Exploration into the impact of CEO and CIO shared knowledge on firm performance.

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Abstract

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This thesis explores the relationship between shared knowledge of senior executives and organizational performance. The senior executives in question in this work are the CEO and CIO. The work in this thesis is considered to be exploratory due to the use of some new scales to measure constructs and the new format of use for previously established scales. The hopes of this research are primarily to create enough evidence, through correlation evaluation, to generate further research in the stream using similar or the same concepts. Further, the method used to establish correlation was non-parametric, Spearman's Rank Correlation Coefficient, primarily due to the exploratory sized sample and secondly due to its ability to show the degree or correlation between variables. Results of the statistical analysis are that overall the sample relied primarily on separate function to perform the strategic activities of capability identification, governance and environmental analysis, yet only environmental analysis was the only function where higher degrees of shared knowledge had no effect on firm performance.

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1 Introduction

The collaboration between business managers and information technology (IT) managers has been often researched in search of improved performance. The results of research into sharing between business and IT functions has shown that alignment and (Reich & Benbasat, 2000), intentions of IT professionals to form partnerships with business clients (Bassellier & Benbasat, 2004) can lead to increased perceived business performance (Croteau & Raymond, 2004).Unfortunately this alignment is not easy to come by due to a knowledge gap between professionals in these fields.

This gap in understanding between the IT and business managers occurs due to the relatively higher technical knowledge that is required to understand IT and the relatively more organizational knowledge required to manage a business. This was initially defined by researchers as the "problem of implementation" (Churchman & Schainblatt, 1965). Researchers following this stream think of the gap as being "only a couple of inches wide, and a thousand feet deep" (Alderson, 1965).

Prior research in both organizational and IT streams have been very fruitful at defining knowledge areas within each field. Yet research into this subject still has some rough edges, where definition would help focus its intent. For instance the level of the knowledge assessed has ranged from generally operational(Bassellier, Benbasat, & Horner Reich, 2003). But it has also been too focused on knowledge that is relevant only to the here and now of the organization, as opposed to more fundamental, higher levels of the why and how this information came about, the strategic driving forces (Armstrong & Sambamurthy, 1999).

In recent times we have seen the ever increasing use of IT by firms, the initiation and adoption of the internet, the dotcom bust and the resurgence of IT based companies that survived. In addition standardization and development of the IS methodologies and IS research have developed to a point where the CIO role may more systematically be understood by the CEO and other business managers, which was not the case in the early 1990's when the CIO role was considered an imprecise art. The resulting models

and systems may allow for the more realistic capture of these types of knowledge. This type of research has been called for by top academics (Reich & Benbasat, 2000) and has undergone a revival in popularity recently

The main objective of this paper is exploratory research into the impact of business and IT professionals' shared knowledge on firm performance, focusing specifically on the relationship between the CEO and CIO. Among the responsibilities of the CEO and CIO, and the rest of the corporate level top management team (TMT), is the formulation and execution of the firms' strategy. It is this level of the firm and these decisions with which this paper is concerned.

There are three sub objectives within this primary objective: to measure the corporate IT knowledge of CEO's, to measure the corporate business knowledge of CIO's and to analyze the effect on organizational performance due to relative shared knowledge based on the problem of implementation developed by Churchman (Churchman & Schainblatt, 1965). As with most research into the integration of knowledge, goals and objective conflict are highly tied to the theory behind the implementation matrix, making it an ideal tool for the assessment of states of common knowledge.

It is not the purpose of this work to imply that the CEO should know everything about the organization, particularly the function of IT, nor that the CIO should have a mastery of business knowledge comparable to the CEO. The following discussion and empirical testing hopes to clarify what degrees of the common knowledge result in the greatest degrees of success for the firm.

2 Literature Review

The following literature review is intended to introduce the reader to the stream of research which this thesis follows. The selected literature deals with shared domain knowledge between these two executive roles in question and how the stream has developed in measurement and understanding of problem at hand. The concepts, constructs and framework used in this thesis are explained in subsequent sections.

The primary theory on which this research is based, the problem of implementation, " is defined as the issue of management's decision to follow through with the results of the researchers work. This situation was first discussed by Churchman and Shainblatt in 1965 (Churchman & Schainblatt, 1965). In their work they consider how an effective work relationship can be founded between technical staff and managers. Although the original focal group was operations, the same arguments for their approach also apply to today's IT professionals. Churchman's later work states that individuals should "understand" "the personal and organizational goals of their partner and their techniques of accomplishing them". Thus to obtain an "understanding" individuals must have knowledge of their partners domain; what individuals do for the organization, how they do it and why. It is this "understanding" that is believed to represent shared knowledge for the purposes of this thesis and is expected to be correlated with organizational performance.

In response to the "problem of implementation", Churchman (Churchman & Schainblatt, 1965) developed a model called the implementation matrix. This model represents arrangements of states of knowledge from two perspectives, with each individual having understanding or not. These relationships describe the possible arrangements of communication for the translation of a plan developed by scientists or researchers into the implementation stage by managers. The model purports that there are four possible arrangements, mutual understanding, communication, persuasion and separate function. Mutual understanding MU is the superior position, where the CEO and CIO share (or understand) each other's corporate level knowledge. This position is considered superior due to the ease of justifying implementation plans, rationalization, and communication which occurs at this level. Persuasion is used

when the CIO understands CEO's corporate knowledge but the CEO does not understand the CIO's corporate knowledge. This position requires the CIO to constantly be "selling" their ideas to the CEO. Often this is achieved through the psychology of appealing to the wants or needs of the specific CEO. If the CIO does not understand the CEO's corporate knowledge then the CIO must use the communication arrangement to bridge the gap. Communication essentially requires educating the CEO about a specific subject until the CEO is sufficiently familiar to make decisions. The separate function arrangement occurs when neither CEO nor CIO understands their corporate level knowledge or the others. Mutual understanding theory does not require the participants in the relationship to understand each other equally. Any member of the relationship can have an understanding of the other as long as their knowledge meets that sufficient for understanding.

Figure 1. Implementation Matrix

		CIO	
		Low	High
CEO	High	Communication	Mutual understanding
	Low	Separate function	Persuasion

Since Churchman's work, the ideal state of relationships between business and IS professionals has been studied using many different factors. The majority of this work falls into three categories: relationship involvement shared perceptions and shared knowledge. The conception of shared knowledge has been pervasive in systems development literature for decades, and recently there has been a revival of its use in the area of IT alignment. This revival was spurred by the work of Nelson and Cooprider (1996). In their work shared knowledge was found to be a mediator between IS performance and mutual trust and influence between IS and line professionals.

Further papers, (Armstrong & Sambamurthy, 1999) although they follow the use of shared knowledge between the CEO and CIO did not attempt to address the level of subject, grouping strategy level activities with day to day activities. There was also little attempt to draw similarities in concept between the knowledge of the two roles. The focus instead was to create a wake of resource based view investigation into the success of firms with the assumption that knowledge was a primary determinant resource.

Building on this stream Reich and Benbasat (2000) incorporated the concept of shared domain knowledge in assessing social factors of IS alignment. Their operationalization of shared domain knowledge used IS and line professional's length of time experience in each others' field to assume that knowledge of each others' fields were developed in this time. Shared domain knowledge was found to facilitate the communication between IS and lines required for short-term alignment. The development of more standardized measurement of knowledge areas for each of type of professional became the next step in this stream.

Structured approaches to measurement were developed in three papers by Bassellier (Bassellier et al., 2003; Bassellier & Benbasat, 2004; Bassellier, Reich, & Benbasat, 2001). The first two of these papers developed and tested IS knowledge required by line professionals. This work found that line managers IS knowledge, together with their experience with IS, reasonably explained their willingness to champion IS projects (Bassellier et al., 2003). There IS partners were also found to have greater intentions to create relationships with line professionals when they have a qualified degree of business competence (Bassellier & Benbasat, 2004).

Since Bassellier's work other approaches have been used to research the impact of shared knowledge of CEO's and CIO's on firm performance. In one such example the IT savviness of CXO's was cited multiple times as being a direct influence on IT value realization in a case study reporting on CEO and CIO relationships. The case study also suggested that CIO competence affected IT value realization and that the value realization plays a role in organizational performance (Pepard, 2010). Preston and Karahanna (2009) used similar structured approaches to analyze the relationships between the ability of

CIO's to educate their TMT and utilize their strategic knowledge to create greater IS alignment with the business. In this research the only the TMT was questioned regarding these relationships, which provides greater impetus for this research stream in attempting to draw direct lines between shared knowledge and firm performance. Without looking at specific knowledge areas of either business or IT professionals Cohena was able to show that Mutual understanding and Shared Vision of IT positively affect firm performance (2006).Using the same standardized measurement logic as Bassellier, in combination with the implementation matrix, we hope to bring the shared knowledge stream to the corporate level.

Corporate level managers, in particular the top management team, are charged with the responsibility to provide strategic leadership for the firm. The purpose of strategic leadership is to garner above average returns for the owners of the firm. At the heart of these relationships is the notion of agency; the assumption of control of the firm by agents for the principals or owners. At a high level above average returns is the primary goal of the CEO and CIO, by means of strategic analysis and action (Hambrick, 1982). The CIO, and IT employees, on their own are equally incapable of accomplishing above average returns (Willcocks, Feeny, & Olson, 2006), and the CEO and business employees are also incapable of success without the CIO and IT staff.

2.1 The Role of the CEO and CIO

The following three sections outline the roles of the CEO and CIO and what specifics of their domain knowledge have been developed are believed to be of interest in this line of research. Within each section mirroring concepts from each executives domain knowledge will be presented conceptually, followed by literature review for each concept in regard to its affects on the achievement of above average returns for the firm.

As mentioned previously, the end goal or purpose of executive management is the planning of strategic actions and their supervision their implementation (Hambrick, 1982). According to Mintzberg (1980) these employees have ten roles that they play. These roles are: figurehead, leader, liaison, monitor, disseminator, spokesperson, entrepreneur, disturbance handler, resource allocator, and negotiator. These

roles establish not only the day to day functions of the CEO but also the strategic; such as figurehead, entrepreneur and leader.

The academic focus of strategic planning has a varied over the last century or so. Generally it is accepted that until the early nineteen eighties, external factors, such as economy and industry, were the primary driving forces for firm success. Following the fundamental work of Porter (1980) in the development of the SWOT (strengths, weaknesses, opportunities and threats) framework, it became apparent that internal factors, firms strengths and weaknesses, also play an important role in deciding firm successes. Building on this view of the importance of internal abilities Barney, (1991) conceptualized the Resource Based view of the firm, which helps to identify which characteristics of the firm lead to sustained competitive advantage, their core capabilities. From here, it is up to executive teams to create a plan of action. In order for any plan of action to be successful it must be controlled through execution. There are many ways for executives to monitor progress and influence employees to insure that the entire organization is moving in the same direction, through a broad concept of corporate governance (Meyer, 2004). These governance tools range from soft influences, such as culture, to hard calculative accounting measures.

Generally, the CEO's role in regards to their IS department is a "laissez faire" approach. Kearns and Lederer (2003) found that although the CIO and CEO contribute roughly equally to the development of the business plan, the same is not true for the CEO's contribution to the organizations IT plan. Consequently the ability of the IT plan to reflect the business plan is primarily left to the CIO (Earl & Feeny, 1994). Additionally, Kearns and Lederer (2003) also found that the major contributor the firm's competitive advantage is the ability for the IT plan to meet the business' strategic plan.

The role of the CIO is still a relatively mysterious position. Although it is clear that this position is at the top of the IT hierarchy, the definitions and even the precise title used to reference the position still vary wildly. One reason for this is the more technical foundation for that of CIO knowledge compared to that of most other managers (Feeny, Edwards, & Simpson, 1992). Another reason this occurs is the role itself, which is still developing and gaining importance as companies become more and more dependent on

their information systems. The role of the CIO has also become increasingly strategic along its development (Gottschalk, 1999). So much so that it has lead to the development of other roles to handle the more day to day activities of the IS department (Stephens, Ledbetter, Mitra, & Ford, 1992). For the last decade the primary strategic goal of the CIO was to increase the IT alignment of the IT department and goals of the firm (Hoffman, 1998). Standardization of IS leadership has been proposed through a list of six roles for IS leaders by CSC (1996).

It is the knowledge areas required for these corporate (macro) level activities that we are interested in assessing. All of which have been influenced by the same developments within management literature on macro-environmental analysis, resource based capability development and corporate governance. The difference being these the CIOs knowledge is that they are of course created based on a limited IT view, thus creating corporate IT knowledge. These mirroring concepts have been well developed in IT research and rival those of their management cousins.

2.2 CEO knowledge

In the following sections the knowledge, necessary to create a strategic plan following the process outlined above is reviewed. Based on these knowledge areas scales will be selected and developed to test the executives' knowledge of the areas. These knowledge areas are Resource Based Theory, Internal Corporate Governance, and Macro-environmental Analysis.

2.2.1 Resource Based View Capability Identification

The Resource Based View (RBV) of the firm is focused on the exploitation of firm-specific assets. RBV has been developed primarily out of the concepts of firm strengths and weaknesses (Teece, Pisano, & Shuen, 1997), and has all but taken the place of Structure-Conduct-Performance (SCP) strategic formulation in contemporary business thinking (Barney, 2001b). The RBV, despite having inspirations from earlier research, was first coined in Wernerfelt's 1984 article (1984) . This article outlined the basics of the theory without explicitly stating the concepts which allow firms to practice it. The main contribution of this paper was the explanation of the differences between the RBV and the dominant product based Structure-Conduct-Performance view created by Porter (1980). The explicit statements of the theory were not made until Barney, who is considered the father of the theory, developed empirical indicators for the identification of firm resources (Barney, 1991). Since then researches' understanding of RBV has grown and sprouted new areas of research.

