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Inter-organizational Relationship Portfolio Management: A Digital Enablement Perspective of Process Alignment and Process Innovativeness

BY

Xinlin Tang

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ACCEPTANCE

This dissertation was prepared under the direction of the *STUDENT'S NAME* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

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ABSTRACT

Inter-organizational Relationship Portfolio Management: A Digital Enablement Perspective of Process Alignment and Process Innovativeness

BY

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Inter-organizational relationship (IR) has been considered a strategic asset that can help firms achieve both exploitation and exploration benefits. The capability to manage inter-organizational relationships, or a firm's "relational capability" (Dyer and Singh 1998), is considered strategically crucial in order to compete in the contemporary business world. However, there are significant challenges that must be addressed to establish this capability.

First, striking a balance between exploitation and exploration benefits (March 1991) through IR management is especially challenging due to the uniqueness embedded in each relationship (Lee 2004). Second, in order to serve a specific strategic purpose, firms usually need to maintain a relationship portfolio, or to be involved in multiple, simultaneous relationships that vary from arm's length, transaction-based arrangements to close, collaborative partnerships (Cannon and Perreault 1999; Dyer et al. 1998). This has made IR relationship management even more difficult since relationship portfolios cannot be effectively managed by a "one-size-fits-all" strategy. Instead, different strategies and process capabilities need to be developed, based on the strategic segmentation of the relationships and the unique requirements of each relationship (Dyer et al. 1998).

Though it has been suggested that process alignment capability is necessary to obtain exploitation benefits, and process innovativeness capability is needed for exploration benefits, these two processes have been considered to be contradictory (e.g., Adler and Goldoftas 1999; Teece et al. 1997). Firms are challenged to pursue these two types of process capabilities simultaneously, or to become ambidextrous organizations (Benner and Tushman 2003). Yet, in this context, how should firms operating in different environments manage the "process alignment - process innovativeness" paradox across their IR portfolios with dominant upstream and downstream partners to realize gains in competitive performance? In addition, how should they structure their business-to-business information technology assets to establish a

digital platform that supports both process innovativeness and process alignment capabilities across their IR portfolio?

We argue that B2B digital platform ambidexterity must be developed to support an organization that exhibits both process alignment and process innovativeness, i.e., an ambidextrous organization. B2B digital platform ambidexterity represents the digital platform's capability to simultaneously integrate and reconfigure IT resources and assets to support the requirements of an IR portfolio. By combining the existing process alignment perspective of IT business value and real options theory, we propose that B2B digital platform ambidexterity can create value through two mechanisms: (i) by enabling process alignment across the IR portfolio to generate position exploitation benefits and (ii) by enabling process innovativeness for both offering flexibility and partnering flexibility to produce option exploration benefits.

The proposed research model was tested based on data collected through a multi-industry survey. Data were collected for both supplier relationship portfolios and channel partner relationship portfolios at the level of the main product line. Measurement instruments were developed through standard procedures (Churchill 1979; Gerbing and Anderson 1988; Straub 1989). The questionnaires went through two-stage Q sorting, were reviewed by panels of academic professionals and practitioners for content validity, and were then pre-tested by procurement professionals and sales professionals prior to survey administration. After data collection, traditional procedures were applied for scale validation. Safeguards against common method bias were developed through the recommended procedural remedies (Podasakoff et al. 2003) during the research design process. Its effects were further investigated using the Harmon's one-factor test for common method variance after the data collection phase (Podasakoff and Organ 1986). Then, the hypotheses were tested and analyzed using Partial Least Squares and the implications for theory and practice were discussed. The manuscript concludes with directions to future research.

Keywords: Inter-organizational relationship portfolio, B2B digital platform ambidexterity, business process capabilities, competitive performance, options theory

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1 INTRODUCTION

1.1 Emerging trends in business

Information technology (IT) has greatly changed the horizon of the business world and technological innovations have become an important driver of economic prosperity (Greenspan 2002). In a time when technology, especially the Internet, has brought global opportunity, increased competition, and continuously changing customer preferences, more and more businesses realize that the only way to remain competitive is to keep a dual focus: revenue growth and cost containment (IBM 2004). They acknowledge that cultivating the ability to sense and respond effectively to changing market conditions and risks is a top priority across many organizations. This shift in the way enterprises conduct business has imposed new requirements on their IT infrastructure in general, and the business-to-business (B2B) infrastructure, in particular. It is no longer enough for information technology to simply align with the existing business process to support the current positioning strategy of the organization. It should be able to allow dynamic configuration, alteration, and enhancement so that it can keep in sync with changes in business requirements to capture new markets or competitive opportunities.

However, traditional IT infrastructures struggle to fulfill the requirements to simultaneously support both inter-organizational process alignment and process innovativeness. While businesses acknowledge that the ability to change is essential to their success, they also recognize that their IT infrastructures usually become the biggest inhibitor when they need to change (IBM 2004; Overby et al. 2006). Among the top problems and challenges that are identified with current technology is the difficulty to provide harmonious functionality that involves the integration and consolidation of multiple "stovepipe" legacy applications (Brancheau et al. 1996; Wastell et al. 1994). This problem not only exists when integrating

legacy with legacy, but also occurs when combining legacy and so-called "greenfield" systems that capitalize on web application server models (Arsanjani et al. 2002). Since IT infrastructure integration and consolidation are the major tasks in building inter-organizational relationships, this problem greatly limits the capability of firms to partner freely with other organizations.

Another identified problem is the inability of traditional systems to meet changing requirements. This is partly caused by the lack of componentization or poor decomposition into modules. However, even in systems that were supposedly object-oriented, the collaborations between components were often "hardwired" into the application disallowing a "rewiring" of the components to satisfy new business flows. Cost-efficient and non-intrusive changes of IT infrastructure are therefore extraordinarily difficult to achieve. Thus, the rigidity of IT infrastructure often "locks" organizations in their current position, making them unable to respond to changing business requirements and to capture emerging opportunities. This phenomenon has been termed "rigidity traps" (Bharadwaj 2000).

1.2 Emerging trends in technology

Service-oriented architecture (SOA) has been considered a promising approach for solving the rigidity problem of IT and to make it more flexible and subservient to the interests of businesses. It is a rapidly emerging technology that allows the aggregation of business functions from coarse-grained components. Services are business-aligned, loosely coupled units of functionality that rely on interface specifications that can be composed and choreographed into software applications (Arsanjani et al. 2004; Papazoglou and Georgakopoulos 2003). Thus, SOAs promote flexibility by allowing multiple business processes to share the same implementation of common individual steps where the processes and implementations vary independently; services

become the digital representation of business capabilities. This reconfiguration capability promised by SOA makes the technology supportive of businesses' requirements for change.

Initiatives like SOA are fueled by the development of open standards for both technology and business. These standards lay out the document schemas and the conditional choreography of document exchanges needed to complete a business process that extends across multiple organizations. Without such standards, there is (i) no common vocabulary for the communication among organizations, (ii) limited data element reuse, and (iii) difficulty in comparing the process performance. Many of these standards have been developed both within and across industries, and aim to optimize interoperability among businesses and technology applications. These standards facilitate and speed up the benefits derived from integrating a complex variety of multi-player sourced service components into larger systems. Table 1-1 lists some of these industry standards and the body sponsoring them.

Table 1-1: Sample of Existing Industry Standards and Sponsoring Body

Industry Standards	Standards Body
Retail	
UCCNET including EAN-UCC	Uniform Code Council, INC.
ePC Network & Standards	Auto-ID Center
ARTS XML for Retail (IXRETAIL)	Association of Retail Technical Standards
Electronics	
PIPs, RNIF, Business Directory, etc.	Rosetta Net
Open Access Standards	OpenEDA. Org
Automative	
ebXML, and other B2B standards	Automotive Industry Action Group
STAR XML	Standards for Technology in Automotive Retail
Telecommunications	
eTOM, NGOSS, etc…	Telemanagement Forum (TMF)
Parlay Specification	The PARLAY Group
Cross-Industry	
XML, SOAP, WSDL, BPEL4, etc.	W3C, OASIS
PDES/STEP ISO 13003	PEDS INC.
Radio Frequency ID (RFID)	EPCGlobal is a subsidiary of ECCnet
SMPI Standards	Voluntary Inter-industry Commerce Standards Association

Though many practitioners remain skeptical about the feasibility of this new digital nirvana, it is believed that the groundwork is being laid for a fundamental shift in platform architecture that underpins corporate IT systems (Waters 2005).

1.3 Problem statement

According to March (1991), both exploitation and exploration benefits are necessary for the long-run competitive performance of firms and inter-organizational relationships can serve as strategic assets for firms to gain both types of benefit (Day 1994; Johnson 1999; Srivastava et al. 1998). On one hand, *position exploitation benefits* can be generated by effectively and efficiently allying with business partners to serve the requirements of existing products or services. Examples include more-efficient transaction management and synchronized business processes for demand fulfillment. These close aligned activities with partners offer the potential to share risk, reduce asymmetries of information (Gulati et al. 2000), and enhance economies of scale and scope(Katz and Shapiro 1985; Shapiro and Varian 1999). On the other hand, inter-organizational relationships can enable access to new information, markets, and technologies (Gulati et al. 2000), and facilitate knowledge sharing and learning among partners (Dyer and Nobeoka 2000; Dyer and Singh 1998). All these resources and capabilities are necessary to achieve exploration benefits from initiatives such as developing and launching new products and entering new markets. Therefore, *option exploration benefits* arise from firms seizing business opportunities by adjusting their inter-organizational relationships.

Based on our review of the literature, we isolate three dominant challenges that firms must address to gain exploration and exploitation benefits from IR management. First, firms must develop distinct process capabilities to achieve exploitation and exploration benefits: (i) process alignment, which represents continuous improvement and rationalization of existing processes,

for exploitation, and (ii) process innovativeness, which emphasizes process change and redesign, for exploration (Benner and Tushman 2003). Though it has been argued in the management literature that process alignment capability is necessary to obtain exploitation benefits and process innovativeness capability necessary for exploration benefits (Benner and Tushman 2003), it is also suggested that firms must balance exploration and exploitation for long-term success (March 1991). However, the literature also argues that these two processes represent contradictory impulses (Adler and Goldoftas 1999; Teece et al. 1997), and firms are challenged to pursue these two types of process capabilities simultaneously (Benner and Tushman 2003).

Second, different environments tend to value exploitation and exploration benefits differently. Benefits from exploration are more valuable in dynamic environments while stable environments favor efficient exploitation of extant competency. Firms will fail to gain competitive advantage from their IRs if they mismatch their emphasis on each type of benefit with their appropriate environments (Eisenhardt and Martin 2000).

Third, organizations usually need to be simultaneously involved in multiple types of relationships, varying from arm's length, transaction-based arrangements to close, collaborative partnerships (Cannon and Perreault 1999; Dyer et al. 1998),or they need to maintain a relationship portfolio, for a specific business purpose. For example, firms can have a portfolio of relationships with upstream partners such as suppliers, for procurement, for product development, or for logistics. Similarly, firms can have a portfolio of relationships with downstream partners, such as channel partners or dominant customers, for marketing their goods and services. This has made IR management even more difficult since these relationship portfolios cannot be effectively managed by a "one-size-fits-all" strategy. Instead, different

strategies and process capabilities should be developed based on the strategic segmentation of the relationships and unique requirements of each relationship (Dyer et al. 1998).

Take Siemens as an example. It is a company whose management of its supplier portfolio is profiled as a poster-child of best practices (Konicki 2002). As one of the largest manufacturers in the electrical and electronics markets, Siemens has a portfolio of 120,000 suppliers worldwide, for procurement. Based on the purchasing value and level of supply risk, Siemens classifies its suppliers into four categories: high-value/volume products with high technical demand, high-value/volume standard products, low-value/volume products with high technical demand, and low-value/volume standard products. Different strategies have been developed and different process capabilities are required to manage each category. For those high-value/volume products with high technical demand, intense relationships have been built with suppliers; the capability to align interacting processes with suppliers is necessary to exploit the benefits of resource synergy. For the high-value/volume standard products, a careful worldwide search and the close monitoring of qualified suppliers are essential for exploring the opportunities to establish new relationships. A change in the relationship portfolio requires the firm to be able to quickly innovate its inter-organizational processes to ensure smooth connections among parties. For those low-value/volume products that are of less strategic importance, guaranteed availability and efficient purchasing processes are used.

Similarly, Compared with their counterparts in the US who are inclined to use an arm-length contract-based strategy and those in South Korea who mainly use a long-term partner-based strategy for their supplier portfolio management, Japanese automakers are able to combine these

two approaches to achieve better performance by developing both process alignment and process innovativeness capabilities, based on strategic segmentation of their suppliers (Dyer et al. 1998).

The above discussion leads to the main research question in this study: How should firms operating in different environments manage the "process alignment - process innovativeness" paradox across their relationship portfolios with their dominant upstream and downstream partners to realize gains in competitive performance?

A related problem pertains to how firms can structure their IT resources to enable the paradoxical set of process capability requirements for the different types of relationship portfolios. The issue of allocating IT resources and establishing capabilities required to support IR management is identified as an issue of significant importance (Rai et al. 2006; Straub et al. 2004b). Previous studies have shed insights on how certain types of IR can be managed using information technology. For example, investment in relational-specific assets, such as Electronic Data Interchange (EDI), can help to build a long-term, stable relationship with partners (Dyer and Singh 1998). Thus, EDI-enabled IT capabilities are very specific to the relationship and display a defined pattern of interaction, typically of a highly structured nature, with the partner. In contrast, research on the e-marketplace also shows how new technologies can help to reduce the search and negotiation costs for one-time transactions (Choudhury et al. 1998). There are also emerging discussions in the field on the different processes and information systems configurations that supply-chain partners can use for information exchange and knowledge creation (Malhotra et al. 2005). However, previous studies do not provide clear answers on what kind of IT capabilities are needed to enable *both* process alignment *and* process innovativeness capabilities for effective IR portfolio management. As relationships create value through

different process capabilities, how can B2B IT assets be structured to establish a digital platform that supports both process innovativeness and process alignment capabilities across the relationship portfolio with dominant upstream and downstream partners?

