DRNEVICH DISSERTATION - CHAPTER 3. ORDINARY AND DYNAMIC CAPABILITIES: IMPLICATIONS FOR FIRM PERFORMANCE AND COMPETITIVE HETEROGENEITY

ABSTRACT

A common issue in strategic management research involves sources of interfirm performance differences. Research on this issue assumes such competitive heterogeneity is attributable to variation in firm level factors of resources and capabilities, but this is difficult to establish empirically. This study begins to address this gap by examining the roles of Information Technology (IT) based capabilities in firm performance. Specifically, we examine whether differences in the heterogeneity of "zero-order" ordinary capabilities and "first-order" dynamic capabilities contribute to differences in firm performance. Results offer empirical support that both types of capabilities, as well as their heterogeneity, can influence performance, but that these effects vary. These observations offer potential implications for research on RBV, dynamic RBV, Dynamic Capabilities, and Competitive Heterogeneity.

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Keywords: Resources, Capabilities, and Firm Performance; Resource-based view; Dynamic Capabilities; Competitive Heterogeneity; Information Technology Strategy; Value Creation.

1. INTRODUCTION

A common topic in contemporary strategic management research involves the subject of competitive heterogeneity and the sources of such persistent performance differences among firms. Traditionally, researchers sought to explain this phenomenon from industrial organization perspectives, which examine the conditions where first-mover advantages are likely to exist, and/or evolutionary perspectives, which address factors that influence the variation, selection, and retention of organizations and capabilities. More recently, the resource-based view (RBV) (Wernerfelt, 1984; Barney, 1991, 2001; Peteraf, 1993) has emerged as a dominant perspective for explaining persistent heterogeneous performance differences advocating that such performance variation is attributable to costly-to-imitate differences in resources and capabilities. However, this relationship between organizational resources and capabilities, and persistent performance has been difficult to establish both conceptually (Priem and Butler, 2001; Barney, 2001; Makadok, 2001) and empirically (Hoopes, Madsen, and Walker, 2003; Leiblein and Madsen, 2004; Hoopes and Madsen, 2004). Concurrently, others have also advocated the need to differentiate the roles of resources and capabilities in theory and empirical research, (Amit and Schoemaker, 1993; Makadok, 2001; Winter, 2003; Hoopes, Madsen, and Walker, 2003; Hoopes and Madsen, 2004) and some suggest dynamic capabilities as a source of competitive heterogeneity (Teece, Pisano, and Shuen, 1997; Eisenhardt and Martin, 2000; Hoopes and Madsen, 2004).

Therefore, collectively, still lacks a cohesive body of empirical studies providing clear and consistent evidence of the sources of firm performance differences, and appears to be struggling to develop a clear theoretical framework for empirically examining the roles of capabilities in the firm. Therefore, accordingly, the purpose of this study is to examine some of the role of capabilities in interfirm performance variation and competitive heterogeneity. We attempt to address this gap through first reviewing and synthesizing the capabilities literature to develop such a theoretical framework for empirically examining the roles of capabilities in the firm. We then apply this framework to examine the roles one of a firm's largest expenditures, Information Technology (IT), may play in the firm as a source of either "zero-order" ordinary capabilities, or "first-order" dynamic capabilities (Dosi, Nelson, and Winter, 2000; Winter, 2003).

Surprisingly, despite the size and scale of IT investments by firms, this is a research context that is for the most part ignored by the strategic management literature (for a few exceptions see Powell and Dent-Micallef, 1997; Tippins and Sohi, 2003; Miller, 2003; Zott, 2003). Conversely, while this is a popular context for research in the Management Information Systems (MIS) field, research there has been unable

to establish a clear and consistent empirical link between IT capabilities, and performance at the level of the firm (Kohli and Deveraj, 2003; Melville et al., 2004; Piccolo and Ives, 2005). Given these issues, some question the appropriate role and use of IT by the firm (e.g., Carr, 2004), as well as the potential role of IT capabilities in competitive advantage. This study advances an argument that IT-based capabilities can be sources of firm performance, but their performance contribution potential relies upon the use and management of these factors within the firm, which will vary in the different strategic and industry contexts in which a firm operates. Thus, the motivation and contextual choice for this study offer a substantial opportunity to address major unresolved theoretical and empirical issues in the Strategic Management literature, as well as address a phenomenological issue of substantial persistent interest to the Management Information Systems literature and IT practitioners.

This paper proceeds as follows: In section 1, we introduced the research problem and context of the study; In section 2, we review, synthesize, and extend existing theory to develop a framework and hypotheses for the roles of IT-based capabilities in firm performance; In section 3, we develop measures and methods to empirically test our hypotheses on a sample of primary data; In section 4, we present and discuss the results of our analysis; and In section 5, we conclude with a discussion of the implications of our study for future research.

2. THEORY AND HYPOTHESES DEVELOPMENT

In this section, we review and synthesize the capabilities literature, and extend existing theory to develop a theoretical framework and hypotheses for the roles of IT-based capabilities in the firm and its performance. We begin this examination of the literature, by reviewing what insights prior research can provide in reference to our constructs of interest.

We first look at firm resources. Amit and Schoemaker (1993: 35) define resources as "stocks of available factors that are owned or controlled by the firm" and can be "converted into final products or services using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, incentive systems, trust between management and labor, and more." While Teece et al. (1997) view resources as "firm-specific assets that are difficult if not impossible to imitate" (Teece et al., 1997: 516). The RBV also relies on this view of the firm-specificity and idiosyncratic nature of resources (Barney, 1991). For the purposes of this study, we view resources more generically, in the Amit and Schoemaker (1993) sense, and do not make assumptions of an asset's need to be firm-specific,

idiosyncratic, rare, valuable, imperfectly imitable, or non-substitutable (Barney, 1991) in order to be a resource.

We next consider the literature on organizational capabilities and routines. Here, Amit and Schoemaker (1993: 35) define capabilities as the firm's "capacity to deploy resources, usually in combination, using organizational processes, to affect a desired end." In this view, capabilities are "information-based, tangible or intangible processes that are firm-specific, and are developed over time through complex interactions among the firm's resources" and can "be thought of as intermediate goods generated by the firm to provide enhanced productivity of its resources, as well as strategic flexibility and protection for its final product or service" (Amit and Schoemaker, 1993: 35). Somewhat similarly, Winter (2003: 991) defines a capability as a "high-level routine, (or collection of routines) that, together with its implementing input flows, confers upon an organization's management, a set of decision options for producing significant outputs of a particular type." Here, Winter (2003: 991) defines a routine as "behavior that is learned, highly patterned, repetitious, or quasi-repetitious, founded in part in tacit knowledge." Similarly, Teece et al. (1997) define routines as rooted in a firm's competencies (Teece et al., 1997: 516), e.g., "distinctive activities" assembled from firm specific assets, which span individuals and groups and are viable across product lines. These organizational routines, due to these characteristics, represent (distinctive) competencies in the view of Teece et al. (1997: 516), and are viewed as core if they define a firm's fundamental business. Therefore, for the purposes of this study, we subscribe to the view that capabilities, by definition, have clear outputs, and are conceptually distinct from these outputs (e.g. production processes result in product outputs) (Hoopes and Madsen, 2004). Thus capabilities, in this view, are distinct constructs from resources. This definition is different than the more inclusive definition of resources found in the RBV (Barney, 1991; 2001; 2003), but is one that has considerable support in the strategy literature (Amit and Schoemaker, 1993; Makadok, 2001; Winter, 2003; Hoopes et al., 2003; Hoopes and Madsen, 2004).

