

RECIPROCITY BETWEEN SENIOR IT EXECUTIVES AND IT CAPABLE FIRMS: A SOURCE OF SUSTAINABLE COMPETITIVE ADVANTAGE

Completed Research Paper

Jee Hae Lim

University of Waterloo
School of Accounting and Finance
Waterloo, Ontario
Canada N2L-3G1
jh2lim@uwaterloo.ca

Theophanis C. Stratopoulos

University of Waterloo
School of Accounting and Finance
Waterloo, Ontario
Canada N2L-3G1
tstratop@uwaterloo.ca

Tony S. Wirjanto

University of Waterloo
School of Accounting and Finance
Waterloo, Ontario
Canada N2L-3G1
twirjant@uwaterloo.ca

Abstract

The objective of this study is to test a pattern of positive reciprocity between senior IT executives (sITes) and firms with superior dynamic IT capability (ITC). Results based on panel data of 1326 large US firms over a 13 year period (1997-2009) support the following positions: 1. There is a positive association between accrued sources of managerial power of sITes, such as structural and expert power, and a firm's ability to develop superior ITC. 2. Firms that achieve such ITC superiority are more likely to signal their appreciation and reward their sITes with more structural power. If sITes value these rewards, they are more likely to stay longer with their firm. 3. There is a positive association between continuity of an already successful IT leadership and a firm's ability to sustain its ITC superiority, thus setting in motion a virtuous cycle of positive reciprocity between sITes and IT capable firms.

Keywords: CIO, IT capability, Sustainable IT capability, Business Value of IT, Structural Power

Introduction

The main objective of this study is to propose and test a pattern of positive reciprocity between senior IT executives and firms with superior dynamic IT capability. More specifically we propose to test the following question: Are firms who reward their senior IT executives (sITes) for their contribution to their firm's ability to develop superior IT capability more likely to sustain their superiority? While IT business value and IT strategic leadership literature recognize the role and contribution of sITes (e.g., Armstrong and Sambamurthy 1999; Chen et al. 2010; Dehning and Stratopoulos 2003), it does not account for the means by which sITes will be motivated to help their firm gain and sustain an IT enabled competitive advantage, and there is no explicit reference to appreciation or reward for their contribution.

The assumption that seems to be taken for granted is that firms appreciate and reward their sITes for their contribution; sITes value these rewards, so they stay and help their firm sustain its IT enabled superiority. However, news stories such as the recent unceremonious departure of Randy Mott from HP (Ricadela 2011) cast doubt to the validity of this assumption. Mott's IT initiatives at HP improved productivity while saving \$1 billion in IT costs (Murphy 2008). The academic side concurs that among incumbent sITes; the probability of promotion is slim (Applegate and Elam 1992), dismissal rate is high (Applegate and Elam 1992; Chatterjee et al. 2001), and a high percentage of sITes were dismissed or left while they were perceived successful on their job (Leidner and Mackay 2007).

Lack of support for the appreciation and reward assumption seems consistent with researchers reporting a boardroom 'IT attention deficit' (Huff et al. 2006) or lamenting that when it comes to IT, board members 'talk the talk but they don't walk the walk' (Corporate Board Member March/April 2007). Asked to evaluate the importance of the question "Has the responsibility for IT corporate governance been assigned to a person in sufficiently senior management position?" board members provided lukewarm results (Bart and Turel 2010). Career and motivation implications of these findings for sITes are particularly important since one of the roles that is typically ascribed to directors is control of the process by which executives are hired, promoted, assessed, and, if necessary, dismissed (Adams et al. 2010). Overall, it seems that the legitimacy of sITes has not been fully established in many organizations (Kaarst-Brown, 2005), therefore the assumption that their contribution is appreciated and rewarded should not be taken for granted.

Meanwhile, a two-pronged consensus is emerging from the IT leadership and IT business value literature. First, sITes must transition into enterprise leaders responsible and personally instrumental in envisioning their firm's IT strategy and developing IT capabilities (Broadbent and Kitzis 2005; Feeny and Willcocks 1998; Smaltz et al. 2006). Second, dynamic IT capabilities are a source of competitive advantage (Bhatt and Grover 2005; Lim et al. 2011; Pavlou and El Sawy 2006; Zhu 2004). Recent empirical evidence has shown that dynamic organizational IT capability (*ITC*) is durably heterogeneous due to path dependence. That is, firms that have developed the ability to distinguish themselves from their competitors through *ITC* are more likely to repeat this in the future than firms lacking such experience (Lim et al. 2011). Given that durable heterogeneity is the cornerstone of the resource-based view, and therefore critical in IT business value literature (Mata et al. 1995; Bharadwaj 2000; Lim et al. 2011), a need and an opportunity arises to understand some of the IT leadership specific antecedents that contribute to the duration of *ITC* heterogeneity.

Motivated by this apparent gap in IT literature, this study introduces a causality-based framework of antecedents and consequent variables in order to examine the positive reciprocity between sITes and IT capable firms. More specifically we employ the expectation theory conceptual framework from the motivation literature and findings from IT business value and IT strategic leadership literature in order to propose that: 1. There is a positive association between accrued sources of managerial power of sITes, such as structural and expert power, and a firm's ability to develop superior *ITC*. 2. Firms that achieve such *ITC* superiority are more likely to signal their appreciation and reward their sITes with more structural power (a proxy for higher compensation). If sITes value these rewards, they are more likely to stay longer with their firm. 3. There is a positive association between continuity of an already successful IT leadership and a firm's ability to sustain its *ITC* superiority (durable *ITC* heterogeneity), thus setting in motion a virtuous cycle of positive reciprocity between sITes and IT capable firms. Results based on panel data of 1326 large US firms from a wide spectrum of industries over a 13 year period (1997-2009) support these propositions.

The study contributes to both the IT business value and IT strategic leadership literature. Our understanding of the role of sITes as well as antecedents and consequents of IT strategic leadership remains limited (Karahanna and Watson 2006). Prior research has relied either on anecdotal evidence or survey data (Karahanna and Watson 2006; Chen et al. 2010). The cross sectional design of survey studies, in particular, does not allow researchers to fully establish the causality between independent and dependent variables this can be done with longitudinal studies (Preston et al. 2008). To the best of our knowledge this is the first study to use large scale panel data in order to study antecedents and consequents of IT strategic leadership. Empirical evidence validates our position that firms that want to achieve and sustain ITC superiority (durable ITC heterogeneity) need to create an organizational climate of positive reciprocity. Such an organization climate can only be developed over time and there is no short cut that competitors can take in order to replicate it. That is, ITC is durably heterogeneous due to not only path-dependence (Lim et al. 2011) but also time-compression diseconomies.

The findings of this study support several practical implications for top management teams, directors, and sITes. For top management teams the message is that firms that want to achieve and sustain an IT enabled competitive advantage need to foster a culture of reciprocity with their sITes. This culture is built over several years. Increasing the power of sITes seems to be a kind of reward that is valued by sITes and it increases the chances that the sITes will help the firms develop and sustain its ITC superiority. The most important part is not that ITC firms reward their sITes, as lack of such evidence would seem paradoxical. The most interesting finding is that rewarding their sITes creates the potential for sustainability of the firm's ITC superiority.

Theoretical Foundation and Hypotheses

Durable Heterogeneity of IT Resources and Capabilities

The resource-based view (RBV) and its extension dynamic capabilities perspective have provided the theoretical foundation of IT business value research (Wade and Hulland 2004; Zhu 2004). The premise of RBV is that certain resources and capabilities are heterogeneously distributed among competing firms; therefore they are a source of competitive advantage (Barney 1991; Helfat and Peteraf 2003, Peteraf 1993). The duration of this resource heterogeneity (temporary or durable) determines the duration of the firm's competitive advantage (temporary or sustainable). Empirical IT business value research has used evidence of superior performance as an implicit support for the underlying assumption of durable-heterogeneity of IT resources and capabilities (Bharadwaj 2000; Bhatt and Grover 2005; Dehning and Stratopoulos 2003) due to isolating mechanisms such as causal ambiguity and path dependence (Bharadwaj 2000).

Counter-arguments suggesting the commoditization of IT resources and capabilities (Carr 2003; Zachary 1991) as well as their indirect relationship to firm value (Barua et al. 1995; Kohli and Grover 2008, Wade and Hulland 2004) has prompted researchers to call for more evidence to confirm the durable heterogeneity of IT resources and capabilities (Lim et al. 2011). Recent empirical evidence has shown that dynamic IT capability (*ITC*), defined as a firm's ability to integrate, build, and reconfigure IT-enabled resources concurrently with organizational and managerial processes in order to align with a rapidly changing competitive environment, is durably heterogeneous due to path dependence (Lim et al. 2011). That is, firms that have developed the ability to distinguish themselves from their competitors through *ITC* are more likely to repeat this in the future than firms lacking such experience. While the findings of Lim et al. (2011) contribute to our understanding of the association between IT capabilities and firm value, they do not provide specific insight on the kind of IT leadership related choices and decisions that may help a firm resist competitors' attempts to imitate or improve on its *ITC*.

IT Strategic Leadership

The main focus of strategic leadership literature is on players, such as senior executives, top management teams, or boards of directors, who have overall responsibility for entire organization. Strategic leadership scholars are concerned with characteristics of senior executives, with what they do, how and why they make their strategic choices, and their effect on their firms' performance. Executives have different experiences, capabilities, values, and personalities. As a result, they interpret and respond differently to strategic stimuli. The main premise is that the choices and decisions of senior executives play a significant role on firm performance (Finkelstein et al. 2009).

By extension, IS strategic leadership literature focuses on IS leadership at the executive level (Karahanna and Watson 2006). IS strategic leadership research proposes an association between certain antecedents such as management power, skills, and capabilities of sITes, and consequents such as organizational role of IT or effectiveness of sITes. Our brief review of this literature will try to highlight the following two points and how they relate to the research objectives of this study: (1) antecedents and the use of 'CIO' as a blanket title for all sITes, and (2) consequents without reference to reward or appreciation for sITes.

Antecedents

Management power is a critical antecedent for the IT strategic leadership literature. It has been described as an 'elusive quality' (Applegate and Elam 1992), has been defined as the capacity of senior executives to exert their will, and it accrues to top managers who can cope with uncertainty and are uniquely positioned to do so (Finkelstein 1992). While there are several sources of power (Finkelstein et al. 2009; Finkelstein 1992; Mintzberg 1983), IT strategic leadership research has focused on structural power (formal authority) and expert power (expertise). The former is based on organizational structure and hierarchical authority (Finkelstein 1992; Hambrick 1981; Mintzberg 1983) while the latter is based on the manager's relevant experience and expertise (Finkelstein 1992; Mintzberg 1983).

An executive's title(s) and position in the organizational hierarchy represent his/her structural power within the firm; the greater the number of different titles the higher his/her structural power (Finkelstein 1992). While IT strategic leadership studies have established the importance of structural power, the majority of them have concentrated on sITes' hierarchical position relative to the firm's TMT (see table 1). There is no reference to official title or number of titles of sITes. In spite of overwhelming evidence that there is a plethora of titles associated with sITes (e.g., Banker et al. 2011, p. 489; Grover et al. 1993, p. 108; Karimi et al. 1996, p. 76; Armstrong and Sambamurthy 1999, p. 310), there seems to be a consensus of using the blanket title 'CIO' to describe all senior IT executives. For example Banker et al. (2011) state that the "*CIO* is defined as the highest level IT executive or manager in a firm or business unit, even if the term CIO may not always be used." Similarly, Grover et al. (1993; p. 108) accept that the title "CIO has been somewhat loosely defined and is often used interchangeably with various titles such as Information Technology (IT) Director, Vice President of IS, Director of Information Resources, and Director of IS, to describe a senior executive responsible for establishing policy and controlling information resources." Our own research based on 1326 large US firms over a 13 year period (1997-2009) produced 317 different official titles for sITes.