1.4 Research questions

Trends in technology and business require managers to reposition and rethink the enterprise architecture so that IT and business process capabilities can be leveraged to meet the continuously changing business requirements in IR portfolio management. Traditionally siloed, technological developments have enabled the evolution of business networks towards disciplined alignment of predictable activities. While this can produce efficiency gains from the current position exploitation (Barua et al. 2004; Hitt and Brynjolfsson 1996; Mukhopadhyay et al. 1995b), it may impose significant constraints on the ability of a business network and its member firms to survive and keep competitive advantage in a world where change is the main theme. The emerging trends in business have already shown that traditional B2B infrastructure is not flexible enough to keep up with the changing requirements of organizations in managing their IR portfolio. Though recent developments in technology seem to be theoretically promising, there is no research on how these new developments in technology can be used to support the dual strategic focus in a real-world business setting. Therefore, the challenge facing practitioners and IT researchers is how to structure their B2B digital assets into a platform that supports the focus on contemporary organizations through the management of their important strategic assets and their IR portfolio, as well as how to evaluate the platform capability under this new situation.

In this dissertation, we first address these questions theoretically by investigating what capabilities of B2B digital platforms are needed to enable organizations to simultaneously achieve the two mandates for their success: the on-going improvement of existing processes

across organizational boundaries to deliver services and products, and the option to explore new business opportunities through process innovativeness with their partners to provide effective responses to internal and external customer needs. We then propose a new model of IT business value that better captures the business value of B2B digital platform capabilities using a combined lens of the resource-based view and real options theory. Finally, we investigate how contextual variables that characterize the relationship portfolio influence the value creation and value appropriation capabilities of the B2B digital platform.

The proposed model was tested using data collected from two independent groups of key informants in focal firms – one on their supplier relationship portfolio management practices and the other on their channel partner relationship portfolio management practices.

The specific research questions are:

a) *How can B2B digital platform capabilities enable business process capabilities across a focal firm's IR portfolio, which, in turn, generate exploitation and exploration benefits?*
b) *How does the focal firm's governance orientation of its IR portfolio shape the relationship between B2B digital platform capabilities and business process capabilities?*
c) *How does environmental turbulence shape the relationship between competitive performance of a focal firm and the exploration and exploitation benefits that the focal firm accrues from its IR portfolio?*

The remainder of the research manuscript is organized into four sections. First, we draw on literature streams to inform our research model and develop hypotheses. Then, we map out the research method and conduct the data analysis. We conclude this manuscript with discussion about theoretical contributions and practical implications based on our findings.

2 THEORY BUILDING AND HYPOTHESES DEVELOPMENT

In order to compete in the business world, firms usually maintain a group of inter-organizational relationships (IR) rather than just one. This trend has become more and more obvious since technological revolution and increasing globalization have radically transformed the competitive landscape. For firms to survive, they must build dynamic core competencies and develop their human capital and manufacturing technologies through outsourcing (Hitt et al. 1998; Nadler and Tushman 1999).

There are many ways to categorize these complicated IRs. Based on the length of the relationships, they can be categorized into long-term and short-term. Based on the purpose of the relationships, firms work with their partners for total quality management (TQM), just-in-time (JIT), new product co-development, etc. From the perspective of interaction management structures, the relationships may vary from arm's length, transaction-based arrangements to strategic alliances or joint ventures which are close, collaborative partnerships (Cannon and Perreault 1999). Firms usually need to continuously re-evaluate old relationships and establish new ones depending on their strategic requirements.

In addition to changes in the relationship portfolio, each IR is dynamic by itself, which means that, throughout the relationship lifecycle, firms may change the interaction requirements and adjust the way they conduct business with the same partner. Due to the complicated nature of the IR portfolio, different technology applications may be needed to support these IRs, such as Supply Chain Management Systems (SCMS) (Subramani 2004), EDI (Hart and Saunders 1998), Web services (Barua et al. 2004), etc. Even when similar applications can be used for different relationships, some adaptation of the program is usually needed to accommodate the uniqueness of different suppliers and time frames(Johnson et al. 2004). Therefore, a powerful but flexible

B2B digital platform that can accommodate these different and changing applications is essential to achieve competitive advantage through inter-organizational relationship management.

In this section, we first define B2B digital platform ambidexterity based on the literature stream of ambidexterity. We then draw on the existing IT business value and real options literature to inform the building of our research model and develop our hypotheses on how B2B digital platform ambidexterity can generate business value from IR portfolio management.

2.1 Ambidextrous B2B digital platform for portfolio management

2.1.1 B2B digital platform

Unlike specific technology applications, platform technologies are general-purpose technologies that enable families of applications and related business opportunities (Duncan 1995; Fichman 2004; Taudes et al. 2000). In this study, a B2B digital platform provides necessary support to the process capabilities that are needed to manage the portfolio of inter-organizational relationships. It may include computing platforms (e.g., Internet computing), infrastructure platforms (e.g., wireless networking), and/or application platforms (e.g., web services). As a platform, it has the potential to generate new combinations of resources and structures, which are able to match the present, turbulent circumstances (Kogut 1991).

Though most of the components of a B2B digital platform can be purchased in the marketplace, the different combinations of components, the IT strategies of the different adopting companies, and the technology deployment and learning history make each B2B digital platform unique (Sambamurthy and Zmud 1999). This implies that digital platforms differ in their potential to generate new paths of development and their capability to be reconfigured when facing changes. Some provide a starting point for the exploration and development of new resources and have a

high potential to spawn new usages. Others are specific to certain applications and essentially represent dead ends for further major development (Kim and Kogut 1996).

As the foundation of technology applications, the B2B digital platform is our focal IT artifact. When it is set, it defines what types of applications can be run and how all the applications should be connected and coordinated to support the processes that fulfill business requirements. This path dependency on IT investment will enable or constrain how the inter-organizational processes can be organized, and will influence the way processes function. In addition, platform technology involves huge financial and human investments. According to one estimation, approximately 55 percent of total IT investment is dedicated to platform related technology, processes, and human assets (Weill et al. 2002). Therefore, it usually lasts longer than the specific applications it supports. This implies that investments in platform technology face more uncertainty than the other applications purchased during its lifetime, since it is hard to predict how technology will develop in the long-run, and even harder to foresee how relationship portfolios will change during that time. Thus, it can also have broader and more drastic impacts than single applications on firm performance.

2.1.2 Ambidexterity

Before we introduce the concept of B2B digital platform ambidexterity, we need to understand what ambidexterity is, why it is different from a similar concept – complementarity, and how it has been studied in the literature.

2.1.2.1 Concept of ambidexterity

Ambidexterity refers broadly to an organization's ability to pursue two disparate things at the same time. Manufacturing efficiency and flexibility (Adler and Goldoftas 1999; Carlsson 1989), differentiation and low-cost strategic positioning (Porter 1979; Porter 1996), incremental and

discontinuous innovation and change (Tushman and O'Reilly 1997), and exploitation and exploration in organizational learning (Benner and Tushman 2003; March 1991) are examples of topics that have received a lot of attention in the literature. Though both activities in each of the cited pairs are inter-related and important for organizational survival, they are also contradictory since they compete with each other for attention and resources, and tend to drive each other out, which make it difficult for organizations to balance these potentially conflicting activities (Abernathy 1978; Adler and Goldoftas 1999; March 1991).

For example, it is clear that the exploration of new alternatives reduces the speed with which existing skills are improved, while the improvements in competence of existing procedures make experimentation with others less attractive (Levitt and March 1988). Besides, the certain and reliable returns of exploitation will encourage organizations to favor the short-term virtue of exploitation and to discount the value of exploration, a phenomenon known as *competency trap*. Meanwhile, the huge opportunistic returns associated with exploration will make organizations engage in continuous experimentation and searches without accruing any rewards, a phenomenon known as *innovation trap*.

The simple idea behind the value of ambidexterity is that, although these trade-offs can never be entirely eliminated, the most successful organizations reconcile them to a large degree, and in so doing enhance their long-term competitiveness (Gibson and Birkinshaw 2004). The ambidexterity lens offers a potentially powerful framework for examining the above-mentioned paradoxical phenomena. Poole and Van de Ven (1989) suggest that there are four ways to deal with paradoxes: (1) accept the paradox and use it constructively, (2) clarify levels of analysis, (3)

temporally separate the two levels, and (4) introduce new terms to resolve the paradox. Taking the fourth approach, ambidexterity approaches paradoxes by adopting a synthesis perspective.

2.1.2.2 Ambidexterity vs. Complementarity

Ambidexterity is a different concept from complementarity. According to complementarity theory, several components are considered to be complementary only if doing more of any one increases (or at least does not decrease) the marginal effectiveness of the others in the group (Milgrom and Roberts 1992: 108). Each component potentially exerts an independent main effect on the outcomes, but they may also have a synergistic effect when they interact with each other. It is argued that a system is complementary if the components (1) interact with one another to (2) mitigate the limitations of each (Bendersky 2003).

Complementarity theory has been applied widely in the study of organizational behavior. It has been applied to knowledge development and transfer (Argyris 1999; Argyris and Schon 1996), organizational diversity (Cornelius et al. 2000; Ely and Thomas 2001; Gilbert and Ivancevich 2000), and participatory human resources management practices. For example, when implemented together in internally consistent bundles, multiple human resources policies – such as self-directed teams, training, and total quality management – seem to have more productivity, turnover, and morale effects than do the individual components or no policy at all (Batt 1999; MacDuffie 1995; Richard and Johnson 2001). When applying the complementarity theory to the study of IT business value, Barua *et al*. (Barua et al.) developed a multilayered business value complementarity model in the area of re-engineering. In this model, they argue that "to maximize organizational payoff, complementary factors such as technology, decision authority, business processes and incentives must all be changed in a coordinated fashion in the right direction by the right magnitude, to move towards an ideal design configuration."

Table 2-1 provides a summary comparison between these two constructs.

Table 2-1: Comparison between Ambidexterity and Complementarity

	Ambidexterity	Complementarity
Definition	An organization's ability to pursue two disparate things at the same time. (Gibson and Birkinshaw 2004)	Several component are complementary only if doing more of any one increases (or at least does not decrease) the marginal effectiveness of the others in the group (Milgrom and Roberts 1992: 108).
Relationship between the two activities	- Two separate, but interrelated, non-substitutable elements of one system - These two elements are in conflict, and there are always trade-offs to be made between them, and the absence of one element may lead to failure in the long run.	- Several separate components - Each component potentially exerts an independent main effect on the outcome, but they may also have a synergistic effect when they interact with each other.
Examples	- Exploitation vs. exploration - Mass production vs. customization - Efficiency vs. flexibility	- Incentive systems and innovative working processes - Technology, business process and incentive systems. - Multiple human resource polices
Formula to calculate value	$Value = f(a \times b)$	$Value = f(a, b, a \times b)$

2.1.2.3 Ambidextrous organization

There have been discussions as to whether internal organizational tensions, such as those mentioned above, can ever be effectively reconciled (Ford and Ford 1994; Lewis 2000). Porter (1996), for example, argued that the trade-off between low-cost and differentiated positions is insurmountable, so that organizations have to make an explicit choice for their strategy. However, increasingly, the organizational literature has shown, and current business trends have verified, that organizations need to be ambidextrous to survive and become successful in a dynamic environment. Firms need to align processes to achieve efficiency in their management of today's business demands, while also being adaptive enough to capture the emerging

opportunities brought about by changes in environment, so that they will still exist tomorrow (Duncan 1976; Gibson and Birkinshaw 2004; IBM 2004; Tushman and O'Reilly 1996). The focus has been shifted from trade-off (either/or) to paradoxical (both/and) thinking (Bouchikhi 1998; Earley and Gibson 2002; Lewis 2000; Morgeson and Hofmann 1999).

Scholars have suggested two different mechanisms to achieve ambidexterity, namely structural ambidexterity and contextual ambidexterity. By structural ambidexterity, organizations reconcile seemingly contradictory positions by putting in place structures and systems. For example, alignment and adaptability can be achieved through task partitioning, such as one business unit adopting an "organic" structure and another taking on a "mechanistic" structure, while these highly differentiated business units are loosely coupled with each other (Benner and Tushman 2003; Hedlund and Ridderstrale 1997). Temporal separation can serve as another solution; a system in which an entire unit focuses on one set of tasks one day, and then on a different set of tasks the next (Adler and Goldoftas 1999; McDonough and Leifer 1983).

Contextual ambidexterity, defined as the behavioral capacity to simultaneously demonstrate alignment and adaptability across an entire business unit, approaches the tensions from an individual perspective (Gibson and Birkinshaw 2004). The underlying implication is that, although ambidexterity is a characteristic of a business unit as a whole, it manifests itself in the specific actions of individuals throughout the organization. Therefore, organizations can choose to build a performance management system and social context that encourage individuals to make their own judgments when balancing conflicting demands (Gibson and Birkinshaw 2004). These two approaches have been considered complementary, rather than exclusive, in achieving ambidextrous organizations (Adler and Goldoftas 1999; Gibson and Birkinshaw 2004).

Recently, the requirement of organizational ambidexterity has been extended from internal organizational management to external inter-organizational relationship (IR) management. Based on a study of 60 leading companies that focused on supply-chain management to ensure satisfactory delivery of goods and services, Lee (2004) concludes, "the best supply chain[s] aren't just fast and cost-effective. They are also agile and adaptable." Though keeping a well-aligned supply chain is essential to achieve position exploitation benefits under a stable environment, such as cost reduction and resource synergy as have been touted in the literature (Dyer and Nobeoka 2000), great companies do not maintain the same supply networks when markets or strategies change. Rather, such organizations continually adapt their supply chains through process innovativeness so they can adjust to changing needs and even reap the benefits of option exploration when the time is right. Evidence shows that only companies that can simultaneously align with their existing relationships and adapt their IR portfolio when necessary can be successful in the long-run. But the question remains as to how these two paradoxical inter-organizational process capabilities can be enabled simultaneously by B2B digital platforms for IR portfolios management.

2.1.3 B2B digital platform ambidexterity

Though the ambidextrous organization has attracted increasing attention in the management field, little research has been conducted on the role of IT in this new type of business, and especially on how the B2B digital platform should be structured to cope with the requirements of organizations seeking to achieve ambidexterity in their IR portfolio management. This is an important research topic in the IS field since the field is premised on the centrality of information technology in everyday socio-economic life. We intend to fill this gap by arguing that the B2B

digital platform should also be ambidextrous in order to support the inter-organizational process ambidexterity for IR portfolio management.

We define *B2B digital platform ambidexterity* as the capability of the digital platform to simultaneously integrate and reconfigure IT resources and support the requirements of an IR portfolio. This ambidextrous capability, in turn, will enable process alignment and process innovativeness for IR portfolio management. *Integration* represents the ability to integrate data, communication technologies, and applications into a whole to achieve synergy across the IR portfolio. *Reconfiguration* is the ability of a firm's B2B platform to expand to accommodate new applications, or to be changed or recombined to support new relationships, as necessary. It measures the flexibility and the growth capability of the IT platform.