We next examine the literature on "dynamic" capabilities. Teece Pisano and Schuen (1997) define a "Dynamic Capability" as "firm-specific capabilities that can be sources of advantage" to explain how "combinations of competencies and resources can be developed, deployed, and protected" (Teece et al., 1997: 510). They further conceptualize dynamic capabilities, and as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997: 517). They also refer to the "ability to achieve new forms of competitive advantage as dynamic capabilities" where dynamic refers to "the capacity to renew competencies so as to achieve congruence with the changing business environment," and capabilities refers to "the key role of strategic management

in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competencies to match the requirements of a changing environment" (Teece et al., 1997: 515).

However, Eisenhardt and Martin (2000) define dynamic capabilities as "the firm's processes that use resources -- specifically the processes to integrate, reconfigure, gain, and release resources -- to match and even create market change." Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die" (Eisenhardt and Martin, 2000: 1107). Eisenhardt and Martin (2000), as well as others (Mosakowski and McKelvey, 1997; Williamson, 1999; Priem and Butler, 2000), are critical of defining dynamic capabilities vaguely as a "routine for learning routines." Instead, they argue that dynamic capabilities can integrate, reconfigure, allocate, and distribute resources within firms (Eisenhardt and Martin, 2000: 1107). Further, while dynamic capabilities can be idiosyncratic in their details, they exhibit "common features that are associated with effective processes across firms" (Eisenhardt and Martin, 2000: 1108). This is because there are "more and less effective" ways of dealing with the "challenges addressed by a given capability" (Eisenhardt and Martin, 2000: 1108). In this view, dynamic capabilities are things such as alliance making, strategic decision making, knowledge brokering, and product development. Yet there is no assumption as to whether the dynamic capability is effective, ineffective, unique, or superior. If it happens to be superior, it is termed a "best practice" (Eisenhardt and Martin, 2000: 1108). This raises a "commonality" issue of dynamic capabilities that implies: 1) there are multiple paths to developing dynamic capabilities; 2) routines are substitutable and fungible across contexts; 3) Dynamic capabilities are not likely to be sources of sustainable competitive advantage; and 4) the scale of "idiosyncratic firm effects" may be "overstated" in the literature (Eisenhardt and Martin, 2000: 1109-1110). Therefore, in the view of Eisenhardt and Martin (2000), dynamic capabilities are typically valuable, may be somewhat rare (not possessed equally across all firms), but are not sustainable, inimitable, or immobile, and are highly vulnerable to substitution because they must have key features in common to be effective. Thus, dynamic capabilities can be sources of competitive advantage, but not sustainable competitive advantage (Eisenhardt and Martin, 2000: 1110).

Therefore, for the purposes of this study, we adopt an emerging view that dynamic capabilities are capabilities, which differ from "ordinary" capabilities in that they govern the rate of change of other capabilities (Collis, 1994; Dosi et al., 2000; Winter, 2000; 2003; Hoopes and Madsen, 2004). This view is rooted in Winter's (2003) definition of dynamic capabilities as a "first-order" change beyond "zero-order" "ordinary capabilities" (Winter, 2003: 992). In this view, zero-order capabilities are the "ordinary"

capabilities through which a firm currently earns its living (i.e. current products, production processes, scale, customers, and markets) (Winter, 2003: 992). Conversely, first-order capabilities are the "dynamic" capabilities, which operate on ordinary capabilities through first-order change (i.e. changing products, production processes, scale, customers, and markets) (Winter, 2003: 992; Hoopes and Madsen, 2004). This view is also consistent with the conclusions of Eisenhardt and Martin (2000: 1118), stating, "overall, dynamic capabilities are best conceptualized as tools that manipulate resource configurations." Here, Eisenhardt and Martin (2000: 1118) suggest using these dynamic capabilities to "enhance existing resource configurations," or in dynamic markets, to "build new resource configurations and move into fresh competitive positions" where RBV's assumptions may break down.

Therefore, while this definition roughly aligns with those in the prior literature, it allows for greater specificity in terms of how we can measure capabilities since it applies regardless of the degree of firm specificity or environmental dynamism (Hoopes and Madsen, 2004). For example, firms may have homogeneous zero-order capabilities and heterogeneous first-order capabilities, which could result in variation a firm's rate of change and differences in performance over time. Further, in many cases, a firm's zero-order capabilities and first-order capabilities may both be heterogeneous from that of its competitors. In these circumstances variation in a firm's rate of change and differences in performance are likely sustainable for longer periods of time (Hoopes and Madsen, 2004). Therefore, using Winter's (2003) definition allows for context independent empirical examination of capabilities, as well as the ability to measure competitive heterogeneity through differences in first order change rates. This approach is also theoretically consistent with current research examining the inputs to, and effects of capabilities on performance (King and Tucci, 2002; Zollo and Singh, 2003; Hoopes et al., 2003; Macher and Mowery, 2004; Turner and Makhija, 2004; Hoopes and Madsen, 2004). Thus this study, utilizes this clearer theoretical framework for empirically examining the roles of capabilities in the firm, to addresses recent calls (Hoopes et al., 2003; Hoopes and Madsen, 2004), to study the relationship between zero and first order capabilities and their affects on firm performance and competitive heterogeneity.

Therefore, in this study, we seek to examine the roles these capabilities may play in the firm, as well as how the relationship between zero and first order capabilities and their affects on firm performance and competitive heterogeneity. In this context, we view a firm's usage of IT as supporting either zero-order ordinary capabilities, or first-order dynamic capabilities, both of which may potentially have a positive relationship with outputs of the capability (i.e. process-level performance). While it is clear that the IT can play such roles in the firm, the usage and effectiveness of IT to form the basis of zero and first order capabilities can vary widely in different industry and firm contexts. For example, zero-order IT

capabilities can reduce a firm's costs though improving operational and transactional efficiency. Zero-order IT capabilities can also be used to improve the quality of a firm's existing processes and products. Such zero-order IT capabilities can also be used to improve the speed and efficiency at which a firm operates and responds to changes in its current markets. Finally, IT can be used to support first-order capabilities as a basis for creating and enabling new processes, products, and even markets. These are just a few of the prominent zero-order and first order roles IT may play in the firm. We examine these expected relationships through the hypotheses below:

Hypothesis 1a - Zero-order uses of IT will have a positive relationship with process-level performance.

Hypothesis 1b - First-order uses of IT will have a positive relationship with process-level performance.