Formal title(s) reflect an executive's accrued structural power (Finkelstein 1992; Ocasio 1994). Firms assign higher title(s) to top managers who can cope with uncertainty and are uniquely positioned to do so (Finkelstein 1992), and IT executives with multiple titles are among the highest paid sITes with compensation packages of \$1 million or more (Marlin 2004). Therefore in the context of RBV and IT business value literature, formal titles are a reflection of unique and difficult to imitate IT management skills. These kind of skills have been linked to a firm's ability to manage technical and market risks associated with IT investments (Bharadwaj 2000; Mata et al. 1995). They are heterogeneously distributed among competing firms (Mata et al. 1995) and are a source of sustainable competitive advantage (Dehning and Stratopoulos 2003). Therefore, there is theoretical and practical support for the need to make a distinction among sITes in terms of their formal titles and number of titles and consider their effect on organizational role of IT or effectiveness of sITes.

Consequents

The spectrum of consequents in IT strategic leadership literature can be described in terms of three concentric and expanding circles. The first one is focusing at the individual (sITe) level, and an association has been established between management power and sITes' IT leadership styles, their latitude for strategic decision making, and their perceived effectiveness. The second one is focusing at the IT organization level. Studies have linked sITes' management power to role of IT within the organization, effective use, alignment between IT and business strategy, etc. The third one finds a positive association between IT strategic leadership and financial as well as market measures of firm performance. Overall, research supports the position that sITes are instrumental for envisioning their firm's IT strategy, developing IT capabilities, and adding value. Nevertheless, reference to reward or appreciation for sITes is conspicuously absent from the extant literature. This gap in the existing literature is critical given that individuals are motivated because they want to fulfill certain needs such as financial safety and esteem.

Meanwhile turnover is high among sITes, i.e., job security is low, credibility of sITes has been on a roller coaster ride (Austin et al. 2009), and their legitimacy remains relatively low (Kaarst-Brown 2005).

Conceptual Research Framework and Research Hypotheses

In his classic book, *Work and Motivation*, Victor Vroom (1964) developed a theoretical framework (expectancy theory), for understanding the relationship between what motivates people and the work they perform. Built on the premise that an employee's performance is based on such attributes as personality, skills, knowledge, experience, and abilities, the theory proposes the following: Motivation to perform is driven by employees' beliefs about *expectancy* (what they are capable of doing), *instrumentality* (performance related reward), and *Valence* (value they place upon the reward). In the context of our study, the expectancy theory in conjunction with, IT business value and IT management literature, provides the foundation for the conceptual research framework (Figure 1).

The main point of this framework: First, we must establish that sITes' power contributes to their firm's ability to develop superior ITC, i.e., achieve temporal ITC heterogeneity in the context of the resource based view. Second, top executives and board members of firms who value their firm's ability to achieve such an objective are more likely to exhibit signs of appreciation and reward their sITes for their contribution. The manifestation of appreciation will be translated into job security as well as rewards (promotion) for the sITes. Third, arguably, if sITes value this reward then they will want to stay longer with their firm. Ensuring a continuity of an already successful IT leadership and working towards sustainability of the ITC superiority (enduring ITC heterogeneity) is setting in motion a pattern of positive reciprocity between sITes and firms with superior ITC.

[Insert Figure 1]

ITC and IT Leadership

A company's quest to achieve and sustain ITC superiority is a continuous and incremental process. Concentrating on each one of steps of this process provides the foundation for linking *ITC* to strategic IT leadership (Fig. 2). The process starts with an accumulation of flexible IT infrastructure, human IT skills, and complementary resources/processes; they form the foundation on which IT capability is built. Firms that have the ability to integrate IT based resources with improvements in complementary resources and business processes possess an organizational IT capability (Bharadwaj 2000). Firms with strong organizational learning capability can leverage feedback cycles of experience to build stronger or reconfigure their IT capabilities (Bhatt and Grover 2005).

An organizational IT capability that is aligned with the firm's changing competitive environment is a dynamic organizational IT Capability (ITC) and firms that can resist competitors' attempts to imitate or improve their ITC will achieve durable ITC heterogeneity (Lim et al. 2011). From an IT strategic leadership standpoint, the quest for such sustainable ITC superiority starts with a vision regarding the role of IT in the organization and proceeds with the accumulation and integration of appropriate IT based resources and processes. Continuity of a successful IT leadership (i.e., continuity in vision and execution) is likely to increase the likelihood of transitioning from organizational IT capability to sustainable ITC superiority.

[Insert Figure 2]

H1: Ability to Contribute

IT strategic leadership literature provides ample support for linking structural and expert power of sITes to vision and execution. Senior IT executives with higher structural power are more likely to act as entrepreneurs (Grover et al. 1993), and to shape an organizational mission and vision geared towards a more strategic use of IT in their capacity as strategist and innovation catalyst (Smaltz et al. 2006; Raghunathan and Raghunathan 1989). More powerful sITes are more likely to succeed in promoting their vision among TMT members (Chatterjee et al. 2001) and justify the need for allocation of resources for strategic IT projects (Armstrong and Sambamurthy 1999). Additionally, the accumulated knowledge and expertise (expert power) that sITes bring to their firm is expected to materialize in their ability to achieve firm specific objectives (Hambrick and Mason 1984; Smaltz et al. 2006). For example, executives' education has been related to their capacity to cope with complex problems and develop innovative strategic solutions (Geletknycz and Boyd 2011; Wally and Baum 1994; Wiersema and Bantel 1992). Hence, sITes are likely to form positive expectations regarding their ability to contribute and be motivated to leverage their vision and execution capabilities in order to help their firm achieve ITC superiority. Thus, we postulate:¹

H1a: *Ceteris paribus*, sITes with more structural power are more likely to contribute to their firm's ability to achieve ITC superiority than sITes with less structural power.

H1b: *Ceteris paribus*, sITes with more expert power are more likely to contribute to their firm's ability to achieve ITC superiority than sITes with less expert power.

H2: Reward

Firms continually update their assessments of their non-CEO executives based on individual measures of performance and remove under-performers (Fee and Hadlock 2004). Given the emerging consensus regarding the importance of dynamic IT capabilities (Bhatt and Grover 2005; Lim et al. 2011; Pavlou and El Sawy 2006; Zhu 2004) it is reasonable to assume that sITes will be evaluated in terms of their company's ability to achieve ITC superiority. Senior IT executives who succeed are more likely to be retained and trusted in key decision-making processes (Chan et al. 2006; Preston et al. 2008) and those who fail are likely to lose their credibility with the TMT and their job (Leidner and Mackay 2007). Therefore, we propose that ITC firms are less likely to replace their sITes (lower turnover, higher job security) and more likely to reward (promote) them with more and higher formal titles (increase their structural power). From the sITes' standpoint, we expect that success will increase their job satisfaction and they will be more inclined to stay with their current employer (Ghiselli et al. 2001). Thus, we propose:

H2a: *Ceteris paribus*, firms that achieve superior ITC are more likely to experience (provide) lower turnover of (higher job security to) their sITes than firms with no ITC superiority.

H2b: *Ceteris paribus*, firms that achieve superior ITC are more likely to promote their sITes than firms with no ITC superiority.

H3: Reciprocity Hypothesis

The reward that ITC firms offer to their sITes must satisfy an important extrinsic or intrinsic want or need. Given that such a promotion tends to be associated with higher compensation, sITes with multiple titles are among the highest paid sITes (Marlin 2004), and higher structural power (Finkelstein 1992; Ocasio 1994), we expect that this reward will satisfy both the financial need and esteem need of sITes. If sITes value the reward provided by their firm they will stay with their firm. Therefore, higher valence means higher commitment of the sITe to the firm. Given that many firms do not have plans in place to ensure the continuity of IT contribution in the face of a

¹The conceptualization of durable ITC, it is built on a firm's ability to sustain ITC, implies that achieving ITC is necessary but not sufficient condition for durable ITC heterogeneity. Therefore, the 'ability to contribute' hypothesis, also applies to durable ITC heterogeneity. As a robustness check we test the following hypothesis: Attributes of senior IT executives and durable ITC heterogeneity: *Ceteris paribus*, sITes with more power, experience, expertise and tenure are more likely to contribute to their firm's ability to achieve and sustain ITC superiority than sITes with less power, experience, expertise and tenure.

departing sITe (Leidner and Mackay, 2007), higher commitment ensures continuity of vision and execution therefore it is more likely to lead to durable ITC heterogeneity. Firms with superior and sustained ITC would subsequently bestow more reward on their sITes, thus creating a cycle of positive reciprocity.² Thus, we postulate:

H3: *Ceteris paribus*, senior IT executives in firms with superior ITC are more likely to stay with their firm and provide the necessary continuity in vision and execution needed for the firm to *achieve and sustain* ITC superiority than senior IT executives of non-ITC firms.

Methodology

Sample Selection

To test the positive reciprocity between the role of sITes and IT capable firms, we first obtained our data from *InformationWeek 500 (IW500)* list from 1997 to 2009. InformationWeek (*IW*) has been producing an annual list of the nation's largest and most innovative users of IT. Based on a detailed survey of IT executives, the publication determines the amount, type, and use of IT investments for each company. To be included in the *IW500* list, a firm must demonstrate a "consistent pattern of technological, procedural, and organizational innovation." Consistent with prior studies (Bharadwaj 2000; Santhanam et al. 2003; Lim et al. 2011) we treat the annual *IW500* list as a proxy for firms that have achieved ITC superiority.

ITC and Durable ITC

Consistent with prior research (Lim et al. 2011) we use a firm's recognition by *IW500* as a proxy for ITC superiority (*ITC*_{it}=1) and the cross-sectional evolution of a firm's recognition in *IW500* over four-year rolling windows (e.g., 1997-00, 1998-01, ... , 2006-09) to classify firms in terms duration of their ITC superiority. More specifically, in each window we classify a firm as one that has achieved and sustained ITC superiority, i.e., achieved durable ITC heterogeneity (*SYS*_{it}) if it has been recognized in *IW500* all years within the four-year rolling window. We classify a firm as one that has achieved but not sustained ITC superiority, i.e., non-durable ITC heterogeneity (*OCC*_{it}) if the firm has appeared less than four times in *IW500* within the four-year rolling window. Finally, we classify a firm as having no ITC superiority (*NON*_{it}) if it has not been recognized in any of the four years.

Measurement of Structural Power

To identify the role of sITes in our sample firms, we searched proxy statements, such as Form 10-Ks and DEF-14A from the U.S. Securities and Exchange Commission (SEC). In order to enhance the completeness and accuracy of our data, we also conducted a subsequent manual review of each sITe's biographical information via Lexis-Nexis, as well as thirteen online information sources (Linkedin, Zoominfo People, Businessweek People, Forbes People Tracker, Reuters, Company Press Release, Company Annual Report, Evanta.com, Boardroominsiders.com, Mergent Online, Resource.Bnet.Com, Factiva, and Marketwatch). These sources also provide information about sITe's title, background, tenure, compensation, and CV. As a result of this data compilation, our sample includes 317 different official titles for sITes [e.g., Chief Information Officer (CIO), Chief Technology Officer (CTO), Sr. V.P. of Information Systems (IS)/Information Technology (IT)/Computing Information Systems (CIS)/Management Information Systems (MIS); V.P. of IS/IT/CIS/MIS; Dir. of IS/IT/CIS/MIS; Exec. Dir. of IS/IT/CIS/MIS; Managing Director of IS/IT/CIS/MIS; Pres. Dir. of IS/IT/CIS/MIS, etc).