The RBV sets itself apart from the previous Structure-Conduct-Performance theories by approaching formulation of strategy through review of the firm's strengths and weaknesses as opposed to the opportunities and threats of a firm's industries. The RBV is built on two assumptions. The first assumption is that a firm's resources, or those it can obtain, vary within an industry or group of competing firms. It also assumes that the resources necessary for competition are not easily transferable through established transaction models. The resources these assumptions refer to are believed to be strengths or weakness' of a firm (Wernerfelt, 1984). Although there is some dispute over what these resources are specifically, they have been classified into four categories; physical, capital, human and organizational (Barney, 1991; Hitt, Ireland, Hoskisson, Rowe, & Sheppard, 2002). Physical assets, capital assets and human resources are rarely contested but there is some blurring between organizational resources and capabilities. Capabilities are the capacity of a firm to uniquely combine or integrate resources for the obtainment of competitive advantage (Hitt et al., 2002). Competitive advantage can be temporary or sustained implementation of a value creating strategy. There is no time definition to separate temporary

from sustained advantages, instead the determination of sustainability is made in regards to the duplication or nullification of strategies by competitors (Barney, 1991).

The model used to evaluate the potency of capabilities is the VRIO framework. It states that a potent capability must be combined of resources that are *valuable, rare, imperfectly Imitable* and *not substitutable* (Barney, 1991). Barney defined the *value* of a resource as the ability to conceive of or implement strategies that exploit opportunities and/or neutralize threats in a firm's environment, improving the firms efficiency and effectiveness (J. Barney, 1991). Due to the variety of strategic choices and industry environments, the above definition does not provide a clear technique to the determination of a resources value (J. B. Barney, 2001a). Fortunately work has continued in this direction, notably Miller and Shamsie's work in to appropriating value in the film industry (1996). The determination of *rarity* is also an externally based since the firm must see if it's current and potential competitors also possess the same resources. Barney's original work explicitly states (1991), that the number of firms that possess the resources must be less than the number of firms that do not possess the resources. This concept is applicable to bundles of resources; the availability of some mix of resources may limit some competitor's responses. A resource is *imperfectly imitable* if a competitor does not possess or cannot obtain the resources necessary to duplicate the focal firm's strategy or capability. There are three conditions which can determine if a resource leading to competitive advantage is difficult to imitate; *unique historical circumstances, causal ambiguity,* and *social complexity. Substitutable resources* are strategically equivalent resources to those which are rare or imitable. A strategic equivalent can be created out of a different mix of similar resources or a different mix of completely different resources depending on the organization of the firm. Organizations must support their capabilities with proper structure, control systems and reward mechanisms (Hitt et al., 2002) in other words *organized to be exploited*. The capability must be managed in such a way to exploit the resources providing the advantage. This organization of a capability is believed to make the difference of whether it can provide temporary or sustained advantage (Robins & Wiersema, 1995).

The generic steps to formulating a strategy in the Resource Based View are:

1) Identify and classify your firm's unique resources relative to competitors;

2) Identify the firm's capabilities relative to competitors and the resources that support them

3) Appraise the rent generating potential using the VRIO framework

4) Select a strategy which best exploits the firm's resources and capabilities relative to external opportunities

5) Identify resources which are candidates for upgrading or replenishing investment (Grant, 1991).

2.2.2 Internal Corporate Governance

Recently, corporate governance has been a buzz word in both academic and trade publications. "Processes that coordinate and control an organizations resources and actions", that define corporate governance, are at the center of issue (Meyer, 2004). This is primarily the result of the large scale corporate scandals occurring in the early 2000's, in such companies as Computer Associates and Enron. The model selected has been adapted from (Meyer, 2004) systemic governance model. Meyer applied this model to the IS department in recent publication but is simply adapted to fit IS from his previous publications. This model regards five concepts; culture, structure, internal economy, methods and tools, and metrics and rewards. The following paragraphs attempt to address these issues individually, and then their systemic use for governance is discussed.

Meyer (2004)defined *culture* as the behavioral patterns (habits and conventions) generally practiced within an organization. The competing cultures model of organizational culture explains that organizations have differing values that can be assessed and assigned using the firms' traits (Hauser & Paul, 2006). The value orientations in this model are positioned against two sets of extremes, flexibility or control, and internal or external. These sets are represented on a perpendicular axis; at the end of each arm is the extreme of that value orientation. In accordance to this mapping there are four possible culture types, group, adhocracy, rational, and hierarchy. Associated with each of these types are a set of cultural traits.

Structure is the definition of jobs and reporting hierarchy (organizational chart), as well as the processes that combine people into teams as work flows across organizational boundaries (Meyer, 2004), its

centralization and formalization. *Structure* is the combination of two concepts; centralization and formalization. Centralization can be seen as the distribution of power throughout the organization. This power is used in the decision making process regarding ones' own job, firm wide policy, and hiring. This concept combines two sub concepts, participation in decision making and authority hierarchy. Participation is reflected in individuals input to policy, hiring and firing. The remaining decisions regarding and individuals performance of their own job constitutes authority hierarchy (Schminke, Cropanzano, & Rupp, 2002). Formalization is simply the extent of a firms' explicit statement of its policies and processes.

The concept of *internal economy* can be seen as the financial means of decision making within the firm in order to guide the application of resources. Meyer (2004) Academic publications have developed these attributes into two larger concepts; chargeback, and strategic accounting practices. These are the activities of budgeting, transfer-pricing, priority setting, project approval, and tracking processes.

Chargeback is a cost control method which attempts to improve efficiency and effectiveness within organizations through application of resource reallocation. Conventional methods of chargeback assign profit centers to all departments within the organization; these cost centers create price billing procedures for interaction with the other cost centers. A model of chargeback systems developed by Bergeron (1986) states that a well executed chargeback system has five main principles, accountability, authority, cost variability, quality of information, and involvement. Despite the criticism of chargeback systems their ability to impact cost reduction without decreasing business unit performance is noted (J. Ross, Vitale, & Beath, 1999).

Strategic management accounting practices facilitate financial decision making regarding budgeting, priority setting and project approval. They are defined primarily as a set of accounting practices that are externally-orientated or long-range in nature. Recent work has identified 15 activities which fit the qualifications above, these are; activity-based costing, attribute costing, benchmarking. brand valuation, competitive position monitoring, competitor cost assessment, competitor performance appraisal, integrated performance management, life cycle costing, quality costing, strategic costing, strategic pricing, target costing, and value chain costing. This is a relatively daunting list of practices that can be more simply

classified under four main categories; costing, competitor accounting, strategic accounting, and brand value accounting (Karen S Cravens, Chris Guilding, 2001).

Methods and tools are relatively foreign to academic publication and is defined as the procedure, methods, skills and tools that people use. Due to the lack of academic support for this concept, this concept was deemed too vague and lacking sufficient definition to be of practical use at this stage in its development.

The *metrics and rewards* concept is made up of two sub-concepts. The first is feedback systems which allow for the setting and tracking of performance measurement; and the second is the establishment of proper incentives which act as justification for employees to modify their behavior. In order for the performance evaluation to be effective, the systems must consider the firms external environment, especially their customers and competitors taking into consideration the strategic goals of their own firm.

2.2.3 Macro-Environmental Analysis

The Macro-Environmental analysis diagnoses major factors of the market positioning and external influences of the firm. Market positioning is the product differentiation or economy of scale strategies employed by the firm relative to its competitors. Two concepts are important here the positioning of competitors and the basis of the reasoning for how the changes in the environment will affect the focal firm and the industry at large.

The Political, Economic, Socio-logical, Technological (PEST) Model

There are many perspectives that have been developed to aid managers in their assessment of a firm's external analysis. One such model taught in many business schools is the PEST model. This model integrates a wide array of macro level factors which can affect firms, but it cannot be considered to encapsulate all possible external factors, opportunities or threats, as no model can. Despite this, it does have two powerful advantages. First since it is such a high level analysis that the factors can be used in nearly every situation and secondly the model is highly flexible in its process.

The importance of external analysis began to interest researchers in the sixties. This research yielded numerous views of the macro environment of the firm. In 1981 the book by Fahey and Narayanan (1986) brought together a diversity of subject matter into a singular view of macro-environment analysis. Their original incarnation of the model included only four segments, Political, Economic,Social, and Technological. Although the authors made no attempt to brand the model it became effectively known as the PEST model (Fahey & Narayanan, 1986).

The current model, PESTEL, is used by looking at six external segments; demographic, socio-cultural, political/legal, economic, technological, environment/global (Hitt et al., 2002). These segments are made up of additional sub-categories. The sub-segments are only a basis for examination, suggested places to look, and their number can be tailored to fit the larger segment with proper justification. This customization is strength of this model which allows the analyst to have quite a broad view of the segments and to tailor the model to take advantage of interaction affects. The following paragraphs elaborate further on the six high level categories.

The *demographic* segment looks at the characteristics of the firms target population. This is generally accepted to be the size, age groups, geographic distribution, income and ethnicity of the population. The next segment examines the *socio-cultural* values, norms and social attitudes of the target population. These are the aspects of the target populations' society. The *political/legal* segment's attention is focused on the legal and political forums, the courts, regulating bodies and governmental interest groups. Firms can interact substantially here with the decisions made in these forums as they can also have direct or indirect effects on focal firms. The *economic* segment is a macro level view of the economy in which the firm is not believed to have a great deal of control over its fate. This view is so broad it is highly related to global events, especially in today's world of international markets. The *technological* front refers to the changes in knowledge of how inputs can be combined to create outputs. Advances in this segment are usually regarded as increases in efficiency or reduction of costs through the focal firms' research and development. The technology segment looks at a grand view which encompasses all facets of technology allowing for the analysis of business benefits provided by all technologies used by the firm. The *global*

segment is a combination of all the previously mentioned segments with a focus on the changes and characteristics of emerging markets and international events. This segment also takes into consideration the issues of the "commons", those of shared resources between all industries and people.

In more recent documentation the model has included one further segment, the *Industry/Market*. The industry segment regards the competition that a firm faces. Executives' appropriate positioning of firms within the market is key to understanding how changes will affect the firm (Albright, 2004). Changes in this segment can also include the relations throughout the supply chain of the industry.

Not only does the PESTEL model specify what segments need to be looked at but also how to look at them and track the information which is recovered from scanning. This process uses four activities; scanning, monitoring, forecasting, and assessment (Fahey & Narayanan, 1986). The purpose of the initial *scanning* is to watch for changes happening either currently or in the near term of the firm's external environment. Successful scanning activities alert the firm of environmental changes before they affect the firm, possibly before the change has even begun and therefore negative effects may be prevented. All six segments must be scanned using a broad assortment of sources (Albright, 2004). *Monitoring* follows the links envisioned in the scanning phase in order to either confirm or disprove an emerging pattern. This activity should be a formalized, systematic search for data focused on specific trends. It is not sufficient for firms to know what patterns have established, they must also attempt to predict the future of these patterns by *forecasting*. The factors of forecasting are the rate at which the change is occurring, what areas will be affected by the change, and how drastically will these areas change (Walsh, 2005).The *assessment* step takes the activity of forecasting one step further by making assumptions about how and why the change will affect the firm and the industry. It is the leap from "understanding the environment… to identifying what that understanding of the environment means to the organization" (Fahey & Narayanan, 1986) allows them to gain advantage over other organizations.

The previous three sections have outlined the content of the CEO's knowledge domain, for the purposes of this paper. Knowledge of these areas can be obtained from a variety of sources; conversations with TMT members, educational programs, experience, seminars or conferences, etc. This research is not

intended to explain how this knowledge is obtained but rather to mark the results in the organization one the knowledge has been obtained.

2.2.4 CEO knowledge and performance

The section below reviews prior research in to the affects of the above constructs, from the CEO knowledge domain, on various organizational performance metrics. The constructs below are presented in the same order as above. Financial metrics of performance were not the only ones considered. The assumption justifying this research is that an executive with knowledge of these areas will shape them withing the organization to create firm performance.

The majority of empirical work regarding the Resource Based View has had two goals. The first has been to establish empirically testable statements and observations in line with the Resource Based View theory, in order to prove that the RBV is a useful tool in the analysis of competitive strategy in comparison to the SCP. Researchers in this stream have taken on the task of defining and empirically testing specific capabilities. The economy of scale capability has been shown to provide competitive advantage with in an industry (Makadok, 1999). This research also managed to provide an instance where the RBV predictions regarding immitatability are shown to be correct. As firms in the same industry imitate the success in economies of scale, this capability gradually loses its potency. Following the knowledge based view, a spinoff of Resource Based View; IT managers with strong business knowledge have been show to affect improved managerial capabilities in organizations (Fink, 2007).

The second goal of the empirical work has been to justify the existence of the theory in the shadow of the Structure-Conduct-Performance theory. Research has compared firm performance of strategic groups within an industry and structural forces affecting firms to find that performance was not predicted well by the selection of one particular strategy over the other (Cool & Schendel, 1988). Instead the authors believed that the firm specific asset accumulation and competences in combination with the market environment could better explain the performance differences. Following from these developments Rumelt

(1991) considered intra-industry performance differences versus inter-industry performance differences. The findings of this comparison report that the contribution to performance of business unit specific resources greatly outweighs that of the industry factors. Even in organizations which are greatly diversified, support for the importance of resources over industry selection exists (Robins & Wiersema, 1995). Thus it is expected that a TMT with a good understanding of Resource Based View would lead to increased firm performance.

The competing cultures model has been used by Parker (2000) as a barometer of change within an organization. This research attempted to show that the traditionally highly structured public sector management of Australia was moving to a more external (customer) orientation. Contrary to managements' expectations the results showed that the majority of public sector management departments remained internally focused and employing a control model. The competing culture model shows reliability in varying international settings and also that subtle changes in organizations' cultures can be captured using this model. A further study showed that a firms' cultural focus directly affects their market effectiveness. So firms with internal focus have greater internal market effectiveness, and firms with an external focus have greater external market effectiveness (Leisen, Lilly, & Winsor, 2002). In combination the results of these two studies would lead researcher to believe that a manager with an understanding of organizational culture, following the competing cultures model, and a desire to change this culture based on the firms needs would be able to improve firm performance.