Further, IT can provide the firm with radical new possibilities and strategic options (i.e. on-line sales channels, B2B sourcing, customer information portals, R&D co-located collaboration, etc.), that offer previously unavailable sets of decision options for the firm. Therefore, given the potential for new (radical) change to produce greater (new) outputs than (incremental) changes to existing capabilities, we moderately expect that the affects of first-order dynamic IT capabilities, might surpass the effects of zero-order ordinary IT capabilities. We examine these expected relationships through the hypothesis below:

Hypothesis 1c - First-order uses of IT will have a significantly more positive relationship with process-level performance than zero-order uses of IT.

Next, we examine the relationship between the outputs of the zero or first order capability (process-level performance) and firm-level performance change. In regards to this relationship, we expect the influence of the change in capability output (process-level performance change) on firm-level performance generally to be positive. For example, as the output of the capability increases, firm-level performance should likewise increase to some extent (ceteris paribus). For example, as output increases at the process-level (i.e. due to the use of IT by marketing as a zero-order capability to support existing customer relationships, or as a first-order capability to create new customer relationships), we would expect firm-level performance (i.e. sales revenue) to increase (ceteris paribus). Likewise, poor process-level performance should similarly decrease firm-level performance to some extent (ceteris paribus). For example, a decrease in customer demand (i.e. due to lack of IT capability and the inability of marketing to manage current, or create new customer relationships), we would expect firm-level performance (i.e. sales revenue), to decrease (ceteris paribus). We examine this prediction through the hypothesis below:

Hypothesis 2a - Process-level performance change will have a positive relationship with firm-level performance change (ceteris paribus).

Next, we also need to examine the specific role that zero-order ordinary capabilities and first-order dynamic capabilities, through their outputs, have on firm-level performance change. Here, the use of IT by the firm to enhance its ordinary capabilities at the zero-level should likewise increase firm-level performance to some extent (ceteris paribus). For example, as output of the zero-order ordinary capability increases (i.e. due to the use of IT by marketing as a zero-order capability to support existing customer relationships), we would expect firm-level performance (i.e. sales revenue), to increase (ceteris paribus). Likewise, the use of IT by the firm to enhance its dynamic capabilities at the first-level should likewise increase firm-level performance to some extent (ceteris paribus). For example, as output of the first-order dynamic capability increases (i.e. due to the use of IT by marketing as a first-order capability to create new customer relationships), we would expect firm-level performance (i.e. sales revenue), to increase (ceteris paribus). We examine these expected relationships through the hypotheses below:

Hypothesis 2b - Zero-order uses of IT will have a positive relationship with firm-level performance change (ceteris paribus).

Hypothesis 2c - First-order uses of IT will have a positive relationship with firm-level performance change (ceteris paribus).

Further, as at the process level, given the potential for new (radical) change to produce greater (new) outputs than (incremental) changes to existing capabilities, we similarly expect that the affects of first-order dynamic capabilities, might surpass the effects of zero-order ordinary capabilities. We examine these expected relationships through the hypothesis below:

Hypothesis 2d - First-order uses of IT will have a significantly more positive relationship with firm-level performance change than zero-order uses of IT (ceteris paribus).

Finally, we need to consider the role of capability heterogeneity in firm performance, and examine the roles and relationships of homogeneous and heterogeneous zero-order and first-order capabilities. The dynamic of these roles and relationships is particularly important not only for theory (Hoopes and Madsen, 2004) but also for practice. Debates in the popular business press and practitioner literature,

often grounded in extensive anecdotal evidence, currently assume that only proprietary technologies (i.e. rare and idiosyncratic firm-specific assets), can serve as sources of competitive advantage for firms. However, quite conversely, most technologies are moving in the opposite direction, towards open infrastructures (Carr, 2004). Specifically, the observed trend is that firms are moving away from much of the complicated proprietary IT systems acquired during the "technology bubble era" and making large scale moves to simple, "off-the-shelf" commodity IT (Carr, 2004). One example is the continued, post Y2K growth in enterprise resource planning (ERP) systems. Even while such ERP systems are customizable, the trend seems to be for firms to stick with simplicity, or have limited customization done by outside consultants. Further, as outside consultants frequently standardize their approaches and leverage their knowledge across clients, even such specialized customized IT systems are far more homogeneous than would be expected (Carr, 2004). These observations, while admittedly largely anecdotal, indicate an increasing commoditization of IT. Such increasing homogeneity of IT capabilities is potentially problematic for common competence perspectives of the role and value of IT to the firm and its performance. For example, the prevalent common view in academic research advocates that IT's role in performance and sustainable competitive advantage, is based on the RBV, and notions of preventing the erosion of a capability's uniqueness and inimitability (e.g., Melville et al., 2004; Piccoli and Ives, 2005). Yet, as we have illustrated, the trend in IT and "IT-dependent strategic initiatives" (Piccoli and Ives, 2005), appears to be away from such specialization and uniqueness, in favor of the standardization of IT for efficiency benefits (Carr, 2004).

These current observations of IT usage in practice (Carr, 2004), clearly appear problematic for competence perspectives such as the RBV (Wernerfelt, 1984; Barney, 1991), and potentially some views (Teece et al., 1997) of flexibility perspectives that depend upon the heterogeneity of resources and capabilities. However, these observations may support IT's role in the firm from governance perspectives, such as transaction cost economics (TCE) (Williamson, 1975, 1991), through standardized, homogenous IT's use in improving efficiency and reducing agency costs. For example, the observed trend of commoditization, standardization, and simplicity of IT, while clearly valuable from an operational and transaction efficiency standpoint, suggest conditions of low uniqueness and inimitability, or homogeneity of the IT resources and capabilities. Therefore, reliance on RBV assumptions alone to explain the IT - performance relationship is problematic. Specifically, as a strict traditional interpretations of the RBV tell us that "picking" resources (Makadok, 2001), from factor markets (such as many types of commoditized IT), cannot provide sources of sustainable competitive advantage to a firm, as they are neither rare, nor isolated from imitation and/or substitution (Barney, 1986; Rumelt, 1995). Similarly, the observed trend in IT, may also be problematic for views of flexibility perspectives such as dynamic capabilities which

also rely on assumptions of capability heterogeneity (i.e. Teece et al., 1997). Specifically, if the strategic benefits of dynamic capabilities are based upon the existence and role of heterogeneous first-order dynamic capabilities (Dosi, Nelson, and Winter, 2000; Winter, 2003), these observations are problematic for advocating performance benefits from IT capabilities. However, if we buy into assumptions of commonality across successful dynamic capabilities (Eisenhardt and Martin, 2000), than this trend in IT is less problematic as the strategic benefits of dynamic capabilities are based upon the existence and role of homogeneous first-order dynamic capabilities.