Consistent with the extant literature (Finkelstein 1992), we identify sITes according to their official title as well as the number of titles. In assessing structural power for sITes we introduce the following classification: 1. sITes with the formal title of CIO plus additional official titles (e.g., CIO & Executive Vice President), 2. sITes with just the title of CIO, and 3. sITes without the CIO title (e.g., CTO or Managing director). For sake of simplicity, in the remainder of our discussion we refer to from the high power to low power group as *CIOplus*, *CIO*, and *Non-CIO*.

² A counter argument is that the sITe will become complacent and will not be interested in further development of the ITC or resisting competitor's attempts to replicate this ITC. What is holding them from becoming complacent is the threat of replacement (turnover)

Expert Power

While IT-related explicit knowledge enables IT managers to exhibit IT leadership and to leverage the business value of IT (Bassellier et al. 2001; 2003), academic education provides the declarative or explicit knowledge for IT expertise, whereas experience represents professional maturity (Kollmann et al. 2009). Over the years these individual sources of IT expert power are likely to complement each other in order to form a sITes cumulative expert power. Therefore, in this study we concentrate on the cumulative IT-related experience (*CumITexp*) as the complementary effect of an IT related academic degree (*ACD*), the prior IT-related employment (*ITEF*), and the IT-related practical experience (*ITfirm*). This means that the number of individual sources is not as important as the fact that the sITe has some form of IT related expert power. A sITe with an *ACD* and *ITEF* and *ITfirm* has the same *CumITexp* as another with *ACD* and *ITEF* or just one of these firms of IT related expert power.

Appreciation and Reward

We consider the change in sITe (TO_{it}) as a form of organizational appreciation for IT as well as a sign of the sITe's job satisfaction. The firm's top management is not likely to replace the sITe if they are satisfied with his/her contribution and the firm's sITe is not likely to want to leave the firm if his/her need for esteem is satisfied. We introduce two forms of reward (promotion) in the context of this study. The first one ($SPro|S_{it}$) is defined as follows: +2=*non-CIO* to *CIOPlus*; +1=*non-CIO* to *CIO* or *CIO* to *CIOPlus*; 0=no change in title; -1=*CIOPlus* to *CIO* or *CIO* to *non-CIO*; -2=*CIO Plus* to *non-CIO*. Variable takes values in the range +2 to -2, and it is calculated only if $S_{it}=1$. The second one ($WPro|S_{it}$) is defined as follows: +1=from *non-CIO* to *CIO* or *CIOPlus* or from *CIO* to *CIOPlus*, as well as *CIO* to *CIO* or *CIOPlus* to *CIOPlus*; 0=*non-CIO* to *non-CIO*; -1=*CIOPlus* to *CIO* or *CIO* to *non-CIO*. Variable takes values in the range +1 to -1, and it is calculated only if $S_{it}=1$.

Control Variables

To account for extraneous sources of variation between sITes' management power and ITC superiority, three control variables for firm characteristics are included. Firm size (Cheng 2005; Lev 1983), the natural log of total assets (*SIZE*), represents a firm's ability to sustain a competitive advantage from its market power or positional advantages, as well as superior financial and human resources endowments (Brynjolfsson and Hitt 1996; Morrow et al. 2007; Roberts and Dowling 2002). The need to control for the past financial performance of a firm (*ROA*) is twofold: (1) a firm's strategic IT capability choice could be a function of its past performance (Santhanam and Hartono 2003), and (2) it is likely that the selection of firms with superior IT capability by industry experts might be influenced by the firm's past performance (Bharadwaj 2000). A firm's reputation might be another factor that may influence the selection of firms with superior IT capability by industry experts. Market-to-book-value (*MV*) has been suggested as a proxy for reputation because it captures tangible and intangible assets (Roberts and Dowling 2002), as well as the market's expectations of future economic returns (Mueller 1990).

While there are numerous studies that have tried to explore determinants of executive compensation (reward), attempts to link compensation to firm performance has produced inconclusive results (Finkelstein et al. 2009). Faced with this constraint and based on our review of prior studies on strategic leadership and IT business value research, we chose to concentrate on the following two control variables for the testing of the association between ITC superiority and reward of sITes: concentration ratio (CR_i) and Tobin's Q (TQ_{it}).

There are two competing arguments that can be made for the effect of concentration ratio on the association between ITC superiority and reward of sITes. First, in strategic leadership literature, mimetic isomorphism has been introduced as a promising determinant of executive pay (Finkelstein et al. 2006; Rajagopalan and Datta 1996), which means that firms will try to mimic visible signs of reward and appreciation shown by the most prominent competitors. Therefore, mimetic isomorphic pressure will be higher when the number of competitors is small (concentration ratio is high). Second, high visibility or peer recognition of ITC superiority has a detrimental effect of the firms ability to sustain its IT enabled competitive advantage (Dehning and Stratopoulos 2003) and is likely to have a negative effect on appreciation and reward of sITes. Peer recognition is likely to be higher when the number of competitors is small (high concentration). Concentration ratio (CR_i) is the annual sales revenues for the four largest firms in each four-digit SIC code divided by the sales for all firms in the industry (Banker et al. 2011).

Given that typical IT benefits are related to such intangibles as improved customer satisfaction, and improved service quality and agility, Tobin's q has been used as a performance proxy for examining how firm performance relates to IT investment (Bharadwaj et al. 1999; Chari et al. 2008; Ravichandran et al. 2009), IT synergies (Tanriverdi 2006), and superior IT capability (Masli et al. 2011). Overall, Tobin's q is the kind of performance measure more likely to capture and reflect co-presence of such intangibles as good management skills (Adams et al. 2010) and superior IT capability (Masli et al. 2011). Tobin's q (TQ_{it}) is computed as a ratio of market value [(fiscal year-end market value of equity) + (liquidating value of the firms' outstanding preferred stock) + (current liabilities) - (current assets) + (book value of inventories) + (long-term debt)] to book value of total assets (Chung and Pruitt 1994).

Econometric model

H1: Testing sITes' Ability to Contribute

The testing of H1a and H1b is based on the estimation of (1), an indicator function similar to the one in Lim et al. (2011), using the random-effect (RE) approach proposed by Wooldridge (2005).

$$ITC_{it} = f(ITC_{it-1}, SP_{it-1}, CumITExp_{it-1}, SIZE_{it-1}, ROA_{it-1}, MV_{it-1}, \eta_b, \phi_b, u_{it}) \quad (1)$$

Where ITC_{it} indicates firms that have achieved ITC superiority; SP is the measure of structural power; CumITExp represents expert power; and SIZE, ROA, and MV are the control variables. (Please see Table 1 Panel C for variable definitions). The remaining variables η_b , ϕ_b , and u_{it} capture the fixed effects, time effects, and time-variant unobserved variables respectively. Additionally, u_{it} is assumed to be uncorrelated with the vector of observable firm characteristics.

H2: Testing sITes' Reward

The testing of H2a and H2b is based on the estimation of (2a) and (2b1, 2b2) respectively. Please notice that this is a two-stage process, in which estimation of (1) is stage one.

$$TO_{it+1} = f(y_hat_{it}, CR_{it}, TQ_{it}, \alpha_b, \psi_b, \varepsilon_{it}) \quad (2a)$$

$$SPro|S_{it} = f(y_hat_{it}, CR_{it}, TQ_{it}, \alpha_b, \psi_b, \varepsilon_{it}) \quad (2b1)$$

$$WPro|S_{it} = f(y_hat_{it}, CR_{it}, TQ_{it}, \alpha_b, \psi_b, \varepsilon_{it}) \quad (2b2)$$

Where TO_{it} captures sITes Turnover and $SPro|S_{it}$ as well as $WPro|S_{it}$ capture two measures of reward offered to sITes. y_hat_{it} is the predicted ITC value based on estimation of (1) and CR_{it} as well as TQ_{it} are two control variables. The variables α_b , ψ_b , and ε_{it} capture the fixed effects, time effects and time-variant unobserved variables respectively. It is assumed that ε_{it} is uncorrelated with the vector of observable firm characteristics.

To account for the possible endogeneity bias in the estimation of (2a) and (2b1, 2b2) we employ a two-stage estimation with correlated error terms, i.e., $Cov(u_{it}, \varepsilon_{it})$ is not equal to 0, and fixed firm effects (proxied by firm dummies) are included in the specification to control for unobservable firm characteristics.

H3: Testing Reciprocity between ITC firms and sITes

The testing of H3 is based on the estimation of (3), an indicator function similar to the one in Lim et al. (2011), using the random-effect (RE) approach proposed by Wooldridge (2005).

$$SYSvsOCC_{it} = f(SYSvsOCC_{it-1}, Con_{it-1}, SIZE_{it-1}, ROA_{it-1}, MV_{it-1}, \mu_b, \theta_b, v_{it}) \quad (3)$$

Where $SYSvsOCC_{it}$ lets us contrast SYS versus OCC firms; Con_{it} is the measure of continuity in IT leadership, and SIZE, ROA, and MV are the control variables. The remaining variables μ_b , θ_b , and v_{it} capture the fixed effects, time effects, and time-variant unobserved variables respectively. v_{it} is assumed to be uncorrelated with the vector of observable firm characteristics.

Results

Descriptive statistics

Contrasting the distribution of formal titles and number of titles between ITC and non-ITC firms reveals what seems to be a 'move in the middle' approach (see Table 2 - panel A). This is reflected as a rising trend in the number of sITes with the formal title of just CIO. While this trend is relatively more stable among non-ITC firms, it becomes more prevalent among ITC firms after the dot com crash. This move in the middle type of approach among ITC firms is paralleled by a decline in the ranks of sITes that have the title of CIO plus other titles, and the group of sITes without the CIO title. We speculate that this may reflect an attitude among directors and top management teams that while IT is ubiquitous it is not necessarily a strategic priority among all firms. Thus it is not justifiable to assign the highest level of structural power to sITes. This is consistent with the RBV view that formal title(s) are accrued and reflect heterogeneously distributed IT management skills.

Contrasting firms in terms of the duration of their ITC heterogeneity (*SYS* = durable, *OCC* = non-durable, and *NON* = non-ITC) and looking at the continuity of IT leadership is a critical component of this study (see Table 2 - Panel B). As we were expecting, the probability of continuity in the firm's IT leadership, i.e., the same sITe stays with the firm for four consecutive years, is the highest among the group of firms that achieve and sustain their ITC superiority (*SYS*). This is important given prior research that has shown the average tenure of an sITe to be less than 3 years (Leidner and Mackay 2007).

Econometric results

In order to validate the role of sITes' formal title and number of titles (structural power) on their firm's ability to achieve ITC superiority (H1a), we consider the following three scenarios: First, we contrast *CIOplus* or *CIO* versus *non-CIO* (SP1). Second, we contrast *CIOplus* versus *CIO* or *non-CIO* (SP2). Third, we contrast *CIOplus* versus *CIO* (SP3). Results based on all three specifications of structural power, reported in Table 3 - Panel A, support H1a. More specifically, the coefficient for all three specifications is positive and statistically significant (p-value<.05), ranging from .11 to .13. This means that an increase in the structural power of an sITe (higher formal title or number of titles) in the prior period increases the probability that the firm will achieve ITC superiority by 11 to 13%.