The study of structure has interested researchers for many years and continues to be a frequently discussed issue. In 1980 a summary regarding formalization and centralization was conducted (Dalton, Todor, Spendolini, Fielding, & Lyman, 1980). The review revealed that the relationship between performance and centralization of authority seems to be slightly negative, yet was not completely apparent. Similarly, the summary could not draw specific correlation between formalization and performance.

More recent research (Miller, 1987) has revealed that centralization and formalization have differing affects on successful and unsuccessful firms. Rationality in strategy generation for successful firms was

shown to be positively influenced by decentralization. Unsuccessful firms seemed to suffer from too much interaction due to decentralization. Factors of formalization showed similar mixed results. Formalization appeared to increase assertiveness during the process to the point where it may have impeded firms from being successful. Yet formalization in successful firms was correlated with the ability of their members to interact effectively. Thus, the ability to understand how structure affects or can be manipulated depending on the firm should be of interest to strategic decision makers in order to achieve above average returns.

As new constructs and ideas develop their relation to structure often comes into question. Thus although the relationship between structure and performance may not be significant, the interactions between structure and other variables remain open for greater success. For instance, Green et. al. (2005) found that no factor of structure was related to performance but that market orientation, which was positively influenced by formalization, does create significant success. It stands to reason that an understanding of structure would allow organizational leaders to modify structure to capitalize on interacting characteristics.

There are many expected benefits from *internal economy*. For instance improved accountability, long term focus, coordination, understanding of competitors' strategy and sources of competitive advantage are all expected to support strategic goals and should result in greater organizational performance (Forrest, 1996; Kapferer, 1992). All of these results are in line with Epstein's (2000) Action-Profit-Linkage model, which aims to link economic impacts to the actions of employees and customers.

Empirical and case study data have been used to show that strategic costing can yield "potential strategic benefits from knowing what factors drive cost and how to use cost analysis to gain competitive advantage" (Shank & Govindarajan, 1992). In addition value has been found in the use of chargeback systems by creating perceptions of the ability to control costs; this perception is stronger in upper management, than described by the users of IT resources (Quinlan, 2002). Executives ability to complete relevant costing analysis has positive effects not only on profit and customer satisfaction but also on less tangible aspects of organizations like organizational learning (Epstein et al., 2000).

Similar to internal economy, metrics and rewards can be leveraged by savvy executives to generate increased performance. Picken and Dess (1997), offer convincing case studies to support the use of

feedbacks, not only to control key indicators but also to maintain the validity of those indicators through secondary loops. Such motivation based feedback schemes have proven impressively effective in group settings. It has been found that dynamic combination incentive programs can improve a wide range of performance outcomes. It stands to reason that knowledge of these systems is required to tailor them to specific situations, as opposed to applying a set system to any situation. Such tailored systems can increase positive behaviors like productivity and quality, while at the same time unwanted behavior, such as absenteeism and turnover, were decreased (Moreno, 2003).

Successful scanning activities alert the firm of environmental changes before they affect the firm, possibly before the change has even begun and therefore negative effects may be prevented. All six segments must be scanned using a broad assortment of sources (Albright, 2004). *Monitoring* follows the links envisioned in the scanning phase in order to either confirm or disprove an emerging pattern. This activity should be a formalized, systematic search for data focused on specific trends. It is not sufficient for firms to know what patterns have established, they must also attempt to predict the future of these patterns by *forecasting*. The factors of forecasting are the rate at which the change is occurring, what areas will be affected by the change, and how drastically will these areas change (Walsh, 2005).The *assessment* step takes the activity of forecasting one step further by making assumptions about how and why the change will affect the firm and the industry. It is the leap from "understanding the environment… to identifying what that understanding of the environment means to the organization" (Fahey & Narayanan, 1986) allows them to gain advantage over other organizations.

As we have seen each of the factors of CEO knowledge domain can be tailored by executives to reap an optimized set of processes to control and coordinate the organization It would then be expected that an optimized organization would generate greater than average returns.

2.3 CIO Knowledge

The following sections thoroughly explain the models of corporate level IT knowledge. The models presented here represent the most current understanding of IT management through; IT Capability identification, IT Governance, and Strategic role of IT.

2.3.1 Information Technology Capability Identification

The following assembly of IS capabilities has been classified using a system defined by Day (1994). The basis of these classifications was developed for the creation of a market-driven organization. This view of capabilities is facilitated by the process model of the firm. Thus the capabilities can been sorted into three possible classifications; outside-in, spanning, and inside-out.

Outside-in capabilities represent the firm's view of its environment, its customers, suppliers, competitors, and other stakeholders. These processes "enable the business to compete by anticipating market requirements ahead of competitors and creating durable relationships with stakeholders". Processes which begin from the inside then respond to the external environment are classified as *inside-out*. These processes link internal functions of the firm to other internal functions. *Spanning* capabilities are quite literally those that are "the tie that binds". These processes integrate the functions of the outside-in and inside-out capabilities (Day, 1994). These three types of capabilities work in tandem to allow the organization to conceptualize its environment (outside-in), develop plan of action (spanning), follow through with the plan (inside-out), organize its response (spanning) and deliver the solution (outside-in). The table below defines capabilities which fall into these groups.

Table 1. IT Capabilities *(Day, 1994)*.

Capability	Definition
Manage external relationships	The firm's management of linkages between the IS function and stakeholders outside the firm, such as suppliers and customers.
Market Responsiveness	The collection, dissemination, and response to information regarding the firm's external market intelligence.
IS-business partnerships	The integration and alignment between the IS function and other functional areas or departments of the firm.
IS Planning and change management	The planning, management and appropriate use of technology architectures and standards to anticipate and meet future business needs.

IS infrastructure	The firm's use of computer hardware and software regardless of its nature of development, either proprietary or off-the-shelf.
IS technical skills	The technical skill level regarding hardware and software and the ability to deploy, use and manage it.
IS development	The alertness to emerging technologies and the ability to develop or experiment with them for the purpose of quick adoption.
Cost effective IS operations	The efficient and cost-effective IS operation on an ongoing basis.

2.3.2 Information Technology Governance

The definitions of IT governance are considerably easier to track than those of Corporate Governance, through compiling these definitions it is possible to create a composite meaning of IT governance. IT governance is the organizational control of firm stakeholder groups throughout the organization, decision rights regarding the IT function and direction, for the purpose of effective and efficient firm service (Willcocks et al., 2006; Robinson, 2005; Luftman & Brier, 1999; Sambamurthy & Zmud, 1999). Recent academic work has combined the two previous streams of this research (Brown & Grant, 2005), Contingency and Structure. The creators of the current framework consider this as the basis of IT governance. *Specifying the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT* (Weill & Ross, 2004).

This model is known as the matrixed approach to IT governance. The matrix is created using the structure types located along the vertical (row) axis and the decision domains along the horizontal (column) axis. The table created is a valuable tool in the analysis and design of IT governance (Weill & Ross, 2004). The function of IT governance can be summarized as the determination of a framework of who makes each type of decision (a decision right), who has input to a decision (an input right) and how these people (or groups) are held accountable for their role to create desirable behavior in the use of IT. This model defines six possible governance types ranging from highly centralized to highly decentralized structures but also across control from primarily by business managers to primarily by IT managers. Regardless of type, IT governance must create decision structures for five IT decision domains. Additional

understanding of how these concepts interact with the firm strategy and how they change over time (J. Ross, 2003) is required to select the correct governance model for a firm and improve firm performance.

Table 2. IT Governance Matrix *(Weill & Ross, 2004)*.

	Decision Domain				
Governance Structure	IT Principles	IT Architecture	IT Infrastructure Strategies	Business Application Needs	IT Investment
Business Monarchy					
IT Monarchy					
Federal					
IT Duopoly					
Feudal					

Table 3. Centralization Positions *(Weill & Ross, 2004)*.

Position	**Definition**
Business Monarchy	The most centralized approach, senior business executive(s) make all IT related decisions for the whole enterprise.
IT Monarchy	Decisions for the whole enterprise are controlled by the head of the IT department and their senior team.
Federal	Corporate level executives and business representatives of all the operating groups collaborate with the IT department.
IT Duopoly	A two party decision making approach involves IT executives and a group of business leaders representing the operating units.
Feudal	Business units or process leaders make separate decision on the basis of the unit or process needs
Anarchy	The most decentralized structure, individual user or small group pursues their own IT agenda.

Table 4. Decision Domains *(Weill & Ross, 2004)*.

Domain	Definition
IT Principles	The high-level decisions about the strategic role of IT in the business.
IT Architecture	An integrated set of technical choices to guide the organization in satisfying business needs
IT Infrastructure Strategies	The centrally coordinated, shared IT services that provide the foundation for the enterprise's IT capability and were typically created before precise usage needs were known.
Business Application Needs	Business requirements for purchased or internally developed IT applications.
IT Investment	Prioritization of how much and where to spend on IT.

2.3.3 Strategic Role of Information Technology

This item was ranked the second most important issue of IS professionals in a recent survey and still holds a high position (J. Luftman & McLean, 2004, Luftman, 2008). This paper adopts the definition of strategic role of information technology as the IT applications used to help the organization gain a competitive advantage, reduce competitive advantage, or meet other strategic enterprise objectives (Croteau & Bergeron, 2001). This vision of IT is prescribed to be a consensus between the top executives in a firm (Feeny et al., 1992).

This model of the 4 visions of IT was developed through structured interviews with a significant number of CEOs in the late 1980's by Schein (1992). Schein's work looked at the CEOs view of the role of IT based organizational change processes. This change process entails the unfreezing, changing and refreezing of the organization. This work resulted in the clarification of four types of factors affecting the role of the CEO.

Visions of IT were defined as "levels of impact" according to the author. The CEOs beliefs regarding what IT could or could not do for them and the organization, regardless of their explicit understanding of the foundations for the belief. Thus, they are based not only on the internal IT abilities of the firm but on the macro-environmental venue, a sub-section of the IT scanning area. These beliefs were then classified into 4 visions, *Automate, Inform-up, Inform-down, and Transform* ((Dehning, Richardson, & Zmud, 2003), (Schein, 1992)). The *Automate* role regards IT as a means of replacing human labor in

business processes. The Inform up and down roles are similar because they refer to the ability of IT to communicate information about business processes in their respective directions within the organization. The purpose of the *inform up* role is information relay is to facilitate the process of decision making by executives. The *inform down* role provides the same benefits of information but for the purpose of control and knowledge sharing by non executive levels. The *inform down* position also refers to horizontal communication such as coordination between teams. Finally the *transform* role describes the ability of IT to redefine the business and influence industry processes and relationships.

Through understanding that setting an appropriate vision of IT for the firm, executives can affect firm performance. But as research has shown above this vision must be shared so in order to obtain above average results it would be expected that both individuals would have to have some idea of what a vision of IT for the firm is.

2.3.4 CIO knowledge and performance

In the section below, research that demonstrates how performance improvements can be made using IT corporate level knowledge is presented. This section follows the order in which the CIO knowledge areas were previously presented and mirrors that of the CEO knowledge areas.

Most IT capability researchers have found that IT was not sufficient to bring about performance benefits but instead it is their fit with organizational situations that yields above average results For instance one study showed that when applied with strategic purpose provided better control of the IT destiny, business unit and supplier collaboration, leading to improved financial return (Willcocks et al., 2006) Another study found that the areas of IT planning, delivery and support, were necessary, for the accomplishment of strategic objectives of the firm (J. W. Ross, Beath, & Goodhue, 1996). Further research attempted to establish the direct link between the IT capability and firm performance. Based on the Resource Based View these resources were tested to stand up against the argument of immitatability of IT. As predicted, the strictly IT resources were shown to have no effect on the firm performance but the other human and organizational IS resources were shown to create added value for IT leading firms (Powell &

Dent-Micallef, 1997; Jeffers, 2003). IT resources bundled in this fashion were also found to create an IT capability that allowed firms to outperform others on many accounting profit measures and also on similar measures of cost (Bharadwaj, 2000). Thus by knowing how to build the right IT capabilities organizations can grow to increase their performance.

Many researchers have supported the idea of increasing TMT and even board level understanding of IT governance in search of improved performance, both on a defensive and offensive front, although statndardized measurement of the relationship has not been performed (Nolan, 2005; Karst, 2005). Although the IT governance framework presented previouslyhas only recently been created, it was selected on the strength of its theoretical background, acceptance in the community and also its successful use in research cases. Since its publication, the framework has aided in the analysis of IT governance in multiple organizations. Of note Johnson & Johnson (Peterson, 2004), Novozymes (Larsen, Pedersen, & Viborg Andersen, 2006)(Larsen 2006) and fifteenth century warship, the Vasa(Brown, 2006). Other research has shown that IT governance through effective data use can lead to information that can drive significant benefits; including top-line sales, identifying cost savings, improving customer satisfaction and monitoring regulatory compliance (Todd, 2008). In addition enterprise level capabilities have been shown to benefit from and appropriate IT governance model (Law, 2007).

In order to create increased performance executives need an understanding of what factors have positive and negative results due to IT strategic vision. In individuals such positive factors are a clear definition of competitive position, need for innovative response and strong leadership (King & Teo, 1996). Often an individual's vision of IT is developed through personal experiences, such as project leadership or education. A firm's vision of IT can also be classified, although this has usually been done through the identification of the beliefs of either the CIO, CEO or both. The first of such studies showed that the quality of the relationship between the CIO and the CEO is predominantly better if the CEO and CIO share the same vision of IT (Feeny et al., 1992). Tai and Phelps (2000) investigated this relationship further and found that CEOs and CIOs often share the same vision of IT but that the CIO often puts a greater importance on the transformational role of IT than the CEO. In addition CEOs and CIOs both seem to

place the role of IT as informing up the hierarchical structure. Their findings also implied that there may be limits to the strategic role of IT based on certain cultural differences, such as the desire to hold control through information. Competence of these roles has been shown to be positively related to the intention to lead IT projects by business managers (Bassellier et al., 2003) These conceptions of the strategic roles of IT in previous studies all place the understanding of these IT roles under the realm of the CIOs knowledge. All of these factors combine to purport that a shared strategic vision of IT affects organizational performance (Marchand, 2007).