Collectively, while these observations support IT's ability to play a strategic role in the firm as *homogeneous zero-order capabilities* as sources of operational and transactional efficiency from governance perspectives such as TCE, they conflict with IT's ability to play a strategic role in the firm as a *heterogeneous zero-order capabilities* from competence perspectives such as the RBV (Mata et al., 1995; Carr, 2004; Piccoli and Ives, 2005). Similarly, the role of first-order dynamic capabilities is also potentially contentious if the value of the capability to the firm is dependent upon assumptions of heterogeneity (Teece et al., 1997). This view suggests that IT's ability to play a strategic role in the firm would be only through *heterogeneous first-order capabilities*. However, the implications of this trend is less contentious if the value of the capability to the firm is assumes commonality across successful dynamic capabilities (Eisenhardt and Martin, 2000). This view suggests that IT's ability to play a strategic role in the firm could be through *homogeneous first-order capabilities*.

This discussion suggests that there is a paradox between the *roles IT can play* in the firm from different perspectives of strategic management theory, and the actual *roles IT does play* in practice. Therefore, these arguments create the need to examine the differences among major theoretical perspectives for the role of IT capabilities in the firm and its performance. From our discussion in this section, we develop several issues to examine regarding the roles and relationships of homogeneous and heterogeneous zero-order and first-order IT capabilities. Specifically, we examine the roles and relationships between homogeneous and heterogeneous zero-order and first-order IT capabilities and their theorized implications for performance. Thus, drawing from the discussion and arguments developed in this section, as well as those in related prior literature (Hoopes, Madsen, and Walker, 2003; Leiblein and Madsen, 2004; Hoopes and Madsen, 2004), we develop the following hypotheses to examine the roles and relationships of homogeneous and heterogeneous zero-order and first-order IT capabilities:

Hypothesis 3a - *Homogeneous zero-order* ordinary IT capabilities will positively affect performance in combination with *homogeneous first-order* dynamic IT capabilities.

Hypothesis 3b - *Homogeneous zero-order* ordinary IT capabilities will positively affect performance in combination with *heterogeneous first-order* dynamic IT capabilities.

Hypothesis 3c - *Heterogeneous zero-order* ordinary IT capabilities will positively affect performance in combination with *homogeneous first-order* dynamic IT capabilities.

Hypothesis 3d - *Heterogeneous zero-order* ordinary IT capabilities will positively affect performance in combination with *heterogeneous first-order* dynamic IT capabilities.

Next, based upon the theory discussion and hypotheses developed in this section, in this section, we develop a general conceptual model of the role of IT capabilities in the firm and its performance. To do this, we leverage a basic conceptual model developed from a recent review of the literature (Melville et al., 2004), and then modify it based upon the observations and arguments raised in this section. Our model begins with IT usage interacting with a firm's business processes. The measurement of the effects of these IT capabilities are in terms and can affect the organization at the process-level, and the firm-level through process-level effects. Collectively, we assume this relationship among IT capabilities, processes, process-level and firm-level performance is influenced by a firm's strategy and the external environment. This general conceptual model of the role of IT capabilities in the firm and its performance is in the figure below. The hypotheses developed in this section are depicted in the model and labeled respectively.

Figure 1. General Conceptual Model of the Role of IT in the Firm
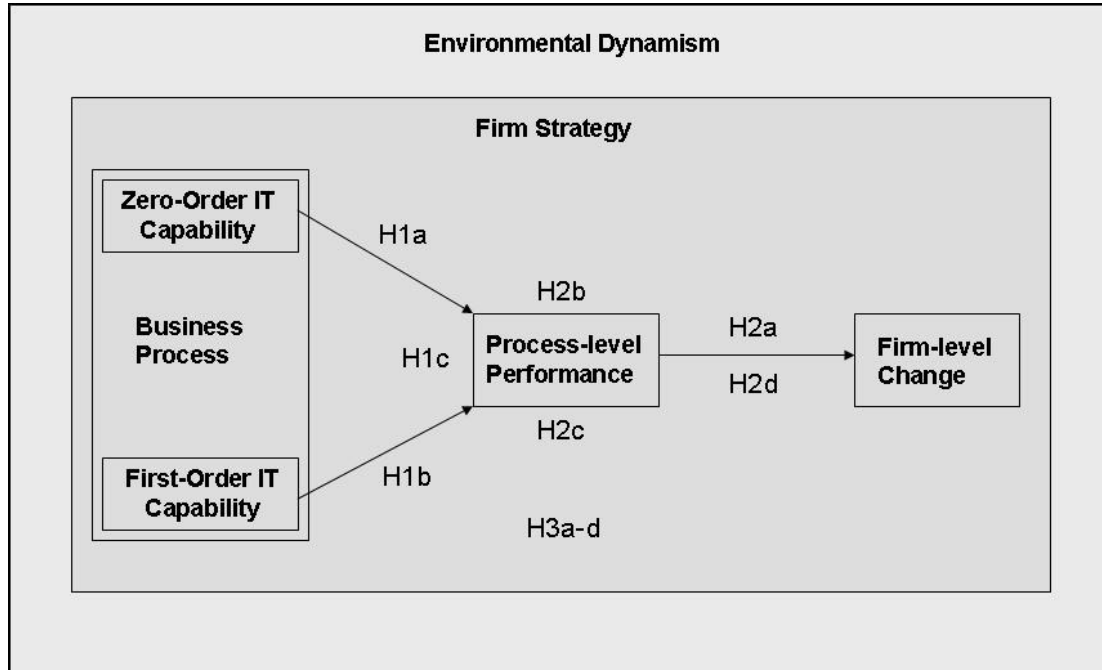
In the following section, we discuss the sample data, measures, and methods to examine the hypotheses developed in this section. Following the methods and measures, we present the results of our analysis, and discuss the implications and conclusions that can be drawn from our observations.

3. METHODS AND MEASURES

Sample: To test our hypotheses we collected data from a sample of the population of all large private sector firms operating in the South American country of Chile. We select this sample setting for several reasons. First, Chile is a modern, developed industrialized country. Second, Chile is on the verge of joining the North American Free Trade Agreement (NAFTA), which opens their markets to international competition from firms from the United States, Canada, and Mexico. Further, NAFTA also creates opportunities for Chilean firms to access markets in the other NAFTA countries, as well as interact with firms and customers in those markets. This event creates a unique situation where we have an entire population of firms rapidly adopting IT as well as changing most of their major business processes in order to upgrade and retool their organizations to prepare for the opportunities and threats created by NAFTA membership. This affords the opportunity to collect primary data at the resource, capability, business process, and firm level from the same population as they face an increasingly dynamic market

environment. Collectively, these factors make Chile a strong target for collecting the rich primary data necessary to test our model and hypotheses. Thus, this sample setting and data, while somewhat less generalizable, is more preferable than collecting sample data from firms in a more mature, stable market (such as U.S. based firms) for examining the issues of this study.

