead of conceiving of organizations as structural systems designed to implement an organization's activities as determined by their leaders, organizations can be conceived of as 'subsets' of 'interdependent' systems, across which knowledge is divided (Van Cauwenberg & Cool, 1982). While it is the job of management to formulate the actions of the organization, they do so in relationship with the operational groups of the organization that own the knowledge to carry out the organization's activities, as well as with higher (i.e. institutional) levels of organization that are responsible for designing organizational activities to meet the objectives of the organization (Van Cauwenberg &

Cool, 1982). Social relationships can be defined based on the stakeholders that participate in knowledge governance. In this system, business units are instrumental to the development of an organization's competencies through their specialized knowledge and unique activities (Child & Heavens, 2001). Consequently, formulating the actions of a business unit requires the input of different stakeholders and requires achieving a balance between responsibility and control (Child & Heavens, 2001; Van Cauwenberg and Cool, 1982).

Based on this conceptualization, it is proposed that organizational actions are formulated at the level of the business unit and that business units are composed of two different subgroups, business unit leaders and business unit lines (Child & Heavens, 2001; Van Cauwenberg & Cool, 1982). Furthermore, business units formulate their actions in conjunction with stakeholders across three different types of institutional relationships: vertical, horizontal, and external (Child & Heavens, 2001). Stakeholders that participate in each of the three types of social relationship that are significant to knowledge governance were defined based on descriptions provided in the literature. Vertical knowledge governance occurs across relationships with stakeholders at the higher or institutional level of organization – i.e. top executives; horizontal knowledge governance constitutes relationships with other business units within the organization – i.e. internal business units; and external knowledge governance constitutes relationships with external stakeholders such as customers, suppliers, partners, and even competitors (Child & Heavens, 2001; Van Cauwenberg & Cool, 1982).

In conjunction with this, it was also necessary to assess the way organizations formulate their actions across these relationships. To this effect, Rajagopalan and

Spreitzer's (1997) typology was used, based on the original typology of strategy formulation, to describe ways that organizations formulate their actions across specific relationships: rational, learning, and cognitive.

Supported by the operationalization of these two dimensions, knowledge governance can be assessed based on how organizations govern knowledge across different relationships – vertical, horizontal, and external – defined by the way stakeholders participate in different methods of knowledge governance across each of these relationships. Based on this type of operationalization, the complexity of participation can be represented based on the way stakeholders participate in each type of knowledge governance.

4.1.2 Knowledge Governance Processes

Knowledge governance processes can vary in different organizational settings as Shrivastava's (1983) typology of organizational learning systems describe. In order to better qualify knowledge governance processes in different organizations they will also be assessed based on their specific characteristics, as follows: knowledge governance processes can be either formal or informal. Business units can formulate their actions based on formal planning processes as well as informal interactions between key stakeholders (Dougherty et al., 2000; Shrivastava, 1983). Knowledge governance can involve learning across multiple stakeholders. However, governance can also be described based on participants upon whose authority and control business unit actions are formulated (Child & Heavens, 2001). Therefore knowledge governance can also be assessed based on who is responsible for formulating an organization's actions and

making decisions. Knowledge governance processes can vary substantially in different conditions and in different organizational contexts. Consequently, it is assumed there is no correct method of governing knowledge. Knowledge governance can also be assessed based on how effective it is in the organizational context in which it occurs.

4.1.3 Context

The context of the organization was assessed in relationship to knowledge governance based on two concepts. Firstly, the context was assessed based on industry conditions present in organizational environments that are driven by industry life cycle stages and rate of technological change (Lei & Slocum, 2005). Secondly, the context was assessed in relationship to the extent of hypercompetition experienced by organizations who participated in the survey.

4.1.3.1 Industry Environment

Lei and Slocum's (2005) descriptions of growth and mature stages of the industry life cycle and rate of technological change were used to operationalize industry conditions faced by organizations. According to the authors, the growth stage of the industry life cycle is defined by growing markets, increasing competition, development of differentiated products, and emphasis on establishing customer loyalty (Lei & Slocum, 2005). The mature stage of the industry life cycle is defined by customers becoming more knowledgeable, products and pricing becoming more similar between competitors, and profit margins decreasing (Lei & Slocum, 2005). A low rate of technological change implies that technology is improving in a 'gradual and predictable' manner, and a high rate of technological change suggests that technological change is redefining the industry

through a revolution of the existing dominant design (Lei & Slocum, 2005). Organizations were able to select the industry conditions their organizations experienced as dichotomous variables.

The extent of hypercompetitive change faced by organizations was operationalized based on the parameters suggested by Bogner and Barr (2000) (as the propositions were derived from their article literature review). Specifically, hypercompetitive change was assessed based on the: scale, duration, and scope of discontinuous change occurring in an organization's market, competitive, product development, and regulatory conditions; the uncertainty in each of these four conditions; and the characteristics present in hypercompetitive industries. Scale was interpreted as the relative extent of change, scope as the breadth of change experienced, and duration was based on the perpetual nature of changes experienced by the organization. Items were measured using a 5-point Likert scale with options ranging from completely disagree to completely agree including a neutral midpoint.

4.1.4 Activities

The activities of organizations were defined based on the strategic requirements of different industry environments. Constructs were based on the strategic requirements of each strategic archetype related to industry environments presented in Lei and Slocum (2005). The strategic requirements of each strategic archetype, was operationalized in the same manner proposed by the authors – using Hambrick's model of strategic pillars (Lei & Slocum, 2005). According to this model, the strategic activities of a firm can be described based on the 'arenas' the firm will compete in such as products, markets,

technologies, functions, etc; the 'vehicles' or methods through which it will compete such as internal development, joint venture, or acquisition; the 'distinguishing features' of its products or services; and the 'staging' or process through which it evolves and develops its actions (Lei & Slocum, 2005). Items were measured using a 5-point Likert scale with options ranging from completely disagree to completely agree including a neutral midpoint.

4.1.5 Organization

Priorities related to the development of competencies were operationalized based on descriptions provided in Fowler et al. (2000). The authors describe the different ways in which competencies are based on the development of knowledge. According to the Fowler et al. (2000), technology competencies are based on "discovering and inventing new applications of product development knowledge" (p. 361); market competencies are based on developing knowledge about customer groups, customer needs, and competitors' activities; architectural competencies are based on "integrating the knowledge of internal groups" (p. 363); and finally the trajectory of competency development is influenced by the ability to develop up to date knowledge over time. Items were measured using a 5-point Likert scale with options ranging from completely disagree to completely agree including a neutral midpoint.

4.1.6 Outcomes

According to Dess and Robinson, both subjective and objective measures have been shown to measure organizational performance (as cited by Croteau & Raymond,

2004). Consequently, subjective measures of performance were used to assess how well organizations performed relative to their competitors. Performance was evaluated based on subjective measures along two dimensions – growth and profitability, based on the Venkatraman instrument (Croteau & Raymond, 2004).

Performance was also assessed based on a firm's success in organizational learning. Success is evaluated based on four types of organizational learning priorities identified in the literature, namely: strategic innovation, operational efficiency, changing internal practices, and business adaptability (March, 1991; Senge, 1990).

Performance-based items were measured using a 5-point Likert scale with options ranging from completely disagree to completely agree including a neutral midpoint..

4.1.7 Survey Development

The proposed research model is exploratory – meant to assess and describe how firms are governing knowledge in the context of conditions faced by the organization. The main challenges in the development of a survey instrument were to introduce the concept of knowledge governance and define it in a practical way – making sure that questions were both relevant and meaningful to the target population, and also to avoid lack of clarity or ambiguity in the development of items that were not found to be previously operationalized. The survey was composed and pre-tested by five practitioners and five academic participants. The feedback was positive overall, however, the pre-testing process was important to the development of practical operationalization of the model based on theoretical concepts. To this effect the process of pre-testing was

instrumental in developing a survey that provided an effective means of assessing knowledge governance.

The primary concern of the academic pre-testers was the lack of previous operationalization of the constructs. This was a significant challenge of building new theory and testing new concepts. To meet this challenge, the literature review was used to support conversion of theoretical concepts into practical language, concepts, and examples. As well, all pre-testers were asked to identify items that were confusing, ambiguous, unclear or lacking practical application. Feedback was used to clarify items, and concepts until the survey was considered to be 'well-explained', 'well constructed', relevant, and easy to understand.

As well, there was concern expressed about the simplification of items in order to assure that items tested a specific concept. To this effect, the original vehicle item, based on the Hambrick operationalization of strategic archetypes was divided into two separate items. The first item was used to test the organization's internal vehicle and the second item was used to test the external vehicle for meeting the strategic requirements of their industry environment.

The time frame of hypercompetitive change was also brought into question. To address this, questions were framed in the present tense. This was considered appropriate as knowledge governance was also being assessed in the present tense.

The practitioner pre-testing was a very important part of the survey development as it assured that questions about knowledge governance were framed in a manner to reflect actual management practices, and to assure that questions, items, and concepts being evaluated would be clearly understood by the target audience.

The operationalization of the typology based on the Rajagopalan and Spreitzer (1997) model was not self-evident to the pre-testers. To this effect, alternative terms that were consistent with the explanations of each type of knowledge governance as well as practically relevant were selected in accordance with practitioner feedback. (Original items, rational, learning, and cognitive were replaced with objective, learned, and creative.)

The concept of knowledge governance was foreign to all pre-testers and in the interest of clarity practical explanations of different methods of knowledge governance were developed based on the practical examples of case studies used to support the theoretical explanations in the literature review.

Finally, to support the explanation of the concept of governance across stakeholder relationships, a practical example of a question and answer were provided to remove any remaining ambiguity for the target audience.

The cover letter and survey instrument used in this research are included in this the appendices of this thesis.

4.1.8 Methodology

The purpose of this research is to evaluate the way knowledge is governed within firms.

The primary unit of analysis will be business units as they are the primary owners of knowledge within firms (Van Cauwenberg & Cool, 1982). The target audience for the survey is business unit leaders or CXO level executives of large organizations because it is their responsibility to control and leverage the knowledge of the business unit on behalf

of the organization. A mailing list of randomly selected CXO level executives of 1000 large Canadian organization was obtained from Dunn and Bradstreet. A paper based survey was sent to each CXO, followed by two reminder notices.

5 Descriptive Data Analysis

This chapter provides a description of the data collected through the survey as well an overall assessment of knowledge governance practices and industry conditions of organizations that participated in the survey.

5.1 Demographic Data

Out of 1000 surveys that were mailed out, 70 were completed and returned for a response rate of 7%. Considering the novelty of the concept of knowledge governance as well as the length of the survey, this was satisfactory for an exploratory analysis of the concepts proposed.

Firms that participated in the survey were primarily from Ontario (64.3%) with minor representation from other provinces: Alberta (14.3%), British Colombia (8.6%), Nova Scotia (5.7%), New Brunswick (2.9%), Manitoba (1.4%), Newfoundland (1.4%), and Saskatchewan (1.4%) (see Table 1). A broad range of industries participated in the survey including services (27.1%), manufacturing (24.3%) finance, insurance, and real estate (11.4%) and wholesale trade (11.4%), retail trade (7.1%), transportation and communication (7.1%), construction (5.7%), and mining (5.7%) (see Table 2). The data represents various types of organizations including privately held (34.3%), publicly listed (31.4%), government (11.4%), not-for-profit (11.4%), subsidiaries (10%), and other (1.4%) (see Table 3). Respondents were leaders of business units from various functions including finance and administration (41.4%), operations (21.4%), corporate and strategy (20%), marketing and sales (12.9%), and product development (4.3%) (see Table 4).

Forty percent of organizations that participated in the survey are small (<1000 employees), twenty-seven percent are medium (1000-2499 employees), and twenty-seven percent are large (=>2500 employees) (see Table 5). The mean revenue of firms that participated was 1,166,050,246$ with a standard deviation of 2,402,830,903$ (see Table 6). The mean number of years in their position was 7.9 (SD=4.6) and mean numbers of years with their firm was 16.3 (SD=9.6) (see Table 6).

	Province	Frequency	Percent
1	ON	45	64.3
2	AB	10	14.3
3	BC	6	8.6
4	NS	4	5.7
5	NB	2	2.9
6	MB	1	1.4
7	NL	1	1.4
8	SK	1	1.4
	Total	70	100.0

Table 1 – Demographic Data by Province

	Industry	Frequency	Percent
1	Services	19	27.1
2	Manufacturing	17	24.3
3	Finance, Insurance, Real	8	11.4
4	Wholesale Trade	8	11.4
5	Retail Trade	5	7.1
6	Transportation, Communication	5	7.1
7	Construction	4	5.7
8	Mining	4	5.7
	Total	70	100.0

Table 2 – Demographic Data by Industry

	Type	Frequency	Percent
1	Privately Held	24	34.3
2	Publicly Listed	22	31.4
3	Government	8	11.4
4	Not-For-Profit	8	11.4
5	Subsidiary	7	10.0
6	Other	1	1.4
	Total	70	100.0

Table 3 – Demographic Data by Type

	Function	Frequency	Percent
1	Finance & Administration	29	41.4
2	Operations	15	21.4
3	Corporate & Strategy	14	20.0
4	Marketing & Sales	9	12.9
5	Product Development	3	4.3
	Total	70	100.0

Table 4 – Demographic Data by Function

Firm Size	# Employees	Frequency	Percent
Small	0-999	28	40.0
Medium	1000-2499	19	27.1
Large	2500+	19	27.1
	Missing	4	5.7
	Total	70	100.0

Table 5 – Demographic Data by Firm Size

	Range	Minimum	Maximum	Mean	Std. Deviation
Revenue	15,000,000,000	-2,200,000,000	12,800,000,000	1,166,050,246	2,402,830,903
Years in position	19	1	20	7.88	4.62
Years with firm	35	1	36	16.32	9.60

Table 6 – Demographic Data – Relevant Measures of Central Tendency and Dispersion

5.2 Knowledge Governance Descriptive Results

5.2.1 Summary

An overview of how organizations that participated in the survey governed their knowledge presents a revealing picture.

Vertical knowledge governance occurred through a high level of participation from top executives - 85.7% of top executives participated in objective, 64.3 % in learned, and 72.9% in creative knowledge governance. In comparison, there was a low level of participation in horizontal knowledge governance from other internal units of the

organization – 28.6% of internal units participated in objective, 32.9% in learned, and 21.4% in creative knowledge governance. There was greater participation of external stakeholders than internal units in knowledge governance. Business units governed their knowledge in collaboration with all four types of external stakeholders – customers, suppliers, partners and competitors. The highest level of participation by external stakeholders was by customers – 38.6% of customers participated in objective, 51.4% in learned, and 28.6% in creative knowledge governance. The lowest level of participation was by competitors – 20.0% of competitors participated in objective, 35.7% in learned, 12.9% in creative knowledge governance. This is remarkable because business units that participated in the survey more commonly shared knowledge and experience with competitors (35.7%) than internal units (32.9%) as a basis for formulating their actions.

The way stakeholders participated in different methods of knowledge governance also says something about the roles of different relationships in governing knowledge. Formulating business unit actions based on both objective (85.7%) and creative (72.9%) methods of knowledge governance are central to the role of top executives, however, objective methods of knowledge governance are more common than creative.

On the other hand, formulating business unit actions across vertical relationships based on both objective (82.9%) and learned (88.6%) methods of knowledge governance are central to the role of business unit leaders. The emphasis on the actual knowledge and experience of business unit leaders appropriately reflects their role as the owners of and people responsible for the knowledge of their business unit (Van Cauwenbergh and Cool, 1982). Nonetheless, business unit leaders more commonly participate in objective

knowledge governance across horizontal (72.9%) and external (60.0%) relationships than other methods of knowledge governance.

On the other hand, business unit lines participated in learned knowledge governance at much higher levels than other methods of knowledge governance across all vertical, horizontal and external relationships – indicating that actual knowledge and experience based on an organization's context is important in formulating the actions of business units. 67.1% of business lines participated in learned knowledge governance across vertical relationships, in comparison to 35.7% in creative, and 32.9% in objective KG. 64.3% of business lines participated in learned knowledge governance across horizontal relationships, in comparison to 48.6% in objective, and 31.4% in creative KG. 52.9% of business lines participated in learned knowledge governance across external relationships, in comparison to 24.3% in both objective and creative KG. These results also show an emphasis on objective knowledge governance (48.6%) across horizontal relationships by business unit lines.

There was not a great difference in participation in different methods of knowledge governance by internal business units (28.6% of internal units participated in objective, 32.9% in learned, and 21.4% in creative knowledge governance). Learned knowledge governance was the most common method participated in by all external stakeholders (see table 7), especially by customers (51.4%). however, both objective (45.7%) and learned (47.1%) are common methods of knowledge governance with suppliers.

Learned knowledge governance had the greatest influence in determining business unit actions across all three types of relationships, vertical (50.0%), horizontal

(52.9%), and external (57.1%). However, in 40.0% of cases, objective knowledge governance was the most influential method in determining business unit actions across vertical relationships. Creative knowledge governance had the greatest influence in determining business unit actions in the fewest amount of cases across all three types of relationships - vertical (18.6%), horizontal (17.1%), and external (14.3%).

Overall, there was much greater participation in vertical knowledge governance by top executives than business unit lines indicating that top down approaches to knowledge governance is quite common. Learned knowledge governance was the most important method of governance, showing the highest level of participation from many stakeholders and also having the greatest influence in determining organizational actions. However, objective knowledge governance is quite important as well. Horizontal knowledge governance occurs with limitations, such as not a lot of participation from other internal units, and objective knowledge governance as the most common method participated in by business unit leaders. Creative knowledge governance does not have a great influence in formulating business unit actions.

Knowledge governance processes in organizations are both formal and informal (See Table 8). Vertical knowledge governance processes are slightly more formal (48.6%) than informal (34.3%), external knowledge governance processes are slightly more informal (47.1%) than formal (40%), and horizontal knowledge governance processes are equally divided (38.6%). A small percentage of organizations use both formal and informal processes across vertical (14.3%), horizontal (10%), and external (2.9%) relationships.

Respondents rated their external knowledge governance processes as slightly less effective than their internal ones (See Table 9). Respondents rated the effectiveness of their knowledge governance processes on a scale of one (not effective at all) to five (highly effective) on average at 3.59 (SD=0.68) for vertical, 3.56 (SD=0.62) for horizontal, and 3.37 (SD=0.71) for external.