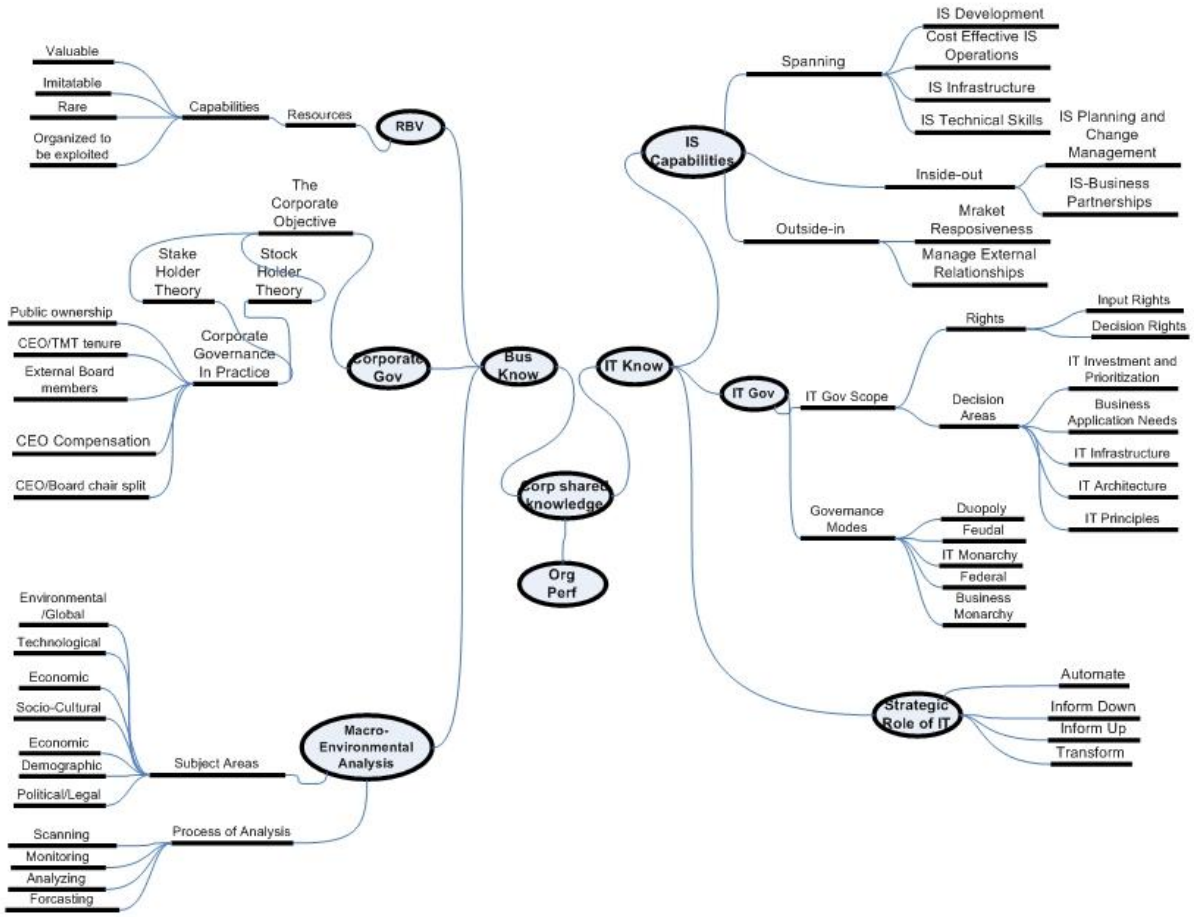
2.4 Firm Performance

Firm performance is a frequently tested concept. There are many ways that have been invented to test this concept. Generally these methods can be divided into two groups: financial and perceptual; both of which have been used in this stream of research to measure success (Armstrong & Sambamurthy, 1999; Tai & Phelps, 2000). Two such examples of financial measures are Return on assets, or revenue. Perceptual models can measure the beliefs of respondents regarding the focal concept. Financial measures often prove to be difficult, time consuming and heavily influenced by external factors. Although perceptual factors can also be biased, they are much easier to collect and assess. For these reasons perceptual measures were selected for this study.

3 Research Model and Hypothesis Development

Two models presented below display the conceptual hypotheses in this thesis. The model directly below is a conceptual model showing the hierarchical relationships of all the constructs.

Figure 2.Conceptual Model

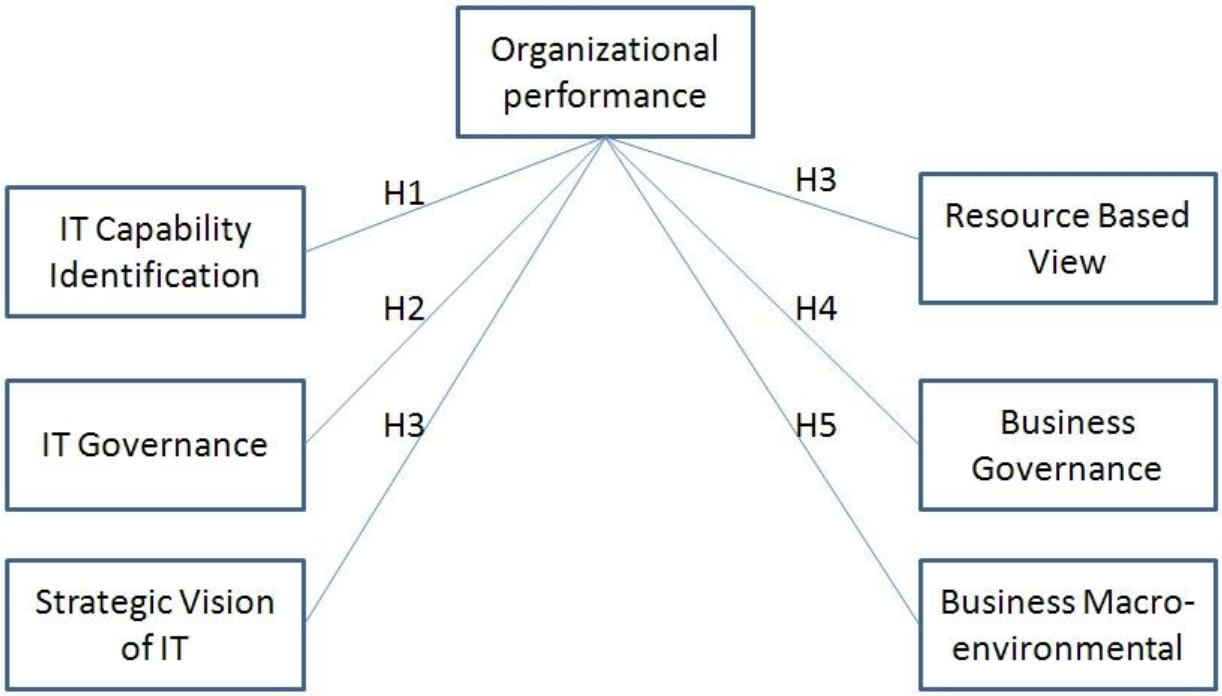


The theoretical model below graphically represents the hypotheses between concepts that this research aims to establish, that strategic level shared knowledge is associated with organizational performance. The solid lines connecting concepts in this model symbolize the hypotheses that will be statistically tested. Rectangles on this diagram represent concepts. Each of the concepts displayed in this map, as abstract constructs, will correlate to items on questionnaires

in the following section. These questionnaires will assess the corporate level knowledge that each member of a CEO/CIO pair has about the others knowledge area.

The below model have been designed to prove that the following assumptions exist; the CIO's understanding of CEO knowledge correlates with the organizations performance (H1, H2, H3), the CEO's understanding of CIO knowledge correlates with the organizations performance (H4, H5, H6), and if both the CIO's understanding of the CEO's knowledge and the CEO's understanding of the CIO's knowledge are both correlated with organizational performance Churchman's Mutual Understanding relationship exists. If only the CEO's understanding is correlated to organizational performance the communication relationship exists. If only the CIO's understanding is correlated to organizational performance the persuasion relationship exists. If either the CIO or CIO's understanding is correlated to organizational performance then the relationship is expected to be separated function.

Figure 3. Theoretical Model



The model above portrays the subjects and concepts developed in the literature review. There are three hypotheses that can be drawn from the model above; these are

H1: The higher the CEO understanding of the corporate IT capability is, the higher the organizational performance is.

H2: The higher the CEO understanding of the corporate IT governance is, the higher the organizational performance is.

H3: The higher the CEO understanding of the corporate IT macro-environmental is, the higher the organizational performance is.

H4: The higher the CIO understanding of the corporate business capabilities is, the higher the organizational performance is.

H5: The higher the CIO understanding of the corporate business governance is the, higher the organizational performance is.

H6: The higher the CIO understanding of the corporate business macro-environmental is, the higher the organizational performance is.

4 Methodology Overview

This section covers the creation of scales and samples from which to collect data and also the methods by which the data was analyzed. To begin the scales were developed to measure the corporate level knowledge areas according to the model provided above. Once these scales were developed, the task of selecting an appropriate sample was accomplished. After which the methods for data collation and analysis are discussed.

4.1 Scale development

Following the thorough literature review, a search specifically for empirical development of these constructs was undertaken. This search was conducted primarily in two ways firstly through the pearl of citation method, from the initial theoretical development, and secondly through use of periodical and book review using local resources. The model used in this study has three constructs making up the CIO's scale, IS capabilities, the strategic role of IT and IT governance. Three scales were also developed for the CEO's scale, which is composed of: resource based capabilities, environmental analysis, and organizational governance.

4.1.1 CEO's knowledge scale for IT

The CIO knowledge scale is built up from the three primary knowledge areas discussed in the literature review. Presented below is a review of the method and summary of scale selections used to measure these knowledge areas.

As elaborated in the theoretical development literature review the primary basis for the understanding of the IS capabilities used in this study comes from Wade (2004). From his summary of resource based IS capabilities some scales were found direct from reference to (Bharadwaj, Sambamurthy, & Zmud, 1998) those of: managing external relationships, IS business partnerships, and IT planning / change management. Two of the remaining scales were matched and adapted based on the definitions provided for market responsiveness and IS development. The scale for market responsiveness from

(Tseng, 2005) required adaptation from considering more general types of resources to IT resources. Two sources, Grover (Kearns & Lederer, 2003) and Bajwa (2005), were used to create the IS development construct, this is because no single scale encompassed all the concepts mentioned in its definition. The remaining construct, IS technical skills, used items selected based on the strength of reliability from their previous use in Stratman's work (2002).

The next construct in the CIO's knowledge domain is IT governance, as according to the matrix model created by Weill and Ross (Weill & Ross, 2004).The sub-constructs which required scales were: IT governance archetypes, IT architecture and IT investment and prioritization. IT archetypes, in accordance with the development of Ross and Weill, are developed out of research on centralization or structure of IT. Although these concepts have been around for some time, in their current form based on decision rights they have only been used for categorization and often have required interviews and have not been operationalized for questionnaires. Thus these items have been developed for this specific study but do have some grounding in the concept of centralization from organizational structure. The six items used here have been adapted from Schminke (2002) to fit the ideas of participation and hierarchy of decision making regarding IT. IT architecture is also a concept that has been around for a long time. Although it has shared some confusion with IT infrastructure in its development, the current operationalizations allow for separation of the two ideas. Zhang (2005) used the same operationalizations as those used in this study, reliably, while also using items for IT infrastructure in the same scale. The final sub-construct that required a scale was IT investment and prioritization. Bacon's scale (1992) was a very good match to the Weill and Ross model, encompassing factors greater than just purely financial objectives by including those which were organizational and external to the organization.

Three sets of sub-constructs were merged due to high correlation with one another despite differences in nomenclature. The first set was cost effective use of IT and business application needs. The reason for this was that both sub-constructs dealt with the concept of efficient IT provision which met the needs of its users. Consequently, the items used for this shared construct were placed in IT governance under business application needs. These items were adapted from Coupe (1996) and are founded in the ISSERVQUAL

instrument. Although the original scale is quite large the item selected represent those with the highest loading based on the result of the study cited above. The second set of sub-constructs that were found to be to similar to provide reliability were vision for the role of IT and IT principles from IT governance. Since the items for the vision for the role of IT are so well supported in research it was a simple choice to ensure their inclusion. The last set was a simple matter of exact duplication of IT infrastructure in both the models of IS capabilities and IT governance. These items were found in (Bharadwaj et al., 1998).

Schein's model for visions of IT use is one of the most used categorization of an organizations or an individual's belief regarding the uses of IT. The version of these visions used in this study was taken from (Armstrong & Sambamurthy, 1999). The adaptation made to these items was to divide the multiple concepts found in each vision into their individual items and ensure that they were phrased as such not to be mixed items. This resulted in two items for each vision of IT, eight items all together.

4.1.2 CIO's knowledge scale for business

Since the model was designed to measure the mirroring ideas relative to their positions, there are also three constructs in the CEO's knowledge scale.

The first construct, resource based capabilities, was measured using a previously validated scale from (Sharma & Vrendenburg, 1998). This scale captures the majority of the concepts that have been developing regarding this theory.