Though this may be the first research study on B2B digital platform ambidexterity, both integration and reconfiguration have been discussed in the literature. Integration is achieved by resolving data type and semantic differences among multiple databases and integrating various hardware platforms, communication technologies, and applications to work together seamlessly (Broadbent et al. 1999b; Turnbull 1991). A B2B digital platform with a high level of integration capability is able to transmit, combine, and process data from multiple parties, such as customers, suppliers, or vendors. Further, it should be easy to share data among various internal systems (e.g., forecasting, production, shipment, accounting, etc.) and to retrieve information from various databases for decision support (e.g., cost information, reporting tools) (Sikora and Shaw 1998). It will ensure that different technologies and applications cannot only work together more efficiently, but also become much more valuable than they were individually (Schilling 2000). However, a single focus on platform integration will inevitably lead to the rigid and

monolithic systems that we already find in many large companies (Waters 2005). Previous studies have indicated that high levels of integration can introduce irreducible dependence between tasks, thereby making these processes highly vulnerable from a redesign standpoint (Brandyberry et al. 1999; Upton 1997). Then, it becomes a source of business inertia (Schilling and Steensma 2001).

While integration is a sophisticated construct employed in previous research (Barua et al. 2004), reconfiguration can find its roots in the research on IT infrastructure flexibility (Byrd and Turner 2000; Duncan 1995), modular systems (Schilling 2000; Stremersch et al. 2003), platform organization (Ciborra 1996), and service-oriented computing and architecture (SOC and SOA) (Arsanjani et al. 2004; Papazoglou and Georgakopoulos 2003).

Reconfiguration can be achieved through modularized components and standardized interfaces that represent the "rules" of the system architecture and enable (or prohibit) the mixing and matching of components (Arsanjani et al. 2004; Duncan 1995; Schilling 2000). Modularized components can increase sharability and reusability by encapsulating data, functions, and individual processes into modules (Duncan 1995, Arsanjani, 2004 #734). Thus, it is quite easy to refine, move, or even replace these separated components based on the requirements of business. Standards-based architecture enables firms to reap some of the many advantages of network externality (Garud and Kumaraswamy 1995). These may include a stronger customer position with suppliers, which allows a firm to play rival suppliers off each other in order to more easily procure products, and a higher platform value, which occurs when several organizations use the same standards (Shapiro and Varian 1999).

Though integration can achieve synergistic specificity by providing greater functionality by optimizing the way components work together and through producing more stable performance, the concerns of business practitioners have already shown the harmful outcome of favoring integration and ignoring reconfiguration. However, too much reconfiguration will produce a fragmented system that makes it hard to achieve stable and efficient performance. Just as Mr. Phillips at Oracle mentioned in a discussion of the benefits of SOA, "Whatever integration you do with SOA will never be as effective as more tightly integrating parts of the stack" (Waters 2005). In other words, flexibility in the future (reconfiguration) is achieved at the cost of today's performance (integration). Therefore, only an ambidextrous digital platform can help an organization achieve both process alignment and process innovativeness in IR portfolio management, by striking a balance between integration and reconfiguration. Thus, since IT integration and IT reconfiguration are important for firm performance, firms need to maintain both capabilities at all times, or to construct an ambidextrous digital platform, even though firms may never completely maximize their benefits from either capability (Burgelman 1991; Burgelman 2002).

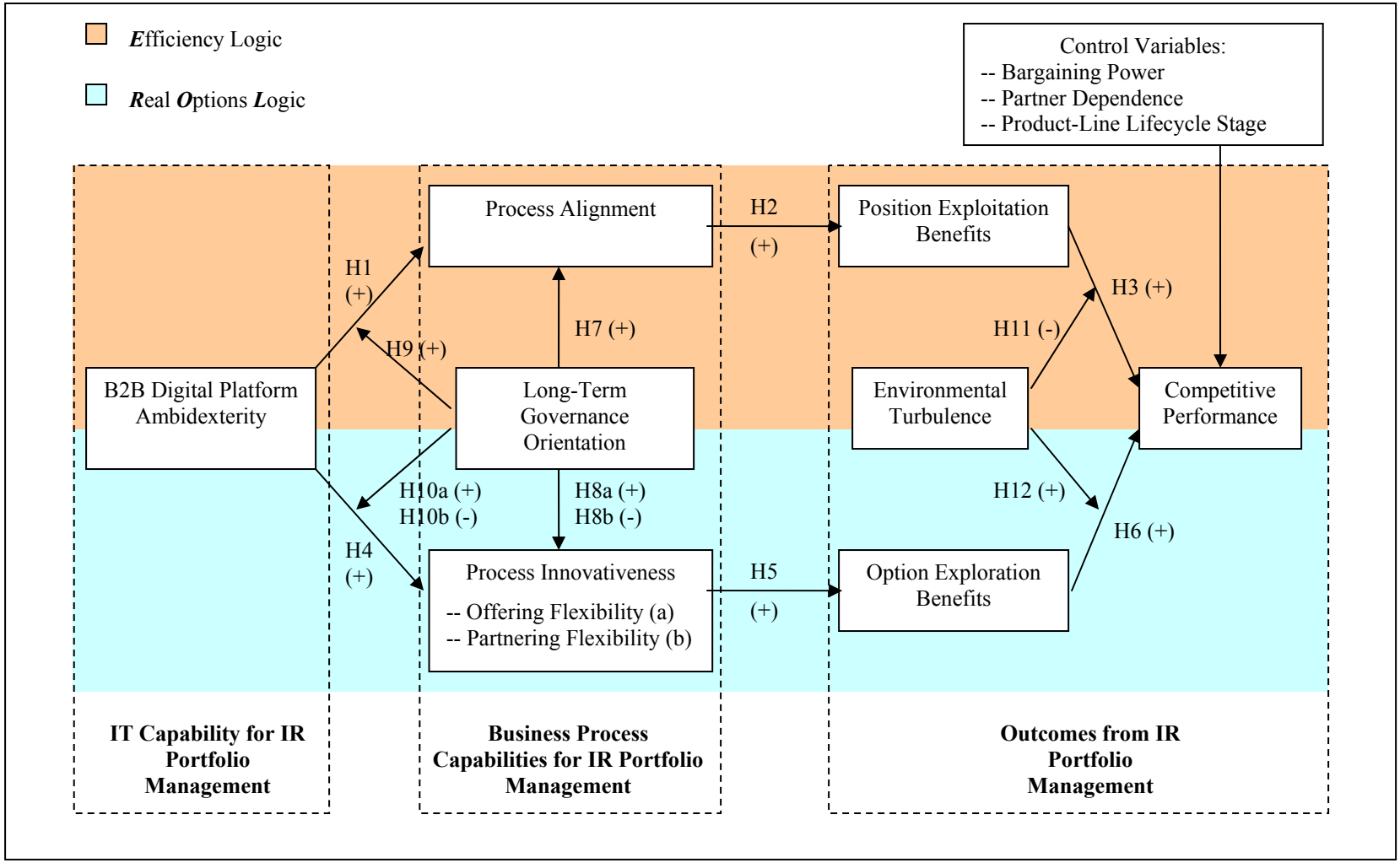
While B2B digital platforms are likely to have some combination of integration and reconfiguration (Schilling 2000), their ambidexterity can be assessed in two specific ways, i.e., *synergy* and *balance*.[1] First, as IT integration and IT reconfiguration are inter-related, they should generate synergistic effects when pursued together. This mutual amplification can be represented as a cross-product of their two scores, akin to the approach used to evaluate "moderating fit" as per Venkatraman(1989). Second, these two IT capabilities should be in balance for overall long-term performance and a skew in one direction will result in local

[1] A similar conceptualization of ambidexterity, based on the notions of synergy and balance, was used by He and Wong (2004) in their empirical test of the effects of exploitation and exploration strategies on firm performance.

optimization of selected aspects. The balance can be represented as the difference between their two scores, similar to the approach used to capture "matching fit" as per Venkatraman(1989). Thus, a B2B digital platform is ambidextrous if there is synergy and balance across the two dimensions of IT integration and IT reconfiguration.

Next, we present the research model and develop the theoretical arguments for how an ambidextrous B2B digital platform enables process capabilities for value creation from IR portfolio management.

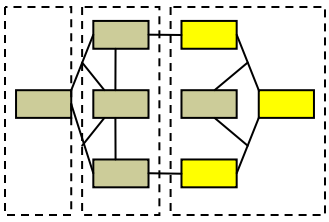
Figure 2-1: The Dual Efficiency Real Options Logic (DEROL) Model for IR Portfolio Management



2.2 Dual efficiency – real option logic (DEROL) for IR portfolio management

Figure 2-1 shows the DEROL model of how an ambidextrous B2B digital platform enables two distinct value-creation mechanisms from IR portfolio management: process alignment for exploitation benefits and process innovativeness for exploration benefits. We start this section with a discussion on the nomology of IR portfolio management outcomes. We then discuss the enabler role of B2B platform ambidexterity to process capabilities and the underlying logic of these two mechanisms. The moderating roles of long-term governance orientation and environmental turbulence as moderators in these causal pathways are developed subsequently. We conclude this section with the discussion of alternative explanations to competitive performance.

2.2.1 Nomology of IR portfolio management outcomes



Existing studies have employed various types of dependent variables to examine firm performance. The most commonly used dependent variables are financial measures, such as return on investment (ROI) and return on assets (ROA) (Barua et al. 1995; Byrd and Marshall 1988; Lai and Mahapatra 1997; Mahmood and Mann 1993; Rai et al. 1997; Tam 1998) and revenue (Lichtenberg 1995). As a special financial measure, Tobin's q has also been used as a measure of a firm's intangible value or long-term performance (Bharadwaj et al. 1999; Hitt and Brynjolfsson 1996). Other commonly used dependent variables include output-based measures and expense-based measures. Examples for output-based measures are management output (Prattipati and Mensah 1997), milk production (Van Asseldonk et al. 1988), and total mail sorted (Mukhopadhyay et al. 1997a). Examples for expense-based measures include labor hours (Mukhopadhyay et al. 1997a), expenses

(Francalanci and Galal 1998), capacity utilization (Barua et al. 1995), and inventory turnover (Mukhopadhyay et al. 1995a).

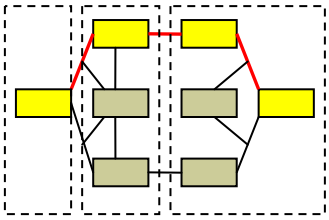
These measures can also be categorized into the intermediate process level and the organizational level. Since the immediate effects of IT manifest in process improvements, more conclusive results are expected when IT investments are related to process performance (Mukhopadhyay et al. 1997b; Segars et al. 1998). Empirical studies using intermediary performance measures such as process efficiency and quality have reported more consistent results (Nidumolu and Knotts 1998; Rai et al. 1997). However, these measures have a strong efficiency focus. Though some studies have reported competitive advantage through IT investment, this advantage is still efficiency based. As Melville et al. (2004) define in their review work, the effectiveness measures denote that "IT may enable a firm to improve efficiency regardless of whether mimicked by competitors, or may yield performance impacts unique to a particular firm relative to its competitors" (p. 287). It is only recent that strategic benefits have been included in the performance metrics of IT business value (Mukhopadhyay and Kekre 2002; Subramani 2004). For example, Subramani (2004) argues that strategic benefits can be generated from the explorative usage of supply chain management systems to gain more customer-specific knowledge.

The main thesis in the IT productivity and business value literature has been that IT investments lead to improved firm performance as measured by return on assets (ROA), market share, and gross margin (Hitt and Brynjolfsson 1996; Rai et al. 1997). The literature also recognizes that better financial performance is the result of improvements in intermediate operational measures

(Mukhopadhyay et al. 1995b; Mukhopadhyay et al. 1997b). In order to fully capture the value created by B2B digital platform ambidexterity, we employ a two-stage benefit model.

Position exploitation benefits are generated from the effectiveness and efficiency of allying with business partners to serve the existing requirements of products or services. Examples include more-efficient transaction management, and automating and rationalizing business processes, which are efficiency focused. *Option exploration benefits* arise from taking advantage of emerging opportunities in the business world. These include the development of new products and services and entry into new markets. *Competitive performance* reflects the achievement of organizational objectives in relation to a firm's external environment. It is based on the two first-order benefits and can be measured by market share, profitability, and customer satisfaction.

2.2.2 The efficiency pathway of business value from IR portfolio management



The stream of research on IT business value has long been a topic of interest to both practitioners and academicians. This attention to IT value stems, in part, from the significant investments organizations have made in IS and, in part, from the increasing role IT plays in the strategic thinking of most organizations (Ravichandran and Lertwongsatien 2005).

In the following sections, we briefly review previous studies of IT business value that focus on the theoretical base and the mechanism of how IT can generate business value. We then discuss how the existing literature helped us frame the efficiency logic of the research model.

2.2.2.1 Previous studies on IT business value through process alignment

Existing literature on IT business value investigates the issue in two contexts: inside the organizational boundary or in an inter-organizational setting.

The first group of studies on IT business value focuses on understanding how IT can be used to create value within an organization. In this stream's early studies, microeconomic theory provides a rich set of well-defined constructs interrelated with theoretical models and mathematical specifications. To describe production processes, microeconomics employs the paradigm of a production function that relates physical input resources (factors) with output products or services. By isolating distinct activities within a business, economically and technologically, one may identify the value added by an input to individual products (Barua et al. 1995; Brynjolfsson and Hitt 1995; Dewan and Kraemer 2000, Lichtenberg, 1995 #829). For example, Mukhopadhyay et al. (1997b) show that higher use of optical character recognition and barcode sorting technologies in the mail sorting process at the United States Postal Service would significantly improve the mail sorting output. In addition, IT can also improve the sorting quality, which in turn enhances output.

While microeconomic theory focuses on the activities within a business, industrial organization theory provides a useful lens to examine how firms jointly interact in IT investment decisions. Agency theory and the incomplete contracts literature have been drawn upon to understand firms' decisions on IT insourcing and outsourcing processes (Bakos and Nault 1997; Clemons and Kleindorfer 1992). Transaction cost theory has been a dominant theory in the empirical study of IT business value. It lays down the foundation for IT as a cost-reduction tool, and its role in firm performance as an efficiency generator (Choudhury et al. 1998; Christiaanse and Venkatraman 2002; Subramani 2004).