Results related to expert power, the second component of management power and the focus of H1b reported on Table 3 - Panel A, strongly support the importance of sITes' expert power on their firm's ability to achieve ITC superiority. For the testing of the sITe's expert power we consider various sources of experience and expertise, such as prior IT management experience or prior experience in an IT related firm/industry or IT related education, as being complementary to each other and forming an aggregate level of sITe's expert power (*ITCumExp*). The contribution of sITe's expert power to his/her firm's ability to achieve ITC superiority is positive (*ITCumExp* coefficient ranges from 23.5% to 29.2%) and statistically significant (p-value<0.05) in all three specifications of structural power. While not an explicit hypothesis in the context of this study, results reported in Table 3 are consistent with the findings of Lim et al. (2011) regarding the path dependence of ITC. The coefficient of lagged ITC (*ITC_{it-1}*) is positive (ranges from 20.4% to 23.8%) and statistically significant (p-value<0.05).

The robustness of the aggregate form of expert power (*CumITExp*) based results, prompted the testing of the individual attributes of sITe's expert power. Results shown in Table 3 - Panel B remain unchanged with respect to the role of structural power (coefficient of SP1, SP2, and SP3 remain positive and significant), however the individual components of sITes' expert power (*AcDeg*, *ITBef*, and *ITFirm*) as well as the effect of sITes' number of years with the firm (*Tenure*) are either insignificant or marginally significant. These results indicate that while sITes' expertise can be attributed to multiple sources, there is no single value which appears to be more important than the others.

Empirical evidence reported in Table 4 validates our position that ITC firms offer higher job security (lower turnover) to their sITes (H2a) and are more likely to promote them (reward them with more and/or higher titles) than non-ITC firms (H2b). The coefficient of y_hat_{it} in (2a) is negative (-0.238) and statistically significant (p-value<0.05). This means that the likelihood that an ITC firm will experience sITe turnover is 23.8% lower than that of a non-ITC firm. The y_hat_{it} coefficient in (2b1) and (2b2) are positive (0.315 and 0.323 respectively) and

statistically significant (p-value<0.01). This means that the likelihood that an ITC firm will reward its sITe with a higher formal title and/or more titles is more than 30% higher than non-ITC firms.

Having established that management power contributes to ITC superiority (H1a and H1b) and that ITC firms are more likely to appreciate and reward their sITes (H2a and H2b), next we examined the effect of continuity in a firm's IT leadership on its ability to achieve and sustain ITC superiority (H3). Results reported in table 5 (Dep.Var: *SYSvsOCC_{IT}*) show that the coefficient capturing continuity in IT leadership (*Cont_{it}*) is 20.8% and statistically significant (p-value<0.05). This means that the probability that a firm will sustain its ITC superiority is 20.8% higher if there is a continuity in the firm's IT leadership. For completeness we examined the role of continuity in IT leadership when contrasting *OCC vs NON* firms (Dep.Var: *OCCvsNON_{IT}*). As expected, the coefficient of *Cont_{it}* is positive and significant but the effect is not as strong as within the group of *SYS* firms. This is consistent with our position that continuity of IT leadership is more important for firms that aim to achieve and sustain ITC superiority.

Robustness checks

A barrage of robustness checks, several of them un-tabulated for brevity, ensures that our results are not sensitive to methodological choices. All robustness checks reliably generate results which are consistent with the propositions of this study.

The conceptualization of durable ITC implies that achieving ITC is necessary but not a sufficient condition for durable ITC heterogeneity. Therefore, the 'ability to contribute' hypothesis (H1a and H1b) also applies to durable ITC heterogeneity. As a robustness check we test the following hypothesis: sITes with more structural and expert power are more likely to contribute to their firm's ability to *achieve and sustain* ITC superiority than sITes with less structural and expert power. We test this by using duration of ITC heterogeneity as a our dependent variable (*SYSvsOCC_{IT}* and *OCCvsNON_{IT}*). Results reported on Table 6 show (Dep.Var: *SYSvsOCC_{IT}*) support our position that management power contributes to a firm's ability to achieve and sustain its ITC superiority. All three specifications of structural power are positive (*SP1*=0.105, *SP2*=0.127, and *SP3*=0.109) and statistically significant (p-value<0.05).

Similarly, the *CumITExp* is positive (25.7% to 31.6%) and significant (p-value<0.05) in all three specifications of structural power. Replicating the analysis with *OCCvsNON_{IT}* shows that the role of management power is only marginally significant. This is consistent with the argument presented in Lim et al. (2011) that the group of *OCC* firms may include firms that want to achieve ITC superiority only in certain periods as well as firms that achieve but cannot sustain their ITC superiority. The role of management power may be strong in the former but weak in the latter. Replicating the above tests with individual components of sITes' expert power (Table 7) confirms our previous finding that individual components of sITes' expert power are not as important.

As an additional robustness check for the reward hypothesis (H2b) we consider the additional constraint that the person who is rewarded has to be the same one that helped the firm achieve its ITC superiority. We did this by estimating the following specifications of (2b1) and (2b2):

$$SPro|SNC_{it} = f(y_hat_{it}, CR_{it}, TQ_{it}) \quad (R.2b1)$$

$$WPro|SNC_{it} = f(y_hat_{it}, CR_{it}, TQ_{it}) \quad (R.2b2)$$

Where

- *SPro|SNC_{it}*=Was the IT executive promoted or demoted (given same name & non-ITC)? Variable takes values in the range +2 to -2.
- *WPro|SNC_{it}*=Was the IT executive promoted or demoted (given same name & non-ITC)? Variable takes values in the range +1 to -1.

As it was expected the *y_hat_{it}* coefficient in (R.2b1) and (R.2b2) is positive and significant, but smaller (0.293 and 0.305 respectively) when compared to the *y_hat_{it}* coefficient in (2b1) and (2b2) (0.315 and 0.323 respectively) and statistically significant (p-value<0.01). This means that the likelihood that an ITC firm will reward its sITe with a higher formal title and/or more titles is 31.5% and 32.3% respectively.

Consistent with Lim et al. (2011) we considered different proxies as well as alternative measurements for some of the control variables and untabulated results remain unchanged.

Discussion

In spite of the importance of rewards as a motivation factor, the strategic IT leadership literature is peppered with references to punishment (Applegate and Elam 1992; Chatterjee et al. 2001; Leidner and Mackay 2007) rather than rewards. Given that sITes are personally instrumental in envisioning their firm's IT strategy and developing IT capabilities, this study introduced reciprocity between sITes and IT capable firms as a source of sustainable ITC superiority.

Managerial IT skills are very important but they tend to be tacit. In this study we used structural and expert power in order to proxy the role superior IT management skills on ITC. Our evidence shows that both of them are important. According to our study sITes endowed with more and higher formal titles are likely to be more successful in their quest to help their firm develop superior IT capability. Given that sITes are individual motivated by the need for financial safety and esteem, we hypothesized that IT capable firms are more likely to reward their sITes for their contribution. Evidence based results clearly support our position that sITes of IT capable firms enjoy higher job security (lower turnover) and are rewarded with more and higher formal titles. This is very important given that there is a positive correlation between number of titles of sITes and their compensation. The main message from the second set is that there is a heterogeneity in terms of the way firms reward or not reward their sITes. Given that reward and job security (lower turnover) are indications of how valuable IT management skills are to the firm's top management team and an indication of the inclusion of the sITes to the inner circle, these results provide the causal validation that could not be generated by prior studies based no cross sectional data sets.

Given the hyper-competitive nature of the modern corporate landscape, a firm's ability to develop superior IT capability is necessary but not sufficient condition for firms that want to obtain a sustainable competitive advantage. Firms that want to achieve IT enabled and sustained competitive advantage must evolve their IT capability and resist competitors' attempt to copy or improve their superior IT capability. The main message here is that continuity of IT leadership matters, and given that for many firms there is no provision for such continuity, firms that nurture this continuity of successful IT leadership will enjoy the benefits of durable ITC heterogeneity.

Practical Implications

We can divide the practical implications of this study according to the stakeholder involved. In this study we recognize two stakeholders. 1. The firm's top management team and board members. 2. sITes. Not all firms see the importance of developing superior ITC. Firms who see the importance of achieving and sustaining ITC superiority, will reward their sITes because this reward leads to continuity of IT leadership. Therefore top management teams and directors who want to achieve and sustain an IT enabled competitive advantage need to foster a culture of reciprocity with their sITes. Developing such a culture of trust and reciprocity is a long-term endeavour. The empirical evidence from our study indicates that increasing the power of sITes seems to be a kind of reward that is valued by sITes and it increases the chances that the sITes will help the firms develop and sustain its ITC superiority. The most important part is not that ITC firms reward their sITes, as lack of such evidence would seem paradoxical. The most interesting finding is that rewarding their sITes creates the potential for sustainability of the firm's ITC superiority.

Theoretical Implications

The results of our study indicate that title matter and consistent with RBV could be treated as a proxy for different IT management power. This offers a new venue for the IT strategic leadership literature which has focused primarily on sITes membership to his/her firms top management team (TMT) and found that this may not be the right path for sITes. "... TMT/CIO engagements alone do not directly impact CIO role effectiveness. Rather, CIO capability may mediate the relationship between TMT/CIO engagements and CIO role effectiveness. In other words, though TMT/CIO engagements might be a necessary condition for CIO role effectiveness, they are not sufficient" (Smaltz et al. 2006; p. 220). Our study found evidence that structural power measured by a relatively easier to measure and more readily available proxy provides more robust evidence regarding the role of sITes on their firm's ability to achieve and sustain its ITC superiority.

This study contributes to the literature on dynamic capabilities by identifying a foundation upon strategic management builds, maintains, and enhances distinctive and difficult-to-replicate advantages (Teece et al. 1997). Our conceptual framework proposes and empirical analysis validates that creating a culture of reciprocity, the foundation for enduring ITC heterogeneity, is an incremental and time consuming process refined after several iterations. Therefore, ITC is durably heterogeneous due to path-dependence (Lim et al. 2011) as well as due to time compression diseconomies. This is consistent with the view that the capabilities approach which sees “value augmenting strategic change as being difficult and costly. Moreover, it can generally only occur incrementally. Capabilities cannot easily be bought; they must be built. From the capabilities perspective, strategy involves choosing among and committing to long-term paths or trajectories of competence development” (Teece et al. 1997; p. 529).

Limitations and Suggestions for Future Research

Like all studies, there are limitations that we must acknowledge. First, since *InformationWeek* has been a well respected and widely used source of secondary information on IT capability (Bharadwaj, 2000; Santhanam and Hartono, 2003), it was assumed that firms listed in *IW500* are a proxy for firms with superior IT capability. However, we cannot confirm that the *IW500* firms are independently evaluated each year. Second, Finkelstein (1992) suggests that official title, number of titles, and compensation are a proxy of hierarchical power. While we use official title and number of titles, compensation was excluded because in spite of our herculean efforts, we were unable to find enough data points to complete a meaningful statistical analysis. As a matter of fact we could find compensation data for 2 to 3% of the total number of firms in each year. Nevertheless, since survey data have shown that sITes with multiple titles are among the highest paid sITes (Marlin 2004), we feel confident that this limitation does not seem to compromise the main message of our study. We hope that our work will inspire researchers to come with better and more creative ways in order to shed more light on role of structural and expert power of senior IT executives.

We hope that future research will build on our approach in order to explore other areas such as; Is there an association between the sustainability of a firm’s capability to innovate with IT and the firm’s competitive agility (i.e., ability to launch tactical and strategic movements). Does the complementarity of experience and expertise in a firm’s top management team (senior business and senior IT executives) affect the likelihood that the firm will reward its senior IT executives? Does the complementarity of experience and expertise in a firm’s top management team (senior business and senior IT executives) affect the sustainability of a firm’s capability to innovate with IT and its competitive agility?