The next scale developed for this study is organizational governance. Although the framework used here references IS governance, the scale is built on theory which was originally created for the control and governance of organizations. There are four sub-constructs in this framework: culture, structure, internal economy and metrics/rewards. Both culture and structure all long existing constructs and have been relatively well developed; especially the structure scale from Schminke (2002) has been relatively similar for almost thirty years. The scale, adapted from Hauser (2006), used for culture was originally designed to categorize the amount of each of the four possible culture types within an organization. The scales for internal economy had to be created from two other previously established scales in order to

remain consistent with the concepts of the framework. The concept of selection and prioritization is measure using a group of strategic management accounting practices which was used previously to identify their use within firms by Cravens (2001). These strategic management accounting practices consider costing and value of activities in firms relative to their environment and therefore represents financial measures for the decision making process of organization wide activities and projects. The other section of the internal economy concept has to do with transfer pricing, how organizations bill each other internally. The scale used for this was originally used by Bergeron (1986) to measure the use of transfer pricing in regards to data processing services. Adaptations for this scale required the removal of the words "data processing" before services for each item. The final sub-scale in this construct measures metrics and rewards. This scale was taken from Mikesell's (2000) PhD thesis, because of the general agreement with the frameworks definition. Unfortunately the scale showed relatively low reliability, this was dealt with by changing some words in the items to reduce the mixing of concepts.

The phrasing changes made during the adaptation and development of all scales were focused around the idea that their purpose was to allow the participants to provide a perceptual rating of how knowledgeable they were regarding each of the concepts within these constructs. This was facilitated using the "I know about…" followed a concept under investigation focused on the participants understanding within the focal firm. This format is based on that of used by research which lead to the development of this study and can be found in Armstrong (1999). In total the numbers of items on the CEO and CIO scale respectively are 73 and 78.

The final scale used measures the CIO's knowledge of macro-environmental analysis. Although the original theory used a process of scanning with three steps, in recent research the steps have been changed and increased to include the dissemination of the information found through scanning and the ability to act on the information. The scale from Matsuno (2000), although it does not cover all the areas that have been postulated in research it does cover the original four (political, economic, socio-cultural, technological) and also a view of the relevant industry. Though, the primary reason this scale was selected

was for its measurement of these areas, it also encompasses the process of environmental analysis. Below is a table outlining the number of items per construct and their reference.

Table 5. Scale sources

Construct	Concept	Source and Items
CIO SURVEY		
Organizational capabilities	RBV theory (CIO1 – CIO3)	Sharma & Vrendenburg, 1998
	Continuous innovation (CIO4 – CIO9)	Sharma & Vrendenburg, 1998
Macro-environmental analysis	Information gathering (CIO10 – CIO13)	Matsuno & Mentzer, 2000
	Information development (CIO14 – CIO18)	Matsuno & Mentzer, 2000
	Responsiveness (CIO19 – CIO20)	Matsuno & Mentzer, 2000
Organizational governance	Leadership (CIO21 – CIO24)	Hauser & Paul, 2006
	Bonding (CIO25 – CIO28)	Hauser & Paul, 2006
	Strategic emphasis (CIO29 – CIO32)	Hauser & Paul, 2006
	Dominant attribute (CIO33 – CIO36)	Hauser & Paul, 2006
	Participation (CIO37 – CIO38)	Schminke et al., 2002
	Hierarchy (CIO39 – CIO42)	Schminke et al., 2002
	Formalization (CIO43 – CIO46)	Schminke et al., 2002
	Strategic accounting (CIO47 – CIO50)	Bergeron, 1986; Cravens & Guilding, 2001
	Chargeback systems (CIO51 – CIO56)	Bergeron, 1986; Cravens & Guilding, 2001
	Evaluation (CIO57 – CIO58)	Mikesell, 2000
	Feedback (CIO59 – CIO64)	Mikesell, 2000
Organizational performance	Growth (CIO65 – CIO67)	Croteau & Bergeron, 2001
	Profitability (CIO68 – CIO72)	Croteau & Bergeron, 2001

CEO SURVEY		
IS Capabilities	External relationships (CEO1 – CEO3)	Bharadwaj et al., 1998
	Market responsiveness (CEO4 – CEO7)	Tseng, 2005
	IS business partnerships (CEO8 – CEO11)	Bharadwaj et al., 1998
	IT development planning (CEO12 – CEO13)	Bharadwaj et al., 1998
	IS infrastructure (CEO14 – CEO19)	Bharadwaj et al., 1998
	IS technical skills (CEO20 – CEO23)	Stratman & Roth, 2002
	IS development (CEO24 – CEO26)	Grover,1993; Bajwa 2007
IS macro-environmental analysis	Automate vision (CEO27 – CEO28)	Armstrong & Sambamurthy, 1999
	Informate up vision (CEO29 – CEO30)	Armstrong & Sambamurthy, 1999
	Informate down vision (CEO31 – CEO33)	Armstrong & Sambamurthy, 1999
	Transform vision (CEO34 – CEO35)	Armstrong & Sambamurthy, 1999
IS Governance	Centralization (CEO36, CEO38 – CEO39)	New Development
	Decentralization (CEO37, CEO40 – CEO41)	New Development
	IT architecture (CEO42 – CEO43)	Zhang, 2005
	Business application needs (CEO44 – CEO48)	Coupe & Onodu, 1996
	Discounted cash flow (CEO49 – CEO50)	Bacon, 1992
	Other financial (CEO51 – CEO52)	Bacon, 1992
	Management criteria (CEO53 – CEO56)	Bacon, 1992
	Development criteria (CEO57 – CEO59)	Bacon, 1992
Oganizational performance	Growth (CEO60 – CEO62)	Croteau & Bergeron, 2001
	Profitability (CEO63 – CEO67)	Croteau & Bergeron, 2001

4.2 Selection

Once all of the appropriate scale options were selected, individual items within these scales were evaluated for removal. This process was important due to the limited time of the survey respondents. No set number was used to determine the number of items to be eliminated. Instead, items were first removed under four justifications: Overlap of concept, relevancy to framework or theory, reverse codification, and for the purpose of increasing reliability.

4.3 Validation

Two forms of validation were done to help insure satisfactory results; pre-testing with relevant individuals and item sorting. Pre-testing was performed to check that the relevancy of the scales to the CEO and CEO roles. The CEO survey was pre-tested with two CEO's and one professional executive coach. Two senior IT professionals reviewed the CIO survey for a practioners' opinion on relevancy, in addition to taking an opinion from another PhD in management of information systems. The primary issues that surfaced were regarding the use of vocabulary that was too academic and large number of items. The first issue was easy to resolve simply by asking the pre-testers words they would feel more comfortable with and making the replacements. The second issue is slightly more delicate. The assembly of the scales was performed with an awareness that if they were too long it would reduce the participation of the sample, yet a scale with too few items would lack reliability. Therefore some items which covered repetitive material were dropped to maintain reliability yet manage the length.

The item sorting of questionnaires was done with graduate level students of administration programs. These students were told to associate items with constructs based on relatedness of concepts and given as much time as they required but were not given any further instructions or aid. In order to test the inter-rater reliability of the scales based on the collected responses Perreault and Leighs (1989)formulas were used. Although there are many options for calculating inter-rater reliability, for instance Cohen's kappa, this particular method was chosen due to the large number of constructs in each scale. This method of calculation includes the verification of reliabilities against an expected number based on the number of

constructs being measured in the scale. In the case of the CEO knowledge scale there are six constructs, resulting in an expected reliability of approximately 82%. Comparably the CIO knowledge scale has 15 constructs and an expected reliability of 76%. Any calculated value above these expected numbers imply the reliability of the scale. The values resulting from calculations for the scales used in this study were, 83% percent for the CEO scale and 78% for the CIO scale.

4.4 Formatting and design

The design of this scale follows that of Armstrong (1999). This was used because of its establishment within the same research stream and also due to its brevity in comparison other similar formats used in other research. One variation from precedent was the refrain of using the "I know about *how*" phrasing. This was done purposely for two reasons; firstly the "how" limitation of in an organization prevents the participant from reporting about their knowledge and instead focuses them on their organization, a conflict of levels. Secondly, the use of "how" limits the type of knowledge being discussed, most likely to explicit knowledge of process, which is not the aim of this research.

4.5 Mailing sample

For the purposes of this study, of corporate level knowledge, the expected respondents to the survey are Chief Executive Officers and Chief Information Officers. The CEO of an organization is described as the upper most hierarchical manager of that firm. The CIO has a similar description as the upper most hierarchical manager within or responsible for the firms IT/IS. Due to the lower acceptance of the term CIO, correspondences with the respondents refer to this individual by both their hierarchical description and title CIO. These individuals should come from firms over significant ranges in industry, firm size, firm revenue, and geographic location. The range of the industries will test the model for applicability over range competitive fields, each with their own differing success factors, maturity levels and varying competition. Although the Canadian mailing list was sorted according to revenue in USD for the purposes of ensuring that the responding firms would be large enough to require the services of senior IT leaders. Due to the large number of mailings this still reflects a fair amount of revenue variation.

Historically, similar research of corporate level managers has obtained response rates of just above 10%. An additional sample was taken from US firms in the attempt to increase the response rate. This sample maintained the characteristics of the Canadian sample.

The database used to collect the Canadian mailing addresses and the CEOs name for this study is called Worldscope. This database is primarily used to find accounting information and is created through accounting reporting. The total database held 1666 usable record, those with a reported CEO and a mailing address. From the 1666, some records were removed due to data error. Further some records were removed to prevent the necessary translation of the survey into French which would have added sophistication to the process of reliability analysis. This still allowed for the use of 1000 records as the sample.

The US sample mailing list was created using the Dunn and Bradstreet database. This database is primarily used for businesses marketing efforts and is consider premier in its field. Selection criteria for survey recipients were the same in the US as it was in Canada, as described above.

The total number of responses was 61; 34 CEO or similar responses, and 27 CIO or similar responses. Thus the response rate was under 1%.

5 Statistical analysis

This portion discusses the statistical analysis under taken and its results. Multiple statistical approaches will be used to assess the model and establish its results. The primary method of assessing the correlation between the knowledge areas and performance was Spearman's Rank Correlation Coefficient. But before making justification for the use of either of these methods some descriptive statistics be reviewed.

5.1Descriptive statistics

The tables below document some descriptive statistics that characterize the data collected. The primary purpose of analysis of descriptive statistics is to search for possible affects or bias resulting from certain patterns in the sample data. Such affects will be discussed in this section and accounted for during the implementation of statistical analysis.

The table directly below displays the title of the respondents and the frequency that this title appeared. The title is important in this research as the goal was to reach the uppermost individual for both the sample organizations and their IT departments. According to the results CEO is the most frequently appearing respondent title for the business side yet VP of IT and IT manager were tied for the most frequently occurring title for the highest ranking individual in the IT organization. Not surprisingly there are more titles for the uppermost IT individual that that of the organization, probably due to the lack or standardization or flexibility of the CIO role.

Table 6. Title Distribution

Title	Count
CEO	32
Executive chair	1
President	1
CFO	7
VP engineering	1
VP IT	6
IT president	1
IT director	5
IT manager	6
Total	61

There was some disagreement between CEO's and CIO's regarding the industry of their firm. In descending order the respondents varied across the Energy, Services, Finance, Manufacturing, Agriculture, Health, Mining, Technology, and Auction.

Other key indicators were also tracked to further establish generizability. These fields were the executive's length of time at the position, their length of time at the firm, the number of employees in the firm and the total revenue of the firm. The table below show the good diversity of the sample regarding these four areas.

Table 7. Generalizability statistics

CIO Descriptive	Term in position	Term at firm	# of employees	Total revenue
Minimum	1	0.5	23	250,000
Maximum	20	37	68000	430 B
Average	6.18	9.98	7286	165 B

CEO Descriptive	Term in position	Term at firm	# of employees	Total revenue
Minimum	1	0.5	23	55,000
Maximum	20	37	68000	430 B
Average	6.48	10.41	9237	302 B

Table 8. Descriptive statistics

Response construct	Average	Minimum	Maximum	Std Dev
IS capabilities	3.68	2.73	4.77	0.48
IS Governance	3.72	2.50	5.00	0.65
IS macro-environmental analysis	3.80	2.62	5.00	0.63
CEO Org performance	3.55	2.12	5.00	0.75
RBV capabilities	3.80	1.77	5.00	0.77
Corp governance	3.85	2.63	4.82	0.55
Macro-environmental analysis	3.49	1.72	5.00	0.86
CIO Org performance	3.56	1.14	4.75	0.71

The results of the descriptive statistics above show that there does not appear to be a significant amount of skew for any construct. This is based on the fact that all responses follow an approximately normal distribution i.e. all data points fall within two standard deviations. This would lead us to believe that the data is suitable for testing using the Spearmans rank correlation. Unfortunately other forms of data validation, specifically confirmatory factor analysis, for convergent and divergent validity cannot be performed on such low sample sizes.

Below we look at the per item descriptive statistics. The data is measured similarly to the above with a minimum, maximum, average and median for a set.