Though the rational perspective – maximization of organizational efficiency and effectiveness through IT – is widespread within IT business value research, other perspectives also bring us

valuable insights into the inter-organizational level studies (Melville et al. 2004). For example, Chatfield and Yetton (2000) applied the theory of embeddedness to study how inter-organizational relationships affect IT business value in the context of EDI. Kumar et al. (1998) also proposed a rationality of information systems that stresses relationships and trust within and across organizations and apply it to explain the failure of an inter-organizational information system implemented in the textile industry.

Recently, the resource-based view (RBV) has gained popularity in this field and has been applied to both groups. Wade and Hulland (2004) provide an overview of the literature on IT-related resources and their impact on firm strategy and performance. They rely on the definition of Sanchez et al. (1996) that resources are a set of assets and capabilities available to a firm that is useful in detecting and responding to market opportunities or threats. Assets, which can be tangible or intangible, are defined as those resources available for a firm to "use in its processes for creating, producing, and/or offering its products (goods/services) to a market," whereas "capabilities are repeatable patterns of actions in the use of [IT] assets" (Wade and Hulland 2004).

Some resources, particularly certain IT assets, are easily available (e.g., IT hardware, the Internet, etc.) or transferable (e.g., patents). Compared to theses resources, capabilities as market responsiveness and management of external relationships are firm-specific and deeply embedded within an organization (Amit and Shoemaker 1993; Makadok 2001; Teece et al. 1997). Therefore, capabilities are higher-order resources that involve the ability of a firm to deploy resources in combination with organizational processes to obtain desired outcomes (Amit and Shoemaker 1993; Grant 1991; Makadok 2001).

Though originally internally focused, RBV has been extended beyond the boundaries of organizations, in which inter-organizational relationships have been treated as an important resource that can provide focal firms with access to valuable resources or capabilities difficult to build internally (Barringer and Harrison 2000). Thus, the capability to collaborate with the right organizations at the right time has become a source of competitive advantage.

The resource-based view (RBV) provides a reasonable explanation of why firms perform differently even though they may have access to the same technology. Mata et al. (1995) have argued that physical systems such as the Internet and related technologies by themselves are not a source of value; rather, it is the ability to combine, coordinate, and exploit IT resources with other organizational and environmental resources to address business problems that is difficult to conceive and implement. This view has been verified by Barua et al. (2004). They show that not all firms possess the same ability to create online information capability (OIC), even when they have access to the same IT assets such as the Internet. They argue that OIC can be influenced by other organizational and inter-organizational resources including business processes, incentives, and intangible resources such as trust and relationship with business partners.

By arguing that IT capabilities can be distinct and embedded in each organization, RBV helps IT researchers respond to the critics who believe that IT might provide only limited and short-term advantages to innovators before being copied by competitors (Vitale et al. 1986). Only then can IT be upgraded from a tool to achieve operation efficiency to an important component in organizational strategy.

No matter which theory is applied, it is widely acknowledged that investment in IT assets or capabilities may not be directly linked to improved performance. For example, Barua et al. (1995) argue that the association between IT investment and performance attenuates as the distance between cause and effect widens. The authors develop a model of IT business value in which the impact of IT on firm performance is mediated by intermediate processes. The process-centric perspective argues that IT creates value for the organization by improving individual business processes, or inter-process linkages, or both. Consequently, the greater the impact of IT on individual business processes and on inter-process linkages, the greater the contribution of IT to firm performance. However, building IT capability alone is not a necessary and sufficient condition for improving firm performance. This perspective is adopted by many other researchers, such as Weill (1992), Soh and Markus (1995), and Rai et al. (1997).

The following table provides a summary of some of the previous studies on IT business value, based on their research setting and theoretical base.

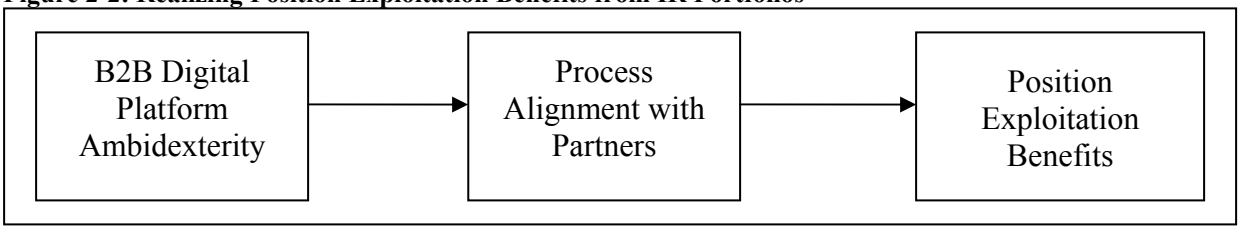
Table 2-2: Previous Studies on IT Business Value through Process Alignment

Research Setting	Theoretical Base	Prior Studies
Organizational Level	Microeconomics	(Barua et al. 1995; Brynjolfsson and Hitt 1995; Dewan and Kraemer 2000; Hitt and Brynjolfsson 1996; Lichtenberg 1995; Mukhopadhyay et al. 1997b)
	Resource-based view	(Bharadwaj 2000; Broadbent et al. 1999a; Powell and Dent-Micallef 1997; Santhanam and Hartono 2003)
Inter-organizational Level	Industrial organization theory	(Bakos and Nault 1997; Choudhury et al. 1998; Christiaanse and Venkatraman 2002; Clemons and Kleindorfer 1992; Sobrero and Roberts 2001; Subramani 2004).
	Social embeddedness theory	(Chatfield and Yetton 2000; Kumar et al. 1998)
	Resource-based view	(Barua et al. 2004; Christiaanse and Venkatraman 2002; Zhu and Kraemer 2002)

2.2.2.2 Linking B2B digital platform ambidexterity to position exploitation benefits

Drawing on this perspective, we suggest that B2B digital platform ambidexterity enables process alignment among business partners, which results in exploitation benefits (Figure 2-2) and consequently firm performance.

Figure 2-2: Realizing Position Exploitation Benefits from IR Portfolios



Process alignment represents the firm's ability to map, improve, and adhere to their existing work processes with their business partners to ensure the smooth operation of the relationships. Research shows that IT and business process alignment are natural partners (Jarvenpaa and Stoddard 1998; Kettinger and Grover 1995). Technology usually leads to improved information transfer and sharing capability, and it also automates or provides new methods to coordinate processes. Such capabilities have the potential to lower costs and improve services that affect revenues (e.g., better customer service) (Hammer and Champy 1993). However, to capitalize from these benefits, firms have to change their old processes for doing business.

Therefore, the adoption of B2B digital platform technology is often accompanied with changes to inter-organizational business processes. The relationship between information technology and process alignment has been studied in the IS field (Clark and Stoddard 1996; Riggins and Mukhopadhyay 1999; Subramani 2004). For example, the EDI literature has shown that a firm is able to share information at the right time and improve performance when business processes are changed along with EDI technology implementation (Clark and Stoddard 1996; Riggins and

Mukhopadhyay 1994). For instance, firms can align their processes to consolidate fragmented ordering within the organization in order to negotiate better overall prices with their suppliers.

Similarly, integrating with a channel partner's IT platform grants the focal firm access to the partner's real-time sales data and thus creates the opportunity for the focal firm to redesign its planning and manufacturing processes. For example, an integrated IT platform allows firms to link their material procurement processes to retailer orders, or to incorporate information on retailer promotions in their production planning processes. In turn, these redesigned planning and manufacturing processes derive efficiency benefits for the focal firm. These arguments suggest that B2B digital platform ambidexterity is an enabler of process alignment, both inside the firm and across the partnership. Higher levels of B2B digital platform ambidexterity are therefore likely to be associated with higher levels of business-process alignment.

Hence,

> *H1: There is a positive relationship between B2B digital platform ambidexterity of the focal firm and its process alignment capability in managing its inter-organizational relationship portfolio.*

The literature provides evidence that exploitation benefits from process alignment can be accrued from both supplier and customer IR portfolios. On the supply side, higher levels of process alignment will enable firms to improve their coordination of material movement (Srinivasan et al. 1994), which can reduce transaction costs, lower lead times, reduce order fulfillment errors, and increase inventory turnover rates (Clemons et al. 1993; Mukhopadhyay et al. 1995b; Mukhopadhyay et al. 1997a; Srinivasan et al. 1994; Straub et al. 2002). Additionally, improved supply-side process alignment is more likely to lower the cash conversion cycle for the firm (Magretta 1998) and lead to enhanced profitability.

Similarly, IT-enabled customer-side process alignment may lead to a smaller sales force, less paperwork, and fewer data input errors, since an aligned process makes it possible to shift the responsibility of product information search, order entry, and tracking to customers (Johnston and Vitale 1988; Weill and Vitale 2001). For example, selling an airline ticket online costs a carrier about $6 as compared to more than $20 if the ticket is sold via telephone (Wagner 2002). Additionally, aligned processes can put a customer in control of the content, order, and duration of the flow of information, which may increase his/her satisfaction due to higher decision quality, memory, knowledge, and confidence (Ariely 2000). Based on our discussion, we posit the following hypothesis:

H2: The higher the level of B2B digital platform ambidexterity, the more position exploitation benefits can be gained by the focal firm through process alignment across the IR portfolio.

In recent years, firms have achieved a distinct competitive advantage from improving how they operate in defined product-market positions. Their ability to align processes with those of their partners has a profound impact on how well they are able to exploit the current positions in which they operate (Lee 2002). Indeed, the strategic strength of the Toyota Motor Corporation of Japan has been described as largely dependent on its capability to fine-tune its network of suppliers to increase productivity and reduce cost (Fruin 1992; Langfield-Smith and Greenwood 1998).

H3: Higher levels of position exploitation benefits are associated with higher levels of competitive performance.

2.2.2.3 Deficiency of the efficiency pathway on IT business value

The previous research on IT business value has provided great insight into whether and how IT can lead to superior firm performance. But just as the management literature has challenged the

resource based view (RBV) and transaction cost economics (TCE) about their static view of the environment (Eisenhardt and Martin 2000; Teece et al. 1997), the current IT business value model based on these theories does not adequately account for the role of IT in a dynamic environment.

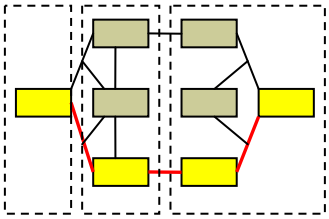
The traditional model focuses on how IT capabilities can be deployed with complementary process alignment capability to achieve higher performance through relationships with a group of specific partners (Clark and Stoddard 1996; Subramani 2004). The implicit underlying assumption is that this relationship portfolio can remain unchanged for a long period and firms can gain efficiency benefits, even competitive advantage by investing in and continuously refining the partner-specific assets and capabilities used to support the relationship portfolio.

However, this underlying assumption may not hold true in a highly competitive and dynamic environment. In such an environment, organizations need to frequently "partner" with new partners to achieve competitive advantage (Shapiro and Varian 1999). Even though the same relationship can last, the services or products exchanged between partners may change greatly because of the quick shift of customer preference. Therefore, IT capabilities should be able to generate benefits not only by exploiting the current position through process alignment for a specific inter-organizational relationship portfolio, but also by exploring the possible business opportunities through process innovativeness to continuously adapt the inter-organizational relationship portfolio.

The previous research stream of IT business value has provided great insight on how IT can lead to superior firm performance in a stable environment. However, this value-creation mechanism is inadequate to profile the capabilities of the required process and the role of IT for IR

management in dynamic environments. We draw on real options theory to suggest that process innovativeness is a core capability required to generate benefits in such contexts and that B2B digital platform ambidexterity enables process innovativeness as real options.

2.2.3 The real option pathway of business value from IR portfolio management



The concept of option originates from the stock market. An option is a right, but not the obligation, to acquire an asset at a fixed price on or before a specific date (Copeland and Weston 1992). The intuition behind an option is that the buyers fix their downside risk, i.e., they can never lose more than the cost of the option, while gaining a potentially unlimited upside benefit, i.e., the possibility of a bull market that drives the stock to a higher price than the specific strike price. This concept has been extended into real options theory and widely employed in the financial and management fields. In this section, we first review how real options theory has been applied in these fields and discuss the previous research that employs option theory in the IS field. We then explore why B2B digital platform ambidexterity can be considered as a real option and how it can generate option exploration benefits.

2.2.3.1 Real options theory in the financial and management fields

Real options theory is based on the recognition that the flexibility embedded in some real assets has option-like characteristics: improving the assets' upside potential while limiting downside losses. It has been suggested as a capital budgeting and strategic decision-making tool because it compensates for the traditional net present value (NPV) rule by explicitly accounting for the value of future flexibility (Amram and Kulatilaka 1999; Trigeorgis 1996). Just like the current IT business value model, traditional NPV makes implicit assumptions concerning the stable environment and management's passive commitment to an unchangeable "operating strategy"

(e.g., partnering with the same organizations for its foreseeable life, or competing in the same market by providing the same types of products or services).

Real options models, however, are based on the assumption that there is an underlying source of uncertainty and information asymmetry at the time of initial investment, such as a change of customer preference or a shift in market. As new information emerges and uncertainty about market conditions is gradually resolved, real options create value by providing management with the flexibility to alter its operating strategy in order to capitalize on favorable future opportunities (Trigeorgis 1995). The following formula presents the logic of an option-based expanded NPV rule (Formula (2-1)):

Expanded (strategic) NPV = Passive NPV of expected cash flows +
Value of options from active management **Formula (2-1)**

Real options theory has been used to analyze a variety of evaluation and investment phenomena. These phenomena include joint ventures (Kogut 1991), investment in R&D (Kumaraswamy 1996), venture capital investments (Hurry et al. 1992), and technology positioning investment (McGrath 1997). Real options theory has provided a valuable lens to understand these complex investment decisions. For example, Roberts and Weitzman (1981) find that in sequential decision-making, it may be worthwhile to undertake investments with negative NPV when early investment can provide information about future project benefits, especially when their uncertainty is great. Folta and Miller (2002) examine buyouts and equity purchases of partner firms subsequent to initial minority equity stakes. This initial investment grants the firm privileged access to information about the partner, along with contractual, operational, and managerial links between the firms, which give the equity investor an advantage position relative

to outsiders. Consistent with real options theory, firms are more likely to exercise their buyout options when the uncertainty is lowered by their privileged access to information.