References

- Adams, R. B., Hermalin, B. E., and Weisbach, M. S. 2010. "The Role of Boards of Directors in Corporate Governance: A Conceptual Framework and Survey," *Journal of Economic Literature* (48:1), pp. 58-107.
- Applegate, L. M., and Elam, J. J. 1992. "New Information Systems Leaders: A Changing Role in a Changing World," *MIS Quarterly* (16:4), pp. 469-490.
- Armstrong, C. P., and Sambamurthy, V. 1999. "Information Technology Assimilation in Firms: The Influence of Senior Leadership and IT Infrastructures," *Information Systems Research* (10:4), pp. 304-327.
- Austin, R. D., Nolan, R. L., and O'Donnell, S. 2009. *Adventures of an IT Leader*, Boston, MA: Harvard Business Press.
- Banker, R. D., Hu, N., Pavlou, P. A., and Luftman, J. 2011. "CIO Reporting Structure, Strategic Positioning, and Firm Performance: To Whom Should the CIO Report?," *MIS Quarterly* (35:2), pp. 487-504.
- Barney, J. 1991. "Firm Resources and Sustained Competitive Advantage," *Journal of Management* (17:1), pp. 99-120.
- Bart, C., and Turel, O. 2010. "IT and the Board of Directors: An Empirical Investigation into the 'Governance Questions' Canadian Board Members Ask about IT," *Journal of Information Systems* (24:2), p. 147.
- Barua, A., Kriebel, C. H., and Mukhopadhyay, T. 1995. "Information technologies and business value: An analytic and empirical investigation," *Information Systems Research* (6:1), pp. 3-24.
- Bassellier, G., Benbasat, I., and Reich, B. H. 2003. "The influence of business managers' IT competence on championing IT," *Information Systems Research* (14:4), pp. 317-336.
- Bassellier, G., Reich, B. H., and Benbasat, I. 2001. "Information technology competence of business managers: A definition and research model," *Journal of Management Information Systems* (17:4), pp. 159-182.
- Bharadwaj, A. 2000. "A resource-based perspective on information technology capability and firm performance: an empirical investigation," *MIS Quarterly* (24:1), pp. 169-196.
- Bhatt, G. D., and Grover, V. 2005. "Types of information technology capabilities and their role in competitive advantage: An empirical study," *Journal of Management Information Systems* (22:2), pp. 253-277.
- Boynton, A. C., Zmud, R. W., and Jacobs, G. C. 1994. "The Influence of IT Management Practice on IT Use in Large Organizations," *MIS Quarterly* (18:3), pp. 299-318.
- Broadbent, M., and Kitzis, E. 2005. *The new CIO leader: setting the agenda and delivering results*, Harvard Business Press.
- Brynjolfsson, E., and Hitt, L. 1996. "Paradox Lost? Firm-Level Evidence on the Returns to Information Systems Spending," *Management Science* (42:4), pp. 541-558.
- Carr, N. G. 2003. "IT Doesn't Matter," *Harvard Business Review* (81:5), pp. 41-52.
- Chan, Y. E., Sabherwal, R., and Thatcher, J. B. 2006. "Antecedents and outcomes of strategic IS alignment: an empirical investigation," *IEEE Transactions on Engineering Management* (53:1), pp. 27-47.
- Chatterjee, D., Richardson, V. J., and Zmud, R. W. 2001. "Examining the Shareholder Wealth Effects of Announcements of Newly Created CIO Positions," *MIS Quarterly* (25:1), pp. 43-70.
- Chen, D. Q., Mocker, M., Preston, D. S., and Teubner, A. 2010. "Information Systems Strategy: Reconceptualization, Measurement, and Implications," *Management Information Systems Quarterly* (34:2), pp. 233-259.
- Cheng, Q. 2005. "What Determines Residual Income?," *The Accounting Review* (80:1), pp. 85-112.
- Chung, K. H., and Pruitt, S. W. 1994. "A Simple Approximation of Tobin's q," *Financial Management* (23:3), pp. 70-74.
- Daellenbach, U. S., McCarthy, A. M., and Schoenecker, T. S. 1999. "Commitment to Innovation: The Impact of Top Management Team Characteristics," *R&D Management* (29:3), pp. 199-208.
- Dehning, B., and Stratopoulos, T. C. 2003. "Determinants of a sustainable competitive advantage due to an IT-enabled strategy," *Journal of Strategic Information Systems* (12:1), pp. 7-28.
- Earl, M. J., and Feeney, D. F. 1994. "Is Your CIO Adding Value?," *Sloan Management Review* (35:3), pp. 11-20.
- Fee, C. E., and Hadlock, C. J. 2004. "Management turnover across the corporate hierarchy," *Journal of Accounting and Economics* (37:1), pp. 3-38.
- Feeny, D. F., and Willcocks, L. P. 1998. "Core IS capabilities for exploiting information technology," *Sloan Management Review* (39:3), pp. 9-21.

- Feeny, D. F., Edwards, B. R., and Simpson, K. M. 1992. "Understanding the CEO/CIO Relationship," *MIS Quarterly* (16:4), pp. 435-448.
- Finkelstein, S., Hambrick, D. C., and Cannella, A. A. 2009. *Strategic leadership: theory and research on executives, top management teams, and boards*, Oxford University Press US.
- Finkelstein, S. 1992. "Power in Top Management Teams: Dimensions, Measurement, and Validation," *The Academy of Management Journal* (35:3), pp. 505-538.
- Geletkanycz, M. A., and Boyd, B. K. 2011. "CEO Outside Directorships and Firm Performance: A Reconciliation of Agency and Embeddedness Views," *The Academy of Management Journal* (54:2), pp. 335-352.
- Ghiselli, R. F., La Lopa, J. M., and Bai, B. 2001. "Job satisfaction, life satisfaction, and turnover intent among food-service managers," *The Cornell Hotel and Restaurant Administration Quarterly* (42:2), pp. 28-37.
- Grover, V., Jeong, S.-R., Kettinger, W. J., and Lee, C. C. 1993. "The chief information officer: a study of managerial roles," *Journal of Management Information Systems* (10:2), pp. 107-130.
- Hambrick, D. C., and Mason, P. A. 1984. "Upper Echelons: The Organization as a Reflection of Its Top Managers," *The Academy of Management Review* (9:2), pp. 193-206.
- Hambrick, D. C. 1981. "Environment, Strategy, and Power Within Top Management Teams," *Administrative Science Quarterly* (26:2), pp. 253-275.
- Helfat, C. E., and Peteraf, M. A. 2003. "The dynamic resource-based view: capability lifecycles," *Strategic Management Journal* (24:10), pp. 997-1010.
- Huff, S. L., Maher, P. M., and Munro, M. C. 2006. "Information technology and the board of directors: Is there an IT attention deficit?," *MIS Quarterly Executive* (5:2), pp. 55-68.
- Kaarst-Brown, M. L. 2005. "Understanding an Organization's View of the CIO: The Role of Assumptions About IT," *MIS Quarterly Executive* (4:2), pp. 287-305.
- Karahanna, E., and Watson, R. T. 2006. "Information systems leadership," *IEEE Transactions on Engineering Management* (53:2), pp. 171-176.
- Karimi, J., Gupta, Y. P., and Somers, T. M. 1996. "The congruence between a firm's competitive strategy and information technology leader's rank and role," *Journal of Management Information Systems* (13:1), pp. 63-88.
- Kearns, G. S., and Lederer, A. L. 2003. "A Resource-Based View of Strategic IT Alignment: How Knowledge Sharing Creates Competitive Advantage," *Decision Sciences* (34:1), pp. 1-29.
- Kohli, R., and Grover, V. 2008. "Business value of IT: An essay on expanding research directions to keep up with the times," *Journal of the Association for Information Systems* (9:1), pp. 23-39.
- Kollmann, T., Häsel, M., and Breugst, N. 2009. "Competence of IT Professionals in E-Business Venture Teams: The Effect of Experience and Expertise on Preference Structure," *Journal of Management Information Systems* (25:4), pp. 51-80.
- Leidner, D. E., and Mackay, J. M. 2007. "How incoming CIOs transition into their new jobs," *MIS Quarterly Executive* (6:1), pp. 17-28.
- Leidner, D. E., Preston, D., and Chen, D. 2010. "An examination of the antecedents and consequences of organizational IT innovation in hospitals," *The Journal of Strategic Information Systems* (19:3), pp. 154-170.
- Lev, B. 1983. "Some economic determinants of time-series properties of earnings," *Journal of Accounting and Economics* (5:1), pp. 31-48.
- Li, Y., Tan, C.-H., Teo, H.-H., and Tan, B. C. . 2006. "Innovative usage of information technology in Singapore organizations: do CIO characteristics make a difference?," *IEEE Transactions on Engineering Management* (53:2), pp. 177-190.
- Lim, J.-H., Stratopoulos, T., and Wirjanto, T. 2011. "Path Dependence of Dynamic Information Technology Capability: An Empirical Investigation," *Journal of Management Information Systems* (Forthcoming).
- Marlin, S. 2004. "Double Duty," in *Information Week* (November 8).
- Mata, F., Fuerst, W., and Barney, J. 1995. "Information technology and sustained competitive advantage: A resource-based analysis," *MIS Quarterly* (14:4), pp. 487-505.
- Mintzberg, H. 1983. *Power in and around organizations*, Prentice-Hall.
- Morrison, C. J. 1997. "Assessing the productivity of information technology equipment in US manufacturing industries," *Review of Economics and Statistics* (79:3), pp. 471-481.
- Morrow, J. L., Sirmon, D. G., Hitt, M. A., and Holcomb, T. R. 2007. "Creating value in the face of declining performance: firm strategies and organizational recovery," *Strategic Management Journal* (28:3), pp. 271-283.
- Mueller, D. C. 1990. *The Dynamics of company profits: an international comparison*, Cambridge University Press.
- Murphy, C. 2008. "HP Goes All In With An IT Transformation," in *Information Week*.
- Ocasio, W. 1994. "Political Dynamics and the Circulation of Power: CEO Succession in U.S. Industrial Corporations, 1960-1990," *Administrative Science Quarterly* (39:2), pp. 285-312.

- Pavlou, P. A., and El Sawy, O. A. 2006. "From IT Leveraging Competence to Competitive Advantage in Turbulent Environments: The Case of New Product Development," *Information Systems Research* (17:3), pp. 198-227.
- Peteraf, M. A. 1993. "The Cornerstones of Competitive Advantage: A Resource-Based View," *Strategic Management Journal* (14:3), pp. 179-191.
- Pfeffer, J. 1985. "A review of the book: Power In and Around Organizations. By Henry Mintzberg. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1983.," *American Journal of Sociology* (91:2), pp. 454-456.
- Preston, D. S., Chen, D., and Leidner, D. E. 2008. "Examining the Antecedents and Consequences of CIO Strategic Decision-Making Authority: An Empirical Study*," *Decision Sciences* (39:4), pp. 605-642.
- Raghunathan, B., and Raghunathan, T. S. 1989. "Relationship of the rank of information systems executive to the organizational role and planning dimensions of information systems," *Journal of Management Information Systems* (6:1), pp. 111-125.
- Rajagopalan, N., and Datta, D. K. 1996. "CEO Characteristics: Does Industry Matter?," *The Academy of Management Journal* (39:1), pp. 197-215.
- Ricadela, A. 2011. "Apotheker Revamps HP Management," in *BusinessWeek: Technology*.
- Roberts, P. W., and Dowling, G. R. 2002. "Corporate reputation and sustained superior financial performance," *Strategic Management Journal* (23:12), pp. 1077-1093.
- Santhanam, R., and Hartono, E. 2003. "Issues in linking information technology capability to firm performance," *MIS Quarterly* (27:1), pp. 125-153.
- Sharon G. Levin, Levin, S. L., and Meisel, J. B. 1987. "A Dynamic Analysis of the Adoption of a New Technology: The Case of Optical Scanners," *The Review of Economics and Statistics* (69:1), pp. 12-17.
- Smaltz, D., Sambamurthy, V., and Agarwal, R. 2006. "The antecedents of CIO role effectiveness in Organizations: An empirical study in the healthcare sector," *IEEE Transactions on Engineering Management* (53:2), pp. 207-222.
2007. "Special Report: Information Technology and the Board," in *Corporate Board Member* (March/April).
- Teece, D. J., Pisano, G., and Shuen, A. 1997. "Dynamic capabilities and strategic management," *Strategic management journal* (18:7), pp. 509-533.
- Vroom, V. H. 1964. *Work and motivation*, Wiley.
- Wade, M., and Hulland, J. 2004. "Review: The Resource-Based View and Information Systems Research: Review, Extension and Suggestions for Future Research," *MIS Quarterly* (28:1), pp. 107-142.
- Wally, S., and Baum, J. R. 1994. "Personal and Structural Determinants of the Pace of Strategic Decision Making," *The Academy of Management Journal* (37:4), pp. 932-956.
- Wiersema, M. F., and Bantel, K. A. 1992. "Top Management Team Demography and Corporate Strategic Change," *The Academy of Management Journal* (35:1), pp. 91-121.
- Wooldridge, J. M. 2005. "Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity," *Journal of Applied Econometrics* (20:1), pp. 39-54.
- Zachary, G. 1991. "Technology," in *The Wall Street Journal*, p. B1.
- Zhu, K. 2004. "The Complementarity of Information Technology Infrastructure and E-Commerce Capability: A Resource-Based Assessment of Their Business Value," *Journal of Management Information Systems* (21:1), pp. 167-202.