Table 9. CIO Item Descriptive

Item *I know about …*	**Min**	**Max**	**Avg**	**Med**	**Std Dev**
Organizational capabilities - Resources					
our long history of capability development	3	5	3.93	4.0	0.83
our competitors' inability to build up equivalent capabilities even using additional resources	0	5	3.00	2.5	1.37
our sources of capabilities that can not be easily identified or imitated by competitors	2	5	3.93	3.5	0.94
Organizational capabilities - Continuous innovations					
our capabilities provision of benefits to several functional areas/departments	2	5	3.93	3.5	0.91
our capabilities provision of benefits to different levels within the company	1	5	3.83	3.0	1.06
our capabilities as a catalyst for collective learning within the company	2	5	3.78	3.5	0.91
our capabilities as a catalyst for innovation within the company	1	5	3.86	3.0	1.08
our capabilities as a catalyst for collaborative problem solving with stakeholders	1	5	3.82	3.0	1.14
our capabilities creation through combination of multiple assets	1	5	3.80	3.0	1.16
Macro- environmental analysis - Information gathering					
the generation of intelligence regarding our competitors' activities	1	5	3.58	3.0	1.17
our contacts maintained with officials of government and regulatory bodies in order to collect and evaluate pertinent information	1	5	3.07	3.0	1.19
our collection and evaluation of information concerning general social or economic trends that might affect our business	1	5	3.50	3.0	1.22
our learning regarding various aspects of our suppliers' business	1	5	3.14	3.0	1.25
Macro- environmental analysis - Information development					
our collection and evaluation of information regarding customers' future needs with respect to our functional areas	2	5	3.57	3.5	1.01
our periodic reports and newsletters providing information on our customers	1	5	3.44	3.0	1.12
our frequent cross-functional meetings where market trends and developments are discussed	1	5	3.30	3.0	1.41
our regular interdepartmental meetings where knowledge of regulatory requirements are updated	1	5	3.76	3.0	1.10
our technical people sharing information about technology for new products with other departments	1	5	3.96	3.0	1.12
Macro- environmental analysis - Responsivemess					
market information being spread quickly through all levels of the firm	1	5	3.45	3.0	1.23
our capability to implement a response immediately to a major competitor's new intensive campaign targeted at our customers	1	5	3.21	3.0	1.13
Organizational governance - Leadership					
our leaders' roles as mentors, sages or parental figures	2	5	3.96	3.5	0.98
our leaders' roles as entrepreneurs, innovators or risk takers	2	5	4.07	3.5	0.89
our leaders' roles as coordinators, organizers or administrators	2	5	4.07	3.5	0.89
our leaders' roles as producers, technicians or hard drivers	2	5	3.96	3.5	0.88

Organizational governance - Bonding					
our loyalty, tradition and commitment providing a connection between members of our organization	3	5	4.10	4.0	0.70
our commitment to innovation, development and to "being first" providing a connection between members of our organization	2	5	3.96	3.5	0.92
our enterprise wide practices providing a connection between members of our organization	3	5	3.93	4.0	0.85
our task and goal accomplishment focus providing a connection between members of our organization	2	5	4.04	3.5	0.83
Organizational governance - Strategic emphasis					
our emphasis on high cohesion, morale and human resources	2	5	3.89	3.5	0.92
our emphasis on growth and acquiring new resources to meet new challenges	2	5	4.21	3.5	0.86
our emphasis on permanence, efficiency and stability	2	5	4.11	3.5	0.91
our emphasis on competitive actions, goals and achievements	2	5	4.10	3.5	0.93
our firm's characteristic of being a very personal place that is, an extended family where people can share a lot of themselves	1	5	3.48	3.0	1.15
Organizational governance - Dominant attribute					
our firm's characteristic of being dynamic and entrepreneurial place where people take risks	2	5	4.04	3.5	0.79
our firm's characteristic of being a place where bureaucracy governs what people do	1	5	3.32	3.0	1.27
our firm's characteristic of being production orientated, where people are concerned with getting the job done and without getting personally involved	2	5	3.74	3.5	0.94
Organizational governance - Participation					
our employees' participation in the decisions of adopting new programs	2	5	3.79	3.5	0.82
our employees' participation in decisions of adopting new policies	2	5	3.89	3.5	0.86
Organizational governance - Hierarchy					
our need for supervisor approval of a decision before any action	1	5	3.83	3.0	1.20
our employees' empowerment to make their own decisions	3	5	4.07	4.0	0.64
our practice of referring to someone higher up for a final answer even in small matters	1	5	3.33	3.0	1.32
our employees' decisions requiring their boss' approval on any matter	1	5	3.08	3.0	1.32
Organizational governance - Formalization					
our organization's large number of written rules and policies	2	5	3.44	3.5	0.97
our rules and procedures manual and its ready availability within this organization	2	5	3.63	3.5	1.01
our complete written job descriptions for most jobs in this organization	1	5	3.38	3.0	1.19
our formal orientation program for most new members of the organization	1	5	3.63	3.0	1.27

Organizational governance - Strategic accounting					
our strategic costing practices for project prioritization	3	5	4.36	4.0	0.71
our competitor accounting practices for project prioritization	1	5	2.63	3.0	1.32
our strategic accounting practices for project prioritization	3	5	4.20	4.0	0.68
our brand value accounting practices for project prioritization	1	5	3.24	3.0	1.41
Organizational governance - Chargeback systems					
our written explanations concerning causes of large chargeback budget variances	2	5	3.67	3.5	1.15
our reporting actions taken to correct causes of operations budget variances	2	5	3.80	3.5	1.12
our operations cost-variance fluctuations in proportion to the use of operation services	1	5	3.67	3.0	1.27
our use of operations needs when preparing budget	2	5	4.04	3.5	0.93
our necessity to stop some operations activities when budgeted funds are used up	2	5	3.72	3.5	1.17
our requirement of close tracking of variance in our operations budget	2	5	4.19	3.5	1.04
Organizational governance - Evaluation					
our deployment of our performance management	3	5	4.07	4.0	0.80
our deployment of our performance measurement system	2	5	4.07	3.5	0.91
Organizational governance - Feedback					
our regular updating of our collective progress towards the organization's priorities	2	5	4.11	3.5	1.00
our regular, external-feedback ability to help us nurture a shared vision	2	5	3.62	3.5	1.07
our employees' understanding of how they contribute to our organization's strategy and key objectives	2	5	3.86	3.5	0.91
our employees' ability to earn incentive compensation based on effectiveness in contributing to the organization's strategic goals	2	5	4.24	3.5	1.01
our feedback mechanism helping us know where we are and how to improve	1	5	3.89	3.0	1.14
our feedback system allowing us to stay focused on keeping our organization viable	1	5	4.11	3.0	1.09
Organizationizational performance - Growth					
The sales growth position relative to our principal competitors is	1	5	3.72	3.0	0.96
My satisfaction with sales growth rate is	2	5	3.46	3.5	0.90
The market share gains relative to our principal competitors are	1	5	3.33	3.0	1.04
The return on corporate investment position relative to our principal competitors is	1	5	3.62	3.0	1.07
Organizationizational performance - Profitability					
My satisfaction with return on corporate investment is	1	5	3.62	3.0	1.09
My satisfaction with return on sales is	1	5	3.56	3.0	1.06
The net profit position relative to our principal competitor is	1	5	3.57	3.0	0.97
The financial liquidity position relative to our principal competitor is	1	5	3.89	3.0	1.14

Table 10. CEO Item Descriptive

Item *I know about …*	**Min**	**Max**	**Avg**	**Med**	**Std Dev**
IS capabilities – External relationships					
our technology collaborations with customers	2	5	4.00	3.5	0.86
our technology collaborations with suppliers	2	5	3.66	3.5	0.81
our technology collaborations with external partners	2	5	3.63	3.5	0.87
IS capabilities – Market responsiveness					
our excess IT resources capability of providing a buffer against unexpected environmental changes	1	5	3.45	3.0	1.12
our IT ability to derive benefits from variations in the firm's environment	2	5	3.44	3.5	0.89
our IT ability allowing us to manage the degree to which our firm relies on variations in the firm's environment	1	5	3.31	3.0	1.00
our IT ability to provide strategic management of risk due to our firm's environment	2	5	3.68	3.5	0.79
IS capabilities – IS business partnerships					
our ability to blend business and technology expertise through multi-disciplinary teams	2	5	3.85	3.5	0.88
our relationships between line management and IT service providers	2	5	3.80	3.5	0.82
IS capabilities – IT development planning					
our line management sponsorship of IT initiatives	3	5	3.89	4.0	0.70
our climate of nurturing IT-project championship	2	5	3.73	3.5	0.79
our inclusion of project management practices in IT planning	2	5	3.94	3.5	0.78
our practices regarding systems development	2	5	3.70	3.5	0.96
IS capabilities – IS infrastructure					
our data infrastructure appropriateness	2	5	3.69	3.5	0.82
our network infrastructure appropriateness	2	5	3.66	3.5	0.86
our IT infrastructure flexibility appropriateness	2	5	3.59	3.5	0.97
our IT operations efficiency and reliability	2	5	3.91	3.5	0.91
our computer facilities available for IT projects	2	5	3.76	3.5	0.87
our firm's sufficient computing capacity	3	5	3.97	4.0	0.69
IS capabilities – IS technical skills					
our IT staff's technical expertise	2	5	3.88	3.5	0.90
our IT staff's technical ability to conduct a formal validation of all system changes	1	5	3.44	3.0	0.97
our IT staff's ability to analyze the technical impact of proposed system changes	2	5	3.53	3.5	0.74
our IT staff's ability to efficiently implement system upgrades	2	5	3.82	3.5	0.86
IS capabilities – IS development					
our end user's accessibility to new technologies	2	5	3.52	3.5	0.82
our formal evaluations conducted for new technologies	1	5	3.21	3.0	1.04
our formal decisions made to adopt new technologies	1	5	3.52	3.0	1.09

IS macro-environmental analysis – Automate vision					
our IT's role to replace human labor or at least transform its productivity in our organization	3	5	4.06	4.0	0.67
the potential for our IT to create cost saving or quality improvement in our organization	3	5	4.23	4.0	0.58
IS macro-environmental analysis – Informate up vision					
our IT's role to provide data that allow clearer management views of the dynamics of our business	2	5	3.83	3.5	0.84
the potential for our IT to increase managerial control over our business	2	5	3.94	3.5	0.86
IS macro-environmental analysis – Informate down vision					
our IT's role to provide data that yields a far fuller picture at the operations level	2	5	3.86	3.5	0.99
our IT's role to provide employees greater insights into their own activities	1	5	3.60	3.0	1.09
the potential of our IT systems to improve employees' empowerment	1	5	3.60	3.0	1.14
IS macro-environmental analysis – Transform vision					
our IT's role to fundamentally alter our industry through new products or business strategies	2	5	3.63	3.5	0.95
our IT's possibility to redefine the industry practices and partnerships	2	5	3.31	3.5	1.09
IS Governance - Centralization					
the empowerment of our IT employees in making their own decisions	2	5	3.50	3.5	1.00
the need for executive approval of an IT decision before any action	2	5	3.94	3.5	0.92
our IT specialists and executives participation in IT decisions when adopting new enterprise wide policies	3	5	4.24	4.0	0.73
IS Governance - Decentralization					
our practice of referring to someone in IT for a final answer even for small IT matters	2	5	3.74	3.5	0.94
our executives requiring business unit leaders' agreement on any IT decision	1	5	3.94	3.0	1.07
our business unit leaders participation in the IT decisions of adopting changes to optimize their local needs	2	5	3.94	3.5	0.97
IS Governance – IT architecture					
our consistency regarding IT policies throughout our enterprise	2	5	3.85	3.5	0.97
our use of business strategy in IT architecture development	1	5	3.61	3.0	1.04
IS Governance – Business applications needs					
our IT business applications production of output required by end-users	1	5	3.50	3.0	1.16
our IT business applications functioning without failure	2	5	3.73	3.5	0.89
our IT business applications being easily operated by end-users	2	5	3.52	3.5	0.95
our IT business applications resulting in precise output	2	5	3.41	3.5	0.94
our IT business applications permitting only appropriate users to access data	1	5	4.15	3.0	1.08
IS Governance – Discounted cash flow					
the use of net present values for our IT investment	1	5	3.25	3.0	1.28
the use of internal rate of returns for our IT investment	1	5	3.35	3.0	1.36

IS Governance – Other financial					
the use of payback methods for our IT investment	1	5	3.50	3.0	1.41
the use of budgetary constraints for our IT investment	3	5	4.15	4.0	0.76
IS Governance – Management criteria					
the use of support of business objectives for our IT investment	2	5	3.88	3.5	0.83
the use of support of management decision making for our IT investment	2	5	3.97	3.5	0.76
the use of probability of achieving benefits for our IT prioritization	1	5	3.23	3.0	1.18
legal/government requirements affecting our IT prioritization	2	5	3.48	3.5	0.98
IS Governance – Development criteria					
technical/system requirements affecting our IT prioritization	2	5	3.50	3.5	0.88
learning new technology affecting our IT prioritization	2	5	3.29	3.5	1.00
IT project resource implications affecting our IT prioritization	1	5	3.56	3.0	1.08
Organizational performance - Growth					
The sales growth position relative to our principal competitors is	2	5	3.82	3.5	0.83
My satisfaction with sales growth rate is	1	5	3.21	3.0	1.05
The market share gains relative to our principal competitors are	2	5	3.61	3.5	0.97
The return on corporate investment position relative to our principal competitors is	2	5	3.70	3.5	0.90
Organizational performance - Productivity					
My satisfaction with return on corporate investment is	2	5	3.34	3.5	0.92
My satisfaction with return on sales is	1	5	3.25	3.0	1.02
The net profit position relative to our principal competitor is	1	5	3.76	3.0	1.15
The financial liquidity position relative to our principal competitor is	2	5	3.88	3.5	1.09

5.2 Variable Correlations

Correlation between variables was calculated using the Spearman's rank correlation co-efficient. This method was selected due to the low sample size. Non-parametric correlation methods, like Spearman's rank co-efficient, are well suited for small sample sizes where a normal distribution cannot be proven or assumed. The values of Spearman’s Rank Correlations vary from -1 to 1. The more positive the value the more positive the relationship between the variables, conversely the same logic can be applied to negative values.