Data Collection Process: We used a survey instrument to collect data from all companies in the sample. This consisted of a "pen and paper" instrument administered to the entire population of approximately 700 large private sector firms based in Chile. Since we needed to collect information at the level and type of IT usage, organizational capabilities, capability outputs, and resulting process-level change, collecting data through survey methods seemed most appropriate. Such a collection method affords us the opportunity to obtain primary data at the capability, business process, and firm level from the same population as they face an increasingly dynamic market environment. One difficulty with surveys in transitional economies such as Chile is the concentration of information in a few individuals within firms (Hoskisson et al., 2000). Therefore, we relied on one qualified person to identify a small set of individuals in each firm to provide the required data. Thus, we initially sent the survey to the president or director of the firm and asked them to identify respondents in their organization. Since we were collecting information related to IT-based capabilities, capability outputs, and resulting process-level change, we requested the president/director to identify the person(s) who would be the most appropriate respondent(s) to provide information pertaining to each area (Hoskisson et al., 2000). Multiple respondents from each firm participated in completing each survey. Most of the respondents completed sections related to their area of expertise/operation with an average of two respondents participating in completing each section of the survey. This approach is consistent with prior research on working with single or a limited number of respondents to ensure a cross-section of qualified respondents, and limit threats to validity posed by single-respondent / common-method bias (Lyles and Baird, 1994; Zander and Kogut, 1995; Capron et al., 1998; May et al., 2000; Kriauciunas and Kale, 2006). This collection process took place in 2003 at these firms to gather information for the five-year period of 1999 through 2003, regarding their usages of IT, and changes in the organization's major business processes to prepare for the implications of NAFTA membership.

Instrument: The survey examines four areas of business processes that are common across companies to be effective in a free market system as determined through interviews with company managers throughout both Central Europe and South America (Kriauciunas, 2005; Kriauciunas and Kale, 2006). These areas consist of quality assurance systems (QA); human resource systems (HR); marketing systems (MKT); and general technological infrastructure (TI). We developed a separate section in the survey for each area of

operation using a parallel set of questions. The survey instrument was based on an earlier survey used in Lithuania in 2000-2001 as well as interviews with managers in Lithuania, Poland, Ukraine, and Bulgaria in October 2001 (see Kriauciunas, 2005; Kriauciunas and Kale, 2006 for more information on the instrument development process). The survey administration and data collection were done in the native language (Spanish), through a partnership with Universidad Adolfo Ibanez, in Chile, To address language issues, an English language version of the survey instrument was first prepared, then translated into Spanish and back-translated to ensure accuracy of the instrument and to be consistent with accepted survey design and data collection procedures (Hitt et al., 2000; Filatotchev et al., 2000; May et al., 2000). We then compared the original English language version with the double-translated version to identify and resolve any issues. The survey was also piloted and validated prior to its administration and had no significant issues identified (Kriauciunas, 2005; Kriauciunas and Kale, 2006). The quality and completeness of the responses indicated the survey was ready for use with the broader sample of firms in our study.

By the end of the survey period in December 2003, we received complete and usable responses on 192 unique IT-dependent business process changes at 48 individual firms, giving us a sample representing approximately 7% of the population of like firms in the country of Chile. Testing for non-response bias was conducted with no significant issues identified. As the responses were in Spanish and/or on a Spanish language survey instrument, we also used bi-lingual research assistance at Universidad Adolfo Ibanez to translate and code the data to ensure English language consistency of the response data. The data collected includes general background information on the respondents and their firm and both objective and subjective quantitative performance data on the firm. We also collected data, using a series of questions measured by a seven point Likert Scale, on their use of IT to support both zero-order and first-order capabilities, and the strategic objectives for and results of four major business process change initiatives. We describe in detail the survey measures utilized to examine the variables in this study in the remainder of this section, and an excerpt of the survey instrument is provided in the appendix.

Measures

To be consistent with best practice suggestions for measuring the value of IT to the firm (Barua et al., 1995; Mukhopadhyay et al., 1995; Melville et al., 2004), from our collected data, we create measures for dependent variables of performance change at both the process and firm levels. Likewise, we also create measures from our collected survey data for independent variables for zero-order and first-order IT capabilities, business process, and process and firm-level performance change. Further, we also collect data to create measures from our survey items for additional measures for the extent of the change of the

process, which is used as an interaction variable with IT capability to measure heterogeneity in the IT capability. Finally, several other measures such for firm size, industry, strategic objectives, and industry dynamism were collected for use as control variables. An over view of the variables used in this study with their measures are listed in the table below and described in detail in the remainder of this section.

Table # 1: Study Variables and Measures

Variable	Description	Measure
Sales	% Change in Sales	2003-1999 Sales / 1999 Sales in Chilean Pesos
Firm Performance	Firm-level Change	Aggregation of Likert scale measured survey data items
Process Performance	Process-level Performance	Aggregation of Likert scale measured survey data items
IT0	Zero-order IT capability	Aggregation of Likert scale measured survey data items
IT1	First-order IT capability	Aggregation of Likert scale measured survey data items
QA	Quality Assurance	1 or 0 binary variable for business process
HR	Human Resources	1 or 0 binary variable for business process
MKTG	Marketing	1 or 0 binary variable for business process
Change	Extent of Change	Aggregation of Likert scale measured survey data items
IT0_C	Zero-order capability heterogeneity	Interaction of IT0 and Change variables
IT1_C	First-order capability heterogeneity	Interaction of IT1 and Change variables
SO1	Strategic Objective 1 - "Strategizing"	Aggregation of Likert scale measured survey data items
SO2	Strategic Objective 2 - "Economizing"	Aggregation of Likert scale measured survey data items
Size	Firm Size	Log of sales revenue and as number of employees
Industry	Firm Industry participation	% of firm revenue from industry group
Dynamism	Industry Dynamism	Dummy variables coded as moderate or high

Dependent Variables: The dependent variables of interest in this study are process-level performance change and firm-level performance change. We measure **Process-level performance change** through survey questions in relation to the impact of the results of the processes-level change (PI). This measure uses multiple items to ask the respondents their perception of the results of the change. To select these items, we first relied on fieldwork and prior research (May et al., 2000; Pearce, 1991; Filatotchev et al., 2000; Carson, 1991), to identify a set of items that firms might typically focus on while competing in a transitioning economy. Items for the measures of this variable include: Productivity; Costs; Sales; Profit; Investment; Market share; Number of new clients; Customer satisfaction; Intra / interfirm conflicts; Business process performance; Quality of products or services; Stakeholder satisfaction; Employee

satisfaction; and Union satisfaction. The items are measured on a seven point Likert scale where a low score (1) represents a significant decrease, a moderate score (4) represents no impact, and a high score (7) represents a significant increase in performance across the items. In coding the responses to these items, it is necessary to reverse score the negative impact items (i.e. costs, conflicts, investment) so that the response values all have the same directionality (i.e. high scores can be interpreted positively). We next conducted confirmatory factor analysis using principle components, maximum likelihood, and varimax rotation methods on these items to confirm the construct validity of this measure. Results of this analysis helped revise the items for the measure, and confirm that we could use a single factor, comprised of a subset of four items (sales; customer satisfaction; business process performance; and quality of products or services), to represent the perceived process-level performance change. Reliability analysis indicated that all items to measure "process-level change impact" loaded onto a single factor with a Cronbach alpha measure of 0.904. This conforms to the accepted level of at least 0.70 (Nunally, 1978; Bollen and Lennox, 1991; Diamantopoulos and Winklhofer, 2001).