		Objective*		Learned		Creative*	
		Freq	%	Freq	%	Freq	%
Vertical	Top Executive	60	85.7	45	64.3	51	72.9
	Business Leader	58	82.9	62	88.6	40	57.1
	Business Line	23	32.9	47	67.1	25	35.7
	Influence	28	40.0	35	50.0	13	18.6
Horizontal	Internal Business Units	20	28.6	23	32.9	15	21.4
	Business Leader	51	72.9	46	65.7	41	58.6
	Business Line	34	48.6	45	64.3	22	31.4
	Influence	20	28.6	37	52.9	12	17.1
External	Customers	27	38.6	36	51.4	20	28.6
	Suppliers	32	45.7	33	47.1	19	27.1
	Partners	24	34.3	27	38.6	20	28.6
	Competitors	14	20.0	25	35.7	9	12.9
	Business Leader	42	60.0	37	52.9	30	42.9
	Business Line	17	24.3	37	52.9	17	24.3
	Influence	18	25.7	40	57.1	10	14.3

* The term Objective replaces Rational. The term Creative replaces Cognitve. See Section 4.1.7

Table 7 – Knowledge Governance Descriptive Results – Summary

	Vertical		Horizontal		External	
Process Type	Freq	%	Freq	%	Freq	%
Formal	34	48.6	27	38.6	28	40.0
Informal	24	34.3	27	38.6	33	47.1
Both	10	14.3	7	10.0	2	2.9
Missing	2	2.9	9	12.9	7	10.0
Total	70	100.0	70	100.0	70	100.0

Table 8 – Knowledge Governance Descriptive Results – Process Type

	Vertical Mean = 3.59 (0.68)		Horizontal Mean = 3.56 (0.62)		External Mean = 3.37 (0.71)	
Effectiveness	Freq	%	Freq	%	Freq	%
1 Not at all	0	0	0	0	0	0
2	3	4.3	3	4.3	7	10.0
3	24	34.3	22	31.4	26	37.1
4	33	47.1	35	50.0	28	40.0
5 Highly Effective	4	5.7	1	1.4	1	1.4
Missing	6	8.6	9	12.9	8	11.4
Total	70	100.0	70	100.0	70	100.0

Table 9 – Knowledge Governance Descriptive Results – Knowledge Governance Effectiveness

5.3 Vertical Knowledge Governance

5.3.1 Methods of Knowledge Governance

	Top Executives		Business Leaders		Business Lines		Influence	
	Freq	%	Freq	%	Freq	%	Freq	%
Objective only	4	5.7	1	1.4	3	4.3	24	34.3
Learned only	4	5.7	4	5.7	17	24.3	27	38.6
Creative only	2	2.9	0	0	4	5.7	7	10.0
Objective & Learned	9	12.9	23	32.9	10	14.3	3	4.3
Learned & Creative	2	2.9	6	8.6	12	17.1	5	7.1
Objective & Creative	18	25.7	5	7.1	2	2.9	1	1.4
Obj, Learned, Creative	29	41.4	29	41.4	7	10.0	-	-
Missing	2	2.9	2	2.9	15	21.4	3	4.3
Total	70	100.0	70	100.0	70	100.0	70	100.0

Table 10 – Vertical Knowledge Governance – Method of Knowledge Governance

The survey revealed several patterns in the way different stakeholders are participating in knowledge governance.

The majority of top executives (41.4%) and business leaders (41.4%) are determining how business units should practice based on all three methods of knowledge

governance. This suggests that all three methods of knowledge governance are required and play a role in determining how business units practice.

In a significant number of organizations, business leaders are participating in objective & learned methods of knowledge governance (32.9%) and top executives are participating in objective & creative knowledge (25.7%). The differences of methods participated in by different stakeholders, supports the idea that the contribution and role of stakeholders at different levels of the hierarchy varies (Van Cauwenberg & Cool, 1982). Business leaders are responsible for managing the functional knowledge of the organization, whereas top executives are responsible for making sense of the organization's activities at the institutional level.

The majority of business unit lines (24.3%) participate in learned knowledge governance only. This reinforces the importance of actual knowledge and experience based on the organization's actual context that business unit lines are engaged in. There are a variety of ways that business unit lines participate in vertical knowledge governance – 14.3% participate in objective and learned, 17.1% participate in learned and creative, 10.0% participate in all three. These differences may be due to different organizational characteristics or different organizational roles. Further research is required.

5.3.2 By Structure

Based on the typology used by Weill and Ross (2005) (see Legend Vertical knowledge governance by structure), this section describes the relationships across different domains of knowledge in an organization through which business units

determined how to practice. Relationships play a significant role in developing new ways of practicing across domains of knowledge (Carlile, 2002).

The most common type of objective knowledge governance is centralized (47.1%). Top executives and business unit leaders are determining how business units should practice based on objective methods of knowledge governance.

The most common type of learned knowledge governance is integrated (44.3%). Organizations are determining how to practice based on the knowledge and experience across all levels of the hierarchy. However, in a significant number of organizations (21.4%) learned knowledge governance is functional.

The most common type of creative knowledge governance is centralized (25.7%), followed by integrated (21.4%), and top executive monarchy (17.1%). The difference require further research, however, it is notable that creating knowledge in many organizations is the role of top executives.

There are differences between the structures that determine how business unit should practice, and structures that are actually accountable determining how they should practice. The most common type of accountability structures are business unit monarchy (32.9%), followed by centralized (27.1%), and top executive monarchy (25.7%). In a few organizations accountability is integrated (11.4%). Knowledge is distributed but accountability is not poses the question whether leadership is actually shared, when accountability is not (Ireland and Hitt, 1999).

Legend: Vertical knowledge governance by structure

Vertical KG Structure	Top Executive	BU Leader	BU Line
Top Executive Monarchy	X		
Business Unit Monarchy		X	
Decentralized			X
Centralized	X	X	
Functional		X	X
Distributed	X		X
Integrated	X	X	X

	Objective		Learning		Creative		Responsiblity	
KG Structure	Freq	%	Freq	%	Freq	%	Freq	%
TE Monarchy	7	10.0	4	5.7	12	17.1	18	25.7
Unit Monarchy	3	4.3	6	8.6	4	5.7	23	32.9
Decentralized	1	1.4	1	1.4	1	1.4	0	0
Centralized	33	47.1	10	14.3	18	25.7	19	27.1
Functional	2	2.9	15	21.4	3	4.3	1	1.4
Distributed	0	0	0	0	6	8.6	0	0
Integrated	20	28.6	31	44.3	15	21.4	8	11.4
Missing	4	5.7	3	4.3	11	15.7	1	1.4
Total	70	100.0	70	100.0	70	100.0	70	100.0

Table 11 – Vertical Knowledge Governance Structure

5.3.3 Vertical Decision Making

Hierarchical cluster analysis by variable was used to determine what (if any) patterns of vertical knowledge governance occur in strategic decision making. All variables are dichotomous defining how organizations govern knowledge in making decisions based on who participates, what type of knowledge is shared and who is accountable in strategic decision making. The analysis is a useful descriptive device, in determining what variables are closely associated together, what patterns exist in vertical knowledge governance, and how variables and patterns are grouped together.

The analysis was based on between-groups average linkage clustering using the simple matching measure of distance. Simple matching is a binary method of measuring distance, that reflects the dichotomous nature of the variables. Similarity in this method is based on whether both or neither of the variables are present in strategic decision making of organizations (SPSS). In other words, variables are defined as similar when both occur as well as don't occur in an organization. It should be noted that this method is used in all the hierarchical cluster analysis in the remainder of this thesis.

The cluster analysis allows us to see how participation, accountability and types of knowledge governance are related. The first cluster grouping indicates that business leader participation and learned KG are closely associated with top executive accountability – in other words, decisions based on actual knowledge and experience are associated with the participation of business leaders, but are ultimately the responsibility of top executives. While the second cluster grouping indicates that top executive participation and business leader accountability are closely associated with objective KG – decisions based on objective knowledge such as standards of operations are more closely associated with top executive participation and the responsibility of business leaders. These two groups are loosely associated with creative knowledge governance – creative KG is less common in decision making but none-the-less part of the main cluster. Finally, business line participation and accountability are loosely associated with each other but are outside the main groups of vertical knowledge governance in organizations.

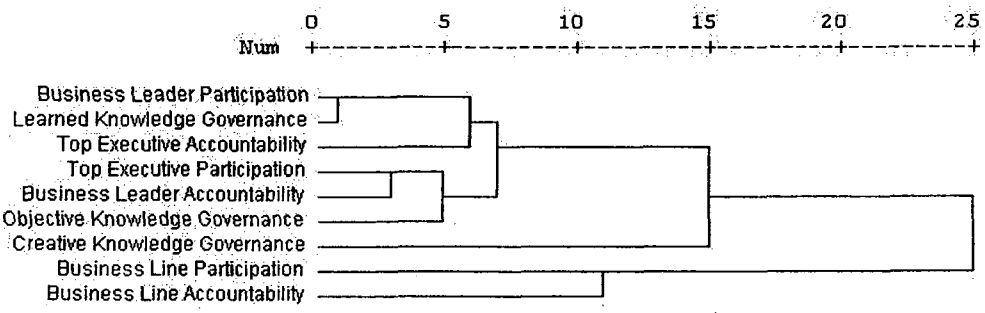

Figure 4 – Vertical Decision Making – Hierarchical Cluster Analysis by Variable

	Decision Input		Decision Accountability	
	Freq	%	Freq	%
Top Executive	61	87.1	57	81.4
BU Leader	60	85.7	61	87.1
BU Line	21	30.0	18	25.7

Table 12 – Vertical Decision Making by Stakeholder

Method of KG	Freq	%
Objective	58	82.9
Learned	55	78.6
Creative	42	60

Table 13 – Vertical Decision Making – Method of Knowledge Governance – Summary

	Decision Input		Decision Accountability	
	Freq	%	Freq	%
TE Monarchy	8	11.4	8	11.4
Unit Monarchy	4	5.7	10	14.3
Decentralized	1	1.4	0	0
Centralized	36	51.4	33	47.1
Functional	3	4.3	2	2.9
Distributed	0	0	0	0
Integrated	17	24.3	16	22.9
Missing	1	1.4	1	1.4
Total	70	100.0	70	100.0

Table 14 – Vertical Decision Making by Structure

Methods of KG	Freq	%
Objective only	9	12.9
Learned only	2	2.9
Creative only	1	1.4
Objective & Learned	16	22.9
Learned & Creative	8	11.4
Objective & Creative	4	5.7
Obj, Learned, Creative	29	41.4
Missing	1	1.4
Total	70	100.0

Table 15 – Vertical Decision Making – Methods of Knowledge Governance

5.4 Horizontal Knowledge Governance

5.4.1 By Stakeholder

The survey revealed several patterns in the way different stakeholders are participating in knowledge governance.

Internal units are most commonly determining how business units should practice based on objective and learned (12.9%) or all three types (10.0%) of knowledge governance.

The majority of business unit leaders are determining how business units should practice based on all three methods of knowledge governance (47.1%).

Business unit lines are determining how business units should practice in a variety of ways – 24.3% based on all three methods of KG, 21.4% based on objective and learned methods, and 12.9% based on learned knowledge governance only.

	Internal Unit		Business Leaders		Business Lines		Influence	
	Freq	%	Freq	%	Freq	%	Freq	%
Objective only	3	4.3	5	7.1	2	2.9	15	21.4
Learned only	3	4.3	2	2.9	9	12.9	32	45.7
Creative only	3	4.3	0	0	1	1.4	7	10.0
Objective & Learned	9	12.9	8	11.4	15	21.4	2	2.9
Learned & Creative	4	5.7	3	4.3	4	5.7	2	2.9
Objective & Creative	1	1.4	5	7.1	0	0	2	2.9
Obj, Learned, Creative	7	10.0	33	47.1	17	24.3	1	1.4
Missing	40	57.1	14	20.0	22	31.4	9	12.9
Total	70	100.0	70	100.0	70	100.0	70	100.0

Table 16 – Horizontal Knowledge Governance by Stakeholder

5.4.2 By Structure

Based on the typology adapted from Weill and Ross (2005) (see Legend Horizontal knowledge governance by structure), this section describes the horizontal relationships across different domains of knowledge in an organization through which business units determined how to practice. Relationships play a significant role in developing new ways of practicing across domains of knowledge (Carlile, 2002).

Objective knowledge governance occurs across different horizontal relationships to determine how business units should practice – 27.1% of cases are business unit monarchies, 21.4% are functional, 22.9% are integrated.

Learned knowledge governance occurs across different horizontal relationships to determine how business units should practice – 27.1% are integrated, 22.9% are functional, and 15.7% of cases are business unit monarchies.

Creative knowledge governance occurs across different horizontal relationships to determine how business units should practice – 32.9% of cases are business unit monarchies, 12.9% are functional, 11.4% are integrated.

In the majority of cases accountability is based on BU monarchy (64.3%), however in a small number of cases it is cross functional (11.4%).

Legend: Horizontal knowledge governance by structure

	Group		
Horizontal structure	Internal Unit	BU Leader	BU Line
IU Monarchy	X		
Business Unit Monarchy		X	
Decentralized			X
Cross-Functional	X	X	
Functional		X	X
Distributed	X		X
Integrated	X	X	X

	Objective		Learning		Creative		Accountability	
KG Structure	Freq	%	Freq	%	Freq	%	Freq	%
IU Monarchy	2	2.9	0	0	2	2.9	4	5.7
BU Monarchy	19	27.1	11	15.7	23	32.9	45	64.3
Decentralized	2	2.9	6	8.6	1	1.4	0	0
X-Functional	1	1.4	0	0	1	1.4	8	11.4
Functional	15	21.4	16	22.9	9	12.9	2	2.9
Distributed	1	1.4	4	5.7	4	5.7	0	0
Integrated	16	22.9	19	27.1	8	11.4	3	4.3
Missing	14	20.0	14	20.0	22	31.4	8	11.4
Total	70	100.0	70	100.0	70	100.0	70	100.0

Table 17 – Horizontal Knowledge Governance by Structure

5.4.3 Horizontal Decision Making

Hierarchical cluster analysis by variable was used to determine what (if any) patterns of horizontal knowledge governance occur in strategic decision making. The analysis was based on between-groups average linkage clustering using the simple matching measure of distance, as in the previous section. There are two main clusters which contain the primary information. business leader participation and accountability are closely associated together and first linked to learned, then objective, and then

creative knowledge governance. This comprises the main dimensions of decision making across horizontal relationships, reinforcing the relative importance of different types of knowledge governance. The second major cluster indicates that BU line participation and accountability and IU participation and accountability are also associated with each other. In other words, there is a relationship between lines and other IU in horizontal decision making. It reinforces the idea that it is not the role of leadership to integrate knowledge and that knowledge integration occurs based on the context, that enables organizations to develop new theories of action (Dougherty et al., 2000).

	Decision Input		Decision Accountability	
	Freq	%	Freq	%
Internal Unit	31	44.3	24	34.3
BU Leader	57	81.4	57	81.4
BU Line	16	22.9	15	21.4

Table 18 – Horizontal Decision Making by Stakeholder

Method of KG	Freq	%
Objective only	47	67.1
Learned only	49	70.0
Creative only	34	48.6

Table 19 – Horizontal Decision Making – Method of Knowledge Governance – Summary

	Decision Input		Decision Accountability	
	Freq	%	Freq	%
IU Monarchy	5	7.1	4	5.7
BU Monarchy	25	35.7	31	44.3
Decentralized	0	0	0	0
X-Functional	16	22.9	11	15.7
Functional	6	8.6	6	8.6
Distributed	0	0	0	0
Integrated	10	14.3	9	12.9
Missing	8	11.4	9	12.9
Total	70	100.0	70	100.0

Table 20 – Horizontal Decision Making by Structure

Method of KG	Freq	%
Objective only	9	12.9
Learned only	6	8.6
Creative only	1	1.4
Objective & Learned	13	18.6
Learned & Creative	9	12.9
Objective & Creative	3	4.3
Obj, Learned, Creative	21	30.0
Missing	8	11.4
Total	70	100.0

Table 21 – Horizontal Decision Making – Method of Knowledge Governance

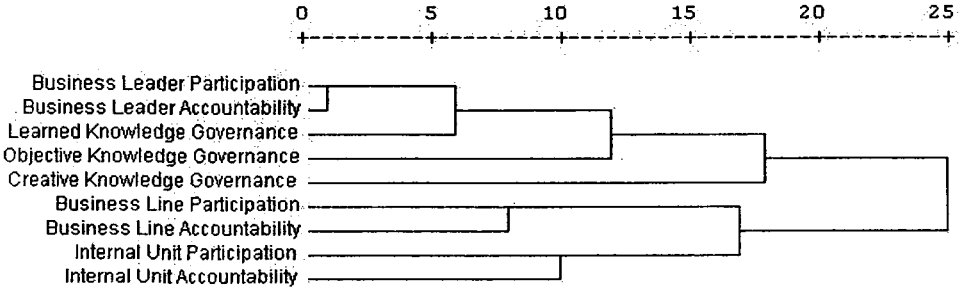

Figure 5 – Horizontal Decision Making – Hierarchical Cluster Analysis by Variable

5.5 External Knowledge Governance

5.5.1 By Stakeholder

The way external stakeholders are participating in external knowledge governance varies (See Table 22). The most common patterns are summarized below.

Customers are most commonly determining how business units should practice based on learned (22.9%), all three (12.9%), or objective and learned (11.4%) methods of knowledge governance.

Suppliers are most commonly determining how business units should practice based on learned (14.3%), all three types (14.3%),

In the majority of cases partners are determining how business units should practice based on all three methods of knowledge governance (17.1%).

In the majority of cases competitors are determining how business units should practice based on learned methods of knowledge governance (20.0%).

Business unit leaders are most commonly determining how business units should practice based on all three (25.7%), objective and learned (12.9%), or objective (11.4%) methods of knowledge governance.

Business unit lines are most commonly determining how business units should practice based on learned (21.4%), objective and learned (12.9%), or learned and creative (11.4%) methods of knowledge governance.

	Customer		Supplier		Partner		Competitor	
	Freq	%	Freq	%	Freq	%	Freq	%
Objective only	6	8.6	9	12.9	3	4.3	5	7.1
Learned only	16	22.9	10	14.3	7	10.0	14	20.0
Creative only	4	5.7	1	1.4	1	1.4	3	4.3
Objective & Learned	8	11.4	9	12.9	5	7.1	6	8.6
Learned & Creative	3	4.3	4	5.7	3	4.3	3	4.3
Objective & Creative	4	5.7	4	5.7	4	5.7	1	1.4
Obj, Learned, Creative	9	12.9	10	14.3	12	17.1	2	2.9
Missing	20	28.6	23	32.9	35	50.0	36	51.4
Total	70	100.0	70	100.0	70	100.0	70	100.0

Table 22 – External Knowledge Governance by Stakeholder

	Business Leaders		Business Lines		Influence	
	Freq	%	Freq	%	Freq	%
Objective only	8	11.4	1	1.4	16	22.9
Learned only	6	8.6	15	21.4	35	50.0
Creative only	1	1.4	2	2.9	7	10.0
Objective & Learned	9	12.9	9	12.9	2	2.9
Learned & Creative	4	5.7	8	11.4	3	4.3
Objective & Creative	7	10.0	2	2.9	0	0
Obj, Learned, Creative	18	25.7	5	7.1	0	0
Missing	17	24.3	28	40.0	7	10.0
Total	70	100.0	70	100.0	70	100.0

Table 23 – External Knowledge Governance – Method of Knowledge Governance

5.5.2 By Structure

Objective knowledge governance occurs across different external relationships to determine how business units should practice – 27.1% of cases are collaboration, 18.6% are external partner monarchies, and 17.1% are integrated.

Learned knowledge governance occurs across different external relationships to determine how business units should practice – 31.4% are integrated, 15.7% of cases are external stakeholder monarchies.

Creative knowledge governance occurs across different external relationships to determine how business units should practice – 18.6% of cases are collaboration, and 15.7% of cases are external stakeholder monarchies.

In the majority of cases accountability is based on BU monarchy (44.3%), however in some of cases it is a collaboration (24.3%).