Besides being used to evaluate specific investment decisions, real options theory has also been used to study the choice firms make to build on and create their bundle of resources. Key to this perspective on options is the premise that resources create the potential for decision makers to act in ways that could not have been foreseen at the time a specific investment decision was made. For instance, Bowman and Hurry (1993) view an organization's resources – its capabilities and assets – as a bundle of options for future strategic choice. Options come into existence when existing resources and capabilities generate choices and allow preferential access to future opportunities. Courtney et al. (1997) also propose that real options theory sheds insights on the way to construct business portfolios and pursue the development of important capabilities.

2.2.3.2 Real options theory applications in the IS field

As Trigeorgis (1995) predicted that real options theory has great potential to make a significant difference in the field of information technology or other platform investments (p.27), we have seen a surge in the application of real options theory in the information systems (IS) field.

Many IS researchers use a real options lens to provide a rationalized justification of IT investment decisions through option valuation algorithms. Taudes (1998) investigates options models to evaluate "software growth options," which are formed by IS functions embedded in an IT platform that can be brought into operation at certain implementation decision points, when found beneficial. In a later study, Taudes and his colleagues (2000) customize the option pricing model (Formula (2-1)) in the context of software platform implementation. They argue that the

value from implementing a flexible IT platform consists of two parts: (1) the benefit of the base configuration chosen and (2) the value of the "software growth options" embedded – that is, the possibility of introducing new IS functions when it is economically feasible to do so. This logic can be represented by the following formula (Formula (2-2)).

Value of a software platform = NPV of fixed application portfolio +
Option value of implementation opportunities

Formula (2-2)

They also illustrate how this model can help organizations make better decisions through a real-life case study concerned with the decision of whether to continue using SAP R/2 or to switch to SAP R/3. Bardhan et al. (2004) develop a real options portfolio optimization algorithm to value and prioritize a portfolio of projects. Instead of creating a customized option valuation algorithm, Fichman (2004) deals with the option value of IT platform investments conceptually. Starting from the basic assumption of real options theory, he explores the possible antecedents that can affect the option value in IT platform investment.

Though real options theory represents a theoretically attractive way to provide an objective valuation of flexibility inherent in many investments, the use of this methodology presents many practical difficulties. Option models make specific assumptions regarding the incorporation of risk, implementation opportunities, and the variance parameters, which make the algorithms complex and error-prone. It is even unclear what conclusions should be drawn from an option analysis where those assumptions do not hold (Benaroch and Kauffmann 2000; Taudes et al. 2000).

An alternative to developing a customized option valuation algorithm that better matches the characteristics of the investment proposal is to conduct an empirical study of similar projects and assess whether firms that embed options in their IT platforms really enjoy higher performance than those that do not. This approach has recently become practical. The quick development of standard communication technologies (such as the Web, e-mail, and instant messaging) and enterprise software packages (most notably in the areas of customer relationship management and enterprise resource planning) have made B2B digital platforms affordable to more companies. Thus, we have a large enough population to empirically investigate the performance of various B2B digital platforms.

In this study, we adopt the second approach and apply the real options lens to evaluate whether incorporating options into B2B digital platforms can actually generate competitive advantage for organizations and what the value-creation mechanisms is.

2.2.3.3 B2B digital platform ambidexterity as real options

A real option is the investment in physical and human assets that provides the opportunity to respond to future contingent events (Bowman and Hurry 1993; Kogut and Kulatilaka 2001; McGrath et al. 2004). In this research, we view B2B digital platform ambidexterity as real options and argue that these options bring flexibility to IR portfolio management. This is consistent with previous research that treats IT platform and capabilities as real options (e.g., Fichman 2004; Kogut and Kulatilaka 2001).

Three conditions are prerequisites to applying real options concepts to an investment decision: uncertainty, the provision of future managerial discretion to be exercised at the appropriate time, and irreversibility. All three conditions hold for B2B digital platform ambidexterity.

Table 2-3 summarizes the conditions that must be met for B2B digital platform ambidexterity to be treated as an option and shows how these conditions are met.

Table 2-3: Summary of B2B Digital Platform Ambidexterity as Real Options

Conditions to Become Real Options	Explanation of the Conditions	Why B2B Digital Platform Ambidexterity Meets Each Condition
Uncertainty	Uncertainty is generated from information asymmetry in the time between establishing the option and facing the exercise decision.	At the time of implementing the ambidextrous platform, there is incomplete information about how the technology will change and standards develop. Even less is known about how the relationship portfolio may change and what process capabilities will be required for this changed portfolio of relationships.
Future decision rights	The flexibility for management to alter its operating strategy to capitalize on favorable future opportunities or mitigate losses.	An ambidextrous platform can be expanded by incrementally adding new application modules to capitalize on capabilities and resources distributed across the relationship portfolio in response to emergent market opportunities; the platform can also mitigate losses by enabling changes to the relationship portfolio and to the offering portfolio of products.
Irreversibility	The inability to revisit an investment or decision without additional cost.	Sunk costs for software and hardware, tight coupling of technology and processes, and path dependency of future IT investments on past decisions related to choices of standards and architecture in the development of the platform make it impossible to revise the platform without cost.

Uncertainty is generated from information asymmetry in the time between establishing the option and facing the exercise decision (Coff and Laverty 2001). The huge cost involved in developing a B2B digital platform usually makes it a long-term investment. During the lifetime of a digital platform, the uncertainty it faces can come from two sources. Direct uncertainty comes from technology itself, such as the emergence of new dominant standards and unpredictable disruptive technological shifts. On the other hand, uncertainty can also come from

changes in the environment in which the platform operates. For example, in order to maintain their competitiveness, organizations may continually orchestrate new sources for value creation through frequent "partnering" (Shapiro and Varian 1999). The new relationship may have different standard choices and system requirements compared with the previous relationship. New applications or services may also emerge as customers' preferences change. Both of these types of uncertainty cannot be predicted at the time of platform implementation.

To represent a real option, an investment should be able to generate future choices or decision rights (McGrath et al. 2004). It means that management may have valuable flexibility to alter its operating strategy in order to capture favorable opportunities or mitigate losses as new information arrives and uncertainty about market conditions is resolved. In a dynamic and highly competitive world, a B2B digital platform plays a critical role in responding to and shaping business opportunities by providing more options (Sambamurthy and Zmud 2000).

First, an ambidextrous platform can be expanded by incrementally adding new applications and functions. This capability serves to enhance offering flexibility in options execution since it allows firms to defer the implementation of applications/functions until they are really needed, or economically feasible. At the end of each incremental segment, managers will also have another opportunity to consider which options are available, which should be retained, and which should be discarded in ensuing segments.

Previous research shows that highly partner-specific or offering-specific digital platform investment, though it improves the efficiency of specific relationships, also inhibit its owners' relationship with others by increased transaction specificity and switching costs (Clemons and Kleindorfer 1992; Webster 1995). Firms often reported delays or under-expected performance

when they integrated their processes with their partners since the digital platform could not be easily reconfigured to accommodate the new relationship. Thus, B2B digital platform ambidexterity can be an adjustable, open-ended tool by supporting a wide array of possible configurations and associated applications (Orlikowski 1992; 1996). The high interpretative flexibility provided by an ambidextrous B2B digital platform enables a greater set of implementation configurations (Fichman 2004), which can be adjusted to support different requirements from changes in IR portfolio and product/service offerings. Therefore, companies will enjoy greater flexibility and easiness in adapting their product offerings and IR portfolio without incurring great losses on the digital platform when markets or strategies change.

Irreversibility signifies the inability to revisit an investment or decision without incurring costs (Kogut and Kulatilaka 2001). The investments in a B2B digital platform are largely irreversible due to the tight coupling of technology and organization (Fichman 2004). Investments in software and hardware development are sunk costs that cannot be retrieved if they turn out to be unusable in the future. Other investment associated with organizational learning and adaptation, such as expenditures for training, hiring experienced workers and consultants, developing new policies and procedures, and establishing supporting infrastructure, which is even more expensive than the out-of-pocket costs of the technology, is irreversible too.

Besides, technology and organization are dynamically coupled in their evolution, and it is impossible to identify clear matches between them (Dosi and Kogut 1993). Once a digital platform is in place and runs for a while, it will gradually permeate every corner of the organization and become part of it. The IS literature has recorded great resistance and even performance retreat when firms intend to replace old systems with new ones (Robey et al. 2002).

Irreversibility also implies that this capability is difficult to replicate in a timely manner in order to support a strategy at a particular time (Kogut and Kulatilaka 2001; McGrath et al. 2004). Investments in IT are path dependent, i.e., the current decision is usually based on former ones, and will influence future ones (McGrath et al. 2004).

For example, the investment in a B2B digital platform usually involves making a standards choice. Once the decision has been made, future investments will be limited to those applications compatible with the same standards. If competitors choose different standards at the outset, it would be difficult to replicate the IT capability of the focal firm in a timely manner. The architecture of the platform will also determine the extent to which it can be extended and reconfigured. Since all these important decisions have to be made at the time the platform is designed and implemented, it will shape the future development of the platform and cannot be reversed easily.

As options discussed in the management and finance fields, B2B digital platform ambidexterity allows firms to execute the embedded option to gain control of the changing environment and capture the benefits by adding new function/services or adapting its relationship portfolio when the situation becomes favorable. Otherwise, firms only incur losses on the extra initial cost of building ambidextrous platform instead of a simple integrated solution and on the stability of performance that can be achieved by an integrated solution. This initial cost can be trivial compared to the cost of lost opportunities.

Because of information asymmetry (i.e., uncertainty about future technology development and business changes) and path dependency (i.e., future applications depend on specific characteristics of the platform) which characterize IT investment, an ambidextrous B2B digital

platform provides firms with more flexibility in managing their inter-organizational relationship portfolio rather than inhibiting change. In a changing environment, it is essential to act early and quickly to capture the emerging opportunity since the value of the opportunity will decline significantly when it becomes obvious to competitors (Kester 1984). In this situation, those organizations with ambidextrous digital platforms can react in a timelier manner than those that have rigid systems, or have to build their platforms from scratch. Their B2B digital platforms have the capability to be quickly and economically expanded to provide additional products/services when necessary, or can be easily combined with a new partner's platform to ensure the smooth exchange of information if firms need to adapt their inter-organizational relationship portfolio to capture the transient window of opportunity. Thus, B2B digital platform ambidexterity gives a firm preferential access to opportunities simply by being "in the right place at the right time" (Fox and Marcus 1992). This capability can bring firms a competitive advantage over those competitors that fail to build such options into their digital platform.

As Trigeorgis (1995) discussed, many options occur naturally (e.g., the option to defer, to contract, or to shut down), while others have to be planned and built beforehand (e.g., to abandon and redeploy, to grow, or to switch). In an inter-organizational setting, firms embed various options in their B2B digital platforms by investing in platform ambidexterity. The following table (Table 2-4) maps the six types of options discussed in the literature to the options that can be embedded in an ambidextrous B2B digital platform.

Table 2-4: Options Embedded in an ambidextrous B2B Digital Platform

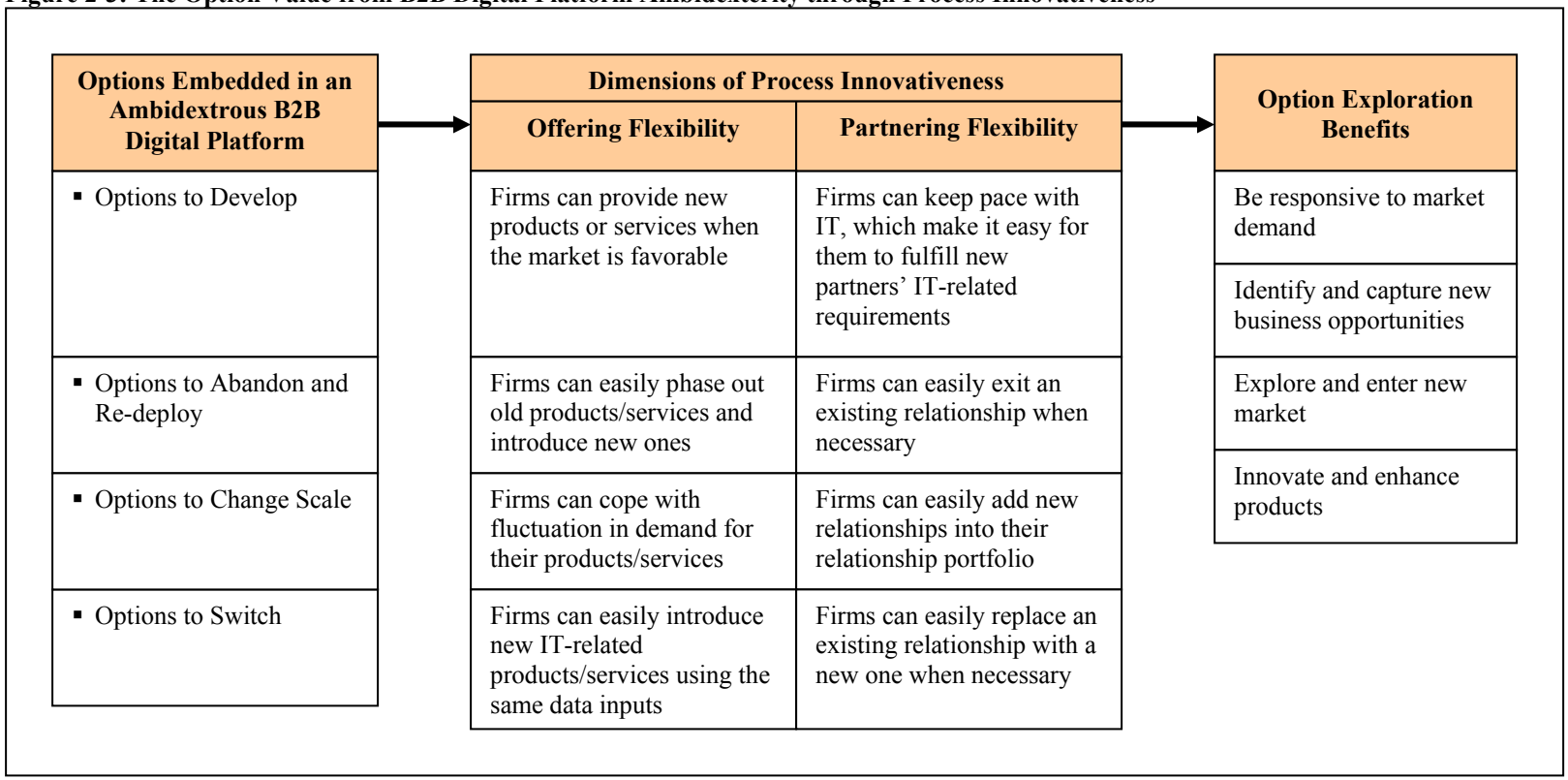
Category	Description in Literature (Adopted from Trigeorgis (1996))	Category Used in this Study	Mapping to B2B Digital Platform Ambidexterity
Option to defer	Management holds a lease on (or an option to buy) valuable land or resources. It can wait (x years) to see if output prices justify constructing a building or plant, or developing a field.	These three types of options have been combined in the current study and labeled as <u>option to develop</u> The reason for combing them and treating them as one type of option are: • Option to defer can be considered to be a multi-stage investment where the initial investment is necessary for future development possibilities. • Time to build option consists of interrelated projects, where the previous stage is necessary to carry out the next stage, and therefore is also an option to develop. • Growth options are opportunities for future development.	At the time of initial investment, management can install only the "base" of the digital platform. New functions and applications can be added incrementally.
Time to build option (Staged investment)	Staging investment as a series of outlays creates the option to abandon the enterprise in midstream if new information is unfavorable. Each stage can be viewed as an option on the value of subsequent stages, and valued as a compound option.		
Growth options	Early investment (e.g,, R&D, lease on undeveloped land or oil reserves, strategic acquisition, information network/infrastructure) is a prerequisite or link in a chain of interrelated projects that open up future growth opportunities (e.g., new product or process generation, oil reserves, access to new markets, strengthening of core capabilities). Like interproject compound options.		
Option to alter the operating scale (e.g., to expand; to contract; to shut down and restart)	If market conditions are more favorable than expected, the firm can expand the scale of production or accelerate resource utilization. Conversely, if conditions are less favorable than expected, it can reduce the scale of operations.	Option to change scale	The digital platform can be easily expanded or shrunk to handle fluctuation in service/product demand and changes in the number of relationships.
Option to abandon	If market conditions decline severely, management can abandon current operations permanently and realize the resale value of capital equipment and other assets in secondhand markets.	Option to abandon and re-deploy	The modular design of the digital platform allows it to be easily re-configured for other uses.
Option to switch (e.g., outputs or inputs)	If prices or demand change, management can change the output mix of the facility ("product" flexibility). Alternatively, the same outputs can be produced using different types of inputs ("process" flexibility).	Option to switch	The digital platform can generate multiple output configurations to be compatible with the constraints of other platforms that may use different technology, and to achieve interoperability with cost economy