We measure **Firm-level performance change** by aggregating across a set of survey items for the combined impact of the process changes (FPI), as well as the firm level impact of the IT investments (FITI). We also utilize accounting based firm level performance measures such as the actual change in sales from 1999 to 2003 and the ROI for 2003. Firm-level performance change is measured first through survey questions in relation to the collective impact of the process level changes on the firm (FPI). This measure uses multiple items to ask the respondents their perception of the results of the change. The items are measured on a seven point Likert scale where a low score (1) represents a significant decrease, a moderate score (4) represents no impact, and a high score (7) represents a significant increase in performance across the items. Negative impact items (i.e. costs, conflicts, investment) were reverse scored so that the response values all have the same directionality (i.e. high scores can be interpreted positively). We conducted confirmatory factor analysis using principle components, maximum likelihood, and varimax rotation methods on these items to confirm the construct validity of this measure. Results of this analysis helped revise the items for the measure, and confirm that we could use a single factor, comprised of a subset of four items (sales; customer satisfaction; business process performance; and quality of products or services), to represent the perceived process-level performance change. The measures for these items were then aggregated across the four process changes (quality assurance, human resources, marketing, and technology infrastructure), to determine the collective impact of the process changes on the firm.

Next, we separately measured **Firm-level performance change** as the perceived impact of the IT usage on the firm. This measure uses multiple items to ask the respondent their perception of the results of the change with respect to the IT usage. To select these items, we also relied on fieldwork and prior research (May et al., 2000; Pearce, 1991; Filatotchev et al., 2000; Carson, 1991), to identify the set of performance factors that firms might typically focus on while competing in a transitioning economy. The items are measured on a seven point Likert scale where a low score (1) represents a significant decrease, a moderate score (4) represents no impact, and a high score (7) represents a significant increase in performance across the items. Negative impact items (i.e. costs, conflicts, investment) were reverse scored so that the response values all have the same directionality (i.e. high scores can be interpreted positively). Reliability analysis indicated that all items to measure "firm-level change impact" loaded onto a single factor with a Cronbach alpha measure of 0.903. This conforms to the accepted level of at least 0.70 (Nunally, 1978; Bollen and Lennox, 1991; Diamantopoulos and Winklhofer, 2001). Results of this analysis helped revise the items for the measure, and confirm that we could use a single factor, comprised of a subset of four items (sales; customer satisfaction; business process performance; and quality of products or services), to represent the perceived impact of the IT usage on the firm-level performance change.

Secondly, we also measure **Firm-level performance change** more objectively through asking the respondents to complete a table providing actual end of year data on their company for the years of 1999 through 2003. With this measure, firm-level performance is calculated as both the return on investment (ROI) for 2003, as well as the actual size adjusted change in revenue for the firm from 1999 to 2003, where revenue is the firm's actual 1999 and 2003 revenue in Chilean Pesos, as reported by the respondents from their firm's financial statements.

Independent Variables: This study uses several independent variables including the level of IT capability, the type of business process change, and the extent of heterogeneity of the IT capability. In regards to the level of **IT capability**, we collected data to create measures from our survey items for independent variables for zero-order and first order IT usage. We measure IT Capability through several survey questions. The questions for IT capability contain multiple items designed to measure the respondents perception of the firm's IT capabilities between 1999 and 2003. These items are measured on a seven point Likert scale where a low score (1) represents that the firm never uses IT in this manner, and a high score (7) represents that the firm frequently uses IT in this manner. Items for the measure of zero-order uses of IT, (termed IT0) we derived from prior theory (Collis, 1994; Dosi et al., 2000; Winter, 2003), to be consistent with zero-level ordinary capabilities which focus on how the firm earns a living now. Items for this measure include: Enhance existing products or services; Enhance existing business

processes; Enhance existing customer relationships; and Enhance existing ways of doing business. Similarly, items for the measure of first-order uses of IT, (termed IT1) are derived from prior theory (Collis, 1994; Dosi et al., 2000; Winter, 2003), to be consistent with first-level dynamic capabilities, which focus on how the firm will compete in the future. Items for this measure include: Develop new products or services; Implement new business processes; Create new customer relationships; and Change way of doing business. We conducted confirmatory factor analysis using principle components, maximum likelihood, and varimax rotation methods on these items to validate that those two distinct factors exist as well as the alignment of the items with our two constructs for IT capability. Following this analysis, results suggested dropping the customer relationship items from each measure based upon a poor differentiation of one of these two items with the two factors. This left three items with a strong relationship with each of our measures for the firm's usage of IT, and provided us with evidence of the consistence and validity of the measures for out IT constructs. Reliability analysis indicated that all items to measure "IT capability" loaded onto two factors with a Cronbach alpha measures of 0.92 for IT0, and 0.91 for IT1. These results conform to the accepted level of at least 0.70 (Nunally, 1978; Bollen and Lennox, 1991; Diamantopoulos and Winklhofer, 2001). These measures and their items are below.

IT Capability Measures:

- *Zero-order capability uses of IT* = aggregation of enhance existing products or services, enhance existing business processes, and enhance existing ways of doing business items.
- *First-order capability uses of IT* = aggregation of help develop new products or services, implement new business processes, and change way of doing business items.

We measure the type of **Business process change** by simply dummy coding the respective business process, (Quality Assurance, Human Resources, Marketing, and Technological Infrastructure) as a binary variable of 0 or 1. This allowed us to control for the respective process through the variables of QA, HR, and MK, with respect to the excluded category (TI). By doing so, we can also examine if the type of process the IT capability works through plays a significant role in the relationship of the IT capability with the firm. However, as these potential relationships (either positive or negative) are beyond the scope of this study, we do not discuss theory in this area, develop specific hypotheses, nor directly examine these potential relationships.

We measure the **Extent of Change** by asking the respondents to evaluate the extent of the change in the business process over the 1999 to 2003 period. The item is measured on a seven point Likert scale where a low score (1) represents a small change for the firm, and a high score (7) represents an extensive change

for the firm. This variable is used to measure the extent of heterogeneity of the IT capability. We measure **IT capability heterogeneity** by combining the measures for the extent of the change of the process and IT capability as an interaction variable to measure heterogeneity in the IT capability. Here, low levels in the extent of change measure in combination with the IT capability were used as a proxy for capability homogeneity, as the IT capability would not be significantly changed from its original, standardized common usage form. Conversely, high levels in the extent of change measure in combination with the IT capability were used as a proxy for capability heterogeneity, as the IT capability would be significantly changed from its original, standardized common usage form. This approach, combined with the two measures for IT capability (IT0 and IT1) was used to create two measures for heterogeneity IT capability, one for heterogeneity in zero-order IT capability (IT0_C) and one for heterogeneity in first-order IT capability (IT1_C).