Legend: External knowledge governance by structure

External structure	External Party	BU Leader	BU Line
External Monarchy	X		
Business Unit Monarchy		X	
Decentralized			X
Collaboration	X	X	
Functional		X	X
Distributed	X		X
Integrated	X	X	X

	Objective		Learning		Creative		Responsiblity	
KG Structure	Freq	%	Freq	%	Freq	%	Freq	%
EP Monarchy	13	18.6	11	15.7	11	15.7	4	5.7
BU Monarchy	8	11.4	3	4.3	9	12.9	31	44.3
Decentralized	1	1.4	4	5.7	2	2.9	1	1.4
Collaboration	19	27.1	10	14.3	13	18.6	17	24.3
Functional	3	4.3	2	2.9	1	1.4	4	5.7
Distributed	1	1.4	9	12.9	7	10.0	2	2.9
Integrated	12	17.1	22	31.4	7	10.0	6	8.6
Missing	13	18.6	9	12.9	20	28.6	5	7.1
Total	70	100.0	70	100.0	70	100.0	70	100.0

Table 24 – External Knowledge Governance by Structure

5.5.3 External Decision Making

Hierarchical cluster analysis by variable was used to determine what (if any) patterns of external knowledge governance occur in strategic decision making. The analysis was based on between-groups average linkage clustering using the simple matching measure of distance, as in the previous section. There are two major clusters in the dendogram. In the first cluster, BU line participation and accountability are associated together and linked to a larger group comprised on customer and competitor accountability, competitor participation, supplier accountability, partner participation, and supplier participation. Once again, BU lines are loosely tied to these external stakeholders in decision making – however the proximity (i.e. similarity) of items related

to external stakeholders is due to their uncommon occurrence in patterns of decision making. The second cluster informs us that the main dimensions of external decision making, namely, BL participation and accountability, are closely associated learned, objective and creative knowledge governance – but are also associated with customer participation. This indicates the difference between BU leader and BL line participation in patterns of external decision making. BU leaders have an important relationship with customers, while BU lines are more closely associated with other stakeholders.

	Decision Input		Decision Accountability	
	Freq	%	Freq	%
Customer	40	57.1	1	1.4
Supplier	21	30.0	13	18.6
Partner	21	30.0	9	12.9
Competitor	9	12.9	0	0
BU Leader	55	78.6	62	88.6
Business Line	25	35.7	19	27.1

Table 25 – External Decision Making by Stakeholder

Method of KG	Freq	%
Objective only	47	67.1
Learned only	51	72.9
Creative only	35	50.0

Table 26 – External Decision Making – Method of Knowledge Governance – Summary

	Decision Input		Decision Accountability	
	Freq	%	Freq	%
Ext Monarchy	4	5.7	2	2.9
BU Monarchy	9	12.9	34	48.6
Decentralized	2	2.9	0	0
Collaboration	26	37.1	9	12.9
Functional	3	4.3	13	18.6
Distributed	3	4.3	0	0
Integrated	17	24.3	6	8.6
Missing	6	8.6	6	8.6
Total	70	100.0	70	100.0

Table 27 – External Decision Making by Structure

Method of KG	Freq	%
Objective only	9	12.9
Learned only	6	8.6
Creative only	2	2.9
Objective & Learned	14	20.0
Learned & Creative	9	12.9
Objective & Creative	2	2.9
Obj, Learned, Creative	22	31.4
Missing	6	8.6
Total	70	100.0

Table 28 – External Decision Making – Method of Knowledge Governance

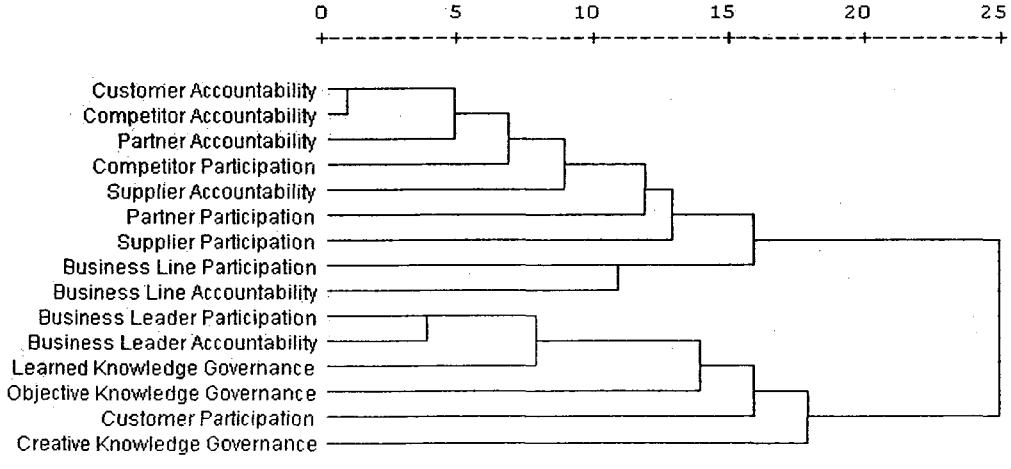

Figure 6 – External Decision Making – Hierarchical Cluster Analysis by Variable

5.6 Context

The following results describe the industry conditions of the organizations that participated in the survey.

The data was first classified based on rate of technological change: 72.9% of organizations experienced a low rate of technological change, while the remaining 27.1% experienced a high rate of technological change. The most common industry conditions experienced by organizations that participated in the survey are: 'customer loyalty is important' (77.1%), 'knowledgeable customers' (71.4%), and 'growing markets' (70%). The least common condition experienced by organizations was 'differentiated rival products' (14.3%). These results show preliminary evidence that some organizations are experiencing both growth and mature industry life cycle conditions simultaneously - such as growing markets and knowledgeable customers. As well, competitive conditions of the marketplace are such that organizations do not have the opportunity to compete based on product differentiation very often.

Industry Life Cycle	Industry Conditions	Low Rate of Technological Change n=51 (72.9%)			High Rate of Technological Change n=19 (27.1%)			Total n=70 (100%)	
		n	%	% total	n	%	% total	n	%
Growth	Growing Market	35	71.4	50.0	14	28.6	20	49	70
	Increasing Competitors	30	83.3	42.9	6	16.7	8.6	36	51.4
	Differentiated Rival Products	6	60.0	8.6	4	40.0	5.7	10	14.3
	Customer Loyalty Important	38	70.4	54.3	16	29.6	22.9	54	77.1
Mature	Decreasing Profit Margins	20	76.9	28.6	6	23.1	8.6	26	37.1
	Similar Pricing*	29	74.4	41.4	10	25.6	14.3	39	55.7
	Similar Product Features*	21	67.7	30.0	10	32.3	14.3	31	44.3
	Knowledgeable Customers	36	72.0	51.4	14	28.0	20.0	50	71.4

* Between Competitors

Table 29 – Context – Industry Conditions – Summary

An exploratory hierarchical cluster analysis was performed to reveal how groupings of industry conditions are actually experienced by organizations that can provide future insight into patterns of knowledge governance.

The hierarchical method of cluster analysis using the simple matching method enables us to see how organizations are experiencing industry conditions. It depicts what industry conditions are closely linked together and how industry conditions are grouped together. It confirms that conditions considered to occur in separate stages of the industry life, are actually closely linked. The results depict that the conditions 'customer loyalty is important' and 'customers are knowledgeable' are very closely associated with the condition refuting the original model. (Whether establishing customer loyalty is a mature condition, or whether knowledgeable customers occurs in the growth phase due to the internet is a question that needs to be answered.) As well, the conditions 'competitors are increasing' and 'pricing is similar between competitors' are closely linked, also refuting the original model.

The results show three major groupings of conditions. The first group linked to and 'product technology is changing incrementally' includes: 'customer loyalty is important', 'customers are knowledgeable', and 'market is growing'. The second group shows that rival products are differentiated is most closely associated with product technology is changing dramatically. Finally we see the following mature conditions grouped together with 'competitors are increasing': 'pricing similar between competitors', 'product features similar between competitors', and 'profit margins decreasing'. The additional insight this cluster analysis provides is that the second and third grouping are loosely associated together. This confirms that their industry

environments based on mature markets and competitive conditions that are linked to radical technological change, as proposed by Lei & Slocum (2005). Despite, the discrepancies related to stages of the industry life cycle, the cluster analysis does in fact confirm the different industry environments depicted by Lei & Slocum (2005). There is a mature set of conditions typical of steady evolution conditions (low rates of technological change and mature industries); there is a group based on radical technological change typical of wild wild west conditions (high rates of technological change and growth industries); these two groups can be linked together resulting in creative destruction conditions (high rates of technological change and mature industries). There is a set of conditions typical of fast growth conditions (low rates of technological change and growth industries).

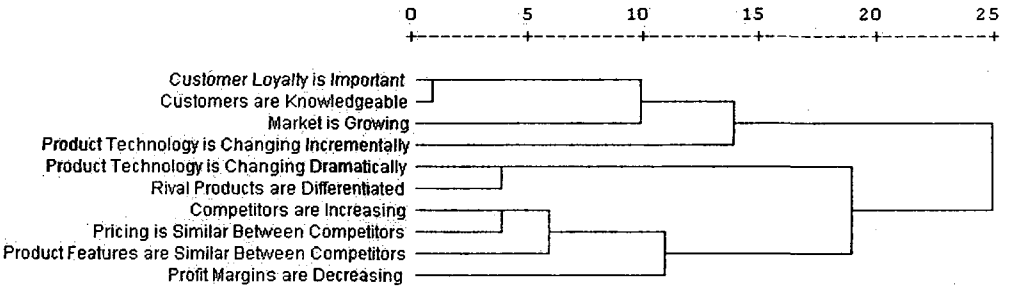

Figure 7 – Industry Environment – Hierarchical Cluster Analysis by Variable

Overall, the results based on actual experience are valuable because they determine the basis upon which organizations have to compete and provide alternative basis for analyzing knowledge governance. However, this analysis is left for future research.

6 Results

This chapter describes the results of the analysis based on the propositions developed in the research model.

6.1 Context

An organizations context plays a significant role in determining the way organizations govern their knowledge. The following analysis is based on the way environmental conditions are related to knowledge governance. The first section presents results based on hypercompetitive change, and the second section is based on industry environments.

6.1.1 Hypercompetitive Change

Results for items assessing hypercompetitive change were normally distributed (see Table 109, Appendix D). However, not all of the proposed constructs were reliable due to the exploratory nature of this research (see Appendix D). Constructs measuring hypercompetitive change in an organization's competitive conditions as well as environmental uncertainty both had alpha<.5 and were consequently excluded from the analysis.

6.1.1.1 Hypercompetitive Change and Creative Knowledge Governance

The relationship between hypercompetitive change and creative knowledge governance was analyzed using two sample t-tests to determine whether types of creative

knowledge governance were related to significantly higher levels of hypercompetitive change.

Organizations in which top executives participated in creative knowledge governance across vertical relationships experienced significantly less hypercompetitive change in their market conditions (M=3.74, SD=0.56) than organizations in which they don't (M=4.07, SD=.58), t(68)=2.16, p=.03 (Proposition 2).

Organizations in which top executives participated in creative knowledge governance across vertical relationships experienced significantly less hypercompetitive change in their regulatory conditions (M=3.40, SD=0.81) than organizations in which they don't (M=3.88, SD=.85), t(68)=2.15, p=.04 (Proposition 2).

	Top Executive Creative Vertical KG				
	No	Yes	t	df	p
Hypercompetitive Change in Market Conditions	4.07 (0.58)	3.74 (0.56)	2.16	68	0.03
Hypercompetitive Change in Regulatory Conditions	3.88 (0.85)	3.40 (0.81)	2.15	68	0.04

Table 30 – Hypercompetitive Change and Creative Knowledge Governance

6.1.2 Industry Environment

The analysis of how organizations are governing their knowledge is based on four distinct types of industry environments, defined by stage of industry life cycle and rates of technological change. While organizations could simply be classified in the quadrants proposed by Lei et al. (1999), based on rate of technological change, the stages of the industry life cycle were represented by a more complex set of data. Taking into consideration that the quadrants represent idealized sets conditions that may not represent the way organizations actually experience industry environments, firms were first

categorized based on their rate of technological change, and then the analysis was performed based on specific growth and mature industry conditions experienced by organizations. While this approach still allows us to discern differences in the way organizations govern knowledge based on the quadrants – it also provides a more detailed analysis based on specific conditions.

This also enables the development of future research based on different typologies of industry environments and ways in which these conditions are grouped together influencing competitive conditions of firms – as well as the way they are related to patterns of knowledge governance.

6.1.3 Significant Associations Between IC And KG by Quadrant

The relationship between industry conditions and types of knowledge governance was assessed by cross-tabulation to determine whether significant variations in knowledge governance were associated with industry conditions. The significant findings do indicate many differences exist in knowledge governance patterns in different industry conditions. Findings under 0.05 are discussed in the following section. It should be noted that the limitations of the data set also limited the patterns that could be reported, due to the minimum requirements of 5 expected counts per cell. However, the results of this research show what trends exist in knowledge governance and the discovery of new questions to be asked in the domain of knowledge governance, whereas future research can develop the picture with greater scope.

The following is an analysis of the specific patterns of knowledge governance based on specific industry conditions, followed by a comparison to the organizational

requirements for developing competencies in each quadrant - as proposed by Lei & Slocum's (2005) model of strategic archetypes.

6.1.4 Fast Growth Industry Environments

Organizations facing fast growth industry conditions, a low rate of technological change and a growth industry life cycle, reveal the most significant associations between industry conditions and types of knowledge governance. The associations are based on objective and learned types of knowledge governance that occur across horizontal and external relationships, when organizations market is growing, competitors are increasing, and customer loyalty is important.

Industry Condition	Type of KG	χ^2	p
Our market is growing	Business Leader Learned Horizontal KG	4.06	.044
	Business Line Objective Horizontal KG	5.72	.017
	Supplier Learned External KG	4.64	.031
Competitors are Increasing	Business Leader Objective Horizontal KG	7.80	.005
	Business Leader Learned Horizontal KG	4.76	.029
	Business Line Objective Horizontal KG	12.89	.000
	Business Line Learned Horizontal KG	5.65	.017
Customer Loyalty is important	Partner Objective External KG	4.15	.042
	Competitor Objective External KG	4.66	.031

Table 31 – Fast Growth: Low Rate of Technological Change and Growth Industry Life Cycle

6.1.4.1 Our Market is Growing

In organizations experiencing growing markets (and a low rate of technological change):

Business unit leaders participated in learned knowledge governance across horizontal relationships significantly more (77.1% vs 22.9%) than other organizations (54.3% vs 45.7%), $\chi^2(1)=4.06$, $p<.05$ (Proposition 3).

Business unit lines participated in objective knowledge governance across horizontal relationships significantly more (62.9% vs 37.1%) and in a manner contrary to other organizations (34.3% vs 65.7%), $\chi^2(1)=5.72$, $p<.05$ (Proposition 3).

Suppliers participated in learned knowledge governance across external relationships significantly more (60% vs 40%) and in a manner contrary to other organizations (34.3% vs 65.7%), $\chi^2(1)=4.64$, $p<.05$ (Proposition 3).

		Business Leader Learned Horizontal KG				
Growing Market & Low Rate of Tech Change		No	Yes	Total	χ^2	p
No	Freq	16	19	35	4.06	.044
	%	45.7	54.3	100.0		
	% of Ttl	22.9	27.1	50.0		
Yes	Freq	8	27	35		
	%	22.9	77.1	100.0		
	% of Ttl	11.4	38.6	50.0		
Total	Freq	24	46	70		
	% of Ttl	34.3	65.7	100.0		

Table 32 – Knowledge Governance by Fast Growth Industry Environments

		Business Line Objective Horizontal KG				
Growing Market & Low Rate of Tech Change		No	Yes	Total	χ^2	p
No	Freq	23	12	35	5.72	.017
	%	65.7	34.3	100.0		
	% of Ttl	32.9	17.1	50.0		
Yes	Freq	13	22	35		
	%	37.1	62.9	100.0		
	% of Ttl	18.6	31.4	50.0		
Total	Freq	36	34	70		
	% of Ttl	51.4	48.6	100.0		

Table 33 – Knowledge Governance by Fast Growth Industry Environments

Growing Market & Low Rate of Tech Change		Supplier Learned External KG			χ^2	p
		No	Yes	Total		
No	Freq	23	12	35	4.64	.031
	%	65.7%	34.3%	100.0%		
	% of Ttl	32.9%	17.1%	50.0%		
Yes	Freq	14	21	35		
	%	40.0%	60.0%	100.0%		
	% of Ttl	20.0%	30.0%	50.0%		
Total	Freq	37	33	70		
	% of Ttl	52.9%	47.1%	100.0%		

Table 34 – Knowledge Governance by Fast Growth Industry Environments

6.1.4.2 Our Competitors are Increasing

In organizations experiencing increasing competitors (and a low rate of technological change):

Business unit leaders participated in objective knowledge governance across horizontal relationships significantly more (90% vs 10%) than other organizations (60% vs 40%), $\chi^2(1)=7.80$, $p<.005$ (Proposition 3).

Business unit leaders participated in learned knowledge governance across horizontal relationships significantly more (80% vs 20%) than other organizations (55% vs 45%), $\chi^2(1)=4.76$, $p<.05$ (Proposition 3).

Business unit lines participated in objective knowledge governance across horizontal relationships significantly more (73.3% vs 26.7%) and in a manner opposite to other organizations (30% vs70%), $\chi^2(1)=12.89$, $p<.001$ (Proposition 3).

Business unit lines participated in learned knowledge governance across horizontal relationships significantly more (80% vs 20%) than other organizations (52.5% vs 47.5%), $\chi^2(1)=5.65$, $p<.05$ (Proposition 3).

Competitors Increasing & Low Rate of Tech Change		Business Leader Objective Horizontal KG			χ^2	p
		No	Yes	Total		
No	Freq	16	24	40	7.80	.005
	%	40.0	60.0	100.0		
	% of Ttl	22.9	34.3	57.1		
Yes	Freq	3	27	30		
	%	10.0	90.0	100.0		
	% of Ttl	4.3	38.6	42.9		
Total	Freq	19	51	70		
	% of Ttl	27.1	72.9	100.0		

Table 35 – Knowledge Governance by Fast Growth Industry Environments

Competitors Increasing & Low Rate of Tech Change		Business Leader Learned Horizontal KG			χ^2	p
		No	Yes	Total		
No	Freq	18	22	40	4.76	.029
	%	45.0%	55.0%	100.0%		
	% of Ttl	25.7%	31.4%	57.1%		
Yes	Freq	6	24	30		
	%	20.0%	80.0%	100.0%		
	% of Ttl	8.6%	34.3%	42.9%		
Total	Freq	24	46	70		
	% of Ttl	34.3%	65.7%	100.0%		

Table 36 – Knowledge Governance by Fast Growth Industry Environments

Competitors Increasing & Low Rate of Tech Change		Business Line Objective Horizontal KG			χ^2	p
		No	Yes	Total		
No	Freq	28	12	40	12.89	.000
	%	70.0%	30.0%	100.0%		
	% of Ttl	40.0%	17.1%	57.1%		
Yes	Freq	8	22	30		
	%	26.7%	73.3%	100.0%		
	% of Ttl	11.4%	31.4%	42.9%		
Total	Freq	36	34	70		
	% of Ttl	51.4%	48.6%	100.0%		

Table 37 – Knowledge Governance by Fast Growth Industry Environments

Competitors Increasing & Low Rate of Tech Change		Business Line Learned Horizontal KG			χ^2	p
		No	Yes	Total		
No	Freq	19	21	40	5.65	.017
	%	47.5%	52.5%	100.0%		
	% of Ttl	27.1%	30.0%	57.1%		
Yes	Freq	6	24	30		
	%	20.0%	80.0%	100.0%		
	% of Ttl	8.6%	34.3%	42.9%		
Total	Freq	25	45	70		
	% of Ttl	35.7%	64.3%	100.0%		

Table 38 – Knowledge Governance by Fast Growth Industry Environments

6.1.4.3 Customer Loyalty is Important

In organizations experiencing customer loyalty is important (and a low rate of technological change):

Partners participated in objective knowledge governance across external relationships significantly less (23.7% vs 76.3%) than other organizations (46.9% vs 53.1%), $\chi^2(1)=4.15$, $p<.05$ (Proposition 3).