Figure 1.

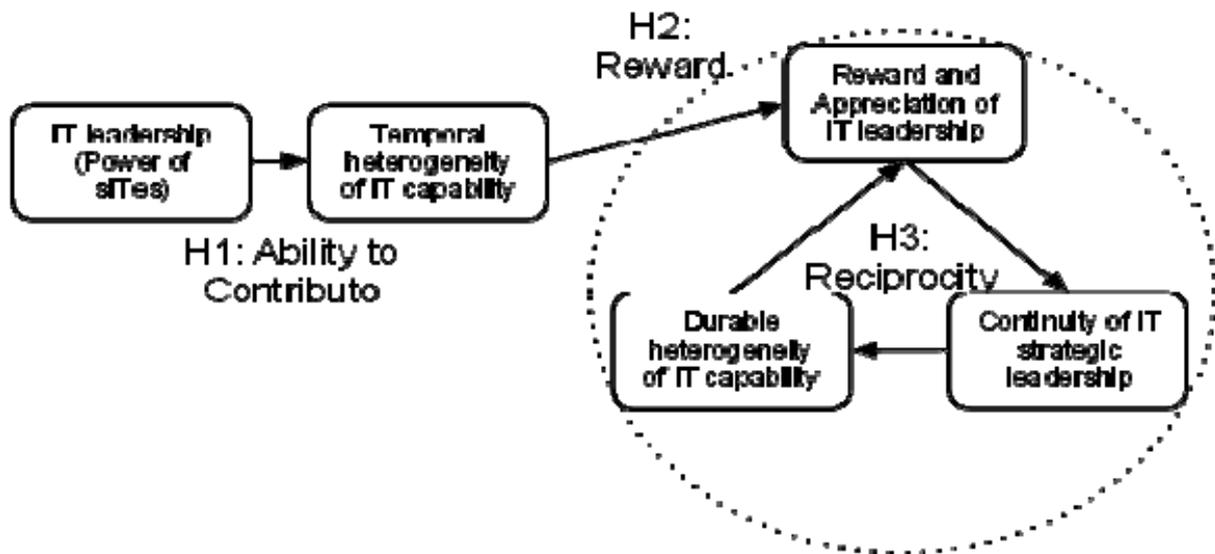


Figure 1. Conceptual research framework

Figure 2.

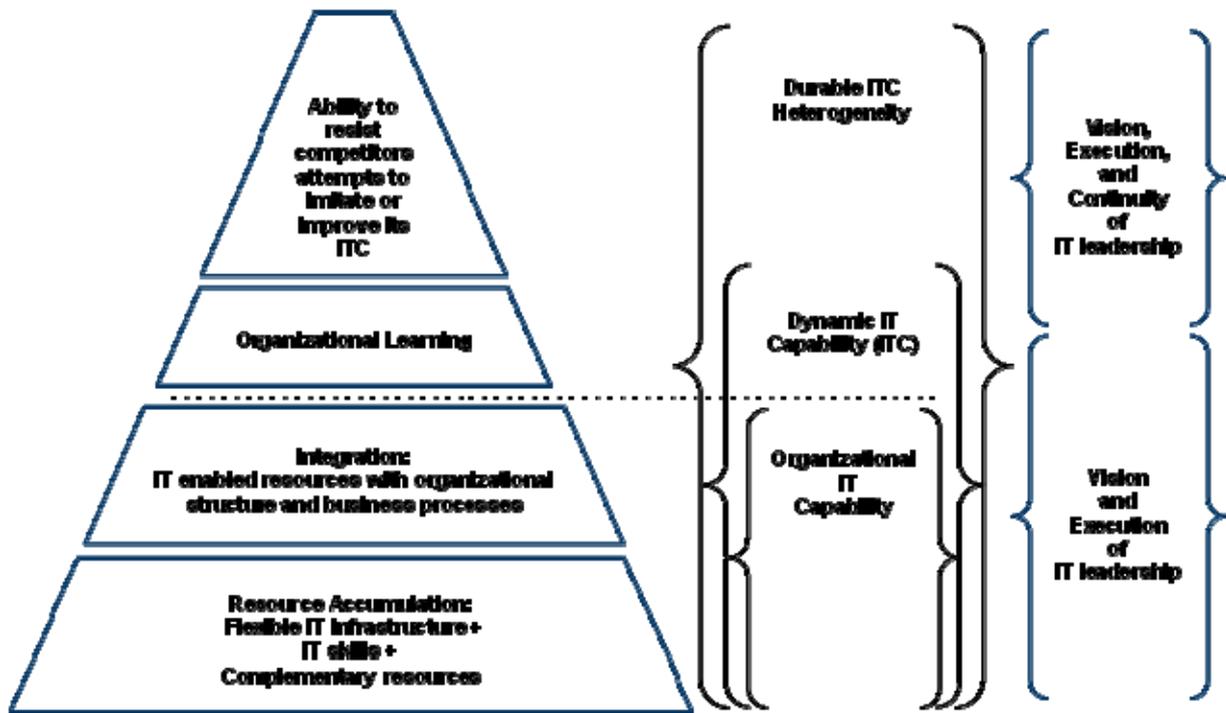


Figure 2. Dynamic IT capability and IT leadership

Table 1. IT Strategic Leadership Summary: Antecedents and Consequents

Antecedents	Consequents
<p>➤ <u>sITes Structural Power</u></p> <ul style="list-style-type: none"> - Member of TMT (Armstrong and Sambamurthy 1999; Chen et al. 2010; Earl and Feeny 1994; Feeny et al. 1992; Kearns and Lederer 2003; Preston et al. 2008) - Reporting structure/distance from CEO (Armstrong and Sambamurthy 1999; Banker et al. 2011; Chen et al. 2010; Kearns and Lederer 2003; Karimi et al. 1996; Preston et al. 2008; Raghunathan and Raghunathan 1989; Smaltz et al. 2006) - Political smartness - ability to negotiate and influence TMT members (Broadbent and Kitzis 2005; Feeny et al. 1992; Smaltz et al. 2006) - Ability to communicate in business terms with TMT members (Broadbent and Kitzis 2005; Feeny et al. 1992; Smaltz et al. 2006) - Credibility within TMT (Broadbent and Kitzis 2005) networking and trust with TMT members (Smaltz et al. 2006) - sITe's vision on how IT and can take the enterprise to the next level (Broadbent and Kitzis 2005) - Managerial roles/qualities of sITes such as spokesperson, monitor, entrepreneur (Grover et al. 1993) <p>➤ <u>sITes Expert Power</u></p> <ul style="list-style-type: none"> - sITes' tenure with current organization (Chen et al. 2010;) - sITes' years of IT related experience (Chen et al. 2010; Earl and Feeny 1994; Feeny and Willcocks 1998) - level of education (Chen et al. 2010; Li et al. 2006) - sITes' IT related knowledge (Armstrong and Sambamurthy 1999; Boynton et al. 1994; Chan et al. 2006; Earl and Feeny 1994; Feeny and Willcocks 1998; Smaltz et al. 2006) - sITes' business related knowledge (Armstrong and Sambamurthy 1999; Boynton et al. 1994; Chan et al. 2006; Feeny et al. 1992; Feeny and Willcocks 1998; Smaltz et al. 2006) - sITes have an IS function analyst experience (Earl and Feeny 1994) 	<p>➤ <u>sITes</u></p> <ul style="list-style-type: none"> - sITe's strategic making authority within the organization (Preston et al. 2008) - Supply (cost/efficiency) or demand (innovation and strategic opportunities) oriented IT leadership focus (Chen et al. 2010) - Effectiveness as this is assessed by TMT in the context of salient roles, behaviors, and responsibilities (Smaltz et al. 2006) <p>➤ <u>IT Organization</u></p> <ul style="list-style-type: none"> - Role of IT within an organization: operational or strategic (Boynton et al. 1994; Raghunathan and Raghunathan 1989) - Innovative use of IT (Leidner et al. 2010; Li et al. 2006) - Effective application of IT in supporting, shaping, and enabling firm's business strategies and value-chain activities (Armstrong and Sambamurthy 1999) - IS maturity, implies strategic IS planning and alignment between IS and business strategy (Grover et al. 1993) - Alignment between IS and business strategy (Chan et al. 2006; Kearns and Lederer 2003) - Business/IS relationship, proxied by CEO/CIO relationship (Feeny et al. 1992) - Developing and achieving core IS capabilities (Feeny and Willcocks 1998) - acceptance of IS planning, resources provided, top management support, links to organizational concerns (Raghunathan and Raghunathan 1989) <p>➤ <u>Firm</u></p> <ul style="list-style-type: none"> - Financial or market performance implications (Banker et al. 2011; Chatterjee et al. 2001; Chen et al. 2010; Lim et al. 2011b; Preston et al. 2008)

Notes: (a). The reference to structural power of sITes in the study of Kearns and Lederer (2003) is implicit. (b) The direction of the association in Grover et al. (1993) and in Karimi et al. (1996) is from firm to sITe's attributes. In Grover et al. 1993 is from IT organization characteristics to sITes' managerial roles and in Karimi et al. 1996 is from business strategy to sITe's structural power. (c) Smaltz et al. (2006; p. 211) define CIO capability as the interpersonal skills and knowledge, including: political savvy, communicative ability, strategic business knowledge; and strategic IT knowledge.