Control Variables: we use several control variables in this study, which, while not of direct interest to our study, could influence the relationships among the other variables in our model, and thus must be included. These control variables consist of measures for firm size, strategic objectives, industry, and industry dynamism. We measure **Firm size** in terms of log of sales revenue and as the number of employees in the first year (1999) of the study to control for size. Neither of which we expect to significantly affect the results. However, as larger firms could have access to more or better resources than smaller firms, it is important to control for firm size. Likewise, as smaller firms may have more flexibility and the ability to develop first-order capabilities more quickly than their larger rivals may, it is also important to control for firm size.

We measure the firm's **Strategic Objective** through several survey questions designed to determine the firm's objective is for each of the business process changes. We asked the firms the extent the decision to undertake the change reflected the following reasons: "to improve the quality of their products or services," "to improve productivity," and "to reduce costs." These reasons reflect pressures of a NAFTA induced free-market economy to undertake change as shown in previous literature (Meyer, 2001; Gregory and Stuart, 1990; Peng and Heath, 1996). Here, we expect the firm's "strategic objective" could moderate the relationship between process-level performance and firm-level performance change. Specifically, if the output of the capability (process-level performance change) aligns with the firm's strategic objective, the relationship between process-level performance and firm-level performance could be more positive than if the output of the capability doesn't align with the firm's strategic objective. For example, if the capability output is a strategically important (i.e. primary) activity for the firm, the performance change at

the firm-level should be greater, than if the process change is a less strategically important (i.e. support) activity (Porter, 1985). Therefore, we must control for this is a variable.

Items for the measure of **Strategic Objective** include: to reduce costs; to increase domestic sales; to increase exports; to improve competitive position; to improve product / service quality; to satisfy customer requirements; to improve productivity; to develop new products or services; to implement new business processes; to create new customer relationships; and to change way of doing business. The items in these questions are measured on a seven point Likert scale where a low score (1) represents a low importance of the item to the firm, and a high score (7) represents importance of the item to the firm. In coding the responses to these items, it is necessary to reverse score the negative impact items (i.e. costs, conflicts, investment) so that the response values all have the same directionality (i.e. high scores can be interpreted positively). Next, these items were categorized based upon their alignment with either efficiency or strategizing objectives (Williamson, 1991). These relationships were then factor analyzed to check for fit and reliability of the measures. These results confirm that we should use two factors, comprised of subsets of the items, to represent the firm's strategic objective. We therefore label these factors as Firm Strategic Objective 1 (FSO1) and Firm Strategic Objective 2 (FSO2) respectively to represent "Strategizing" and "Economizing" types of strategic objectives (Williamson, 1991). The measures for these items were then aggregated across the four process changes (quality assurance, human resources, marketing, and technology infrastructure), to determine the overall strategic objective at the level of the firm. Reliability analysis indicated that all items to measure "Strategic Objectives" loaded onto their respective factors with Cronbach alpha measures of 0.855 for FSO1 and 0.853 for FSO2. This conforms to the accepted level of at least 0.70 (Nunally, 1978; Bollen and Lennox, 1991; Diamantopoulos and Winklhofer, 2001).

We measure **Industry** by asking firms to compete a table allocating a percentage of their revenues to certain major industries. These industry choices included: Food Processing; Fishing/aquaculture; Construction; Light Industry; Chemicals or Petroleum; Utilities (Energy, Water, Telecom); Service/Sales; Governmental/NGO; Forestry; Import/Export; Heavy Industry; Financial/Banking; Transportation; Mining; Consulting; Insurance/Pension/Health Insurance; and Other. We then grouped the firm's responses into three industry categories: processing and manufacturing (15 firms), sales and service (21 firms), and 'other' such as utilities, chemicals, energy, and transportation (12 firms). These categories are similar to those used by Khanna and Rivkin (2001). Firms were coded based upon the percentage of firm revenue earned in each respective industry group.

We measure **Dynamism** by asking the respondents to evaluate their competitive environment over the 1999 to 2003 period. The item is measured as a categorical variable where a low score (1) represents an increasingly stable, less competitive environment, a moderate score (2) represents a moderately dynamic environment with a similar level of competition, and a high score (3) represents a highly dynamic environment with an increasing level of competition for the firm. Dummy variables were then assigned for each category stable environment, moderately dynamic environment, and highly dynamic environment. The coefficients for the other industry categories were then compared with respect to the excluded category (moderately dynamic environment).

Methods

The analysis procedures consist of OLS regression (PROC REG) and Logistical regression (PROC LOGIT) using SAS version 9.1, as well as some supplemental analysis to gain additional insight on some of the variables. This includes principle components analysis (PCA) and confirmatory factor analysis (CFA) using maximum likelihood and varimax rotation methods to further test and validate our individual measures. We begin our analysis by coding and compiling of the survey responses into a single sample data set. This data set consists of coded and calculated measures of the survey responses items from the 48 usable responses from the responding firms. The data includes general background and firm-level performance, information on the firm's general usages of IT, and information pertaining to the business processes changes undertaken from 1999 to 2003. Collectively, this provides us with 192 distinct observations of our variables at the process-level, and 48 observations at the firm-level for analysis. Following this coding and compiling of our sample data, we analyze the descriptive statistics and correlation coefficients of the sample data. Our analysis of the variance / covariance matrix of the variables in our model is used to further validate our selection of the regression models to examine the relationships among our dependent, independent, and control variables.

We next develop regression models to examine relationships depicted in our conceptual model, as well as to test our hypotheses. Specifically, we develop these regression models to determine the significance of our independent variables on each of our dependent variables, as well as to test the theoretical arguments depicted in our hypotheses. We develop and discuss these models in the remainder of this section.

IT Capability on Process-level Performance Change

To examine the direct effects of IT capability on process-level performance change, we use the following models where PLP_{ij} refers the process-level performance change, Zero-order IT Capability ($IT0_{ij}$) refers to IT use for zero-order capabilities and First-order IT Capability ($IT1_{ij}$) refers to IT use for first-order

capabilities by each firm (i), and QA i refers to Quality Assurance process changes, MK i refers to Marketing process changes, and HR i refers to Human Resource process changes for each firm (i) with each process measure (j).

1) Process-level Performance Change = IT0 + Business Process

PLP ij = α1 + β1 IT0 ij + β2 QA i + β3 MK i + β4 HR i + e

2) Process-level Performance Change = IT1 + Business Process

PLP ij = α1 + β1 IT1 ij + β2 QA i + β3 MK i + β4 HR i + e

3) Process-level Performance Change = IT0 + IT1 + Business Process

PLP ij = α1 + β1 IT0 ij + β2 IT1 ij + β3 QA i + β4 MK i + β4 HR i + e

Process-level Performance Change on Firm-level Performance Change

Next, to test the direct relationship between business-level and firm-level performance change, we use the following models where FLCi refers the firm-level performance change, and PLPi refers the process-level performance change for each firm (i).

4) Firm-level Change = Process-level Performance

FLC i = α1 + β1 PLP i + e

Role of IT Capability in Firm-level Performance Change

Next, to test the effects of IT capability on firm-level performance change, we use the following models where FLCi refers the firm-level change, PLPi refers the process-level, Zero-order IT Capability (IT0ij) refers to IT use for zero-order capabilities and First-order IT Capability (IT1ij) refers to IT use for first-order capabilities by each firm (i), and QA i refers to Quality Assurance process changes, MK i refers to Marketing process changes, and HR i refers to Human Resource process changes for each firm (i) with each process measure (j).