Competitors participated in objective knowledge governance across external relationships significantly less (10.5% vs 89.5%) than other organizations (31.2% vs 68.8%), $\chi^2(1)=4.66$ $p<.05$ (Proposition 3).

Customer Loyalty Important & Low Rate of Tech Change		Partner Objective External KG			χ^2	p
		No	Yes	Total		
No	Freq	17	15	32	4.15	.042
	%	53.1%	46.9%	100.0%		
	% of Ttl	24.3%	21.4%	45.7%		
Yes	Freq	29	9	38		
	%	76.3%	23.7%	100.0%		
	% of Ttl	41.4%	12.9%	54.3%		
Total	Freq	46	24	70		
	% of Ttl	65.7%	34.3%	100.0%		

Table 39 – Knowledge Governance by Fast Growth Industry Environments

Customer Loyalty Important & Low Rate of Tech Change		Competitor Objective External KG			χ^2	p
		No	Yes	Total		
No	Freq	22	10	32	4.66	.031
	%	68.8%	31.2%	100.0%		
	% of Ttl	31.4%	14.3%	45.7%		
Yes	Freq	34	4	38		
	%	89.5%	10.5%	100.0%		
	% of Ttl	48.6%	5.7%	54.3%		
Total	Freq	56	14	70		
	% of Ttl	80.0%	20.0%	100.0%		

Table 40 – Knowledge Governance by Fast Growth Industry Environments

6.1.5 Wild Wild West Industry Environments

Organizations facing wild, wild west industry conditions, a high rate of technological change and a growth industry life cycle, reveal a significant association between the industry condition of 'customer loyalty is important' and knowledge governance based on 'customers sharing actual knowledge and experience' to determine business unit actions.

Industry Condition	Type of KG	χ^2	p
Customer loyalty is important	Customer Learned External KG	5.80	.016

Table 41 – Wild Wild West: High Rate of Technological Change and Growth Industry Life Cycle

6.1.5.1 Customer Loyalty is Important

In organizations customer loyalty is important (and a high rate of technological change):

Customers participated in learned knowledge governance across external relationships much less (25% vs75%) and in a manner opposite to other organizations (59.3% vs 40.7%), $\chi^2(1)=5.80$, $p<.05$ (Proposition 4).

Customers Loyalty is Important & High Rate of Tech Change		Customer Learned External KG			χ^2	p
		No	Yes	Total		
No	Freq	22	32	54	5.80	.016
	%	40.7	59.3	100.0		
	% of Ttl	31.4	45.7	77.1		
Yes	Freq	12	4	16		
	%	75.0	25.0	100.0		
	% of Ttl	17.1	5.7%	22.9		
Total	Freq	34	36	70		
	% of Ttl	48.6	51.4	100.0		

Table 42 – Knowledge Governance by Wild Wild West Industry Environments

6.1.6 Steady Evolution Industry Environments

Organizations facing steady evolution industry conditions, a low rate of technological change and a mature industry life cycle, reveal significant associations between industry conditions and types of knowledge governance. The association between knowledgeable customers are based on sharing all three types of knowledge – objective, learned and creative – across vertical relationships to determine the actions of the business unit. The condition of 'decreasing profit margins' is also associated with suppliers sharing objective knowledge.

Industry Condition	Type of KG	χ^2	p
Profit margins are decreasing	Supplier Objective External KG	4.84	.028
Customers are Knowledgeable	Top Executive Learned Vertical KG	3.72	.054
	Top Executive Creative Vertical KG	4.11	.043
	Business Leader Objective Vertical KG	4.05	.044

Table 43 – Steady Evolution: Low Rate of Technological Change and Mature Industry Life Cycle

6.1.6.1 Decreasing Profit Margins

In organizations experiencing decreasing profit margins (and a low rate of technological change):

Suppliers participated in objective knowledge governance across external relationships much less (25% vs75%) and in a manner opposite to other organizations (54% vs 46%), $\chi^2(1)=4.84$, $p<.05$ (Proposition 5).

Decreasing Profit Margins & Low Rate of Tech Change		Supplier Objective External KG			χ^2	p
		No	Yes	Total		
No	Freq	23	27	50	4.84	.028
	%	46.0%	54.0%	100.0%		
	% of Ttl	32.9%	38.6%	71.4%		
Yes	Freq	15	5	20		
	%	75.0%	25.0%	100.0%		
	% of Ttl	21.4%	7.1%	28.6%		
Total	Freq	38	32	70		
	% of Ttl	54.3%	45.7%	100.0%		

Table 44 – Knowledge Governance by Steady Evolution Industry Environments

6.1.6.2 Our Customers are Knowledgeable

In organizations experiencing knowledgeable customers (and a low rate of technological change):

Top executives participated in learned knowledge governance across vertical relationships much more than (75% vs 25%) and in a manner opposite to other organizations (52.9% vs 47.1%), $\chi^2(1)=3.71$, $p<.05$ (Proposition 5).

Top executives participated in creative knowledge governance across vertical relationships much more than (83.3% vs 16.7%) other organizations (61.8% vs 38.2%), $\chi^2(1)=4.11$, $p<.05$ (Proposition 5).

Business leaders participated in objective knowledge governance across vertical relationships much more than (91.7% vs 8.3%) other organizations (73.5% vs 26.5%), $\chi^2(1)=4.05$, $p<.05$ (Proposition 5).

Knowledgeable Customers & Low Rate of Tech Change		Top Executive Learned Vertical KG			χ^2	p
		No	Yes	Total		
No	Freq	16	18	34	3.71	.054
	%	47.1%	52.9%	100.0%		
	% of Ttl	22.9%	25.7%	48.6%		
Yes	Freq	9	27	36		
	%	25.0%	75.0%	100.0%		
	% of Ttl	12.9%	38.6%	51.4%		
Total	Freq	25	45	70		
	% of Ttl	35.7%	64.3%	100.0%		

Table 45 – Knowledge Governance by Steady Evolution Industry Environments

Knowledgeable Customers & Low Rate of Tech Change		Top Executive Creative Vertical KG			χ^2	p
		No	Yes	Total		
No	Freq	13	21	34	4.11	.043
	%	38.2%	61.8%	100.0%		
	% of Ttl	18.6%	30.0%	48.6%		
Yes	Freq	6	30	36		
	%	16.7%	83.3%	100.0%		
	% of Ttl	8.6%	42.9%	51.4%		
Total	Freq	19	51	70		
	% of Ttl	27.1%	72.9%	100.0%		

Table 46 – Knowledge Governance by Steady Evolution Industry Environments

Knowledgeable Customers & Low Rate of Tech Change		Business Leaders Objective Vertical KG			χ^2	p
		No	Yes	Total		
No	Freq	9	25	34	4.05	.044
	%	26.5%	73.5%	100.0%		
	% of Ttl	12.9%	35.7%	48.6%		
Yes	Freq	3	33	36		
	%	8.3%	91.7%	100.0%		
	% of Ttl	4.3%	47.1%	51.4%		
Total	Freq	12	58	70		
	% of Ttl	17.1%	82.9%	100.0%		

Table 47 – Knowledge Governance by Steady Evolution Industry Environments

6.1.7 Creative Destruction Industry Environments

Organizations facing creative destruction industry conditions, a high rate of technological change and a mature industry life cycle, reveal a significant association between the industry condition of 'knowledgeable customers' and knowledge governance

based on 'top executives sharing actual knowledge and experience' to determine business unit actions.

Industry Condition	Type of KG	χ^2	p
Customers are knowledgeable	Top Executive Learned Vertical KG	6.22	.013

Table 48 – Creative Destruction: High Rate of Technological Change and Mature Industry Life Cycle

6.1.7.1 Our Customers are Knowledgeable

In organizations experiencing knowledgeable customers (and a high rate of technological change):

Top executives participated in learned knowledge governance across vertical relationships much less than (35.7% vs 64.3%) and in a manner opposite to other organizations (71.4% vs 28.6%), $\chi^2(1)=6.22$, $p<.05$ (Proposition 6).

Knowledgeable Customers & High Rate of Tech Change		Top Executive Learned Vertical KG			χ^2	p
		No	Yes	Total		
No	Freq	16	40	56	6.22	.013
	%	28.6%	71.4%	100.0%		
	% of Ttl	22.9%	57.1%	80.0%		
Yes	Freq	9	5	14		
	%	64.3%	35.7%	100.0%		
	% of Ttl	12.9%	7.1%	20.0%		
Total	Freq	25	45	70		
	% of Ttl	35.7%	64.3%	100.0%		

Table 49 – Knowledge Governance by Creative Destruction Industry Environments

6.1.8 Summary of Propositions 1-6

#	Proposition	Results
1	Knowledge governance will vary based on conditions of an organization's context.	TRUE, KG associated w/ hypercompetitive change & varies by industry conditions
2	Creative methods of knowledge governance will be positively associated with greater hypercompetitive change.	FALSE, Negative association w/ Top Exec Creative KG
3	Organizations experiencing fast growth industry conditions will govern their knowledge in the manner of concept drivers. Specifically, organizations will:	
a	develop knowledge based on learned methods of knowledge governance – i.e. based on the knowledge and experience of its members;	TRUE, significantly more participation in Learned KG by BU Leader, BU Lines, & Suppliers
b	develop knowledge through a process of internal development – i.e. not based on external relationships;	TRUE and FALSE, significantly less participation in External KG by Partners, & Competitors – but significantly more by Suppliers
c	develop knowledge across horizontal relationships – i.e. across functions;	TRUE, significantly more participation in Horizontal KG by BU Leader, & BU Lines
d	develop knowledge based on objective methods of knowledge governance – i.e. based on a process of fast communication and information flow, using established syntax and methods of communicating across distributed domains of knowledge;	TRUE, significantly more participation in objective KG by BU Leader, & BU Lines
e	develop knowledge based on a technologically stable context and therefore not based on creating new interpretations of an organization's context - i.e. not based on creative methods of knowledge governance.	No Significant Variation
4	It is proposed that organizations experiencing wild wild west industry conditions will govern their knowledge in the manner of pioneers:	
a	develop knowledge based on creative methods of knowledge governance – i.e. based on creating product and technological innovations;	No Significant Variation
b	develop knowledge through unstructured and organic processes – i.e. not based on vertical, and horizontal relationships;	No Significant Variation
c	develop knowledge based on developing product and	TRUE, significantly less

	technological breakthroughs and not on established knowledge or knowledge and experience of stakeholders – i.e. not based on objective and learned methods of knowledge governance;	participation in Learned KG by Customers
d	develop knowledge based on insular or internally driven methods of developing knowledge such as internal debate and experimentation - i.e. not through external relationships.	TRUE, significantly less participation in Learned KG by Customers
5	It is proposed that organizations experiencing steady evolution industry conditions will govern their knowledge in the manner of consolidators:	
a	develop knowledge through vertical methods of knowledge governance – i.e. based on bureaucratic processes emphasizing inflexible decision-making and actions determined across hierarchal relationships;	TRUE, significantly more participation in Vertical KG by Top Execs, & BU Leader
b	develop knowledge based on objective methods of knowledge governance – such as operational standards and organizational objectives;	TRUE and FALSE, significantly more participation in objective KG by BU Leader, significantly less by Suppliers
c	develop knowledge based on non-innovative processes that don't incorporate insights from an organization's context or across functions – i.e. not through operational stakeholders or horizontal relationships;	No Significant Variation
d	develop knowledge based on managing external stakeholders to meet their operational standards and requirements – i.e. not across external relationships.	TRUE, significantly less participation in External KG by Suppliers
6	It is proposed that organizations experiencing creative destruction industry conditions will govern their knowledge in the manner of concept learners:	
a	develop knowledge based on creative methods of knowledge governance – i.e. creating new knowledge about technologies and new interpretations of markets;	No Significant Variation
b	develop knowledge through operational stakeholders – based on exploring and experimenting new technologies or ways of serving customers through an organizations context;	No Significant Variation
c	develop knowledge based on objective and learned methods of knowledge governance – based on established knowledge from mature industry;	FALSE, significantly less participation in learned KG by Top Exec
d	develop knowledge based on learned and creative methods of external knowledge governance – i.e. based on developing competencies and innovations in collaboration with external stakeholder such as partners, suppliers, etc.	No Significant Variation

6.2 Activities

The following section examines how variations in firms' activities – i.e. their strategic requirements - are related to types of knowledge governance.

Results for items describing strategic requirements of organizations were normally distributed (see Table 111, Appendix D). However, due to the exploratory nature of this research, not all the constructs based on each of the four strategic archteypes of the model were tested as reliable. The reliability of the construct based on strategic requirements for consolidator archetype had a reliability of 0.44.

In order to assess what natural groupings of strategic requirements were present in the items, and to provide an alternate analysis, factor analysis was performed. The results are presented below. The factor analysis indicated another means of grouping strategic requirements. These factors are included in the analysis of the relationship between strategic requirements and types of knowledge governance for exploratory purposes only.

6.2.1 Factor Analysis

Exploratory factor analysis was used to uncover the underlying dimensions in the set of strategy items. The purpose of exploratory factor analysis serves to define concepts by which to define organizational strategies in the future as well as to understand how items in the proposed models are actually related. Factor analysis was executed using principal components extraction and varimax rotation methods, and excluding missing cases pairwise. Items S5 and S20 were removed because they contributed to several factors at levels below .5. Item S12 was subsequently removed because its presence resulted in a factor that wasn't sufficiently reliable (alpha=.28). The resulting factor

analysis reduced the items to 5 reliable factors (alpha>.6) that have distinguishable characteristics that are useful in assessing how organizations strategy vary in relation to industry conditions and types of knowledge governance.

The five factors that emerged from the factor analysis are related to different dimensions of organizational strategy and are described below.

Items	**Factor 1: Product development based strategic requirements, Reliability =.91**
S2	Our firm is organized around product development - with significant investments in market research and R&D.
S7	Our firm is organized around R&D and converting technological and engineering competencies into new products.
S9	Our firm competes by being first to market with innovative or proprietary technologies.
S10	Our firm competes by sequentially developing new technologies and expanding quickly into niche markets.

Table 50 – Activities – Factor 1

Items	**Factor 2: Market based strategic requirements – Reliability= .75**
S19	Our firm competes by introducing new products that are easy to use.
S1	Our firm competes by developing a well-defined business concept that can be implemented in multiple markets.
S6	Our firm competes by introducing never-seen-before products to niche markets.
S4	Our firm competes by developing differentiated products that are well branded and highly valued by the marketplace.

Table 51 – Activities – Factor 2

Items	**Factor 3: Strategic requirements related to external relationships – Reliability = .76**
S8	Our firm seeks to license our technology and ideas to other firms in order to reduce the risks and challenges of full market exploitation.
S18	Our firm seeks joint ventures or strategic alliances with firms that have complementary technologies or market insights.
S17	Our firm creates entirely new business units or groups to learn about and experiment with emerging technologies.

Table 52 – Activities – Factor 3

Items	**Factor 4: Strategic requirements for mature industries– Reliability = .59**
S15	Our firm competes by reducing its capital structure and business risk through outsourcing.
S16	Our firm competes by developing new strategies for mature markets.
S14	Our firm competes by delivering standardized products at a low cost.
S11	Our firm competes by offering as wide a product line as possible to a broad market.

Table 53 – Activities – Factor 4

Items	Factor 5: Acquisition based strategic requirements – Reliability =.69
S13	Our firm seeks to merge or acquire competitors in order to increase our size and efficiency.
S3	Our firm seeks to acquire companies that enable us to sell new products or enter new markets quickly.

Table 54 – Activities – Factor 5

6.2.2 Knowledge Governance and Activities

The relationship between knowledge governance and strategic requirements of organizations was assessed using a two sample t-test. Organizations develop competencies through different types of knowledge governance in order to meet their strategic requirements. The following analysis depicts how specific types of knowledge governance are associated with variations in strategic requirements of organizations. The analysis is based on the three archetypes that had a reliability>.6, as well as the strategic factors presented above.

6.2.2.1 Activities of Pioneers

- Organizations had less strategic requirements of pioneers when BU leaders participated in learned vertical knowledge governance (M=2.37, SD=1.08) than when they didn't (M=3.50, SD=.73), t(60)=2.50, p=.015 (Proposition 8).
- Organizations had less strategic requirements of pioneers when internal units participated in learned horizontal knowledge governance (M=2.10, SD=0.96) than when they didn't (M=2.67, SD=1.13), t(60)=1.99, p=.051 (Proposition 8).
- Organizations had less strategic requirements of pioneers when customers participated in learned external knowledge governance (M=2.08, SD=0.96) than when they didn't (M=2.84, SD=1.11), t(60)=2.89, p=.005 (Proposition 8).

- Organizations had less strategic requirements of pioneers when BU leaders participated in objective external knowledge governance (M=2.20, SD=1.08) than when they didn't (M=2.91, SD=1.01), t(60)=2.56, p=.013 (Proposition 8).
- Organizations had less strategic requirements of pioneers when partners participated in creative external knowledge governance (M=1.89, SD=0.85) than when they didn't (M=2.68, SD=1.11), t(60)=2.61, p=.012 (Proposition 8).

	Business Leader Learned Vertical KG				
Strategy Construct or Factor	No	Yes	t	df	p
Pioneer	3.50 (0.73)	2.37 (1.08)	2.50	60	0.015

Table 55 – Knowledge Governance and Activities – Pioneer

	Internal Unit Learned Horizontal KG				
Strategy Construct or Factor	No	Yes	t	df	p
Pioneer	2.67 (1.13)	2.10 (0.96)	1.99	60	0.051

Table 56 – Knowledge Governance and Activities – Pioneer

	Customer Learned External KG				
Strategy Construct or Factor	No	Yes	t	df	p
Pioneer	2.84 (1.11)	2.08 (0.96)	2.89	60	0.005

Table 57 – Knowledge Governance and Activities – Pioneer

	Business Leader Objective External KG				
Strategy Construct or Factor	No	Yes	t	df	p
Pioneer	2.91 (1.01)	2.20 (1.08)	2.56	60	0.013

Table 58 – Knowledge Governance and Activities – Pioneer

	Business Leader Learned External KG				
Strategy Construct or Factor	No	Yes	t	df	p
Pioneer	2.80 (1.04)	2.17 (1.08)	2.34	60	0.023

Table 59 – Knowledge Governance and Activities – Pioneer

Strategy Construct or Factor	Partner Creative External KG		t	df	p
	No	Yes			
Pioneer	2.68	1.89	2.61	60	0.012
	(1.11)	(0.85)			

Table 60 – Knowledge Governance and Activities – Pioneer

6.2.2.2 Activities of Concept Learners

- Organizations had less strategic requirements of concept learners when BU leaders participated in learned vertical knowledge governance (M=3.11, SD=0.86) than when they didn't (M=3.81, SD=.47), t(65)=2.09, p=.041 (Proposition 10).
- Organizations had less strategic requirements of concept learners when suppliers participated in objective external knowledge governance (M=2.92, SD=0.85) than when they didn't (M=3.41, SD=.80), t(65)=2.42, p=.019 (Proposition 10).
- Organizations had more strategic requirements of concept learners when BU leaders participated in creative vertical knowledge governance (M=3.36, SD=0.82) than when they didn't (M=2.96, SD=.86), t(65)=-1.96, p=.054 (Proposition 10).
- Organizations had more strategic requirements of concept learners when BU leaders participated in objective external knowledge governance (M=3.64, SD=0.69) than when they didn't (M=3.03, SD=.86), t(65)=-2.62, p=.011 (Proposition 10).