2.2.3.4 Linking B2B digital platform ambidexterity to option exploration benefits

In previous empirical studies, Kester (1984) documents that the value of a firm's growth options is more than half the market value of equity for many firms, and as much as 70 to 80 percent for more volatile industries. Similarly, Pindyck (1988) also suggests that growth options represent more than half of a firm's value even when demand volatility is moderate. As Myers concludes, "Options are at the heart of the valuation problem in all but the most pedestrian corporate investments . . . it is hard to think of an investment project that does not include important real options" (Myers 1996: 99). To have an option with no value (and thus not represent a real option), an investment would have to meet two tests: (1) the resource in question would generate no future choices, and (2) the resource would allow no "preferential access to future opportunities" (Bowman and Hurry 1993).

Therefore, it will lead to the undervaluation of the business value of information technology if we neglect the valuable opportunities embedded in the B2B digital platform. Drawing on real options theory, we propose that the options embedded in an ambidextrous B2B digital platform can generate option exploration benefits through process innovativeness (Figure 2-3).

Figure 2-3: The Option Value from B2B Digital Platform Ambidexterity through Process Innovativeness



Options Embedded in an Ambidextrous B2B Digital Platform	Dimensions of Process Innovativeness		Option Exploration Benefits
	Offering Flexibility	Partnering Flexibility	
▪ Options to Develop	Firms can provide new products or services when the market is favorable	Firms can keep pace with IT, which make it easy for them to fulfill new partners' IT-related requirements	Be responsive to market demand Identify and capture new business opportunities
▪ Options to Abandon and Re-deploy	Firms can easily phase out old products/services and introduce new ones	Firms can easily exit an existing relationship when necessary	Explore and enter new market
▪ Options to Change Scale	Firms can cope with fluctuation in demand for their products/services	Firms can easily add new relationships into their relationship portfolio	Innovate and enhance products
▪ Options to Switch	Firms can easily introduce new IT-related products/services using the same data inputs	Firms can easily replace an existing relationship with a new one when necessary	

We now elaborate on the mechanism through which value from options embedded in B2B platforms is realized. In dynamic environments, firms need the capability to manage two types of changes: changes in products or services and changes in the relationship portfolio (Malhotra et al. 2005). Changing customer preferences and shorter product lifecycles require firms to deliver new services, or customer-specific add-ons and modifications to standard products, within short periods of time and at reasonable costs. To achieve this, organizations need to frequently "partner" with new partners or modify the process parameters of collaboration with existing partners (Shapiro and Varian 1999). Even though the same relationship may endure, the services or products exchanged between partners may change greatly due to shifts in customer preference. Thus, we define *process innovativeness* as the capability of firms to innovate their work processes with their business partners to (1) cope with the emerging requirements on products and services, and (2) change their work processes to support new partnerships. We refer to the former dimension of process innovativeness as offering flexibility and the latter dimension of process innovativeness as partnering flexibility.

We suggest that B2B digital platform ambidexterity enhances both offering flexibility and partnering flexibility, which are the two dimensions of process innovativeness that we consider (see Figure 2-3). Platform readiness for new software (option to develop) allows for integration with complementary modules of IR partners, thereby enabling a firm to deliver products or services to market, quickly and cost effectively. Reusable data and application assets (option to abandon and re-deploy) can speed up application delivery by reducing the need for new development and facilitating integration with legacy systems, which makes it easy for firms to establish relationships with different partners. Moreover, having the capability to generate outputs in multiple formats (option to switch) makes it feasible to exchange information in the

formats required by new partners, which, in turn enhances partnering flexibility. Thus, process innovativeness is enhanced by the synergistic effects of the IT platform's reconfiguration and integration capabilities. However, biasing the platform's capability significantly in favor of integration and against reconfiguration will adversely affect the innovativeness of processes.

H4: There is a positive relationship between B2B digital platform ambidexterity in the focal firm and its process innovativeness capability in managing its inter-organizational relationship portfolio.

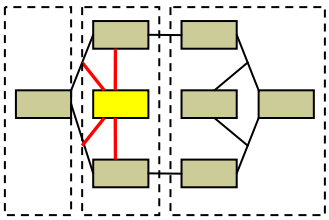
The process innovativeness enabled by B2B digital platform ambidexterity should generate option exploration benefits for the focal firm. For example, process innovativeness for offering flexibility makes the focal firm more responsive to changes in marketplace. The capability to innovate inter-organizational processes for new partnerships can give the focal firm access to new technologies for product development or to new markets. By establishing process innovativeness for offering flexibility and partnering flexibility, firms are more capable of identifying and capturing emergent opportunities that are characteristic of dynamic markets.

H5: The higher the level of B2B digital platform ambidexterity, the more option exploration benefits can be gained by the focal firm through process innovativeness across the IR portfolio.

Whether a firm can capture emerging opportunities is contingent on initial investments in resources and capabilities (McGrath and Nerkar 2004; Miller 1998). Because of the path-dependent accumulation processes of investment, those firms that invest in developing B2B digital platform ambidexterity and in process innovativeness will find themselves with a better chance to capitalize on option exploration benefits than their competitors. Thus, we further argue:

H6: Higher levels of option exploration benefits are associated with higher levels of competitive performance.

2.2.4 Quasi-moderating effects of long-term governance orientation



Issues related to relationship governance have received considerable attention in the inter-organizational relationship management literature. Multiple theories, such as new institutional economics literature, including transaction cost analysis (TCA), have been employed to examine how particular governance processes are carried out among firms (Ghosh and John 1999; Heide 1994; Noordewier et al. 1990). The two basic governance strategies that have been discussed in the literature are long-term partner-based relationships and short-term contract-based relationships, or frequent partnering (Anderson 1985; Klein et al. 1990). Though firms usually combine these two basic strategies to manage their IR portfolio, or adopt a "plural forms" approach (Bradach and Eccles 1989; Heide 2003), they will be inclined to focus more on one strategy based on their specific organizational requirements and culture. We call this inclination governance orientation and follow the traditions of organizational theory and economics to conceptualize these two governance orientations as polar opposites on a single dimension (Genesan 1994; Williamson 1979).

Governance orientation reflects the focal firm's perception as to whether its long-term relationships or short-term relationships with dominant partners contribute more to its competitive performance. Since it refers to a generalized approach toward partners, a firm's orientation will serve to structure the development of process capabilities and direct the behavior of the focal firm in the management of the IR portfolio (Mohr et al. 1996). Thus, firms with long-term governance orientation tend to fine-tune their inter-organizational processes to achieve higher alignment with their partners. For example, Japanese automotive companies have an

established history of developing long-term relationships with major suppliers. Guided by this long-term governance orientation for supplier relationships, the focal firms are actively engaged in improving the inter-organizational processes and systems together with their core suppliers.

H7: There is a positive relationship between the long-term governance orientation of the focal firm and its process alignment capability in managing its inter-organizational relationship portfolio.

On the other hand, governance orientation may have mixed effects on establishing process innovativeness capabilities. The management literature has documented that long-term governance orientation of a focal firm can help increase trust between the firm and its partners. In addition, expectations for future cooperation and gain-sharing will prompt a firm's dominant partners to coordinate their innovation efforts with respect to products or services (Dyer and Nobeoka 2000). Thus, the patterns of cooperation that are encouraged by long-term orientation should then impact a focal firm's offering flexibility. However, a firm with a long-term governance orientation will also have the tendency to become over-embedded in its current network, and reduce its capability to innovate processes that can help form new relationships, or have partnering flexibility (Gargiulo 2000).

H8a: There is a positive relationship between the long-term governance orientation of the focal firm and its process innovativeness for offering flexibility in managing its inter-organizational relationship portfolio.

H8b: There is a negative relationship between the long-term governance orientation of the focal firm and its process innovativeness for partnering flexibility in managing its inter-organizational relationship portfolio.

The IS literature has also discussed the role of business strategy and organizational norms in shaping technology adoption, assimilation, and usage. Adaptive structuration theory (AST) is an

important theory that explains why the use of the same technology may not necessarily lead to the same outcome; it proposes that there is an appreciation for the processes that intervene in the relationship between a technology and the outcomes of its use. It suggests that groups "mediate technological effects, adapting systems to their needs, resisting them, or not using them at all" (Poole and DeSanctis 1990, p. 177). Central to AST is the notion of structuration, the process by which groups create and maintain a social system through the application of structures, which are rules and resources provided by the technology, the task, organizational culture, group norms, and the knowledge represented by participants (DeSanctis and Poole 1994).

In our case, firms may devote extra effort to explore B2B digital platform ambidexterity to develop a specific business process capability under the guidance of their governance orientation. For example, while a firm will dig further into the digital platform's capability to achieve higher process alignment if it intends to maintain a long-term, stable relationship portfolio with a small group of business partners, a firm with a short-term, contract-based governance orientation may invest more in exploring the capability of its digital platform to enable process innovativeness.

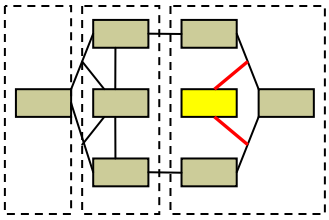
Hence, we also propose a moderating role for long-term governance orientation in shaping the relationships between B2B digital platform ambidexterity and business process capabilities,

H9: Long-term governance orientation positively moderates the relationship between B2B digital platform ambidexterity and process alignment.

H10a: Long-term governance orientation positively moderates the relationship between B2B digital platform ambidexterity and the offering flexibility dimension of process innovativeness.

H10b: Long-term governance orientation negatively moderates the relationship between B2B digital platform ambidexterity and the partnering flexibility dimension of process innovativeness.

2.2.5 Moderating effects of environmental turbulence



Environmental turbulence is defined as 'general conditions of uncertainty' (Mendelson 2000). It is described by (a) dramatic increases in the number of events, (b) frequent turnovers in knowledge resources, (c) high levels of change (both in magnitude and direction), (d) sharp discontinuities in demand and growth, and (e) considerable uncertainty about the future (Glazer and Weiss 1993). The RBV argues that the environment shapes the choice and success of firm resources and strategic initiatives (Moorman and Slotegraaf 1999), while the dynamic capabilities view places environmental turbulence in a central stage (Teece et al. 1997). Porter (1980) (p. 1) argues that the "essence of formulating strategy is relating a company to its environment," while he views effectiveness as the result of pursuing a strategy that matches environmental contingencies (Porter 1991).

Environmental turbulence has been typically used as a contingency variable to explain the effect of strategic and structure decisions on firm activity or performance (Cockburn and Henderson 1998; Damanpour 1996). It consists of three sources (Jap 2001): (a) *market turbulence* - uncertainty in market demands, or a rate of change in the composition of customers and their preferences (Jaworski and Kohli 1993); (b) *competitive intensity* – the number of competitors in the field and their moves (Jap 2001; Schilling and Steensma 2001); and (c) *technological change* – frequency of technical breakthroughs (Glazer and Weiss 1993; Jaworski and Kohli 1993; Weiss and Heide 1993).

The moderating role of environmental turbulence is formally supported by options theory. An option is acquired with a partial investment, and the holder reserves the right to "strike" the option when the opportunity emerges. The higher the environmental turbulence, the more likely these options will be valuable since more strategic opportunities are likely to emerge (Sambamurthy et al. 2003). Teece et al. (1997) argue that there is tremendous value in the ability to sense the need for resource reconfigurations in turbulent environments (p. 520). This view is consistent with the emerging literature on organizational flexibility, wherein authors have noted that many firms have responded to rapid technological change and volatile demand conditions by seeking greater flexibility (Eisenhardt and Brown 1999; Hitt et al. 1998; Nadler and Tushman 1999).

B2B digital platform ambidexterity is especially valuable in turbulent environments where firms need to continuously adapt to turbulent conditions. In changing environments, the opportunities to recombine existing sets of resources become more appealing (Van den Bosch et al. 1999). By investing in B2B digital platform ambidexterity that can be fluidly expanded for new applications, and changed and recombined in a variety of application configurations, firms can more quickly adapt to diverse customer needs and changing environments. The resulting option exploration benefits from process innovativeness will contribute more to competitive performance in turbulent environments than in stable environments.