Figure 4. Theoretical Model with Spearman's rank

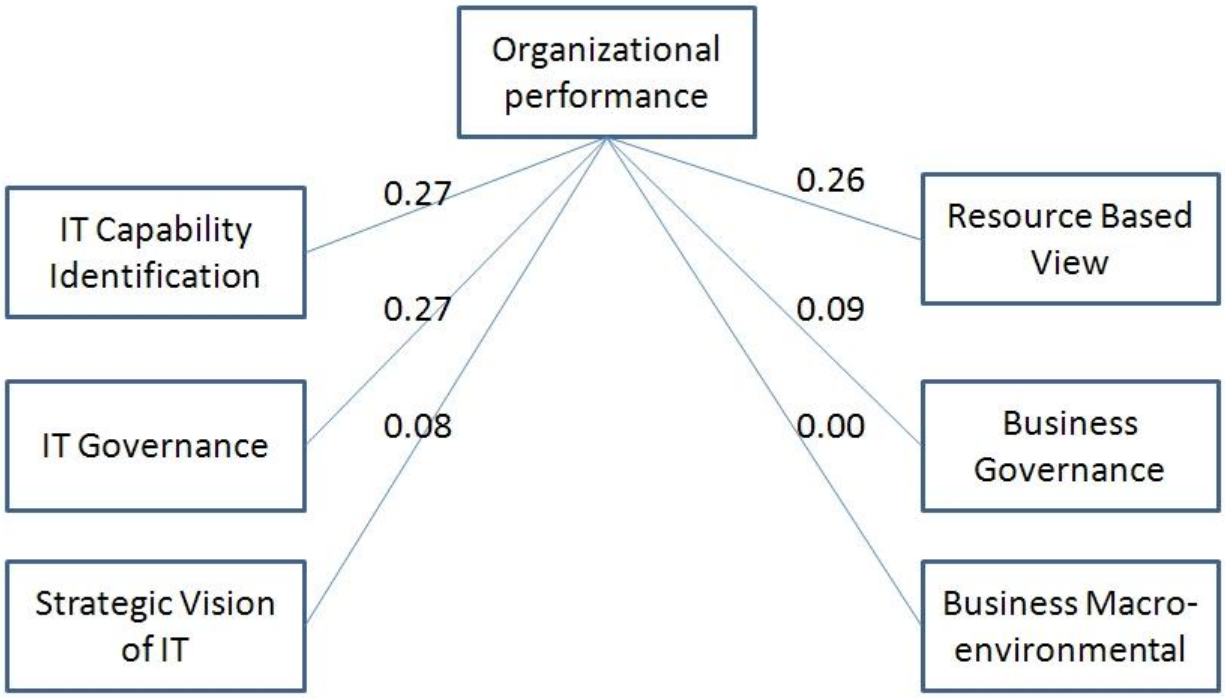


Table 11. Spearman's Correlations

Hypotheses	*N*	*R*	*T(N-2)*	*p-value*
1	29	0.27	1.44	0.16
2	29	0.27	1.43	0.16
3	29	0.08	0.40	0.69
4	29	0.26	1.58	0.12
5	29	0.09	0.53	0.60
6	29	0.00	0.01	0.99

Based on the p-value no null hypotheses can be rejected, therefore no results are significant although hypotheses one, two and four are approaching significance at the .15 level. Hypotheses one, two, and four have moderately strong positive correlations based on the Spearman's R. Hypotheses three, five,

and six have weak positive correlations. Finally, hypotheses seven, eight and nine all have moderately strong negative correlations.

5.3 Discussion

Despite the low significance of results an attempt will be made to draw implications from the Spearman's rank correlation. The above results indicate that the relationship between executive knowledge domains and firm performance are not as clearly defined as our expected results had hoped. Although the initial expectations of this research were that higher the executives' knowledge of each other's domains was then the higher the firm performance, the results would suggest that the impact of firm performance may depend on what the strategic function is.

In the case of Capability identification both business and IT shared knowledge is beneficial to firm performance. CEO knowledge of IT Governance was also found to benefit firm performance but CIO knowledge of Business Governance was only marginally beneficial. Finally, shared knowledge of external macro-analysis does not seem related to firm performance for the CIO and only very weakly for the CEO.

Looking back at the theoretical framework laid out by Churchman, the results of the shared knowledge measures for capability identification suggest that mutual understanding may create improved firm performance as both the correlations between shared knowledge and firm performance are relatively positive. Churchman would also suggest that the CEO take a communication stand point with regards to governance in the organization as the correlation is positive between CEO's knowledge of IT governance and firm performance. Macro-environmental Analysis was only marginally impactful to firm performance due to shared knowledge of either the CEO's or CIO's knowledge, thus the separate function state appears to be the best prescription for this strategic function.

The item descriptive statistics also allow us to make some assumptions about how confident CEO's and CIO's are about their knowledge of each other's domain. Based on the number of item's where the average was greater than the mean we can see that CEO's believe that they are strongest in Strategic Vision of IT

and IT Capability Identification, but require some additional education regarding IT Governance. CIO's on the other hand, believe that they are very strong at Macro-environmental analysis and Business

When looking at both sets of analysis an interesting scenario stands out regarding Governance, although the CEO's knowledge of IT Governance impacts the organizations performance CEO's were the least confident about their knowledge in this area. As stated earlier some additional education in IT Governance would be suggested and when considering the impact on the firm this should be a priority for CEO's.

For the most part the results of the descriptive statistics do no allow us to make further conclusions other than that CIO's believe they are more knowledgable in business more than CEO's believe that they are knowledgeable in IT. The above assumption is supported by the percentage of average responses below the median response, which in CIO's was 4.3% and 11.1% for CEO's. Additionally, only one item from each the CIO and CEO's scales had a response greater than the average response plus the standard deviation. In the CIO scale this was the the ability for feedback systems maintain focus to keep the organization viable and for CEO's that IT Business application easy operation by end user. This would allow us to assume that CIO's have a great understanding of the use of feedback loops in the organization and that CEO's have a good understanding of the usefulness of ease of use in applications.

To sum up our suggestions to practicioners would be that both CEO's and CIO's spend some time sharing with each other on how to identify capabilities for within each others domains, and that CIO's work to educate their CEO about IT governance. Academics on the other hand, should aim to extend our understanding of CIO and CEO shared knowledge by ; 1) further testing the individual constructs used here with greater sample sizes to refine the exploratory results, 2) deepen applicability of results of the research by focusing on individual industries, 3) substitute alternative constructs for strategic vision of IT as the results showed us that there is little relevance between the vision construct and firm performance.

6 Conclusions

Based on the results of this research it appears as though depending on the strategic function, capability identification, governance or environmental analysis, a different state of the implementation matrix may result in optimized results for the firm. This assumption is made because the strong positive results would suggest that to improve firm performatnce the CEO and CIO should both be knowledgeable about each others are of Capability Identification. Also, firm performance could be improved by increasing the CEO's knowledge of IT governance, according to the strong correlation between these factors.

To draw similarities between the concepts tested in this research both capability identification and governance are largely internally focused where as environmental analysis is externally focused.Previous research has suggested that external factors have less effect on firm performance than internal factors. Based on the results of the research performed in this paper readers can assume that the previous research is supported. Thus a possible direction for this research stream is to evaluate if shared knowledge is only necessary for internal evaluations.

7 Limitations

Like any research this thesis suffers from some limitations. These limitations are based in methodology, and practical limitations. Best attempts were made to limit the amount of influence this limitations had on the research but it is impossible to completely remove or predict it all.

The primary limitation of this research is the sample size. This is a practical limitation of the research. Although it was known that there would be a limited response rate but the degree to which this occurred is still surprising. Since the response rate was just over 1% the response is still 10 times lower than that of similar research in the past. To compensate for this low sample size the original statistical methodology was altered. The original plan included cluster analysis, which was to be used to separate the CEOs and CIOs who had understanding of their partner and to separate the successful firms from those who are not. Unfortunately due to the limited sample this approach would not have provided reasonable reliability. Thus non-parametric methods were selected as a more appropriate analysis tool.

Additionally, in order to complete the non-parametric methods data across constructs had to be averaged to create a single vector. This removed some of the level of detail that was intended in the initial exploratory goals. This was compounded by the in ability to do additional reliability testing due to the small sample size.

Finally, the scales did not consider IT ecosystems which may have greater effect on external performance. This is a relatively new environment and would likely require a new scale to be developed or expanded on from the inside-out capability identification in IT capabilities.

Appendix

CEO Survey

Corporate IT Knowledge (for CEO)

This questionnaire is designed to measure the CEO's understanding of IT issues. Therefore, we kindly ask you to indicate your level of understanding regarding your CIO's knowledge domain including IT-based capabilities, the role of IT within your organization, and IT governance.

Using the following scale, please circle the number that best represents your opinion. There are no right or wrong answers. When choosing "very well informed" about an area, it means that you believe you have sufficient knowledge to contribute to discussions about its strategic implications.

A. Using the following scale, please evaluate your knowledge regarding the **IT-based capabilities** of your organization.

Not informed at all	Not well informed	Somewhat informed	Well informed	Very well informed	Not applicable
1	2	3	4	5	na

I know about…						
1. our technology collaborations with customers	1	2	3	4	5	na
2. our technology collaborations with suppliers	1	2	3	4	5	na
3. our technology collaborations with external partners	1	2	3	4	5	na
4.our excess IT resources capability of providing a buffer against unexpected environmental changes	1	2	3	4	5	na
5.our IT ability to derive benefits from variations in the firm's environment	1	2	3	4	5	na
6.our IT ability allowing us to manage the degree to which our firm relies on variations in the firm's environment	1	2	3	4	5	na
7. our IT ability to provide strategic management of risk due to our firm's environment	1	2	3	4	5	na
8. our ability to blend business and technology expertise through multi-disciplinary teams	1	2	3	4	5	na
9.our relationships between line management and IT service providers	1	2	3	4	5	na
10. our line management sponsorship of IT initiatives	1	2	3	4	5	na
11. our climate of nurturing IT-project championship	1	2	3	4	5	na
12. our inclusion of project management practices in IT planning	1	2	3	4	5	na
13. our practices regarding systems development	1	2	3	4	5	na
14. our data infrastructure appropriateness	1	2	3	4	5	na
15. our network infrastructure appropriateness	1	2	3	4	5	na
16. our IT infrastructure flexibility appropriateness	1	2	3	4	5	na
17. our IT operations efficiency and reliability	1	2	3	4	5	na
18. our computer facilities available for IT projects	1	2	3	4	5	na
19. our firm's sufficient computing capacity	1	2	3	4	5	na

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…

20. our IT staff's technical expertise	1	2	3	4	5	na
21. our IT staff's technical ability to conduct a formal validation of all system changes	1	2	3	4	5	na
22. our IT staff's ability to analyze the technical impact of proposed system changes	1	2	3	4	5	na
23. our IT staff's ability to efficiently implement system upgrades	1	2	3	4	5	na
24. our end user's accessibility to new technologies	1	2	3	4	5	na
25. our formal evaluations conducted for new technologies	1	2	3	4	5	na
26. our formal decisions made to adopt new technologies	1	2	3	4	5	na

B. Using the following scale, please evaluate your knowledge regarding the **vision of IT's role** in your organization**.**

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…

27. our IT's role to replace human labor or at least transform its productivity in our organization	1	2	3	4	5	na
28. the potential for our IT to create cost saving or quality improvement in our organization	1	2	3	4	5	na
29. our IT's role to provide data that allow clearer management views of the dynamics of our business	1	2	3	4	5	na
30. the potential for our IT to increase managerial control over our business	1	2	3	4	5	na
31. our IT's role to provide data that yields a far fuller picture at the operations level	1	2	3	4	5	na
32. our IT's role to provide employees greater insights into their own activities	1	2	3	4	5	na
33. the potential of our IT systems to improve employees' empowerment	1	2	3	4	5	na
34. our IT's role to fundamentally alter our industry through new products or business strategies	1	2	3	4	5	na
35. our IT's possibility to redefine the industry practices and partnerships	1	2	3	4	5	na

C. Using the following scale, please evaluate your knowledge with regards to **IT governance** within your organization.

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…

36. the empowerment of our IT employees in making their own decisions	1	2	3	4	5	na
37. our practice of referring to someone in IT for a final answer even for small IT matters	1	2	3	4	5	na
38. the need for executive approval of an IT decision before any action	1	2	3	4	5	na
39. our IT specialists and executives participation in IT decisions when adopting new enterprise wide policies	1	2	3	4	5	na
40. our executives requiring business unit leaders' agreement on any IT decision	1	2	3	4	5	na
41. our business unit leaders participation in the IT decisions of adopting changes to optimize their local needs	1	2	3	4	5	na
42. our consistency regarding IT policies throughout our enterprise	1	2	3	4	5	na
43. our use of business strategy in IT architecture development	1	2	3	4	5	na
44. our IT business applications production of output required by end-users	1	2	3	4	5	na
45. our IT business applications functioning without failure	1	2	3	4	5	na
46. our IT business applications being easily operated by end-users	1	2	3	4	5	na
47. our IT business applications resulting in precise output	1	2	3	4	5	na
48. our IT business applications permitting only appropriate users to access data	1	2	3	4	5	na
49. the use of net present values for our IT investment	1	2	3	4	5	na
50. the use of internal rate of returns for our IT investment	1	2	3	4	5	na
51. the use of payback methods for our IT investment	1	2	3	4	5	na
52. the use of budgetary constraints for our IT investment	1	2	3	4	5	na
53. the use of support of business objectives for our IT investment	1	2	3	4	5	na
54. the use of support of management decision making for our IT investment	1	2	3	4	5	na
55. the use of probability of achieving benefits for our IT prioritization	1	2	3	4	5	na
56. legal/government requirements affecting our IT prioritization	1	2	3	4	5	na
57. technical/system requirements affecting our IT prioritization	1	2	3	4	5	na
58. learning new technology affecting our IT prioritization	1	2	3	4	5	na
59. IT project resource implications affecting our IT prioritization	1	2	3	4	5	na

D. Using the following scale, please evaluate your level of satisfaction with regards to your **organization's performance**

Very low 1	Moderately low 2	Neutral 3	Moderately high 4	Very high 5	Not applicable na

60. The sales growth position relative to our principal competitors is	1	2	3	4	5	na
61. My satisfaction with sales growth rate is	1	2	3	4	5	na
62. The market share gains relative to our principal competitors are	1	2	3	4	5	na
63. The return on corporate investment position relative to our principal competitors is	1	2	3	4	5	na
64. My satisfaction with return on corporate investment is	1	2	3	4	5	na
65. My satisfaction with return on sales is	1	2	3	4	5	na
66. The net profit position relative to our principal competitor is	1	2	3	4	5	na
67. The financial liquidity position relative to our principal competitor is	1	2	3	4	5	na

E. Please provide us with some **background information** for our analysis.

68. What is your title?
69. How long have you been in this position? /year(s)
70. How long have you been working for this firm? /year(s)
71. How many employees work in your firm?
72. What are your firm's approximate total revenues?
73. What is your primary industry?