Strategy Construct or Factor	Business Leader Creative Vertical KG		t	df	p
	No	Yes			
Concept Learner	2.96	3.36	-1.96	65	0.054
	(0.86)	(0.82)			

Table 61 – Knowledge Governance and Activities – Concept Learner

Strategy Construct or Factor	Business Leader Learned Vertical KG		t	df	p
	No	Yes			
Concept Learner	3.81	3.11	2.09	65	0.041
	(0.47)	(0.86)			

Table 62 – Knowledge Governance and Activities – Concept Learner

Strategy Construct or Factor	Supplier Objective External KG		t	df	p
	No	Yes			
Concept Learner	3.41	2.92	2.42	65	0.019
	(0.80)	(0.85)			

Table 63 – Knowledge Governance and Activities – Concept Learner

Strategy Construct or Factor	Business Line Objective External KG		t	df	p
	No	Yes			
Concept Learner	3.03	3.64	-2.62	65	0.011
	(0.86)	(0.69)			

Table 64 – Knowledge Governance and Activities – Concept Learner

6.2.2.3 Activities Based on Product Development

- Organizations had less strategic requirements based on product development when customers participated in learned external knowledge governance (M=2.21, SD=1.11) than when they didn't (M=2.96, SD=1.21), t(60)=2.53, p=.014.
- Organizations had less strategic requirements based on product development when partners participated in creative external knowledge governance (M=2.05, SD=1.07) than when they didn't (M=2.78, SD=1.21), t(60)=2.16, p=.035.

Strategy Construct or Factor	Customer Learned External KG		t	df	p
	No	Yes			
Product Development	2.96	2.21	2.53	60	0.014
	(1.21)	(1.11)			

Table 65 – Knowledge Governance and Activities – Product Development

Strategy Construct or Factor	Partner Creative External KG		t	df	p
	No	Yes			
Product Development	2.78 (1.21)	2.05 (1.07)	2.16	60	0.035

Table 66 – Knowledge Governance and Activities – Product Development

6.2.2.4 Activities based on Market Oriented

- Organizations had less strategic requirements based on marketing when partners participated in creative external knowledge governance (M=3.04, SD=1.18) than when they didn't (M=3.60, SD=0.86), t(65)=2.09, p=.041.

Strategy Construct or Factor	Partner Creative External KG		t	df	p
	No	Yes			
Market	3.60 (0.86)	3.04 (1.18)	2.09	65	0.041

Table 67 – Knowledge Governance and Activities – Market

6.2.2.5 Activities based on External Relationships

- Organizations had more strategic requirements related to external relationships when BU lines participated in objective external knowledge governance (M=3.24, SD=0.94) than when they didn't (M=2.47, SD=.99), t(63)=-2.80, p=.007.

Strategy Construct or Factor	Business Line Objective External KG		t	df	P
	No	Yes			
External Relationships	2.47 (0.99)	3.24 (0.94)	-2.80	63	0.007

Table 68 – Knowledge Governance and Activities – External Relationships

6.2.2.6 Activities based on Mature Markets

- Organizations had less strategic requirements related to mature markets when BU lines participated in learned external knowledge governance (M=3.03, SD=0.77) than when they didn't (M=3.43, SD=.62), t(65)=2.32, p=.024.

	Business Line Learned External KG				
Strategy Construct or Factor	No	Yes	t	df	p
Mature Markets	3.43 (0.62)	3.03 (0.77)	2.32	65	0.024

Table 69 – Knowledge Governance and Activities – Mature Markets

6.2.2.7 Activities based on Acquisitions

- Organizations had less strategic requirements related to acquisitions when BU lines participated in learned vertical knowledge governance (M=2.62, SD=1.21) than when they didn't (M=3.34, SD=1.32), t(60)=2.11, p=.039.
- Organizations had less strategic requirements related to acquisitions when competitors participated in objective external knowledge governance (M=2.12, SD=1.26) than when they didn't (M=3.03, SD=1.23), t(60)=2.37, p=.021.
- Organizations had less strategic requirements related to acquisitions when competitors participated in creative external knowledge governance (M=1.88, SD=1.09) than when they didn't (M=2.98, SD=1.26), t(60)=2.36, p=.022.

	Business Line Learned Vertical KG				
Strategy Construct or Factor	No	Yes	t	df	p
Acquisition	3.34 (1.32)	2.62 (1.21)	2.11	60	0.039

Table 70 – Knowledge Governance and Activities – Acquisition

Strategy Construct or Factor	Competitor Objective External KG		t	df	p
	No	Yes			
Acquisition	3.03	2.12	2.37	60	0.021
	(1.23)	(1.26)			

Table 71 – Knowledge Governance and Activities – Acquisition

Strategy Construct or Factor	Competitor Creative External KG		t	df	p
	No	Yes			
Acquisition	2.98	1.88	2.36	60	0.022
	(1.26)	(1.09)			

Table 72 – Knowledge Governance and Activities – Acquisition

6.2.3 Summary of Propositions 7-10

#	Proposition	Results
7	It is proposed that strategic requirements of concept drivers will be positively associated with :	
a	developing knowledge based on learned methods of knowledge governance – i.e. based on the knowledge and experience of its members;	No significant association
b	developing knowledge through a process of internal development – i.e. not based on external relationships;	No significant association
c	developing knowledge across horizontal relationships – i.e. across functions;	No significant association
d	developing knowledge based on objective methods of knowledge governance – i.e. based on a process of fast communication and information flow, using established syntax and methods of communicating across distributed domains of knowledge;	No significant association
e	developing knowledge based on a technologically stable context and therefore not based on creating new interpretations of an organization's context - i.e. not based on creative methods of knowledge governance.	No significant association
8	It is proposed that strategic requirements of pioneers will be positively associated with :	

a	developing knowledge based on creative methods of knowledge governance – i.e. based on creating product and technological innovations;	FALSE, negatively associated with Partner participation in creative KG
b	developing knowledge through unstructured and organic processes – i.e. not based on vertical, and horizontal relationships;	TRUE, negatively associated with BU Leader participation in vertical, and Internal Unit in horizontal KG
c	developing knowledge based on developing product and technological breakthroughs and not on established knowledge or knowledge and experience of stakeholders – i.e. not based on objective and learned methods of knowledge governance;	TRUE, negatively associated with BU Leader, Internal Unit & Customer participation in learned KG, and BU Leader participation in objective KG
d	developing knowledge based on insular or internally driven methods of developing knowledge such as internal debate and experimentation - i.e. not through external relationships.	TRUE, negatively associated with BU Leader, Customer, & Partner participation in external KG
9	It is proposed that strategic requirements of consolidators will be positively associated with:	
a	developing knowledge through vertical methods of knowledge governance – i.e. based on bureaucratic processes emphasizing inflexible decision-making and actions determined across hierarchal relationships;	No significant association
b	developing knowledge based on objective methods of knowledge governance – such as operational standards and organizational objectives;	No significant association
c	developing knowledge based on non-innovative processes that don't incorporate insights from an organization's context or across functions – i.e. not through operational stakeholders or horizontal relationships;	No significant association
d	developing knowledge based on managing external stakeholders to meet their operational standards and requirements – i.e. not across external relationships.	No significant association
10	It is proposed that strategic requirements of concept learners will be positively associated with:	
a	developing knowledge based on creative methods of knowledge governance – i.e. creating new knowledge about technologies and new interpretations of markets;	TRUE, positively associated with BU Leader participation in creative KG
b	developing knowledge through operational stakeholders – based on exploring and experimenting new technologies or ways of serving customers through an organizations context;	No significant association
c	developing knowledge based on objective and learned methods of knowledge governance – based on established knowledge from mature industry;	TRUE and FALSE, positively associated with BU Line participation in objective KG, negatively associated with BU Leader in learned KG, & Supplier in

		objective KG
d	developing knowledge based on learned and creative methods of external knowledge governance – i.e. based on developing competencies and innovations in collaboration with external stakeholder such as partners, suppliers, etc.	No significant association

6.3 Organization

6.3.1 Descriptive Statistics of Individual Items

Organizational priorities related to the way they develop knowledge are determined by their social context of the organization. Four of the ten items in the survey that measured an organization's priorities were negatively skewed indicating that priorities related to developing knowledge are important to all organizations (see Table 114, Appendix D). The strategic priorities related to organizational learning that were negatively skewed were business adaptability (M=4.23, SD=.71) and operational efficiency (M=4.64, SD=.59). The development of competencies that were important priorities for firms were both market-oriented, based on developing knowledge about customer groups (M=4.14, SD=.93) and customer needs (M=4.35, SD=.86). The competency that was lowest priority and widest distribution for organizations (M=3.22, SD=1.30) was based on discovering and inventing new applications of product development knowledge.

6.3.2 Knowledge Governance and Organization

Organizations develop competencies through knowledge governance processes. The following results describe how types of knowledge governance are associated with

variations in the prioritization of organizational competencies based on t-tests between the two variables.

6.3.2.1 Market Oriented Competencies

- Organizations in which top executives participated in creative knowledge governance across vertical relationships prioritized developing knowledge about customer needs more (M=4.51, SD=.68) than in organizations in which they don't (M=3.95, SD=1.13), $t(66)$=-2.52, p=.014 (Propositions 11 and 13).
- Organizations in which competitors participated in learned knowledge governance across external relationships prioritized developing market knowledge about customer groups less (M=3.83, SD=1.13) than organizations in which they don't (M=4.32, SD=.76), $t(63)$=2.07, p=.043 (Propositions 11 and 13).
- Organizations in which competitors participated in learned knowledge governance across external relationships prioritized developing knowledge about customer needs less (M=4.04, SD=1.06) than organizations in which they don't (M=4.53, SD=.67), $t(66)$=2.37, p=.021 (Propositions 11 and 13).
- Organizations in which business leaders participated in objective knowledge governance across vertical relationships prioritized developing knowledge about competitor's activities more (M=3.93, SD=.95) than in organizations in which they don't (M=3.25, SD=1.22), $t(66)$=-2.13, p=.037 (Propositions 11 and 13).

	Top Executive Creative Vertical KG				
Priority	No	Yes	t	df	p
Developing knowledge about customer needs	3.95 (1.13)	4.51 (0.68)	-2.52	66	0.014

Table 73 – Knowledge Governance and Organization – Market Oriented Competencies

Priority	Business Leader Objective Vertical KG		t	df	p
	No	Yes			
Developing knowledge about our competitors' activities	3.25 (1.22)	3.93 (0.95)	-2.13	66	0.037

Table 74 – Knowledge Governance and Organization – Market Oriented Competencies

Priority	Competitor Learned External KG		t	df	p
	No	Yes			
Developing knowledge about customer needs	4.53 (0.67)	4.04 (1.06)	2.37	66	0.021

Table 75 – Knowledge Governance and Organization – Market Oriented Competencies

Priority	Competitor Learned External KG		t	df	p
	No	Yes			
Developing market knowledge about customer groups	4.32 (0.76)	3.83 (1.13)	2.07	63	0.043

Table 76 – Knowledge Governance and Organization – Market Oriented Competencies

6.3.2.2 Architectural Competencies

- Organizations in which top executives participated in creative knowledge governance across vertical relationships prioritized integrating the knowledge of internal groups less (M=3.83, SD=.81) than organizations who don't (M=4.50, SD=.54), $t(66)=2.27$, p=.027 (Propositions 11 and 14)

Priority	Top Executive Creative Vertical KG		t	df	p
	No	Yes			
Integrating the knowledge of internal groups	4.50 (0.54)	3.83 (0.81)	2.27	66	0.027

Table 77 – Knowledge Governance and Organization – Architectural Competencies

- Organizations in which top executives participated in creative knowledge governance across vertical relationships prioritized developing up to date business knowledge less (M=4.03, SD=.82) than organizations which didn't (M=4.63, SD=.52), $t(67)=1.99$, p=.050 (Propositions 11 and 14).

Priority	Top Executive Creative Vertical KG		t	df	p
	No	Yes			
Developing up-to-date business knowledge	4.63 (0.52)	4.03 (0.82)	1.99	67	0.050

Table 78 – Knowledge Governance and Organization – Architectural Competencies

6.3.2.3 Product Development Competencies

- Organizations in which internal units participated in creative knowledge governance across horizontal relationships prioritized discovering and inventing new applications of product development knowledge less (M=2.54, SD=1.39) than organizations which didn't (M=3.40, SD=1.23), $t(61)$=2.19, p=.032 (Propositions 11 and 15).
- Organizations in which customers participated in learned knowledge governance across external relationships prioritized discovering and inventing new applications of product development knowledge less (M=2.84, SD=1.35) than organizations in which they don't (M=3.61, SD=1.15), $t(61)$=2.44, p=.018 (Propositions 11 and 15).
- Organizations in which partners participated in creative knowledge governance across external relationships prioritized discovering and inventing new applications of product development knowledge less (M=2.72, SD=1.32) than organizations in which they don't (M=3.42, SD=1.25), $t(61)$=1.97, p=.053 (Propositions 11 and 15).

Priority	Internal Unit Creative Horizontal KG		t	df	p
	No	Yes			
Discovering and inventing new applications of product development knowledge	3.40 (1.23)	2.54 (1.39)	2.19	61	0.032

Table 79 – Knowledge Governance and Organization – Product Development Competencies

Priority	Customer Learned External KG		t	df	p
	No	Yes			
Discovering and inventing new applications of product development knowledge	3.61 (1.15)	2.84 (1. 35)	2.44	61	0.018

Table 80 – Knowledge Governance and Organization – Product Development Competencies

Priority	Partner Creative External KG		t	df	p
	No	Yes			
Discovering and inventing new applications of product development knowledge	3.42 (1.25)	2.72 (1.32)	1.97	61	0.053

Table 81 – Knowledge Governance and Organization – Product Development Competencies

6.3.2.4 OL-based Strategic Priorities

- Organizations in which BU leaders participated in objective knowledge governance across horizontal relationships prioritized strategic innovation more (M=4.00, SD=0.98) than organizations in which they don't (M=3.47, SD=.90), t(66)=-2.03, p=.046 (Propositions 11 and 12).
- Organizations in which BU leaders participated in creative knowledge governance across horizontal relationships prioritized strategic innovation more (M=4.05, SD=0.99) than organizations in which they don't (M=3.57, SD=.92), t(66)=-2.02, p=.047 (Propositions 11 and 12).

Priority	Business Leader Objective Horizontal KG		t	df	p
	No	Yes			
Strategic Innovation	3.47 (0.90)	4.00 (0.98)	-2.03	66	0.046

Table 82 – Knowledge Governance and Organization – OL-Based Strategic Priorities

Priority	Business Leader Creative Horizontal KG		t	df	p
	No	Yes			
Strategic Innovation	3.57	4.05	-2.02	66	0.047
	(0.92)	(0.99)			

Table 83 – Knowledge Governance and Organization – OL-Based Strategic Priorities

6.3.3 Summary of Propositions 11-15

#	Proposition	Results
11		
a	Learned and creative methods of knowledge governance will be positively associated with priorities related to organizational learning and competency development.	TRUE and FALSE : Market Competencies : Top Exec Creative positively associated with customer needs; Architectural Competencies: Top Exec Creative negatively associated with integrating internal knowledge, and up-to-date knowledge; Product Development Competencies: Internal Unit Creative, Customer Learned, & Partner Creative negatively associated with product development; Organizational Learning: BU Leader Creative (horizontal) positively associated with strategic innovation;
b	Objective methods of knowledge governance will be negatively associated with priorities related to organizational learning and competency development	FALSE BU Leader Objective (vertical) positively associated with competitor's activities; BU Leader Objective (horizontal) positively associated with strategic innovation;
12	Creative methods of knowledge governance will	TRUE, BU Leader Creative (horizontal) positively
a	be positively associated to the prioritization of strategic innovation;	associated with strategic innovation;
b	Learned methods of knowledge governance will be positively associated to the prioritization of operational efficiency;	No significant association
c	External methods of knowledge governance will be positively associated to the prioritization of business adaptability;	No significant association
d	Internal methods of knowledge governance will be	No significant association

	positively associated to the prioritization of changing internal practices.	
13	The prioritization of marketing competencies will be positively associated with vertical, horizontal and customer types of knowledge governance. *Exploratory*	TRUE, Top Exec Creative positively associated with customer needs; BU Leader Objective (vertical) with competitor's activities; Competitor Learned negatively associated with customer needs and market groups;
14	The prioritization of technological competencies will be positively associated with vertical and functional types of knowledge governance. *Exploratory*	No significant association Internal Unit Creative, Customer Learned, & Partner Creative negatively associated with product development;
15	The prioritization of architectural competencies will be positively associated with horizontal and external methods of knowledge governance. *Exploratory*	No significant association Top Exec Creative negatively associated with integrating internal knowledge, and up-to-date knowledge;

6.4 Outcomes

6.4.1 Descriptive Statistics of Variables

Organizational performance was assessed based on two methods – assessing measures related to financial performance and assessing success at organizational learning. Both methods produced results that were normally distributed (see Table 116, Appendix D). The testing of performance related to knowledge governance was based on the operationalization – financial performance was analyzed along two dimensions, growth and profit, whereas success at OL was analyzed based on each individual item.

6.4.2 Knowledge Governance and Outcomes

The relationship between performance and types of knowledge governance was analyzed using a two sample t-test. The null hypothesis of this test is that there is no variation in performance based on the participation of stakeholders in different types of knowledge governance. The results presented are limited to types of knowledge governance that are related to significant variations in performance.

6.4.3 Vertical Knowledge Governance

- Organizations in which top executives participated in objective knowledge governance across vertical relationships performed better (M=3.55, SD=0.83) than ones that don't (M=2.95, SD=0.59), t(66)=-2.18, p=.033 (Proposition 16).
- Organizations in which top executives participated in creative knowledge governance across vertical relationships performed better (M=3.73, SD=0.83) than ones that don't (M=3.08, SD=0.67), t(65)=-3.03, p=.003 (Proposition 16).
- Organizations in which business unit leaders participated in creative knowledge governance across vertical relationships performed better (M=3.75, SD=0.96) than ones that don't (M=3.17, SD=0.87), t(62)=-2.55, p=.013 (Proposition 16).

	Top Executive Objective Vertical KG				
	No	Yes	t	df	p
Performance	2.95 (0.59)	3.55 (0.83)	-2.18	66	0.033

Table 84 – Knowledge Governance and Outcomes – Financial Performance

	Top Executive Creative Vertical KG				
	No	Yes	t	df	p
PGrowth	3.08 (0.67)	3.73 (0.83)	-3.03	65	0.003

Table 85 – Knowledge Governance and Outcomes – Financial Performance

	BU Leader Creative Vertical KG				
	No	Yes	t	df	p
PProfit	3.17 (0.87)	3.75 (0.96)	-2.55	62	0.013

Table 86 – Knowledge Governance and Outcomes – Financial Performance

6.4.3.1 Influential Type of Knowledge and Performance

Independent-samples t-tests were conducted to evaluate whether performance varied based on the types of knowledge that had the greatest influence on business unit actions.

- Organizations in which sharing objective knowledge had the greatest influence in determining business unit actions were less successful in operational efficiency (M=3.62, SD=0.94) than other organizations (M=4.12, SD=0.77), t(66)=2.40, p=.019 (Proposition 17).
- Organizations in which sharing objective knowledge had the greatest influence in determining business unit actions were less successful in changing internal practices (M=3.19, SD=0.81) than other organizations (M=3.78, SD=0.84), t(65)=2.70, p=.009 (Proposition 17).
- Organizations in which sharing both objective and learned knowledge had the greatest influence in determining business unit actions were more successful in

changing internal practices (M=4.67, SD=0.58) than other organizations (M=3.55, SD=0.85), t(65)=2.24, p=.028 (Proposition 17).