Table 2. Sample (N=1,326)

Panel A: Distribution of Sample by Year

Year	97	98	99	00	01	02	03	04	05	06	07	08	09
ITC	448	448	421	422	409	416	410	399	334	320	325	338	303
Missing	(33)	(6)	(1)	(2)	(2)	(6)	(3)	(3)	(20)	(19)	(19)	(6)	(5)
<i>CIOplus</i>	78	131	131	117	67	51	46	42	42	54	66	68	57
<i>CIO</i>	108	144	152	190	235	245	264	250	202	179	178	193	183
<i>non-CIO</i>	229	167	137	113	105	114	97	104	70	68	62	71	58
Total	415	442	420	420	407	410	407	396	314	301	306	332	298
NonIT													
C	878	878	905	904	917	910	916	927	992	1,006	1,001	988	1023
Missing	(596)	(556)	(516)	(477)	(463)	(449)	(442)	(429)	(404)	(429)	(440)	(458)	(608)
<i>CIOplus</i>	62	65	78	87	77	80	85	92	110	99	91	81	69
<i>CIO</i>	111	124	164	193	216	232	238	266	337	338	336	333	257
<i>non-CIO</i>	109	133	147	147	161	149	151	140	141	140	134	116	89
Total	282	322	389	427	454	461	474	498	588	577	561	530	415

Panel B: Distribution of Sample by Continuity

Year	4-Year Rolling Window									
	9700	9801	9902	0003	0104	0205	0306	0407	0508	0609
SYS	96	148	147	194	194	134	115	114	132	120
Con = 1	46	76	80	102	106	82	65	63	58	54
OCC	764	615	604	482	473	576	579	562	455	455
Con = 1	185	152	178	187	224	264	258	234	186	205
NonITC	466	563	575	650	659	616	632	650	739	751
Con = 1	90	119	135	178	181	168	170	181	227	216

Panel C: Variable Description	
Variable	Description
Dependent Variable	
<i>ITC_{it}</i>	1 if a firm has achieved ITC superiority in year <i>t</i> ; otherwise 0.
<i>SYS_{it}</i>	1 if a firm has achieved and sustained ITC superiority over a four-year window ending in year <i>t</i> (durable ITC heterogeneity); otherwise 0.
<i>OCC_{it}</i>	1 if a firm has achieved but not sustained ITC superiority over a four-year window ending in year <i>t</i> (non-durable ITC heterogeneity); otherwise 0.
<i>NON_{it}</i>	1 if a firm has not achieved ITC superiority in any of the year of a four-year window ending in year <i>t</i> (non-ITC); otherwise 0.
<i>SPro/S_{it}</i>	+2=non-CIO to CIOPlus; +1=non-CIO to CIO or CIO to CIO Plus; 0=no change in title; -1=CIOPlus to CIO or CIO to non-CIO; -2=CIO Plus to non-CIO. Variable takes values in the range +2 to -2, and it is calculated only if <i>S_{it}</i> =1
<i>WPro/S_{it}</i>	+1=from non-CIO to CIO or CIOPlus or from CIO to CIOPlus, as well as CIO to CIO or CIOPlus to CIOPlus; 0=non-CIO to non-CIO; -1=CIOPlus to CIO or CIO to non-CIO. Variable takes values in the range +1 to -1, and it is calculated only if <i>S_{it}</i> =1
<i>S_{it}</i>	1 if sITe has been with the firm for the last three years.
<i>TO_{it}</i>	1 if there is a change in the firm's sITe from <i>t</i> to <i>t+1</i> ; otherwise 0
Independent Variable	
<i>CIOplus</i>	1 if a sITe has the formal title of CIO plus additional official titles; otherwise 0.
<i>CIO</i>	1 if a sITe has just the title of CIO; otherwise 0.
<i>non-CIO</i>	1 if the title of a sITe does not include the moniker 'CIO'; otherwise 0.
<i>SP1</i>	1 if title is CIO Plus or just CIO; 0 if title is non-CIO.
<i>SP2</i>	1 if title is CIO Plus; 0 if title is just CIO or non-CIO.
<i>SP3</i>	1 if title is CIO Plus; 0 if title is just CIO.
<i>ACDeg_{it-1}</i>	1 if 1 if the IT executive had IT-related academic degree; otherwise 0.
<i>ITBef_{it-1}</i>	1 if 1 if the IT executive had experienced as the IT executive(s) from his/her previous employment; otherwise 0.
<i>ITfirm_{it-1}</i>	1 if 1 if the IT executive had IT-related practical experience and/or worked for IT firm(s); otherwise 0.
<i>Tenure_{it-1}</i>	number of years he/she has been IT executive(s) in the firm
<i>CumITexp</i>	1 if the sITe had IT-related academic degree or prior IT executive experience or IT-related practical experience or worked for IT firm(s); otherwise 0.
<i>Con_{it-1}</i>	1 if the same sITe been with the firm for the last four years; otherwise 0.
Control Variable	
<i>SIZE_{it-1}</i>	A natural log of total assets.
<i>ROA_{it-1}</i>	Return on assets.
<i>MV_{it-1}</i>	Market-to-book-value.
<i>CR_{it}</i>	Concentration ratio as the annual sales revenues for the four largest firms in each four-digit SIC code divided by the sales for all firms in the industry.
<i>TQ_{it}</i>	Tobin's Q a ratio of market value [(fiscal year-end market value of equity) + (liquidating value of the firms' outstanding preferred stock) + (current liabilities) – (current assets) + (book value of inventories) + (long-term debt)] to book value of total assets.
<i>Industry</i>	Fixed industry effect.
<i>Year</i>	Fixed year effect.

Table 3. Attributes of Senior IT Executives and ITC Heterogeneity (H1a & H1b)

Panel A	Dep.Var: ITC _{it}		Coeff.(std.)	Sig.	Dep.Var: ITC _{it}		Sig.
	Coeff.(std.)	Sig.			Coeff.(std.)	Sig.	
<i>ITC</i> _{it-1}	0.204 (0.093)	**	0.238 (0.095)	**	0.227 (0.086)	***	
<i>SPI</i> _{it-1}	0.107 (0.045)	**					
<i>SP2</i> _{it-1}			0.130 (0.048)	***			
<i>SP3</i> _{it-1}					0.125 (0.050)	**	
<i>CumITexp</i> _{it-1}	0.235 (0.119)	**	0.292 (0.139)	**	0.263 (0.132)	**	
<i>SIZE</i> _{it-1}	0.091 (0.053)	*	0.116 (0.059)	**	0.111 (0.059)	*	
<i>ROA</i> _{it-1}	0.052 (0.028)	*	0.032 (0.018)	*	0.036 (0.019)	*	
<i>MV</i> _{it-1}	0.044 (0.027)		0.048 (0.026)	*	0.052 (0.027)	*	
<i>ITC</i> _{i0}	0.368 (0.186)	**	0.335 (0.160)	**	0.342 (0.163)	**	
<i>Industry</i>	Included		Included		Included		
<i>Year</i>	Included		Included		Included		
σ_{η}	0.312 (0.137)	**	0.286 (0.129)	**	0.292 (0.132)	**	
<i>Ln L</i>	-1073.5		-995.9		-1025.3		
<i>Wald1</i>	0.023	**	0.015	**	0.019	**	
<i>Wald2</i>	0.046	**	0.028	**	0.031	**	
<i># Obs</i>	9,184		9,184		9,184		

Panel B	Dep.Var: ITC _{it}		Coeff.(std.)	Sig.	Dep.Var: ITC _{it}		Sig.
	Coeff.(std.)	Sig.			Coeff.(std.)	Sig.	
<i>ITC</i> _{it-1}	0.215 (0.090)	**	0.246 (0.085)	***	0.233 (0.089)	***	
<i>SPI</i> _{it-1}	0.111 (0.049)	**					
<i>SP2</i> _{it-1}			0.125 (0.042)	***			
<i>SP3</i> _{it-1}					0.116 (0.047)	**	
<i>ACDeg</i> _{it-1}	0.066 (0.034)	*	0.083 (0.044)	*	0.072 (0.038)	*	
<i>ITBef</i> _{it-1}	0.077 (0.041)	*	0.074 (0.045)		0.068 (0.042)		
<i>ITfirm</i> _{it-1}	0.072 (0.044)		0.079 (0.047)	*	0.066 (0.036)	*	
<i>Tenure</i> _{it-1}	0.075 (0.039)	*	0.070 (0.042)	*	0.069 (0.034)	*	
<i>SIZE</i> _{it-1}	0.116 (0.064)	*	0.112 (0.053)	**	0.108 (0.055)	*	
<i>ROA</i> _{it-1}	0.025 (0.014)	*	0.021 (0.012)	*	0.031 (0.016)	*	
<i>MV</i> _{it-1}	0.033 (0.020)		0.053 (0.030)	*	0.047 (0.025)	*	
<i>ITC</i> _{i0}	0.322 (0.129)	**	0.343 (0.146)	**	0.319 (0.128)	**	
<i>Industry</i>	Included		Included		Included		
<i>Year</i>	Included		Included		Included		
σ_{η}	0.329 (0.124)	**	0.292 (0.130)	**	0.313 (0.125)	**	
<i>Ln L</i>	-1202.2		-1012.6		-1055.3		
<i>Wald1</i>	0.039	**	0.036	**	0.034	**	
<i>Wald2</i>	0.016	**	0.019	**	0.017	**	
<i># Obs</i>	9,184		9,184		9,184		

Note. Variables Defined in Panel C of Table 2. Wald1 records the *p*-value of the Wald test for the joint exclusion of year effects. Wald2 records the *p*-value of the Wald test for the joint exclusion of industry effects. The asterisks *, **, and *** respectively denote significance at the 10, 5 and 1% levels for two-sided alternatives.

Table 4. Firms with Superior ITC and Reward of sITes

	H2a		H2b			
	Dep.Var: TO_{it+1}		Dep.Var: $(SPr o S)_{it}$		Dep.Var: $(WPr o S)_{it}$	
	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.
CR_{it}	0.032 (0.016)	*	0.093 (0.037)	**	0.102 (0.044)	**
TQ_{it}	-0.163 (0.071)	**	0.225 (0.197)	**	0.206 (0.095)	**
\hat{y}_{it}	-0.238 (0.098)	**	0.315 (0.108)	***	0.323 (0.107)	***
Industry	Included		Included		Included	
Year	Included		Included		Included	
Adj. R²	0.81		0.85		0.90	
# Obs	6,535		6,535		6,535	

Note. Variables Defined in Panel C of Table 2. Wald1 records the p -value of the Wald test for the joint exclusion of year effects. Wald2 records the p -value of the Wald test for the joint exclusion of industry effects. The asterisks *, **, and *** respectively denote significance at the 10, 5 and 1% levels for two-sided alternatives.

Table 5. Virtuous Cycle of Positive Reciprocity (H3)

	Dep.Var: SYS_{it} v. OCC_{it}		Dep.Var: OCC_{it} v. $NonITC_{it}$		
	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	
SYS_{it-1} v. OCC_{it-1}	0.255 (0.083)	***	OCC v. $NonITC_{it-1}$	0.141 (0.081)	*
Con_{it-1}	0.208 (0.081)	**	Con_{it-1}	0.137 (0.068)	**
$SIZE_{it-1}$	0.121 (0.048)	**	$SIZE_{it-1}$	0.092 (0.049)	*
ROA_{it-1}	0.073 (0.037)	*	ROA_{it-1}	0.084 (0.044)	*
MV_{it-1}	0.062 (0.032)	*	MV_{it-1}	0.055 (0.034)	
SYS_{i0} v. OCC_{i0}	0.327 (0.130)	**	OCC v. $NonITC_{i0}$	0.312 (0.157)	**
Industry	Included		Industry	Included	
Year	Included		Year	Included	
σ_{η}	0.283 (0.115)	**	σ_{η}	0.336 (0.169)	**
Ln L	-1012.5		Ln L	-1178.5	
Wald1	0.035	**	Wald1	0.038	**
Wald2	0.042	**	Wald2	0.044	***
# Obs	971		# Obs	3,065	

Note. Variables Defined in Panel C of Table 2. Wald1 records the p -value of the Wald test for the joint exclusion of year effects. Wald2 records the p -value of the Wald test for the joint exclusion of industry effects. The asterisks *, **, and *** respectively denote significance at the 10, 5 and 1% levels for two-sided alternatives.