On the other hand, stable environments are less likely to create opportunities for exercising the options embedded in B2B digital platform ambidexterity, and any investment in such options may prove to be of little or no value (Moorman and Miner 1998). Stable environments reward efficient exploitation of extant competencies (Zammuto 1998) and favor the "disciplined

problem solving" of existing processes (Brown and Eisenhardt 1997). The capability to generate more position exploitation benefits becomes the main source of competitive performance.

Therefore, we can expect,

H11: The relationship between position exploitation benefits and competitive performance is negatively moderated by environmental turbulence.

H12: The relationship between option exploration benefits and competitive performance is positively moderated by environmental turbulence.

2.2.6 Control variables: Rival explanations of outcomes extracted by a focal firm from IR portfolio management

Control variables are used to account for factors other than the theoretical constructs of interest, which could explain variance in the dependent variable. In this study, bargaining power, partner dependence, and the product-line lifecycle stage are used as control variables of the outcomes extracted by a focal firm from its IR portfolio management. Hypotheses related to these variables are not proposed because this dissertation does not develop theory related to their effects.

Firms with higher bargaining power are able to negotiate better prices or get more help from their partners. For instance, Hart and Saunders (1997) proposed that a less powerful firm would be willing to adopt EDI technology to satisfy its more powerful partners, even though the more powerful firms may never make the request. Compared with small firms, large firms usually possess higher bargaining power generated not only from their possible larger purchasing volume, but also the brand effects of their names. Since firm size reflects past success and may influence current performance with partners (Aldrich 2000; Aldrich and Auster 1986), including

firm size in the model controls for factors such as relative bargaining power and the size of the resource base that can affect the performance (Zaheer and Venkatraman 1994).

The focal firm's level of dependence on its partners is inversely related to the level of partner replaceability. The level of partner replaceability reflects the ease with which the focal firm can make the transition to other partners for products/services in the event they cannot be delivered by current partners. Low levels of partner replaceability can reflect a cooperative climate in the relationships and therefore can be positively related to the benefits a firm receives from the relationships (Dyer and Singh 1998). Yet low levels of partner replaceability can also make the focal firm more vulnerable to an exercise of power by a partner (Hart and Saunders 1997) and adversely affect its performance. Including partner replaceability in the model helps control for these dependences on outcomes generated from the IR portfolio management.

During its lifecycle, each product line usually will go through four stages: introduction, growth, maturity, and decline (Anderson and Zeithaml 1984). The benefit generated from IR relationship portfolio differs at each of these stages (Abernathy and Utterback 1978). For example, firms can expect higher exploration benefits through their relationships with partners in the introduction and growth stages since they need their partners to provide knowledge, channels, and financial resources to develop and market new products. Comparatively, since the competition with similar products will become intense during the later stages of the product line lifecycle, firms will rely more on their partners to achieve exploitation benefits through information sharing and economies of scale and scope. Including stage of product-line lifecycle in our model controls for these possible effects of IR portfolio management on firm performance.

Table 2-5 summarizes all the constructs used in the research model with their definitions and sources.

Table 2-5: Constructs Used in the Research Model

Construct	Definition	Selected Prior Literature
IT Capability for IR Portfolio Management		
B2B Digital Platform Ambidexterity	The capability of firm's digital platform to simultaneously provide both integration and reconfiguration to support the requirements of IR portfolio.	(Benner and Tushman 2003; Gibson and Birkinshaw 2004)
-- Integration	The ability to integrate data, communication technologies, and applications into a whole to achieve synergy across the IR portfolio.	(Barua et al. 2004; Broadbent et al. 1999b; Turnbull 1991)
-- Reconfiguration	The ability of a firm's B2B digital platform to be expanded to accommodate new applications, or to be changed or recombined to support new relationships when necessary.	(Byrd and Turner 2000; Ciborra 1996; Duncan 1995; Schilling 2000; Stremersch et al. 2003)
Business Process Capabilities for IR Portfolio Management		
Process Alignment	The firm's ability to map, improve, and adhere to their existing work processes with their business partners to ensure the smooth operation of the relationships.	(Clark and Stoddard 1996; Jarvenpaa and Stoddard 1998; Kettinger and Grover 1995; Riggins and Mukhopadhyay 1999; Subramani 2004).
Process innovativeness	The capability of firms to change their work processes.	
-- Offering Flexibility	To change processes with their business partners to cope with the emerging requirements for products and services.	(Gosain et al. 2004; Young-Ybarra and Wiersema 1999)
-- Partner Flexibility	To adapt their processes to support new relationships	(Shapiro and Varian 1999; Gosain et al. 2004)
Moderating Variables		
Long-Term Governance Orientation	The propensity of the focal firm to focus more on long-term partner-based governance strategy rather than short-term contract-based strategy to manage its IR portfolio.	(Mohr et al. 1996)
Environmental Turbulence	General conditions of uncertainty.	(Mendelson 2000)
-- Market Turbulence	Uncertainty in market demands, or rate of change in the composition of customers and their preference.	(Jaworski and Kohli 1993)
-- Competitive Intensity	The number of competitors in the field and their moves.	(Jap 2001; Schilling and Steensma 2001)
-- Technological Change	Frequency of technical breakthroughs.	(Glazer and Weiss 1993; Jaworski and Kohli 1993; Weiss and Heide 1993).

Construct	Definition	Selected Prior Literature
Outcomes from IR Portfolio Management		
Positioning Exploitation Benefits	Generate from the effectiveness and efficiency of allying with business partners to serve the existing requirements on products or services.	(Mukhopadhyay and Kekre 2002; Mukhopadhyay et al. 1997b; Subramani 2004)
Option Exploration Benefits	Arise through firms taking advantage of opportunities that emerge in the business world.	(Mukhopadhyay and Kekre 2002; Subramani 2004)
Competitive Performance	Organizational objectives in relation to a firm's external environment.	(Barua et al. 1995; Hitt and Brynjolfsson 1996; Rai et al. 1997)
Control Variables		
Bargaining Power	The relative power of the focal firm over its partners to negotiate better price or get more help from partners.	(Aldrich 2000; Zaheer and Venkatraman 1994)
Partner Replaceability	The ease with which the focal firm can make the transition to working with other partners for the products/services in the event they cannot be delivered by the current partners.	(Dyer and Singh 1998; Hart and Saunders 1997)
Product-line Lifecycle Stage	The four stages in the lifecycle of a product-line: introduction, growth, maturity, and decline.	(Anderson and Zeithaml 1984)

3 RESEARCH DESIGN AND DATA COLLECTION

The objective of this chapter is to describe the research methodology, the methods of inquiry that led to the originating research questions, and the data collection methods used. Table 3-1 provides an overview of the research design that is discussed in detail in the following sections.

Table 3-1: Overview of the Research Design

	Type of Inter-organizational Relationship Portfolio		Explanation
	Suppliers	**Channel Partners**	
Research Method	Survey	Survey	This is an appropriate method for us to collect data at the primary product line level.
Level of Analysis	Major product line	Major product line	Respondents asked to select he product line that accounts for over 20% of total sales/revenues in their company.
Unit of Analysis	Supplier relationship portfolio	Channel partner relationship portfolio	The two types of IR portfolio allow us to compare our model in these different contexts.
Data Source	Single key informant from focal firms	Single key informant from focal firms	This approach was adopted based on our research objective and the objective to achieve an acceptable response rate.
Target Respondent	Procurement professionals	Sales/ business development professionals	The individuals within the organizations who are most knowledgeable about the aspects of the selected topic. IT related questions are posed in functional terms, so they can be answered most effectively by business professionals.
Industries Included	Industrial machinery and equipment (3511-3599), chemical and allied products (2812-2899), automotive transportation and equipment (3711-3799), and electronic and electric equipment (3624-3647)	Industrial machinery and equipment (3511-3599), chemical and allied products (2812-2899), automotive transportation and equipment (3711-3799), and electronic and electric equipment (3624-3647)	They reflect a broad presence in the overall economy. The SIC codes (indicated in the parentheses) of these four industries also represent environmental turbulence levels 2, 3, 5, and 6 respectively (based on the scale of Johnson et al. (2004)).
Pilot Test	Measurement items went through two-stage validation sorting	Measurement items went through two-stage validation sorting.	It ensures the content validity of constructs.
	Questionnaire was reviewed by panels of academic experts and practitioners	Questionnaire was reviewed by panels of academic experts and practitioners	It ensures content validity of constructs, clarity of instructions, format, and flow.

	Type of Inter-organizational Relationship Portfolio		Explanation
	Suppliers	**Channel Partners**	
	Questionnaire was pre-tested with 21 procurement professionals.	Questionnaire was pre-tested with 29 marketing professionals.	It indicates whether the construct variance is sufficient for testing the posited relationships.
Total Receivable Questionnaires	964 questionnaires	816 questionnaires	
Completion Rate	36.6%	38.1%	It represents the percentage of completed survey we received from respondents.
Data Available for Analysis	964×36.6%=353	816×38.1%=311	The number of responses we received from each survey provides us adequate sample size to test the model in each context.
Source of Secondary Data	E-Rewards	E-Rewards	This source was used to triangulate the subjective measures of competitive performance when respondents provide information about their company symbol in stock markets and to safeguard against common method bias across IVs and DVs.

3.1 Research context

We tested our model in two research settings: the upstream supply context and the downstream sales channel context. The two research settings gave us an opportunity to compare how our model worked in different contexts. Because these two types of relationship have been widely studied in the literature, we found some guidance on the research design and measurement development.

Firms maintain different IR portfolios for different purposes, different people, or different departments to manage the different IR portfolios. For example, the product development department may have alliances to help them with new product development, while the procurement department may also maintain their own set of supplier relationships. To ensure that our questionnaire was directed to the proper informants, we collected data from two separate groups: the questionnaire about the supplier relationship portfolio was directed to the

procurement professionals, while the one about the channel partner relationship portfolio was sent to marketing professionals.

The data were collected at the level of each company's major product line. We defined a major product line as the one that accounts for a significant portion of the total sales/revenue for the company. Respondents were asked to identify the major product line in their firms and then to answer questions based on that specific product line. Due to the importance of a product line for a firm's revenue, firms may treat the line's suppliers or channel partners as strategic partners, and may be willing to invest in B2B digital platform capabilities for the effective management of relationships with them.

Therefore, the empirical research context is a focal firm involved in a portfolio of supplier relationships or channel partner relationships for one of its major product lines. We collected our survey data from the focal firms and the responses represent a focal firm's view of digitally-enabled IR portfolio management for its major product lines. The unit of analysis is the portfolio of inter-organizational relationships for a major product line in a focal firm. We believe that this approach allowed us to focus on how a focal firm can effectively manage its IR portfolio through B2B digital platform, which was appropriate for our research purpose. For measuring all constructs, we asked respondents to keep in mind only those suppliers or channel partners most important to the major product line. This approach helped them focus their responses and avoid "averaging" their responses across all partners on various scale items since all firms have some partnerships that are either trivial or marginal.

3.2 Questionnaire development

Standard recommended procedures were used in the questionnaire development process (Churchill 1979; Gerbing and Anderson 1988; Straub 1989). We based the measures developed for this study on the academic and practitioner literature on inter-organizational relationships. These sources provided the foundation to construct item pools that we could use. Whenever possible, measures validated in previous studies were used and adapted to the context of the investigation. For constructs that did not exist in the literature, such as Platform Integration, Platform Reconfiguration, and Process Alignment, standard psychometric scale development procedures were followed, assuring that all measures covered the range of their concepts' meaning (Straub 1989). The questionnaire was then adapted into two versions to reflect the two types of relationship portfolio at which it was aimed.

We operationalized the key variables using multi-item formative measures. Formative indicators were considered to create a latent construct, did not co-vary, and were not necessarily interchangeable (Chin 1998; Jarvis et al. 2003). Our decision to model a construct as formative or reflective was based on the four major criteria suggested by Javis (2003): (i) direction of causality from construct to indicators, (ii) interchangeability of indicators, (iii) co-variation among indicators, and (iv) nomological net of construct indicators. We discuss the measurement items for each construct in the following sections.

3.2.1 IT capability for IR portfolio management

B2B Digital Platform Ambidexterity

B2B Digital Platform Ambidexterity is conceptualized as a non-substitutable and interdependent combination of Platform Integration and Platform Reconfiguration. Following the method used in the literature to calculate ambidexterity in empirical studies (Gibson and Birkinshaw 2004; He

and Wong 2004), we first measure Platform Integration and Platform Reconfiguration separately. Next, we calculate the B2B Digital Platform Ambidexterity by multiplying the scores associated with each of these two sub-scales.

We refer to Barua et al.'s (2004) work for the development of items for Platform Integration, though substantial changes have been made to conform to the current research setting (Table 3-2). *Platform Integration* is measured by items that focus on the ease with which the B2B digital platform can transfer data among business partners (Goodhue and Wybo 1992), provides seamless connection between different systems, has the ability to allow real-time information sharing (Bhatt 2000; Hasselbring 2000), and combines information from different sources to support decision making (Markus 2000).

Table 3-2: Measurement Items for Platform Integration (Formative Construct)

Aspect Measured	Measurement Item	Informing Source
Data access	Our platform easily accesses data from our suppliers' systems.	Goodhue (1992)
Seamless connection among applications	Our platform provides seamless connections between our suppliers' systems and our systems (e.g., forecasting, production, manufacturing, shipment, etc.)	Bhatt (2000); Hasselbring(2000)
Real-time information sharing	Our platform has the capability to exchange real-time information with our suppliers.	Bhatt (2000); Hasselbring(2000)
Information integration	Our platform easily aggregates relevant information from our suppliers' databases (e.g., operating information, supplier performance, and cost information).	Markus (2000)

Platform Reconfiguration is measured from four perspectives based on an extensive literature review. Reconfiguration means low asset specificity since the platform can be easily changed for other usage and will not lose much value if a specific relationship comes to an end (Ciborra 1996; Young-Ybarra and Wiersema 1999). A digital platform with high reconfiguration should have the potential to grow. For example, it should be able to be expanded to accommodate new

applications or functions whenever necessary (Fichman 2004; Taudes et al. 2000). Modular architectures allow for their components to be disaggregated and recombined into new configurations, bestowing greater flexibility for the system as a whole (Schilling and Steensma 2001). Adaptation at the subsystem level also becomes easy, as innovation can be achieved without undue constraints from other parts of the system (Galunic and Eisenhardt 2001). A standardized interface makes the combination of components from different sources possible and is an indispensable part of modular design (Malhotra et al. 2005). Table 3-3a presents how these four aspects of Platform Reconfiguration can be mapped to the options embedded in digital platform. Four measures have been developed to reflect these perspectives (Table 3-3b)

Table 3-3a: Linking Aspects of Platform Reconfiguration to Options Embedded in Digital Platform

Aspects of Platform Reconfiguration	Options Embedded in B2B Digital Platform				Explanation
	Switch	Abandon	Develop	Change Scale	
Relationship specificity	X				The platform with low relationship specificity can be used to support other relationships and thus generates option to switch.
Extensibility			X	X	Extensibility generates option to develop and option to change scale by allowing new applications or functions to be added incrementally.
Standardization	X				The platform complies to the widely accepted technology standards and makes it compatible with the platforms of potential partners, and thus generates option to switch.
Modularity	X	X		X	Modularity enables option to abandon and redeploy and option to switch by making the platform component reusable in other applications. It also generates option to change scale as it is easy to increase or decrease the modules used in the platform.