- Organizations in which sharing both learned and creative knowledge had the greatest influence in determining business unit actions performed better in growth (M=4.40, SD=0.65) than other organizations (M=3.48, SD=0.82), t(65)=-2.46, p=.017 (Proposition 17).

	Objective				
	No	Yes	t	df	p
Operational Efficiency Success	4.12 (0.77)	3.62 (0.94)	2.40	66	0.019

Table 87 – Knowledge Governance and Outcomes – OL Outcomes

	Objective				
	No	Yes	t	df	p
Changing Internal Practices Success	3.78 (0.84)	3.19 (0.81)	2.70	65	0.009

Table 88 – Knowledge Governance and Outcomes – OL Outcomes

	Objective & Learned*				
	No	Yes	t	df	p
Changing Internal Practices Success	3.55 (0.85)	4.67 (0.58)	-2.24	65	0.028

Table 89 – Knowledge Governance and Outcomes – OL Outcomes

	Learned & Creative*				
	No	Yes	t	df	p
PGrowth	3.48 (0.82)	4.40 (0.65)	-2.46	65	0.017

Table 90 – Knowledge Governance and Outcomes – Financial Performance

* Organizations were allowed to provide multiple answers to questions, and consequently organizations often selected more than one type of knowledge that had the greatest influence on business unit actions.

6.4.4 Horizontal Knowledge Governance

- Organizations in which internal units participate in objective knowledge governance across horizontal relationships perform worse overall (M=3.10, SD=0.73) than ones that don't (M=3.60, SD=0.83), t(66)=2.31, p=.024 (Proposition 16).
- Organizations in which internal units participate in objective knowledge governance across horizontal relationships perform worse in profit (M=3.06, SD=0.99) than ones that don't (M=3.62, SD=0.92), t(62)=2.05, p=.044 (Proposition 16).

	Internal units Objective Horizontal KG				
	No	Yes	t	df	p
Performance	3.60 (0.83)	3.10 (0.73)	2.31	66	0.024
Pprofit	3.62 (0.92)	3.06 (0.99)	2.05	62	0.044

Table 91 – Knowledge Governance and Outcomes – Financial Performance

6.4.4.1 Influential Type of Knowledge and Performance

- Organizations in which sharing objective knowledge had the greatest influence in determining business unit actions performed better in profit (M=3.67, SD=0.96) than other organizations (M=3.05, SD=0.84), t(62)=2.51, p=.015 (Proposition 17).
- Organizations in which sharing creative knowledge had the greatest influence in determining business unit actions were more successful in changing internal practices (M=4.09, SD=0.70) than other organizations (M=3.50, SD=0.87), t(65)=-2.11, p=.039 (Proposition 17).

	Objective		t	df	p
	No	Yes			
PProfit	3.05 (0.84)	3.67 (0.96)	2.51	62	0.015

Table 92 – Knowledge Governance and Outcomes – Financial Performance

	Creative		t	df	p
	No	Yes			
Changing Internal Practices Success	3.50 (0.87)	4.09 (0.70)	-2.11	65	0.039

Table 93 – Knowledge Governance and Outcomes – OL Outcomes

- Organizations in which sharing objective knowledge only had the greatest influence in determining business unit actions performed worse in profit (M=2.96, SD=0.87) than other organizations (M=3.64, SD=0.94), t(62)=2.51, p=.015 (Proposition 17).
- Organizations in which sharing objective knowledge only had the greatest influence in determining business unit actions were less successful at changing internal practices (M=3.00, SD=1.04) than other organizations (M=3.75, SD=0.76), t(65)=3.06, p=.003 (Proposition 17).

	Objective only		t	df	p
	No	Yes			
PProfit	3.64 (0.94)	2.96 (0.87)	2.51	62	0.015
Changing Internal Practices Success	3.75 (0.76)	3.00 (1.04)	3.06	65	0.003

Table 94 – Knowledge Governance and Outcomes

6.4.5 External Knowledge Governance

- Organizations in which customers participate in objective knowledge governance across external relationships perform better in profit (M=3.77, SD=0.88) than ones that don't (M=3.29, SD=0.97), t(62)=-2.01, p=.049 (Proposition 16).

	Customer Objective External KG				
	No	Yes	t	df	p
Pprofit	3.29 (0.97)	3.77 (0.88)	-2.01	62	0.049

Table 95 – Knowledge Governance and Outcomes – Financial Performance

6.4.5.1 Influential Type of Knowledge and Performance

- Organizations in which sharing learned and creative knowledge both had the greatest influence in determining business unit actions performed better (M=4.50, SD=0.50) than other organizations (M=3.50, SD=0.83), t(65)=-2.07, p=.042 (Proposition 17).

	Learning & Creative				
	No	Yes	t	df	p
Pgrowth	3.50 (0.83)	4.50 (0.50)	-2.07	65	0.042

Table 96 – Knowledge Governance and Outcomes – Financial Performance

6.4.6 Summary of Propositions 16-17

#	Proposition	Results
16 a	Objective knowledge governance will be associated to lower performance.	TRUE and FALSE Top Exec Objective is positively associated with Performance Internal Unit Objective is negatively associated with Overall Performance and Performance based on Profit Customer Objective is positively associated with Performance based on Profit

b	Learned and creative methods of knowledge governance will be associated to higher performance.	TRUE Top Exec Creative is positively associated with Performance based on Growth
17 a	Organizations in which objective methods of knowledge have the greatest influence in determining business unit actions will be associated to lower performance.	TRUE and FALSE Vertical KG : Objective methods are negatively associated with OL Success based on Operational Efficiency and Changing Internal Practices When objective methods are paired with learned, positively associated with OL Success based on Changing Internal Practices Horizontal KG : Objective methods are positively associated with Performance based on Profit Objective methods that are not paired with other methods are negatively associated with Performance based on Profit, and OL Success based on Changing Internal Practices;
b	Organizations in which learned or creative methods of knowledge have the greatest influence in determining business unit actions will be associated to higher performance.	TRUE Vertical KG : When learned and creative methods are paired, positively associated with Performance based on Growth. Horizontal KG : Creative methods positively associated with OL Success based on Changing Internal Practices External KG : When learned and creative methods are paired, positively associated with Performance based on Growth.

6.5 Summary by Stakeholder

6.5.1 Vertical

Vertical	Top Executive Knowledge Governance		
	Objective	Learned	Creative
Performance	positive		
Performance based on growth			positive
Steady evolution industry conditions		more	more
Creative destruction industry conditions		less	
Hypercompetitive market conditions			negative
Hypercompetitive regulatory conditions			negative
Market competency priority (customer needs)			positive
Architectural competency priority (integrating internal k)			negative
Architectural competency priority (up-to-date k)			negative

Table 97 – Vertical – Top Executive Knowledge Governance

Vertical	BU Leader Knowledge Governance		
	Objective	Learned	Creative
Performance based on profit			positive
Steady evolution industry conditions	more		
Market competency priority (competitors' activities)	positive		
Concept learner activities		negative	positive
Pioneer activities		negative	

Table 98 – Vertical – BU Leader Knowledge Governance

Vertical	BU Line Knowledge Governance		
	Objective	Learned	Creative
Acquisition activities		negative	

Table 99 – Vertical – BU Line Knowledge Governance

6.5.2 Horizontal

Horizontal	BU Leader Knowledge Governance		
	Objective	Learned	Creative
Fast growth industry conditions	more	more	
Strategic innovation priority	positive		positive

Table 100 – Horizontal – BU Leader Knowledge Governance

Horizontal	BU Line Knowledge Governance		
	Objective	Learned	Creative
Fast growth industry conditions	more	more	

Table 101 – Horizontal – BU Line Knowledge Governance

Horizontal	Internal Unit Knowledge Governance		
	Objective	Learned	Creative
Performance	Less		
Performance based on profit	less		
Technological competency priority (product dev)			negative
Pioneer activities		negative	

Table 102 – Horizontal – Internal Unit Knowledge Governance

6.5.3 External

External	BU Leader Knowledge Governance		
	Objective	Learned	Creative
Pioneer activities	negative	negative	

Table 103 – External – BU Leader Knowledge Governance

External	BU Line Knowledge Governance		
	Objective	Learned	Creative
Concept learner activities	positive		
External relationship activities	positive		
Mature market activities		negative	

Table 104 – External – BU Line Knowledge Governance

External	Partner Knowledge Governance		
	Objective	Learned	Creative
Fast growth industry conditions	less		
Pioneer activities			negative
Product development activities			negative
Market activities			negative
Technological competency priority (product dev)			negative

Table 105 – External – Partner Knowledge Governance

External	Supplier Knowledge Governance		
	Objective	Learned	Creative
Steady evolution industry conditions	less		
Concept learner activities	negative		
Fast growth industry conditions		more	

Table 106 – External – Supplier Knowledge Governance

External	Competitor Knowledge Governance		
	Objective	Learned	Creative
Acquisition activities	negative		negative
Fast growth industry conditions	less		
Market competency priority (customer needs)		negative	
Market competency priority (customer groups)		negative	

Table 107 – External – Competitor Knowledge Governance

External	Customer Knowledge Governance		
	Objective	Learned	Creative
Performance based on profit	positive		
Wild wild west industry conditions		less	
Pioneer activities		negative	
Product development activities		negative	
Technological competency priority (product dev)		negative	

Table 108 – External – Customer Knowledge Governance

7 Discussion

The results of this research allow us to develop a picture of how organizations are governing their knowledge as well as to characterize knowledge governance in relationship to context, activities, outcomes, and organization. The research methodology was based on exploratory and general propositions that were designed to discover how knowledge governance was related to different variables. While some propositions were found to be true and others false, new information emerged about the way knowledge governance is related to each of the variables in the research model.

7.1 Overview

Learned knowledge governance plays an important role related to the participation of every stakeholder in an organization's knowledge governance, as well as across all three types of governance structures – vertical, horizontal, and external. Learned knowledge governance also has the greatest influence in determining business unit actions, followed by objective and creative in all three governance structures. On the other hand, creative methods of knowledge governance have the least participation and the least influence in formulating business unit actions.

Business unit leaders and business unit lines were the common participants to knowledge governance across all three governance structures. While it could be expected that business unit leaders would be the greatest participants in all methods of knowledge governance and in formulating the actions of their business unit, this was not always the case. Top executives participated in objective and creative methods of knowledge

governance more than business unit leaders. The participation of business unit leaders in different methods of knowledge governance also varied by governance structure. In vertical knowledge governance, they most commonly participated in learned knowledge governance, whereas in horizontal and external they most commonly participated in objective. While business unit lines contribute substantially to knowledge governance processes, it is mainly based on learned methods of knowledge governance. Their participation is substantially less in objective and creative methods of knowledge governance.

Of stakeholders outside the business unit, there was greater participation in vertical knowledge governance by top executives than by stakeholders across horizontal and external relationships. There was much greater participation in objective and creative methods of vertical knowledge governance by top executives than by business unit leaders, and especially business unit lines, supporting the notion that top down approaches to knowledge governance are quite common. There was also greater participation in external knowledge governance by external stakeholders than in horizontal knowledge governance by internal units. For example, organizations are sharing knowledge and experience with competitors as a basis for formulating their actions more than with their own internal units. Organizations are substantially governing their knowledge through relationships with all four types of external stakeholders, customers, suppliers, partners and competitors. On the other hand, horizontal knowledge governance occurs with limitations, such as a lack of participation from other internal units, and the emphasis on objective knowledge governance by business unit leaders.

The methods of knowledge governance commonly participated in by different stakeholders varies. Most common patterns emphasize either participating in all three methods of knowledge governance – i.e. top executive participation, business unit leader participation in vertical, horizontal, and external knowledge governance, business unit lines in horizontal knowledge governance, and supplier and partner participation in external knowledge governance – or in participating in learned knowledge governance primarily – i.e. business unit lines in vertical and external knowledge governance, and customer and competitor participation in external knowledge governance. These results show that all three methods play an important role in determining business unit actions. As well, that actual knowledge and experience of organizational stakeholders is important to formulating business unit actions.

It was also found that certain methods of knowledge governance are central to specific roles in the organization. For example, learned and objective methods of knowledge governance are central to business unit leaders as owners and managers of an organization's functional knowledge, and objective and creative methods of knowledge governance are central to top executives as controllers and developers of a firms strategic direction. Whereas business unit lines vary substantially in the methods of knowledge governance they participate in. More research about the way members with direct experience of an organization's context participate in knowledge governance would be beneficial. There is some emphasis on objective and learned methods by internal units and business unit lines across horizontal relationships, which speak to the nature of working across horizontal relationships. Finally, it also appears that suppliers can vary

substantially in their participation in different methods of knowledge governance, and further investigation can occur in this area.

The way knowledge governance occurs across relationships varies based on the method. Learned methods of knowledge governance most commonly occur across integrated relationships (i.e. including all three stakeholder groups) in vertical, horizontal, and external knowledge governance. Whereas objective and creative methods of knowledge governance are mainly centralized or do not include the participation of business lines in vertical and external types of knowledge governance. In horizontal knowledge governance, business unit leaders are most often the only ones to determine the actions of their business unit based on objective and creative methods of developing knowledge.

Accountability for formulating business unit actions mostly resides in the hands of business unit leaders. In certain instances it is shared across different stakeholders. It appears that organizations are using limited models of accountability and the relationship between accountability and knowledge governance requires further investigation. However, it should be noted that in a relatively high 25% of cases, top executives alone are responsible for formulating the actions of business unit.

Hierarchical cluster analysis showed that in vertical knowledge governance, learned methods of decision making were associated with business unit leader participation and top executive responsibility, whereas decisions based on objective knowledge such as standards of operations were associated with top executive participation and the responsibility of business leaders. Whereas in horizontal knowledge governance business unit line and internal unit participation and accountability were

loosely associated with each other, and separated from the role of business unit leaders. The distinction may be based on the role of business unit leader's in determining the role of their business unit in the organization, as opposed to business unit lines developing knowledge across relationships based on the organization's context. Finally, in external knowledge governance, business unit leader and customer participation are the common basis of decision making, whereas business unit line participation and accountability are associated with other stakeholders, suppliers, partners, and competitors.

The results show that top executive participation in knowledge governance is significant, positively associated with the prioritization of market oriented competencies, and performance. However, it is also associated with patterns of knowledge governance in mature industry conditions and negatively associated with hypercompetitive change. The nature of participation by top executives is important because it represents paradigms of traditional management practices where decision-making and knowledge development are concentrated at the top of the organization. In order for organizations to leverage knowledge as a strategic resource and develop knowledge across a distributed system, they may need to evaluate their current practices.

As well, the limitations of horizontal knowledge governance practices in organizations and the association between horizontal knowledge governance, strategic innovation, and a competitive strategy based on differentiation are indicators areas where organizations can improve their knowledge governance practices and value they can create from knowledge.

7.2 Context

7.2.1 Industry Environments

The results of the research confirm that there are significant differences between the way firms govern their knowledge in relation to different forms of discontinuous change, specifically rate of technological change, and industry evolution. Significant differences in the way organizations govern knowledge were found for each quadrant of the industry environments defined by these two forms of discontinuous change. However, there were more significant associations related to quadrants defined by a low rate than a high rate of technological change. Quadrants with low rates of technological change demonstrated specific patterns of knowledge governance, whereas quadrants with high rates of technological change were negatively associated with specific types of learned knowledge governance.

Organizations experiencing fast growth environments (low rate of technological change and growth stage of the industry life cycle), were expected to compete by developing knowledge across functional domains, through the knowledge and experience of employees and based on a process of fast information flow. Organizations were expected to utilize objective and learned types of knowledge governance and emphasize knowledge governance across horizontal relationships. Proposition 3 was supported as these organizations formulated their actions based on business unit leaders and lines sharing both objective and learned knowledge across horizontal relationships significantly more than other organizations. Additionally, organizations competing in fast growth conditions were expected to govern knowledge through internal and not external

relationships. The results confirm that they formulate actions based on the objective knowledge of competitors and partners significantly less. However, they do formulate actions based on knowledge and experience of suppliers significantly more. While this doesn't confirm Proposition 3, however it does support the importance of learning across distributed domains of knowledge in order to develop a differentiated value proposition. To this effect, it demonstrates that the role of suppliers may be quite different than industry stakeholders such as partners and competitors in formulating business unit actions.

The results confirm Proposition 4 based on types of knowledge governance associated with wild wild west industry environments. Based on the organizational requirements for wild wild west industry environments, organizations were expected not to utilize objective and learned methods of knowledge governance and to emphasize knowledge governance across internal and not external relationships. The results show that in these conditions, organizations formulate their actions significantly less based on the knowledge and experience of customers. This pattern of knowledge governance is specifically based on the industry condition when customer loyalty is important. Organizations facing wild wild west conditions compete for customer loyalty by developing proprietary technologies or functionality, and the emphasis on technological innovation and breakthrough is not consistent with formulating actions based on the knowledge and experience of customers (Lei & Slocum, 2005).

These results mostly confirm Proposition 5 based on types of knowledge governance associated with steady evolution industry environments. Based on the organizational requirements for steady evolution industry environments, organizations

were expected to utilize objective types of knowledge governance and emphasize knowledge governance across vertical and not horizontal or external relationships, and also excluding the business unit line as stakeholders. The results show that in these conditions, organizations formulate their actions significantly more based on knowledge and experience and creative knowledge of top executives, and on the objective knowledge of business unit leaders and significantly less on the objective knowledge of suppliers.

The results also reveal that specific types of knowledge governance are significantly associated to specific industry conditions. The industry condition of 'customers are knowledgeable' is associated with vertical and bureaucratic patterns of knowledge governance focusing on the participation of top executives and emphasis on objective knowledge by business unit leaders. The industry condition of 'decreasing profit margins' is associated with formulating actions based on objective knowledge of suppliers less than other organizations.

The results confirm Proposition 6 based on types of knowledge governance associated with creative destruction industry environments. Based on the organizational requirements for creative destruction industry environments, organizations were expected to utilize creative and objective types of knowledge governance and emphasize knowledge governance across external relationships, and including participation of business unit lines. While the results for this type of industry environment were limited, we do find that these organizations formulate their actions significantly less based on the knowledge and experience of top executives. This is consistent with the organizational requirements of firms competing in creative destruction environments because they must

develop innovative knowledge based on the contexts they serve (i.e. business unit lines) and less based on institutional stakeholders such as top executives (Lei & Slocum, 2005). This pattern of knowledge governance is specifically related to the industry condition that customers are knowledgeable.

7.2.2 Hypercompetitive Change

The results determine that Proposition 2 based on hypercompetitive change was not supported - organizations using creative knowledge governance are not facing higher degrees of hypercompetitive change. However, the results do indicate that top executive participation in creative knowledge governance across vertical relationships is related to significantly lower levels of hypercompetitive change in market and regulatory conditions. This provides insights about the role of top executives – they participate in creative knowledge governance when conditions are less hypercompetitive.

A positive association between hypercompetitive conditions and creative methods of governing knowledge was not found. It is possible that organizations are not using creative methods of governing knowledge to make sense of emerging conditions and change. This can be an important concern regarding how organizations are governed in current competitive conditions. This is especially significant since the results show top executives are the greatest participants in creative methods of knowledge governance. Top executives don't have specific knowledge of organizational activities such as product development and marketing, as well their knowledge is not based on an organization's context.