- ☐ Agriculture, forests and fisheries
- ☐ Mining
- ☐ Construction
- ☐ Communications
- ☐ Transports
- ☐ Health
- ☐ Manufacturing
- ☐ Wholesale
- ☐ Retail trade
- ☐ Finance, insurance and real-estate
- ☐ Services
- ☐ Other:

Please return this questionnaire by using the attached prepaid envelope.
Thank you for your precious collaboration!

If you wish to obtain a summary of the results of this survey, please enclose your business card in the return envelope. If you have any comments or questions, please feel free to contact us.

Ian Galloway, M.Sc. student
John Molson School of Business, Concordia University
Phone: (514) 570-1941
Email: i_gallow@jmsb.concordia.ca

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

_____ This confidential number is for reference purposes only

CIO Survey

Corporate Business Knowledge (for CIO)

This questionnaire is designed to measure the CIO's understanding of strategic business issues. Therefore, we kindly ask you to indicate your level of understanding of your CEO's knowledge domain including organizational capabilities, external environment of your organization, organizational governance and performance.

Using the following scale, please circle the number that best represents your opinion. There are no right or wrong answers. When choosing "very well informed" about an area, it means that you believe you have sufficient knowledge to contribute to discussions about its strategic implications.

F. Using the following scale, please evaluate your knowledge of the **organizational capabilities** of your organization

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…						
1. our long history of capability development	1	2	3	4	5	na
2. our competitors' inability to build up equivalent capabilities even using additional resources	1	2	3	4	5	na
3. our sources of capabilities that can not be easily identified or imitated by competitors	1	2	3	4	5	na
4. our capabilities provision of benefits to several functional areas/departments	1	2	3	4	5	na
5. our capabilities provision of benefits to different levels within the company	1	2	3	4	5	na
6. our capabilities as a catalyst for collective learning within the company	1	2	3	4	5	na
7. our capabilities as a catalyst for innovation within the company	1	2	3	4	5	na
8. our capabilities as a catalyst for collaborative problem solving with stakeholders	1	2	3	4	5	na
9. our capabilities creation through combination of multiple assets	1	2	3	4	5	na

G.Using the following scale, please evaluate your knowledge of your **external environment.**

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…

10. the generation of intelligence regarding our competitors' activities	1	2	3	4	5	na
11. our contacts maintained with officials of government and regulatory bodies in order to collect and evaluate pertinent information	1	2	3	4	5	na
12. our collection and evaluation of information concerning general social or economic trends that might affect our business	1	2	3	4	5	na
13. our learning regarding various aspects of our suppliers' business	1	2	3	4	5	na
14. our collection and evaluation of information regarding customers' future needs with respect to our functional areas	1	2	3	4	5	na
15. our periodic reports and newsletters providing information on our customers	1	2	3	4	5	na
16. our frequent cross-functional meetings where market trends and developments are discussed	1	2	3	4	5	na
17. our regular interdepartmental meetings where knowledge of regulatory requirements are updated	1	2	3	4	5	na
18. our technical people sharing information about technology for new products with other departments	1	2	3	4	5	na
19. market information being spread quickly through all levels of the firm	1	2	3	4	5	na
20. our capability to implement a response immediately to a major competitor's new intensive campaign targeted at our customers	1	2	3	4	5	na

H. Using the following scale, please evaluate your knowledge with regards to **organizational governance**

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…

21. our leaders' roles as mentors, sages or parental figures	1	2	3	4	5	na
22. our leaders' roles as entrepreneurs, innovators or risk takers	1	2	3	4	5	na
23. our leaders' roles as coordinators, organizers or administrators	1	2	3	4	5	na
24. our leaders' roles as producers, technicians or hard drivers	1	2	3	4	5	na
25. our loyalty, tradition and commitment providing a connection between members of our organization	1	2	3	4	5	na
26. our commitment to innovation, development and to "being first" providing a connection between members of our organization	1	2	3	4	5	na
27. our enterprise wide practices providing a connection between members of our organization	1	2	3	4	5	na
28. our task and goal accomplishment focus providing a connection between members of our organization	1	2	3	4	5	na

29. our emphasis on high cohesion, morale and human resources	1	2	3	4	5	na
30. our emphasis on growth and acquiring new resources to meet new challenges	1	2	3	4	5	na
31. our emphasis on permanence, efficiency and stability	1	2	3	4	5	na
32. our emphasis on competitive actions, goals and achievements	1	2	3	4	5	na
33. our firm's characteristic of being a very personal place that is, an extended family where people can share a lot of themselves	1	2	3	4	5	na
34. our firm's characteristic of being dynamic and entrepreneurial place where people take risks	1	2	3	4	5	na
35. our firm's characteristic of being a place where bureaucracy governs what people do	1	2	3	4	5	na
36. our firm's characteristic of being production orientated, where people are concerned with getting the job done and without getting personally involved	1	2	3	4	5	na
37. our employees' participation in the decisions of adopting new programs	1	2	3	4	5	na
38. our employees' participation in decisions of adopting new policies	1	2	3	4	5	na
39. our need for supervisor approval of a decision before any action	1	2	3	4	5	na
40. our employees' empowerment to make their own decisions	1	2	3	4	5	na
41. our practice of referring to someone higher up for a final answer even in small matters	1	2	3	4	5	na
42. our employees' decisions requiring their boss' approval on any matter	1	2	3	4	5	na
43. our organization's large number of written rules and policies	1	2	3	4	5	na
44. our rules and procedures manual and its ready availability within this organization	1	2	3	4	5	na
45. our complete written job descriptions for most jobs in this organization	1	2	3	4	5	na
46. our formal orientation program for most new members of the organization	1	2	3	4	5	na

I. Using the following scale, please evaluate your knowledge with regards to **internal metrics and reward systems**

Not informed at all 1	Not well informed 2	Somewhat informed 3	Well informed 4	Very well informed 5	Not applicable na

I know about…

47. our strategic costing practices for project prioritization	1	2	3	4	5	na
48. our competitor accounting practices for project prioritization	1	2	3	4	5	na
49. our strategic accounting practices for project prioritization	1	2	3	4	5	na
50. our brand value accounting practices for project prioritization	1	2	3	4	5	na
51. our written explanations concerning causes of large chargeback budget variances	1	2	3	4	5	na

52. our reporting actions taken to correct causes of operations budget variances	1	2	3	4	5	na
53. our operations cost-variance fluctuations in proportion to the use of operation services	1	2	3	4	5	na
54. our use of operations needs when preparing budget	1	2	3	4	5	na
55. our necessity to stop some operations activities when budgeted funds are used up	1	2	3	4	5	na
56. our requirement of close tracking of variance in our operations budget	1	2	3	4	5	na
57. our deployment of our performance management	1	2	3	4	5	na
58. our deployment of our performance measurement system	1	2	3	4	5	na
59. our regular updating of our collective progress towards the organization's priorities	1	2	3	4	5	na
60. our regular, external-feedback ability to help us nurture a shared vision	1	2	3	4	5	na
61. our employees' understanding of how they contribute to our organization's strategy and key objectives	1	2	3	4	5	na
62. our employees' ability to earn incentive compensation based on effectiveness in contributing to the organization's strategic goals	1	2	3	4	5	na
63. our feedback mechanism helping us know where we are and how to improve	1	2	3	4	5	na
64. our feedback system allowing us to stay focused on keeping our organization viable	1	2	3	4	5	na

J. Using the following scale, please evaluate your level of satisfaction with regards to your **organization's performance**

Very low	Moderately low	Neutral	Moderately high	Very high	Not applicable
1	2	3	4	5	na

65. The sales growth position relative to our principal competitors is	1	2	3	4	5	na
66. My satisfaction with sales growth rate is	1	2	3	4	5	na
67. The market share gains relative to our principal competitors are	1	2	3	4	5	na
68. The return on corporate investment position relative to our principal competitors is	1	2	3	4	5	na
69. My satisfaction with return on corporate investment is	1	2	3	4	5	na
70. My satisfaction with return on sales is	1	2	3	4	5	na
71. The net profit position relative to our principal competitor is	1	2	3	4	5	na
72. The financial liquidity position relative to our principal competitor is	1	2	3	4	5	na

K. Please provide us with some **background information** for our analysis.

73. What is your title?
74. How long have you been in this position? /year(s)
75. How long have you been working for this firm? /year(s)
76. How many employees work in your firm?
77. What are your firm's approximate total revenues?
78. What is your primary industry?

☐ Agriculture, forests and fisheries	☐ Manufacturing
☐ Mining	☐ Wholesale
☐ Construction	☐ Retail trade
☐ Communications	☐ Finance, insurance and real-estate
☐ Transports	☐ Services
☐ Health	☐ Other:

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Thank you for your precious collaboration!

If you wish to obtain a summary of the results of this survey, please enclose your business card in the return envelope. If you have any comments or questions, please feel free to contact us.

Ian Galloway, M.Sc. student
John Molson School of Business, Concordia University
Phone: (514) 570-1941
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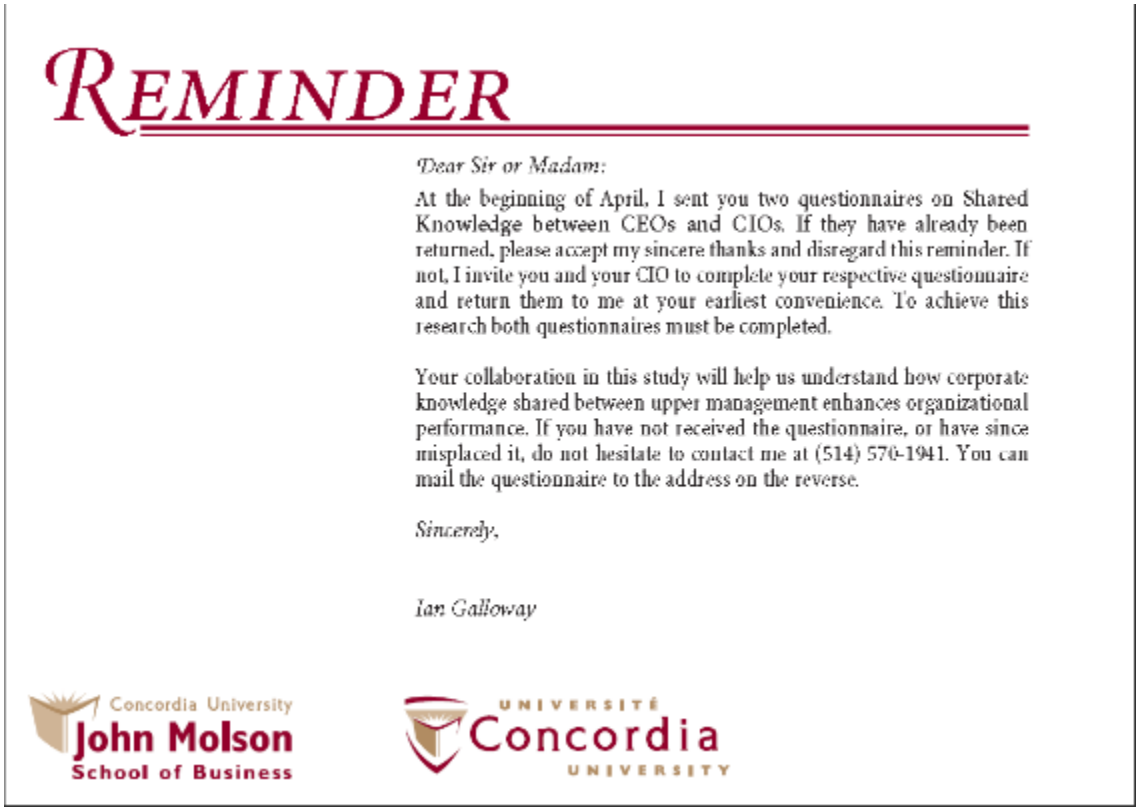
_____ This confidential number is for reference purposes only

Reminder: Canada



REMINDER

Dear Sir or Madam:

At the beginning of April, I sent you two questionnaires on Shared Knowledge between CEOs and CIOs. If they have already been returned, please accept my sincere thanks and disregard this reminder. If not, I invite you and your CIO to complete your respective questionnaire and return them to me at your earliest convenience. To achieve this research both questionnaires must be completed.

Your collaboration in this study will help us understand how corporate knowledge shared between upper management enhances organizational performance. If you have not received the questionnaire, or have since misplaced it, do not hesitate to contact me at (514) 570-1941. You can mail the questionnaire to the address on the reverse.

Sincerely,

Ian Galloway

Concordia University
John Molson
School of Business

UNIVERSITÉ
Concordia
UNIVERSITY

Reminder: USA

REMINDER

Dear Sir or Madam:

At the begining of October, I sent you two surveys on Shared Knowledge between CEOs and CIOs. If they have already been returned, please accept my sincere thanks and disregard this reminder. If not, I invite you and your CIO to complete your respective questionnaire and return them to me at your earliest convenience. To achieve this research both questionnaires must be completed.

Your collaboration in this study will help us understand how corporate knowledge shared between upper management enhances organizational performance. If you have not received the questionnaire, or have since misplaced it, do not hesitate to contact me at (514) 570-1941. You can mail the questionnaire to the address on the reverse.

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