5) Firm-level Performance Change = Process-level Performance Change + IT0 + Business Process

FLC i = α1 + β1 PLP i + β2 IT0 ij + β3 QA i + β4 MK i + β5 HR i + e

6) Firm-level Performance Change = Process-level Performance Change + IT1 + Business Process

FLC i = α1 + β1 PLP i + β2 IT1 ij + β3 QA i + β4 MK i + β5 HR i + e

7) Firm-level Performance Change = Process-level Performance Change + IT0 + IT1 + Business Process

$FLC_i = \alpha1 + \beta1\ PLP_i + \beta2\ IT0_{ij} + \beta3\ IT1_{ij} + \beta4\ QA_i + \beta5\ MK_i + \beta6\ HR_i + e$

Role of IT Capability Heterogeneity in Firm-level Performance Change

Finally, to test the effects of heterogeneity in IT capability on firm-level performance change, we use the following models where FLCij refers the firm-level change, Zero-order IT Capability (IT0ij) refers to zero-order IT use and First-order IT Capability (IT1ij) refers to first-order IT use by each firm (i), and IT0 Heterogeneity (IT0_C for each firm (i) with each process measure (j).

8) Firm-level Change = IT0 + IT1 + Business Process

$FLC_{ij} = \alpha1 + \beta1\ IT0_{ij} + \beta2\ IT1_{ij} + \beta3\ QA_i + \beta4\ MK_i + \beta5\ HR_i + e$

9) Firm-level Change = IT0 + IT1_C + Business Process

$FLC_{ij} = \alpha1 + \beta1\ IT0_{ij} + \beta2\ IT1C_{ij} + \beta3\ QA_i + \beta4\ MK_i + \beta5\ HR_i + e$

10) Firm-level Change = IT0_C + IT1 + Business Process

$FLC_{ij} = \alpha1 + \beta1\ IT0C_{ij} + \beta2\ IT1_{ij} + \beta3\ QA_i + \beta4\ MK_i + \beta5\ HR_i + e$

11) Firm-level Change = IT0_C + IT1_C + Business Process

$FLC_{ij} = \alpha1 + \beta1\ IT0C_{ij} + \beta2\ IT1C_{ij} + \beta3\ QA_i + \beta4\ MK_i + \beta5\ HR_i + e$

Effects of Control Variables on Firm-level Performance Change

Finally, to test the effects of our control variables on our dependent variables, we use the following model where FLCij refers the firm-level change, and we measure the effects of firm size (EMP99 and LS), Firm strategizing strategic objectives (FSO1), Firm economizing strategic objectives (FSO2), industry group membership (PM, FP, SS, CONT, and OTH), and high industry dynamism (HDE) for each firm (i).

12) Firm-level Change = SIZE + Strategic Objective + Industry + Dynamism

$FLC_{ij} = \alpha1 + \beta1\ EMP99i + \beta2\ LSi + \beta3\ FSO1i + \beta4\ FSO2i + \beta5\ PM_i + \beta6\ FP_i + \beta7\ SS_i + \beta8\ CONT_i + \beta9\ OTH_i + \beta10\ HDE_i + e$

We present and discuss the results of our analysis of these models in the following section. We then follow the results presentation with a discussion of some of the conclusions and implications of this study for future research.

4. RESULTS AND ANALYSIS

TBD

5. CONCLUSIONS AND IMPLICATIONS

This paper introduced a conceptual and empirical puzzle, the inability of scholars to clearly link IT resource and capability investments to firm performance and competitive advantage either theoretically or empirically. We leveraged and extended existing theory to develop hypotheses for the roles of IT capability homogeneity and heterogeneity in potentially persistent interfirm performance differences. We developed measures and examined our hypotheses with a sample of data collected from firms in Chile, who undertook extensive IT-dependent business process changes. From our analysis we conclude that IT resource and capability investments can likely serve in a strategic role for the firm as sources of zero-order and first-order capabilities.

These arguments indicate that, contrary to our expectations and popular arguments in the business press (Carr, 2004), the ability of the firm to simply "pick" (Makadok, 2001), heterogeneous zero-order IT resources and capabilities appear to hold some performance implications in our study. Therefore, while we find support in our study for a distinction between "off-the-shelf" "zero-order" type IT (i.e. IT as a resource or capability), and "first order" "IT-dependent strategic initiative" uses of IT (i.e. IT as a dynamic capability) performance implications were less dependent upon the heterogeneity of the capability. Therefore, while these observations appear to support IT's ability to play a strategic role in the firm as *zero-order homogeneous* IT capabilities as sources of operational and transactional efficiency from governance perspectives such as TCE, they may conflict with IT's ability to play a strategic role in the firm as a *zero-order heterogeneous* IT capabilities from competence perspectives such as the RBV (Mata et al., 1995; Carr, 2004; Piccoli and Ives, 2005). Similarly, the role of "first-order" dynamic capabilities is also equally contentious as *first-order homogeneous* IT capabilities could offer the firm sources of tactical flexibility from flexibility perspectives, and/or sources of operational and transactional efficiency from governance perspectives. Yet, *first-order heterogeneous* IT capabilities may also offer the firm sources of strategic flexibility from flexibility perspectives, and/or sources of operational efficiency from competence perspectives.

As this study is not without its limitations, we are obligated to point out the ones we are aware of in the hopes of improving this and subsequent similar research on this topic. First, our measures are exploratory in nature, and given the complexity of the phenomena and constructs we are studying, can benefit from additional theorizing and further development. Others attempting to extend this work may wish to consider the inclusion of additional and/or different items, as well as different methods, such as structural equation modeling, to better measure and test the arguments and predictions in this study. Future research should also consider the inclusion of additional variables and measures, as well as multiple measures. Doing so would address potential concerns with common method bias. Further, a larger, multinational sample and the use of more complex methods may yield additional insights into the relationships we modeled. Such approaches could also address potential problems with external validity and generalizability.

This study attempted to improve our understanding of the role of IT resource and capability investments in the firm and its performance. We focused in this paper on studying the dual roles IT can play in the firm as either a "zero-order" resource or a "first-order" capability (Dosi, Nelson, and Winter, 2000; Winter, 2003). Surprisingly, despite the size and scale of IT investments by firms, this is a research context, ignored for the most part by the strategic management literature. Conversely, while it is a popular context for research in the Management Information Systems (MIS) field, where the value of IT to the firm is a common general assumption, yet research there has been unable to establish a clear and consistent empirical link between IT resources, capabilities, and performance at the level of the firm. As a step in this direction, this study advanced an argument that homogeneous and heterogeneous IT-based resources and capabilities can be sources of interfirm performance variation, and that their performance contribution potential depends upon the identification, use, and management of these factors within the firm, which will vary in different firm and industry contexts. Thus, this study addresses major unresolved issues in both the Strategic Management and Management Information Systems literature.

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