7.3 Activities

The relationship between knowledge governance and organizational activities showed significant associations between the two for firms that competed based on a high rate of technological change – i.e. pioneers and concept learners. The way knowledge governance was associated with organizational activities mostly supported Propositions 8 and 10 developed from the strategic archetypes proposed by Lei and Slocum (2005). The results show that the activities of organizations experiencing a high rate of technological change are associated with distinct ways of governing knowledge.

7.3.1 Pioneers

The results mostly confirm Proposition 8 based on types of knowledge governance associated with Pioneer activities. The strategic requirements of pioneers were expected to be negatively associated with external, objective, learned, and vertical and horizontal types of knowledge governance, and positively associated with creative or functional types of knowledge governance. The strategic requirements of pioneers were negatively associated with business unit leaders participating in objective and learned methods of external knowledge governance, and learned methods of vertical knowledge governance. The strategic requirements of pioneers are negatively related to internal units participating in learned methods of knowledge governance. The strategic requirements of pioneers are also negatively associated with partners participating in creative methods, and customers participating in learned methods of external knowledge governance. These results confirm the insular nature of developing knowledge based on product and technological innovations and breakthroughs.

7.3.2 Concept Learners

The results mostly confirm Proposition 10 based on types of knowledge governance associated with concept learner activities. The strategic requirements of concept learners were expected to be positively associated with creative, learned and objective methods of knowledge governance across operational and external relationships due to their need to create new knowledge based on a mature industry. The strategic requirements of concept learners are positively associated with business unit leaders participating in creative vertical knowledge governance, supporting their requirement of developing new knowledge. They are also positively associated with business unit lines participating in objective external knowledge governance. Developing knowledge across external relationships as well as based on the operational contexts of organizations are important ways in which concept learners compete.

However, the strategic requirements of concept learners are negatively associated with business unit leaders participating in learned vertical knowledge governance, and with suppliers participating in objective knowledge governance. While these results do not support Proposition 10, they suggest that actual knowledge and experience of business unit leaders are less relevant in organizations trying to compete based on organizational renewal and technological innovation. As well, that innovating and mature organizations might not formulate their actions based on objective standards or requirements of suppliers.

7.3.3 Exploratory Analysis

The exploratory analysis of how types of knowledge governance were associated with factors that emerged from the factor analysis of strategic requirements supports the characterization of knowledge governance for future research. Specific types of knowledge governance were found to be negatively associated with the factor based on product development activities – specifically, customer participation in learned methods of knowledge governance, and partner participation in creative methods of knowledge governance. These results reflect associations between knowledge governance and product development activities that were determined based on the activities of pioneers – that organizations that compete through product and technological innovation do not develop knowledge across external relationships or based on existing knowledge of customers.

As well, partner participation in creative methods of knowledge governance were negatively associated with the factor based on market activities. This result also supports the results found by previous analysis, namely that market-oriented organizations such as concept drivers, compete by internal development and not by collaborating with external stakeholders.

Business unit lines' participating in objective external knowledge governance is positively associated with the factor based on external relationships. This result reflects results found through previous analysis, such that external relationships can be the basis for developing objective knowledge about an organization's context, as in the case of concept learners.

Business unit lines' participating in learned external knowledge governance is negatively associated with the factors based on mature markets activities and acquisition activities. Organizations that compete based on mature markets or acquisition oriented approaches may be non-innovative and consequently don't develop knowledge through their operational contexts and across external relationships. Finally, competitor participation in objective and creative methods of knowledge governance are negatively associated with the factor based on acquisition activities. This simply suggests that acquisition oriented companies may not be interested in collaborating with competitors, as a basis for formulating their actions.

7.4 Organizational Priorities

Organizational priorities related to competency development and organizational learning were expected to be positively associated with learned and creative methods of knowledge governance (Proposition 11a) and negatively associated with objective methods of knowledge governance (Proposition 11b). As well specific competencies were expected to be associated with specific knowledge governance structures (Propositions 13-15). While the results do not confirm the propositions, they do characterize the way knowledge governance is related to organizational priorities. The specific reasons for the associations cannot be known, however, they can be the basis for further investigation, as suggested below.

7.4.1 Market Competencies

Top executive participation in creative methods of knowledge governance is positively associated with the organizational priority of developing knowledge about customer needs. This result supports Proposition 11a, that creative knowledge governance will be positively associated with the prioritization of competencies, as well as Proposition 13, such that the development of market competencies can be associated with improving an organization's competitive position and consequently with vertical knowledge governance. On the other hand, competitors' participation in learned methods of knowledge governance across external relationships is negatively associated with prioritizing developing knowledge about customer needs and groups. This suggests that market oriented companies are not formulating their actions by learning from competitors. These results demonstrate that the method of knowledge governance is not the only condition related to the development of competencies but that the stakeholders are also important.

It was found that business unit leaders participation in objective methods of knowledge governance across vertical relationships is positively associated with the organizational priority of developing knowledge about competitors' activities. While this doesn't support Proposition 11b, it suggests that competencies are not simply based on innovation or developing new knowledge. In this case, it suggests that objective methods of developing knowledge – i.e. based on meeting standards or objectives - in relation to an organization's activities can be associated with market competencies based on developing knowledge about competitors.

7.4.2 Architectural Competencies

Top Executives participating in creative methods of knowledge governance is negatively associated with architectural competencies such as integrating knowledge of internal groups and developing up to date business knowledge. This suggests that organizations that prioritize distributed systems of developing knowledge may be distinct from organizations in which top executives create knowledge.

7.4.3 Technological Competencies

Organizations that develop learned methods of knowledge governance with customers, and creative methods with partners as well as internal units are all negatively associated with the prioritization of product development competencies. These results suggest and confirm that product development competencies are based on insular process of innovation and developing knowledge.

7.4.4 Organizational Learning

Business leader participation in objective and creative methods of knowledge governance across horizontal relationships is positively associated with the organizational learning priority of strategic innovation. This suggests that strategic innovation is related to cross-functional collaboration and the integration of internal knowledge.

7.5 Outcomes

The results show that there are associations between types of knowledge governance and performance. While this certainly has implications for determining how

organizations should govern their knowledge, further research is required into the nature of these relationships.

7.5.1 Vertical Knowledge Governance

Organizations create value and leverage the value of knowledge to accomplish innovation through learned and creative methods of knowledge governance – whereas objective methods of knowledge governance can prevent innovation. Propositions 16a and 16b that innovative methods of knowledge governance are related to better performance and non-innovative methods of knowledge governance are related to lower performance were partially supported. However, they do indicate the significance of different types of knowledge governance to organizational outcomes.

Both objective and creative types of vertical knowledge governance were found to be associated with significantly better performance. Specifically, the participation of top executives in objective methods of knowledge governance was related to better overall performance. While this does not confirm Proposition 16a based on the premise that objective knowledge can prevent innovation, this result suggests that objective knowledge still plays an important role in organizations. Objective knowledge can be the basis for a "clear strategic focus", established concepts for evaluating new information, and established standards of operation (Dougherty et al., 2000), and consequently can provide an effective means of strategic control. While governing based on objective knowledge can prevent innovation, organizations that don't govern based on objective knowledge may result in poorer performance.

The participation of top executives in creative knowledge governance is associated with significantly better performance based on growth. Top executives that create knowledge to determine business unit actions may be the basis for developing new strategic directions and opportunities based on business unit activities, resulting in better performance based on growth.

As well, the participation of business unit leaders in creative knowledge governance is associated with significantly better performance based on profit. The role of business unit leaders is to leverage the knowledge and competencies of the business unit on behalf of the organization (Van Cauwenberg & Cool, 1982). Business unit leaders that create new knowledge about business unit activities and are able to develop new competencies may be the basis for better performance based on profit.

However, when objective methods of knowledge governance had the greatest influence on determining business unit actions across vertical relationships, organizations were less successful at operational efficiency and changing internal practices. This confirms Proposition 17 that the method of knowledge governance that influences organizational actions is important.

Organizations were permitted to provide multiple responses to the type of knowledge that had the greatest influence on business unit actions. It was found that organizations in which objective and learned types of knowledge have the greatest influence are related to greater success at changing internal practices. This concurs with the literature that organizations that are able to incorporate new insights into existing knowledge are able to change and innovate (Dougherty et al., 2000). As well it was found

that organizations in which learned and creative types of knowledge have the greatest influence on business unit actions are related to better performance based on growth.

7.5.2 Horizontal Knowledge Governance

The results confirm Proposition 16 that objective knowledge governance across horizontal relationships is related to lower performance. Objective knowledge governance across horizontal relationships can be a barrier to innovation (Carlile, 2002). The results indicate that when business units formulate their actions based on the objective knowledge of other internal units, organizations have lower overall performance and lower performance based on profit.

The results based on objective knowledge provide diverse responses to the Propositions 17a and 17b. When objective knowledge (is one of the types of knowledge that) has the greatest influence in formulating business unit actions across horizontal relationships, organizations have significantly better performance based on profit. However, when objective knowledge only has the greatest influence in formulating business unit actions across horizontal relationships, organizations have significantly lower performance based on profit and significantly less success at changing internal practices. This suggests that objective knowledge governance can have a positive impact on performance if it is used in conjunction with other types of knowledge, however when objective knowledge alone influences actions it has a worse impact on performance.

When creative knowledge has the greatest influence in formulating business unit actions across horizontal relationships, organizations are significantly more successful at changing internal practices, confirming Proposition 17.

7.5.3 External Knowledge Governance

The results disconfirm Proposition 16a that objective knowledge governance across external relationships is related to lower performance. When business units formulate their actions based on objective knowledge of customers, organizations have significantly greater performance based on profit. However, they do confirm the importance of knowledge governance in relation to customers.

The results confirm the Proposition 17c that when multiple types of knowledge have the greatest influence on business unit actions, organizations perform better. Specifically, when learned and creative types of knowledge governance have the greatest influence in determining business unit actions across external relationships, organizations have significantly higher performance based on growth.

8 Conclusion

The purpose of this research was to examine the governance of organizations in relation to the way they leverage knowledge as a strategic resource. One of the primary aims of the approach taken here was to develop a model that supports the concept that knowledge workers are the means of production of modern organizations, enabling organizations to develop new technologies or deliver superior customer service. This was achieved by understanding competencies as dynamic entities that evolve through the knowledge of an organization's stakeholders, as well as through the organizations that develop them.

The theoretical premise of knowledge governance was developed by creating an integrated view of knowledge, innovation, learning, change management, competencies, and governance through theory as well as practical examples from real organizations. Practical examples provided the foundation for grounding and relating the concepts to each other and creating a model that was relevant to organizations.

The methods and design of the research were exploratory. The results of the research provide a picture of how organizations govern their knowledge, and allow us to begin characterizing knowledge governance in relation to variables such as context and outcomes. They provide a starting point based on which we can understand organizational practices as well as develop and investigate further questions. One of the attributes of this research was to characterize knowledge governance patterns based on typical forms of discontinuous change experienced by organizations across different

industries. The results provide an important definition of how organizations evolve as conditions change.

As organizations face discontinuous changes and conditions of the knowledge economy, the implications of how they leverage knowledge as a resource can be seen at the organizational, industry, and economic level. Now more than ever, innovation is required to revitalize the economy. While theory of knowledge governance was developed for this purpose, based on the concerns of business, the development of knowledge has other implications as well related to our health and welfare, the conditions of our environment, and social development as our knowledge continues to evolve in these domains. In light of these changes, knowledge and innovation are increasingly significant and relevant to different levels of social evolution including economic and political decision-making.

8.1 Practical Implications

The benefits of theory in knowledge governance are based on articulating management practices that enable organizations to leverage knowledge as a resource. The benefits range from understanding knowledge as a resource and how organizations compete based on knowledge to practical models that support the development and governance of organizations. The primary challenges faced by organizations are in the distributed nature of knowledge, the continuous changes they face in their environment, and their need to innovate. Through the development of theory we can develop management practices that enable organizations to address these challenges and to compete and remain competitive in the conditions of the knowledge economy.

8.2 Academic Implications

The concept of knowledge governance is just being defined. Different approaches are being developed based on different definitions of knowledge governance. Consequently, the theoretical premise of this thesis can be the basis for future discussion of what constitutes knowledge governance. This approach is practice-oriented and reflects the importance of the way organizations practice in the development of competencies and accomplishing competitive advantage. It examines the organizational level mechanisms play a role in the way individuals and groups utilize their knowledge on behalf of the organization. Consequently, the theoretical premise for this approach can be applied to research different types of social organizations and their capacity to develop knowledge and competencies.

Utilizing the theoretical premise proposed, new theories about knowledge governance can be based on diverse definitions of the major constructs. For example, different theories about the relationship between context, organization, activities, and outcomes to knowledge governance can be developed. New models should be developed for the operationalization of each of these concepts.

Finally, the existing research can serve as the basis for future research in several ways. The operationalization of the contructs proposed, and instruments developed can be vastly improved. The cycle of theory building can be continued based on the results (Carlile & Christensen, 2004), examining why differences in patterns knowledge governance exist and whether these differences result in different outcomes. Furthermore, models based on strategic alignment between knowledge governance and an organization's context can be developed and related to outcomes.

8.3 Limitations

There were several limitations incurred in the process of this research. They were related to the breadth of the topic and theory development, the novelty of the concept, and the exploratory nature of research that resulted.

Due to the exploratory nature of this research, there were several limitations to be considered. The response rate of the survey was only 7%. This may have been due to the novelty of the concept, the length of the survey and the limitations to people's time. However, the results were limited by the relatively small sample size. Additional data would have increased the results that were reported as the validity of the analysis was limited by the sample size. Furthermore, with more data, different types of analysis could have been performed based on operationalizations that combined variables – i.e. allowed knowledge governance to be defined based on relationships and combined types of knowledge used in the formulation of business unit actions.

The second important limitation of this research is the operationalization of items used in the models. Pre-existing instruments were not available and were not used. Some constructs were not reliable enough to support analysis. Consequently, the instruments developed here should be refined, or new ones developed.

The third limitation of this research is in the development of the model. Each parameter of the model was defined based on the theoretical background used to define the premise for knowledge governance. In the future, these parameters, such as the operationalization of competencies or organizational priorities, can be examined more rigorously and defined based on more elaborate research.

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Appendix A – Survey Cover Letter

Concordia University
John Molson
School of Business

Survey on Knowledge Governance

Montreal, March 26, 2007

Subject: Survey on Knowledge Governance

Dear ,

My name is Neha Malde and I am candidate for graduate research studies at the John Molson School of Business at Concordia University. The following survey is part of my thesis supervised by Dr. Anne-Marie Croteau. This research investigates the relationship between the way knowledge is governed as a competitive resource and business performance. As competitive conditions intensify, factors such as acquisitions, off-shoring, bigger competitors, and greater innovation influence the value of knowledge and the pressure to bring ideas to market. Knowledge has become a vital resource for both surviving and thriving in our economy. The following survey evaluates the relationship between knowledge governance, industry conditions, business strategy, and business performance. Your input to this research is very important. Respectfully, a short questionnaire of 20 minutes has been carefully developed with your business interests in mind.

This research has been approved following the ethical review required by the university. All information will be kept confidential and no results will allow the identification of respondents or participant firms. If you have any comments or questions, please feel free to use the contact information provided.

It would be sincerely appreciated if questionnaires could be returned within a week in the attached postage-paid envelopes. To receive an executive summary of the results - including feedback on how knowledge governance is related to industry conditions, business strategy and performance - please include a business card in the return envelope. Thank you in advance for your valuable contribution.

Best regards,

Neha Malde
M.Sc. Student, Concordia University
Tel.: (514) 333-1810
E-mail: n_malde@jmsb.concordia.ca

p.s.: Your coordinates have been obtained from Dun & Bradstreet, Canada.

Appendix B – Knowledge Governance Survey

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Survey on Knowledge Governance

The following survey evaluates the relationships between knowledge governance, industry conditions, business strategy and performance. The first part of the survey is a series of multiple choice questions on strategic factors relating to knowledge governance. The last section evaluates how knowledge is governed across different business relationships. There are no right or wrong answers. The questionnaire takes less than twenty minutes to complete.

Business Conditions

Please use the following scale to answer the following questions:

Completely disagree	Partially disagree	Neutral	Partially agree	Completely agree	Not applicable
1	2	3	4	5	na

1.	Our product development knowledge is completely changing.	1 2 3 4 5 na
2.	Competition in our industry is rapidly escalating.	1 2 3 4 5 na
3.	Our market conditions are completely changing.	1 2 3 4 5 na
4.	Our regulatory requirements are completely changing.	1 2 3 4 5 na
5.	Our product development knowledge is continuously changing.	1 2 3 4 5 na
6.	Our competitive environment is continuously changing.	1 2 3 4 5 na
7.	Our market conditions are continuously changing.	1 2 3 4 5 Na
8.	Our regulatory requirements are continuously changing.	1 2 3 4 5 na
9.	Product development is completely changing our business strategy.	1 2 3 4 5 na
10.	Competitive conditions are completely changing our business strategy.	1 2 3 4 5 na
11.	Market conditions are completely changing our business strategy.	1 2 3 4 5 na
12.	Regulatory requirements are completely changing our business strategy.	1 2 3 4 5 na
13.	There are competing product technologies and standards in our industry.	1 2 3 4 5 na
14.	Market entry and exit by competing firms is relatively easy.	1 2 3 4 5 na
15.	Consumer demands are ambiguous.	1 2 3 4 5 na
16.	Regulatory requirements for our firm are uncertain.	1 2 3 4 5 na
17.	Our product life cycles are decreasing.	1 2 3 4 5 na
18.	Periods of competitive advantage for our products are decreasing.	1 2 3 4 5 na
19.	New innovations are standard in our industry and do not result in above average profits.	1 2 3 4 5 na

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Survey on Knowledge Governance

Business Strategy

Please use the following scale to answer the following questions:

Completely disagree	Partially disagree	Neutral	Partially agree	Completely agree	Not applicable
1	2	3	4	5	na

1.	Our firm competes by developing a well defined business concept that can be implemented in multiple markets.	1 2 3 4 5 na
2.	Our firm is organized around product development - with significant investments in market research and R&D.	1 2 3 4 5 na
3.	Our firm seeks to acquire companies that enable us to sell new products or enter new markets quickly.	1 2 3 4 5 na
4.	Our firm competes by developing differentiated products that are well branded and highly valued by the marketplace.	1 2 3 4 5 na
5.	Our firm competes by developing products related to our core concept or penetrating neighboring geographic markets.	1 2 3 4 5 na
6.	Our firm competes by introducing never-seen-before products to niche markets.	1 2 3 4 5 na
7.	Our firm is organized around R&D and converting technological and engineering competencies into new products.	1 2 3 4 5 na
8.	Our firm seeks to license our technology and ideas to other firms in order to reduce the risks and challenges of full market exploitation.	1 2 3 4 5 na
9.	Our firm competes by being first to market with innovative or proprietary technologies.	1 2 3 4 5 na
10.	Our firm competes by sequentially developing new technologies and expanding quickly into niche markets.	1 2 3 4 5 na
11.	Our firm competes by offering as wide a product line as possible to a broad market.	1 2 3 4 5 na
12.	Our firm competes by developing long term relationships with suppliers.	1 2 3 4 5 na
13.	Our firm seeks to merge or acquire competitors in order to increase our size and efficiency.	1 2 3 4 5 na
14.	Our firm competes by delivering standardized products at a low cost.	1 2 3 4 5 na
15.	Our firm competes by reducing its capital structure and business risk through outsourcing.	1 2 3 4 5 na
16.	Our firm competes by developing new strategies for mature markets.	1 2 3 4 5 na
17.	Our firm creates entirely new business units or groups to learn about and experiment with emerging technologies.	1 2 3 4 5 na
18.	Our firm seeks joint ventures or strategic alliances with firms that have complementary technologies or market insights.	1 2 3 4 5 na
19.	Our firm competes by introducing new products that are easy to use.	1 2 3 4 5 na
20.	Our firm's new products cannibalize old ones.	1 2 3 4 5 na

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Survey on Knowledge Governance

Business Performance

Please use the following scale to answer the following questions:

Completely disagree	Partially disagree	Neutral	Partially agree	Completely agree	Not applicable
1	2	3	4	5	na

1.	Strategic innovation is a important priority for our firm.	1 2 3 4 5 na
2.	Business adaptability is an important priority for our firm.	1 2 3 4 5 na
3.	Changing internal firm practices is an important priority for our firm.	1 2 3 4 5 na
4.	Operational efficiency is an important priority for our firm.	1 2 3 4 5 na
5.	Compared to our principal competitors, our firm is very successful at strategic innovation.	1 2 3 4 5 na
6.	Compared to our principal competitors, our firm is very successful at business adaptability.	1 2 3 4 5 na
7.	Compared to our principal competitors, our firm is very successful at changing internal practices.	1 2 3 4 5 na
8.	Compared to our principal competitors, our firm is very successful at operational efficiency.	1 2 3 4 5 na
9.	Compared to our principal competitors, our rate of employee turnover is low.	1 2 3 4 5 na
10.	Discovering and inventing new applications of product development knowledge is a important priority for our firm.	1 2 3 4 5 na
11.	Developing market knowledge about customer groups is an important priority for our firm.	1 2 3 4 5 na
12.	Developing knowledge about customer needs is an important priority for our firm.	1 2 3 4 5 na
13.	Developing knowledge about our competitors' activities is an important priority for our firm.	1 2 3 4 5 na
14.	Integrating the knowledge of internal groups is an important priority for our firm.	1 2 3 4 5 na
15.	Developing up-to-date business knowledge is an important priority for our firm.	1 2 3 4 5 na
16.	Our sales growth is high compared to our principal competitors.	1 2 3 4 5 na
17.	Our return on investment (ROI) is high compared to our principal competitors.	1 2 3 4 5 na
18.	Our growth in market share is high compared to our principal competitors.	1 2 3 4 5 na
19.	Our net profit is high compared to our principal competitors.	1 2 3 4 5 na
20.	Our return on assets (ROA) is high compared to our principal competitors.	1 2 3 4 5 na

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Survey on Knowledge Governance

Knowledge Governance is how your business unit formulates its actions and makes strategic decisions based on the knowledge of different stakeholders. Your business unit may use the knowledge of business unit leaders, business unit lines, as well as other stakeholders across vertical, horizontal, and external relationships.