Table 6. Robustness Checks: H1a & H1b

	Dep.Var: SYS_{it} v. OCC_{it}						Dep.Var: OCC_{it} v. $NonITC_{it}$						
	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	
SYS_{it-1} v.	0.220	**	0.239	**	0.227 (0.)	**	OCC v.	0.111	*	0.139	*	0.121	*
OCC_{it-1}	(0.089)		(0.104)				$NonITC_{it-1}$	(0.067)		0.084)		(0.073)	
SPI_{it-1}	0.105	**					SPI_{it-1}	0.045	*				
	(0.052)							(0.023)					
$SP2_{it-1}$			0.127	***			$SP2_{it-1}$			0.071	*		
			(0.049)							(0.043)			
$SP3_{it-1}$					0.109	**	$SP3_{it-1}$					0.065	*
					(0.046)							(0.038)	
$CumITexp_{it-1}$	0.257	**	0.316	**	0.298	**	$CumITexp_{it-1}$	0.083	*	0.128	*	0.105	*
	(0.130)		(0.150)		(0.128)			(0.043)		(0.066)		(0.055)	
$SIZE_{it-1}$	0.085	*	0.114	**	0.101	*	$SIZE_{it-1}$	0.087	*	0.113	*	0.106	*
	(0.045)		(0.057)		(0.052)			(0.048)		(0.068)		(0.062)	
ROA_{it-1}	0.041	*	0.043	*	0.037	*	ROA_{it-1}	0.051	*	0.044	*	0.037	*
	(0.024)		(0.023)		(0.019)			(0.031)		(0.026)		(0.022)	
MV_{it-1}	0.035		0.036	*	0.039	*	MV_{it-1}	0.065		0.053	*	0.048	*
	(0.022)		(0.018)		(0.020)			(0.047)		(0.033)		(0.026)	
SYS_{i0} v.	0.326	**	0.312	**	0.322	**	OCC v.	0.325	**	0.315	**	0.320	**
OCC_{i0}	(0.155)		(0.153)		(0.149)		$NonITC_{i0}$	(0.155)		(0.159)		(0.162)	
<i>Industry</i>	Included		Included		Included		<i>Industry</i>	Included		Included		Included	
<i>Year</i>	Included		Included		Included		<i>Year</i>	Included		Included		Included	
σ_{η}	0.292	**	0.283	**	0.289	**	σ_{η}	0.371	**	0.352	**	0.361	**
	(0.116)		(0.123)		(0.126)			(0.160)		(0.175)		(0.183)	
$Ln L$	-1061.2		-1013.7		-1042.2		$Ln L$	-1365.1		-1258.0		-1289.7	
<i>Wald1</i>	0.033	**	0.032	**	0.035	**	<i>Wald1</i>	0.034	**	0.025	**	0.028	**
<i>Wald2</i>	0.045	**	0.040	**	0.043	**	<i>Wald2</i>	0.045	**	0.037	**	0.039	**
<i># Obs</i>	971		971		971		<i># Obs</i>	3,065		3,065		3,065	

Note. Variables Defined in Panel C of Table 2. Wald1 records the p -value of the Wald test for the joint exclusion of year effects. Wald2 records the p -value of the Wald test for the joint exclusion of industry effects. The asterisks *, **, and *** respectively denote significance at the 10, 5 and 1% levels for two-sided alternatives.

Table 6. Robustness Checks: H1a & H1b (continued)

	Dep.Var: SYS_{it} v. OCC_{it}						Dep.Var: OCC_{it} v. $NonITC_{it}$						
	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.	
SYS_{it-1} v.	0.230	**	0.261	**	0.252	**	OCC v.	0.126	*	0.153 (0.077)	**	0.132 (0.067)	**
OCC_{it-1}	(0.080)		(0.101)		(0.101)		$NonITC_{it-1}$	(0.076)					
$SP1_{it-1}$	0.118	**					$SP1_{it-1}$	0.059	*				
	(0.047)							(0.035)					
$SP2_{it-1}$			0.132	**			$SP2_{it-1}$			0.087 (0.052)	*		
			(0.051)										
$SP3_{it-1}$					0.129	**	$SP3_{it-1}$					0.076 (0.045)	*
					(0.051)								
$ACDeg_{it-1}$	0.078	*	0.092	*	0.085	*	$ACDeg_{it-1}$	0.038	*	0.053 (0.031)	*	0.044 (0.026)	*
	(0.041)		(0.047)		(0.044)			(0.023)					
$ITBef_{it-1}$	0.065	*	0.083		0.076		$ITBef_{it-1}$	0.025	*	0.034 (0.020)		0.030 (0.022)	
	(0.034)		(0.050)		(0.047)			(0.015)					
$ITfirm_{it-1}$	0.068		0.081	*	0.078	*	$ITfirm_{it-1}$	0.022		0.036 (0.026)		0.033 (0.023)	
	(0.042)		(0.041)		(0.040)			(0.019)					
$Tenure_{it-1}$	0.071	*	0.084	*	0.080	*	$Tenure_{it-1}$	0.020	*	0.038 (0.022)	*	0.035 (0.021)	*
	(0.038)		(0.043)		(0.042)			(0.020)					
$SIZE_{it-1}$	0.112	*	0.126	**	0.116	*	$SIZE_{it-1}$	0.054	*	0.092 (0.055)	*	0.078 (0.046)	*
	(0.062)		(0.050)		(0.061)			(0.032)					
ROA_{it-1}	0.036	*	0.039	*	0.045	*	ROA_{it-1}	0.028	*	0.020 (0.019)	*	0.016 (0.0095)	*
	(0.019)		(0.020)		(0.023)			(0.016)					
MV_{it-1}	0.039		0.045	*	0.052	*	MV_{it-1}	0.033		0.028 (0.019)		0.022 (0.017)	
	(0.024)		(0.023)		(0.028)			(0.038)					
SYS_{i0} v.	0.307	**	0.306	**	0.295	**	OCC v.	0.328	**	0.342 (0.173)	**	0.338 (0.172)	**
OCC_{i0}	(0.123)		(0.123)		(0.128)		$NonITC_{i0}$	(0.166)					
<i>Industry</i>	Included		Included		Included		<i>Industry</i>	Included		Included		Included	
<i>Year</i>	Included		Included		Included		<i>Year</i>	Included		Included		Included	
σ_{η}	0.326	**	0.277	**	0.292	**	σ_{η}	0.375	**	0.336	**	0.357 (0.182)	**
	(0.139)		(0.115)		(0.122)			(0.191)		(0.170)			
$Ln L$	-1083.5		-995.3		-946.1		$Ln L$	-1426.7		-1307.7		-1352.5	
<i>Wald1</i>	0.025	**	0.026	**	0.028	**	<i>Wald1</i>	0.026	**	0.019	**	0.020	**
<i>Wald2</i>	0.027	**	0.025	**	0.022	**	<i>Wald2</i>	0.030	**	0.022	**	0.024	**
<i># Obs</i>	971		971		971		<i># Obs</i>	3,065		3,065		3,065	

Note. Variables Defined in Panel C of Table 2. Wald1 records the p -value of the Wald test for the joint exclusion of year effects. Wald2 records the p -value of the Wald test for the joint exclusion of industry effects. The asterisks *, **, and *** respectively denote significance at the 10, 5 and 1% levels for two-sided alternatives.

Table 7. Robustness Checks: H2b

	Dep.Var: $(S \text{ Pr } o S)_{it}$		Dep.Var: $(W \text{ Pr } o S)_{it}$	
	Coeff.(std.)	Sig.	Coeff.(std.)	Sig.
CR_{it}	0.085 (0.033)	**	0.107 (0.042)	**
TQ_{it}	0.202 (0.087)	**	0.211 (0.096)	**
\hat{y}_{it}	0.293 (0.097)	***	0.305 (0.104)	***
Industry	Included		Included	
Year	Included		Included	
Adj. R²	0.82		0.88	
# Obs	6,535		6,535	

Note. Variables Defined in Panel C of Table 2. Wald1 records the p -value of the Wald test for the joint exclusion of year effects. Wald2 records the p -value of the Wald test for the joint exclusion of industry effects. The asterisks *, **, and *** respectively denote significance at the 10, 5 and 1% levels for two-sided alternatives.

Appendix A

Consistent with the extant literature (Finkelstein, 1992), we use the official title as well as the number of titles as a proxy for the structural power of senior IT executives. In other words we assume that a senior IT executive with the formal title of CIO or CIO with additional official titles (e.g., CIO & Executive Vice President) possesses greater power than senior IT executives without the CIO title (e.g., Managing director). In this study the group of high power senior IT executives are referred to as *CIOplus*, *CIO*, and other IT experts (*non-CIO*). Our category rules and abbreviated examples are:

Chief Information Officer (CIO) with additional titles (CIOplus)

- Robert Carter

Mr. Robert B. Carter been **Executive Vice President and Chief Information Officer** at FedEx Corporation since June 2000. Mr. Carter is responsible for its key applications and technology infrastructure. He has held numerous positions within the company since 1993 and most recently he served as **Corporate Vice President and Chief Technology Officer** Mr. Carter has received numerous awards and honors, including CIO Magazine's "**20/20 Vision Award**" in 2002. Mr. Carter earned his M.B.A. from the University of South Florida and his Bachelor's degree in **Computer and Information Sciences** from the University of Florida.

- Baskaran Iyer

Mr. Iyer is currently Vice **President and Chief Information Officer (CIO)** of Honeywell International. He has been with the company since 2000 and has held various positions such as Vice President of E-Commerce. Prior to joining Honeywell, Mr. Iyer was CIO for GlaxoSmithKline and Manager, Systems and Programming at Johnson & Johnson. In February 2011, he was honoured some onf of **IDG Computerworld's 2011 Premier IT Leaders**. Mr. Iyer earned a Bachelor of Science in **Mechanical Engineering** from Annamalai University and an Masters of Science in **Computer Science** from the Florida Institute of Technology.

Chief Information Officer (CIO)

- Steve Randich

Mr. Randich is the **Chief Information Officer** for Citigroup since 2005. Before joining Citigroup, Mr. Randich came from Nasdaq Stock Market where he started as Chief Technology Officer and later became Chief Information Office. Prior to that, he has been with companies such as IBM and the Chicago Stock Exchange where he held several positions since 1989. Mr. Randich Attended Northern Illinois University and graduated with a Bachelor of Science in **Computer Science**.

- Diane Bryant

Diane M. Bryant is vice president and **Chief Information Officer (CIO)** of Intel Corporation where she is responsible for Intel's Information Technology organization. Bryant joined Intel in 1985 and has held several

Reciprocity between senior IT executives & IT capable firms

positions including general manager of the Server Platforms Group and Director of Engineering. Bryant received her bachelor's degree in **Electrical Engineering** from U.C. Davis in 1985 and joined Intel the same year. She holds four U.S. Patents.

IT Experts (non-CIO)

- Padmasree Warrior

Mrs. Warrior has been **Chief Technology Officer (CTO)** for Cisco Systems since 2007. Prior to this position, she has held been CTO for various companies such as **Motorola**, and **Semiconductor Products Sector**. In 2007, she was also awarded with a **Doctor of Engineering** from New York's Polytechnic University and inducted into the **Women in Information Technology International Hall of Fame**. Mrs. Warrior holds a bachelor's degree in **Chemical Engineering** from the Indian Institute of Technology.

- Marc Gordon

Mr. Gordon joined the Bank of America in 2004 and is currently the **Chief Technology Officer**. Prior to this position, Mr. Gordon has held various IT level positions with companies such as Accenture, West Marine, and Best Buy. Mr. Gordon holds a BA in **Economics** from Colby College and an MBA in **Information Systems** from the Sloan School of Management at MIT.