Knowledge governance occurs in three different ways:

Objective	Business unit actions are based on **objective knowledge** - for example, by using standards of operations, performance objectives, existing business models, diagnostic controls, business intelligence, industry structure, etc
Learned	Business unit actions are based on explicitly defining strategies and rules from stakeholders' **actual knowledge and experience** – for example, by defining strategic priorities, business standards, policies, concepts, models, rules, etc.
Creative	Business unit actions are based on making sense of emerging events and information, connecting ideas and exploring circumstances in order to **create new interpretations** of business activities - for example, by aligning different areas of expertise, inventing new solutions, creating new strategic directions, etc.

Your business unit may use **one, two or all three** of these ways of governing knowledge. Please use these definitions to complete the following section. Select **as many** options as apply to your business unit. An example is provided below.

Example Question: *How does your business unit (BU) formulate its actions along vertical relationships?* Mark the stakeholder groups (Top Executives, BU Leaders, BU Lines) who provide input to each way of governing knowledge. Select Not Applicable if your business unit does not use that way of governance.

	Top Executives	BU Leaders	BU Lines	NA
Objective	**X**	X		
Learned		X	**X**	
Creative	**X**		**X**	

In this example, all three ways are used. Each line can be described as follows:

- Objective – Top Executives and BU Leaders base business unit actions on performance objectives and standards of operations.
- Learned - BU Leaders and BU Lines define strategic priorities and business standards for the business unit based on their actual knowledge and experience.
- Creative – Top Executives and BU Lines define new strategic directions for the business unit based on exploring new knowledge and emerging trends.

Vertical Knowledge Governance

Vertical knowledge governance is how knowledge is shared across the organizational hierarchy to determine the actions of your business unit. Business units can determine how to act based on the knowledge of their executives, business unit leaders or business unit lines.

1. How does your business unit formulate its actions along vertical relationships?

	Top Executives	BU Leaders	BU Lines	NA
Objective	☐	☐	☐	☐
Learned	☐	☐	☐	☐
Creative	☐	☐	☐	☐

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Survey on Knowledge Governance

2. Who is responsible for determining the activities of your business unit?
   ☐ Top Executives ☐ BU Leaders ☐ BU Lines

3. Is your vertical knowledge governance primarily **formal** – knowledge shared through official review processes, steering committees, development teams, etc - or **informal** – knowledge shared through the process of day to day work and interaction?
   ☐ Formal ☐ Informal ☐ NA

4. Which method of vertical governance has the greatest influence on business unit actions?
   ☐ Objective ☐ Learned ☐ Creative ☐ NA

5. How effective is your vertical knowledge governance?

	Not at all				Highly
	1	2	3	4	5

6. How does your business unit make **major** strategic decisions along vertical relationships?

Who provides input?	☐ Top Executives	☐ BU Leaders	☐ BU Lines
What method(s) are used?	☐ Objective	☐ Learned	☐ Creative
Who is held accountable?	☐ Top Executives	☐ BU Leaders	☐ BU Lines

Horizontal Knowledge Governance

Horizontal knowledge governance is how your business unit shares knowledge with other business units in your firm. Business units can share knowledge with each other in order to coordinate their activities, develop new concepts, or align the interests of different groups. Business units can determine how to act based on the knowledge of their business unit leaders, business unit lines, or of other business units in the firm (internal BU).

1. Name of your business unit: _____
2. Number of internal business units that your unit collaborates with: _____
3. Name of the principal other business unit that you collaborate with: _____

4. How does your business unit formulate its actions along horizontal relationships?

	BU Leaders	BU Lines	Internal BU	NA
Objective	☐	☐	☐	☐
Learned	☐	☐	☐	☐
Creative	☐	☐	☐	☐

5. Who is responsible for determining the activities of your business unit?
   ☐ Internal BU ☐ BU Leaders ☐ BU Lines

6. Is your horizontal knowledge governance primarily **formal** – knowledge shared through official review processes, steering committees, development teams, etc - or **informal** – knowledge shared through the process of day to day work and interaction?
   ☐ Formal ☐ Informal ☐ NA

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Survey on Knowledge Governance

7. Which method of horizontal governance has the **greatest** influence on business unit actions?

Objective Learned Creative NA

	Not at all				Highly
8. How effective is your horizontal knowledge governance?	1	2	3	4	5

9. How does your business unit make **major** strategic decisions along horizontal relationships?

Who provides input?	Internal BU	BU Leaders	BU Lines
What method(s) are used?	Objective	Learned	Creative
Who is held accountable?	Internal BU	BU Leaders	BU Lines

External Knowledge Governance

External knowledge governance is how knowledge is shared across external business relationships. Business units can share knowledge with external stakeholders to determine how to act on their business environment. Business units can determine how to act based on the knowledge of business unit leaders, business unit lines, or by interacting directly with customers, suppliers, partners, or competitors.

1. How does your business unit formulate its actions along external relationships?

	BU Leaders	BU Lines	Customer	Supplier	Partner	Competitor	NA
Objective							
Learned							
Creative							

2. Who is responsible for determining the activities of your business unit?

BU Leaders BU Lines Customer Supplier Partner Competitor

3. Is your external knowledge governance primarily **formal** – knowledge shared through official review processes, steering committees, development teams, etc - or **informal** – knowledge shared through the process of day to day work and interaction?

Formal Informal NA

4. Which method of external governance has the greatest influence on business unit actions?

Objective Learned Creative NA

	Not at all				Highly
5. How effective is your external knowledge governance?	1	2	3	4	5

6. How does your business unit make **major** strategic decisions along external relationships?

Who provides input?	BU Leaders	BU Lines	Customer
	Supplier	Partner	Competitor
What method(s) are used?	Objective	Learned	Creative
Who is held accountable?	BU Leaders	BU Lines	Customer
	Supplier	Partner	Competitor

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Survey on Knowledge Governance

Demographic - Please provide some background information for our analysis

1. Select **AS MANY** of the industry conditions listed below that describe your firm:
   - Our market is growing.
   - Profit margins are decreasing.
   - Our competitors are increasing.
   - Pricing is becoming more similar between competitors.
   - Rival products are differentiated.
   - Product features are becoming more similar between competitors.
   - Customer loyalty is important to our strategy.
   - Customers are knowledgeable about available products in the market.
2. Select the option that **BEST** describes the rate of technological change in your industry:
   - Product technology is improving incrementally.
   - Product technology is dramatically changing products and the industry.
3. Job Title: _____
4. Job Function: _____
5. Number of years in this position: _____ /year(s)
6. Number of years with the firm: _____ /year(s)
7. Number of employees in your organization: _____
8. Total firm revenues: _____
9. What is your firm type?
   - Government
   - Not for Profit
   - Subsidiary
   - Privately held
   - Publicly listed – Symbol:
10. What is your primary industry?
    - Financial Services
    - Government
    - Health
    - High Tech
    - Manufacturing
    - Media
    - Professional Services
    - Retail trade
    - Telecommunications
    - Transportation, Logistics
    - Utilities
    - Other: _____

Thank you for your valuable input!

Please return this questionnaire by using the attached envelope or by faxing it to Neha Malde (514) 848-2824.

Appendix C – List of Propositions

Appendix D – Descriptive Statistics

Hypercompetitive Change

		Mean	Median	SD	Skewness	Kurtosis
Scale						
C1	Our product development knowledge is completely changing.	3.52	4	0.92	-0.85	0.45
C2	Competition in our industry is rapidly escalating.	4.14	4	0.86	-1.14	1.79
C3	Our market conditions are completely changing.	3.96	4	0.75	-0.99	2.73
C4	Our regulatory requirements are completely changing.	3.8	4	0.87	-0.29	-0.55
Duration						
C5	Our product development knowledge is continuously changing.	3.8	4	0.82	-0.61	1.05
C6	Our competitive environment is continuously changing.	4.01	4	0.71	-0.52	0.54
C7	Our market conditions are continuously changing.	4.04	4	0.72	-0.31	-0.21
C8	Our regulatory requirements are continuously changing.	3.69	4	0.96	-0.55	0.33
Scope						
C9	Product development is completely changing our business strategy.	3.18	3	0.91	0.01	0.03
C10	Competitive conditions are completely changing our business strategy.	3.48	4	0.93	-0.55	0.14
C11	Market conditions are completely changing our business strategy.	3.49	4	0.93	-0.57	0.17
C12	Regulatory requirements are completely changing our business strategy.	3.11	3	1.12	-0.29	-0.65
Uncertainty						
C13	There are competing product technologies and standards in our industry.	3.78	4	0.89	-0.62	0.51
C14	Market entry and exit by competing firms is relatively easy.	2.49	2	1.35	0.63	-0.87
C15	Consumer demands are ambiguous.	2.67	3	1.02	0.38	-0.42
C16	Regulatory requirements for our firm are uncertain.	2.36	2	1.12	0.79	0.23
Time						
C17	Our product life cycles are decreasing.	3.16	3	1.43	-0.19	-1.32
C18	Periods of competitive advantage for our products are decreasing.	3.61	4	1.25	-0.47	-0.85
C19	New innovations are standard in our industry and do not result in above average profits.	3.22	3	1.17	-0.19	-0.82

Table 109 – Hypercompetitive Change – Descriptive Statistics – Summary

	Alpha	Items	Minimum	Maximum	Mean	Median	SD
Constructs							
Scale, Scope, Duration of change in....							
product development conditions	.72	C1,C5,C9	1	5	3.49	3.50	0.70
competitive conditions	.48	C2,C6,C10	2.33	5	3.88	4.00	0.59
market conditions	.56	C3,C7,C11	2.33	5	3.83	3.67	0.58
regulatory conditions	.83	C4,C8,C12	1.67	5	3.53	3.67	0.85
Uncertainty	.40	C13-C16	1.25	4.75	2.81	2.75	0.66
Time	.71	C17-C19	1	5	3.32	3.33	1.04

Table 110 – Hypercompetitive Change – Constructs

Activities

		Mean	Median	SD	Skewness	Kurtosis
Concept Drivers						
S1	Our firm competes by developing a well defined business concept that can be implemented in multiple markets.	3.83	4.00	1.07	-1.27	1.32
S2	Our firm is organized around product development - with significant investments in market research and R&D.	2.73	2.00	1.32	0.15	-1.31
S3	Our firm seeks to acquire companies that enable us to sell new products or enter new markets quickly.	3.00	3.50	1.35	-0.35	-1.29
S4	Our firm competes by developing differentiated products that are well branded and highly valued by the marketplace.	3.82	4.00	1.18	-1.10	0.60
S5	Our firm competes by developing products related to our core concept or penetrating neighboring geographic markets.	3.76	4.00	1.10	-0.98	0.42
Pioneers						
S6	Our firm competes by introducing never-seen-before products to niche markets.	2.70	3.00	1.33	0.00	-1.36
S7	Our firm is organized around R&D and converting technological and engineering competencies into new products.	2.40	2.00	1.30	0.31	-1.33
S8	Our firm seeks to license our technology and ideas to other firms in order to reduce the risks and challenges of full market exploitation.	1.82	1.00	1.08	1.00	-0.41
S9	Our firm competes by being first to market with innovative or proprietary technologies.	2.54	2.00	1.47	0.28	-1.43
S10	Our firm competes by sequentially developing new technologies and expanding quickly into niche markets.	2.29	2.00	1.25	0.48	-1.03
Consolidators						
S11	Our firm competes by offering as wide a product line as possible to a broad market.	3.22	4.00	1.24	-0.39	-0.96
S12	Our firm competes by developing long term relationships with suppliers.	4.22	4.00	0.79	-1.18	2.62
S13	Our firm seeks to merge or acquire competitors in order to increase our size and efficiency.	2.75	3.00	1.52	0.11	-1.58
S14	Our firm competes by delivering standardized products at a low cost.	3.17	3.00	1.04	-0.10	-0.58
S15	Our firm competes by reducing its capital structure and business risk through outsourcing.	2.77	3.00	1.11	-0.21	-1.07
Concept Learners						
S16	Our firm competes by developing new strategies for mature markets.	3.51	4.00	0.92	-1.45	1.57
S17	Our firm creates entirely new business units or groups to learn about and experiment with emerging technologies.	2.57	3.00	1.31	-0.01	-1.46
S18	Our firm seeks joint ventures or strategic alliances with firms that have complementary technologies or market insights.	3.27	4.00	1.22	-0.66	-0.69
S19	Our firm competes by introducing new products that are easy to use.	3.30	4.00	1.32	-0.53	-0.90
S20	Our firm's new products cannibalize old ones.	2.95	3.00	1.17	-0.59	-0.96

Table 111 – Activities – Descriptive Statistics of Individual Variables

	Factor				
Item	1	2	3	4	5
S2	0.88				
S7	0.83				
S9	0.75				
S10	0.70				
S1		0.73			
S6		0.68			
S19		0.67			
S4		0.65			
S8			0.81		
S18			0.66		
S17			0.52		
S14				0.69	
S16				0.68	
S11				0.61	
S15				0.59	
S13					0.88
S3					0.75
ALPHA	0.9	0.8	0.7	0.6	0.7

Table 112 – Activities – Rotated Component Matrix of Factor Analysis

	Alpha	Items	Minimum	Maximum	Mean	Median	SD
Constructs							
Concept Drivers	.66	S1, S2, S3, S4, S5	1.00	4.80	3.44	3.5	0.84
Pioneers	.88	S6, S7, S8, S9, S10	1.00	5.00	2.48	2.6	1.10
Concept Learners	.74	S16,S17,S18,S19,S20	1.00	4.40	3.19	3.33	3.19
Factors							
Product Development	0.91	S2,S7,S9,S10	1.00	5.00	2.59	2.75	1.21
Market	0.77	S1,S19,S6,S4	1.00	5.00	3.46	3.5	0.97
External Relationships	0.70	S8,S18,S17	1.00	4.33	2.67	2.67	1.03
Mature Industry	0.59	S11,S14,S15,S16	1.00	4.33	3.21	3.33	.73
Aquisition	0.69	S13,S3	1.00	5.00	2.84	3.00	1.28

Table 113 – Activities – Descriptive Statistics of Constructs

Organization

		Mean	Median	SD	Skewness	Kurtosis
Strategic Priorities Related to OL						
P1	Strategic innovation is a important priority for our firm.	3.85	4	.98	-.87	.28
P2	Business adaptability is an important priority for our firm.	4.23	4	.71	-1.64	6.13
P3	Changing internal firm practices is an important priority for our firm.	3.70	4	.92	-.80	.90
P4	Operational efficiency is an important priority for our firm.	4.64	5	.59	-1.88	4.69
Competencies						
P10	Discovering and inventing new applications of product development knowledge is a important priority for our firm.	3.22	4	1.30	-.47	-.91
P11	Developing market knowledge about customer groups is an important priority for our firm.	4.14	4	.93	-1.36	1.84
P12	Developing knowledge about customer needs is an important priority for our firm.	4.35	5	.86	-1.49	2.56
P13	Developing knowledge about our competitors' activities is an important priority for our firm.	3.81	4	1.03	-.80	.26
P14	Integrating the knowledge of internal groups is an important priority for our firm.	3.91	4	.81	-.37	-.29
P15	Developing up-to-date business knowledge is an important priority for our firm.	4.10	4	.81	-.71	.20

Table 114 – Organization – Descriptive Statistics of Individual Items

Outcomes

	Alpha	Items	Minimum	Maximum	Mean	Median	SD
Constructs							
Pgrowth	.79	P16, P18	2	5	3.54	3.50	.84
Pprofit	.94	P17,P19,P20	1.33	5	3.48	3.33	.96

Table 115 – Outcomes – Descriptive Statistics of Constructs

		Mean	Median	SD	Skewness	Kurtosis
OL Outcomes						
P5	Compared to our principal competitors, our firm is very successful at strategic innovation.	3.90	4	0.86	-0.39	-0.44
P6	Compared to our principal competitors, our firm is very successful at business adaptability.	3.99	4	0.68	-0.28	0.11
P7	Compared to our principal competitors, our firm is very successful at changing internal practices.	3.60	4	0.87	-0.38	0.21
P8	Compared to our principal competitors, our firm is very successful at operational efficiency.	3.93	4	0.87	-0.70	0.77
Financial Outcomes						
P16	Our sales growth is high compared to our principal competitors.	3.52	3	0.88	0.16	-0.66
P17	Our return on investment (ROI) is high compared to our principal competitors.	3.52	3	1.06	-0.11	-0.52
P18	Our growth in market share is high compared to our principal competitors.	3.61	4	0.90	-0.07	-0.73
P19	Our net profit is high compared to our principal competitors.	3.48	3	1.02	-0.24	-0.30
P20	Our return on assets (ROA) is high compared to our principal competitors.	3.44	3	1.00	-0.07	-0.21

Table 116 – Outcomes – Descriptive Statistics of Variables