Table 3-3b: Measurement Items for Platform Reconfiguration (Formative Construct)

Aspect Measured	Measurement Item	Informing Source
Relationship specificity	Our platform is easily adapted to support new relationships.	Ciborra (1996); Young-Ybarra (1999)
Extensibility	Our platform can be easily extended to accommodate	Fichman (2004);

Aspect Measured	Measurement Item	Informing Source
	new applications or functions.	Taudes (2000)
Standardization	Our platform employs technology standards that are accepted by most current and potential suppliers for this product line.	Malhotra (2005)
Modularity & Reusability	Our platform consists of modular software components, most of which can be reused in other business applications.	Schilling (2001); Galunic (2001)

3.2.2 Business process capabilities for IR portfolio management

Process Alignment

The four items for *Process Alignment* measure the focal firm's capability to coordinate interdependency among partners, bring visibility to and jointly optimize the processes, and handle exceptions and errors in a timely manner (Table 3-4).

Table 3-4: Measurement Items for Process Alignment (Formative Construct)

Aspect Measured	Measurement Item	Informing Source
Interdependency coordination	We closely coordinate interdependent processes with our suppliers.	Malone (1994; 1999)
Visibility	The interdependent operating procedures and routines (e.g., manufacturing, bar-coding, packaging, shipping, etc.) are highly visible among our suppliers and us.	Barua et al. (2004); Subramani (2004)
Optimization	Related operating processes are jointly optimized with our suppliers.	Adapted from Gosain et al. (2004)
Exception and error handling	Exceptions and errors that occur during daily operations are shared with our suppliers in a timely manner.	Malone (1994; 1999)

Process Innovativeness

Process Innovativeness is operationalized as a second-order formative construct (Table 3-5). It is measured by two first-order constructs: process innovativeness to generate offering flexibility, and process innovativeness to generate partnering flexibility. *Process Innovativeness for Offering Flexibility* is measured through two items that reflect the ability of the relationship to handle changes in volume and to roll over product offerings. Similar measurement items were used by Gosain et al. (2004). This scale reflects the flexibility of the linkage – how well the focal firms are able to coordinate changes in products/services with their supply partners.

Process Innovativeness for Partnering Flexibility intends to capture the capability of the focal firm to handle changes in the relationship portfolio. Firms usually need to change their relationship portfolio to cope with changes in market and strategy. For example, when Hewlett-Packard started making ink-jet printers in the 1980s, it set up its manufacturing facility in Vancouver, Washington to serve the biggest printer market in the United States at that time. When the ink-jet technology became mature and price was the main source of competitive advantage, a new partnership in Singapore was formed to achieve economies of scale and cater to the Asian market. Three items are developed to measure the firm's capability to establish new relationships, to replace the current relationship with new ones, and to exit relationships when necessary.

Table 3-5: Measurement Items for Process Innovativeness (Second-Order Formative Construct)

Aspect Measured	Measurement Item	Informing Source
For Offering Flexibility **(Formative construct)** In comparison with industry norms, assess your process capability to do the following in conjunction with your suppliers.		
Product rollover	Rapidly phase out old products and introduce new ones.	Adapted from Gosain et al. (2004)
Demand fluctuation	Rapidly respond to change in demand for product volumes.	
For Partnering Flexibility **(Formative construct)** In terms of making the required process changes, how easy would it be for the company to do the following:		
Exit a relationship	Terminate relationship with a supplier for this product line when the market changes.	Informed by Young-Ybarra and Wiersema (1999)
Add a relationship	Add an eligible new supplier that you want to do business with for this product line.	Informed by Young-Ybarra and Wiersema (1999)
Replace a relationship	Replace a current supplier with a new one for this product line.	Adapted from Gosain et al. (2004)

3.2.3 Moderating Variables

Long-Term Governance Orientation

This scale captures the orientation of the focal firm toward using a long-term, partner-based governance strategy. The three items were adapted from Ganesan(1993) and Rai et al. (2006). They capture the focal firm's focus on long-term goals, priority on long-term relationships, and tendency to use good will and trust as the conflict solving methods (Table 3-6).

Environmental Turbulence

Subjective measures are employed to test the environmental turbulence since secondary data for this variable cannot be obtained at the major product line level. Four measures that capture the pace of customer and competitor changes, demand forecast, and technological breakthroughs are adapted from Selnes and Sallis (2003) (Table 3-6).

Table 3-6: Measurement Items for Moderating Variables

	Measurement Items	Informing Source
Long-term Governance Orientation **(Formative Construct)**		
1	Maintaining long-term relationships with our suppliers is important to us.	Adapted from Ganesan (1993)
2	We believe that goodwill and trust are at least as important as contract in solving conflicts with our suppliers.	Adapted from Rai et al. (2006)
3	We focus on long-term goals in our relationship with our suppliers.	Adapted from Ganesan (1993)
Environmental Turbulence **(Formative Construct)**		
1	Customer preferences change rapidly for this product market.	All four items adapted from Selnes and Sallis (2003)
2	There is intense competition for market share in this product market.	
3	Forecasting demand for this product is very difficult.	
4	Technological innovations have brought many new product ideas to this product market in the recent past.	

In addition, the four industries we focus on represent four different levels of environmental turbulence as defined by the work of Johnson et al (2004). Table 3-7 is adapted from Johnson et al's work that provides details on the environmental turbulence scale.

Table 3-7: Environmental Turbulence Scale Based on SIC Code

Industry and SIC Range	Turbulence Level	Nature of Turbulence
Metal fabrications and products, 3411-3499*	1	Stable on most dimensions; moderate technology change; relative stability in industry in terms of competitive activity, composition and demand.
Industrial machinery and equipment, 3511-3599	2	Reasonable new product introduction; innovation incremental in most sectors; relative stability in industry composition, competitive activity, and demand.
Chemical and allied products, 2812-2899	3	New product introduction and innovation significant in some sectors; reasonably intense competition; some alliances; relatively stable demand.
Rubber and plastics, 3011-3069*	4	Reasonable rates of innovation and new products; relatively few new entrants; some alliance activity; somewhat dynamic and growing markets.
Automotive transportation and equipment, 3711-3799	5	Frequent new product introduction and incremental innovation; intense competition; heavy alliance activity; dynamic demand.
Electronic and electric equipment, 3624-3647	6	Strong activity on multiple fronts: radical innovation, technology, new entrants, alliances, dynamic markets and demand, intense competition.

* Industry not included in this study.

3.2.4 Outcomes from IR Portfolio Management

These items focus on benefits highlighted in prior literature. Effective usage of information technology and continuous process alignment can generate *Position Exploitation Benefits* by improving cost efficiency. Real-time information sharing and a well aligned process can reduce the bullwhip effect across the supply chain, bring a higher inventory turnover rate, shorten the order-to-delivery cycle time, provide higher accuracy in order fulfillment, and lower the procurement cost. The four items that measure position exploitation benefits tap the extent to which the focal firm can gain these benefits from their relationships with partners (Selnes and Sallis 2003; Subramani 2004) (Table 3-8).

Measures of *Option Exploration Benefits* assess outcomes from process innovativeness (Table 3-8). These include product innovation/enhancement, new opportunity identification,

commercialization of new innovations, and responsiveness to new market demands (Gold et al. 2001).

Competitive Performance is focused on the focal firms' ability to capture market share, be profitable, and be innovative compared with their major competitors (Drew 1997; Lee 2003) (Table 3-8). Three objective measures — percentage of market share, margin of profitability, and sales revenue — are also included as a triangulation of the performance measures. While self-assessed scales may be criticized for their validity, subjective scales have their own merits since objective indicators cannot solicit a high level of specificity in terms of industry, time horizon, and economic conditions (Song and Parry 1997). Using self-reported performance measures is considered appropriate in this study, since we collect data at the level of specific major product line which makes it difficult to solicit secondary data. According to recent studies, subjective measures can be considered to be suitable proxies for objective measures (Wall et al. 2004). To further alleviate the concern about the validity of subjective measures, the archival data collected by E-Rewards about the firm's annual revenue were used to triangulate the self-reported sales revenue of 2005. Even if overall firm performance may not reflect the performance of any primary product lines, it is still a reasonable validation check (Barua et al. 2004).

Table 3-8: Measurement Items for Outcome Variables

	Measurement Item	Informing Source
Position Exploitation Benefits **(Formative construct)** Using the scale 0 to 100, please indicate how much you have been benefited on the following aspects, as a result of your general relationships with main suppliers of this product line.		
1	Operation costs	All four items adopted from Selnes and Sallis (2003)
2	Inventory turns	
3	Order-to deliver cycle times	
4	Order fulfillment accuracy	

	Measurement Item	Informing Source
Option Exploration Benefits **(Formative construct)** Using the scale 0 to 100, please indicate how much you have been benefited on the following aspects as a result of your general relationships with main suppliers of this product line.		
1	Innovate/enhance products	All four items adopted from Gold et al. (2001)
2	Identify new business opportunities	
3	Rapidly commercialize innovations	
4	Be responsive to new market demand	
Competitive Performance **(Formative construct)** Please compare the performance of your primary product line with that of your competitors, and indicate your performance on the following aspects.		
1	Successfulness	All five items adopted from Drew (1997) and Lee (2003)
2	Market share	
3	Profitability	
4	Growth	
5	Innovativeness	
6	Cost leadership	Suggested by practitioners

3.2.5 Control Variables

Measures for firm size, partner replaceability, and product-line lifecycle stage are adapted from prior studies. Please refer to Table 3-9 for the items used for each construct and their sources.

Table 3-9: Measurement Items for Control Variables

	Measurement Items	Informing Source
Bargaining Power **(Objective Measure)** **–** ***Firm Size***		
1	What is the annual sales revenue of your firm?	Adopted from Subramani (2004)
Supplier Replaceability **(Formative Construct)**		
1	Many suppliers can provide the same products for this product line as the current ones.	Adapted from Subramani (2004)
2	Many suppliers can provide the same margin levels as the current ones for this product line.	Adapted from Subramani (2004)
3	Many suppliers can provide the same support we need for this product line.	Adapted from Ganesan (1993)
Stage of Product Line Lifecycle **(Objective Measure)**		
1	Please indicate the stage of the lifecycle for this product line	Adopted from Anderson and Zeithaml (1984)
	_____ Introduction _____ Growth	
	_____ Maturity _____ Decline	

3.3 Questionnaire Validation

The initial version of the questionnaire went through three rounds of validation and improvement as described below.

3.3.1 Two stage sorting for validation

Originated by William Stephenson (1953), Q-sorting is widely used in social science to identify subjective segments through individual rankings and compare them for similarities. This process was further elaborated by Moore and Benbasat (1991) to include two stages: unstructured sorting and structured sorting. They used this as a means to conceptually validate constructs in their study. As our instruments to measure constructs were either collected from multiple sources and adapted to our context or developed for this study, we used the two-stage sorting process suggested by Moore and Benbasat to validate these questions. Five graduate students participated in the first stage (unstructured sorting) as sorters. We printed the 41 questions on cards and mixed them up. After giving each sorter a set of the mixed-up cards, they were asked to sort the questions by placing related questions together and to give each set of related questions a label (which made up a construct). After each sorter finished his/her work, we discussed the sorting process with them and focused particularly on misplaced items. Refinements to the questionnaire were made based on these discussions. This process helped identify ambiguously worded questions. The labels given by the sorters for the constructs corresponded very closely to the names of the actual constructs. Overall, the five sorters correctly placed more than 90 percent of the questions into the intended constructs (Table 4-2). Since reverse coded items caused most of the ambiguity, these items were reworded.

Table 3-10: Results of Unstructured Sorting Exercise

		Actual Categories													
	Target Category	1	2	3	4	5	6	7	8	9	10	11	N/A	Total	%TGT
1	Integration	18											2	20	90%
2	Reconfiguration	1	16										3	20	80%
3	Process Alignment			18									2	20	90%
4	Offering Flexibility				10									10	100%
5	Partnering Flexibility					13						2		15	86.67%
6	Position Exploitation Benefits						20							20	100%
7	Option Exploration Benefits							19					1	20	95%
8	Competitive Performance								24				1	25	96%
9	LTG Orientation					2				17			1	20	85%
10	Environmental Turbulence										19		1	20	95%
11	Supplier Replaceability					1						14		15	93.33%
	Total Item Placement: 205	Hits: 188										Overall Hit Ratio:			91.71%

Another five graduate students participated in the second stage (structured sorting) as sorters. Again, each sorter was given a set of 41 mixed-up cards with questions. Unlike the previous stage, they were given the names and definitions of the constructs. They had to sort the questions by placing each one into a construct category or a "N/A" (no fit) category. The overall hit ratio increased to over 96 percent, which indicates an improvement in item quality (Table 3-11). Discussions with the sorters about those mismatched items did not reveal any convergent concerns and the 41 questions were then consolidated into an instrument.

Table 3-11: Results of Structured Sorting Exercise

		Actual Categories													
	Target Category	1	2	3	4	5	6	7	8	9	10	11	N/A	Total	%TGT
1	Integration	20												20	100%
2	Reconfiguration	1	18										1	20	90%
3	Process Alignment			19			1							20	95%
4	Offering Flexibility				10									10	100%
5	Partnering Flexibility					14						1		15	93.33%
6	Position Exploitation Benefits						20							20	100%
7	Option Exploration Benefits						2	18						20	90%
8	Competitive Performance								25					25	100%
9	LTG Orientation									20				20	100%
10	Environmental Turbulence									1	19			20	95%
11	Supplier Replaceability											15		15	100%
	Total Item Placement: 205	Hits: 198										Overall Hit Ratio:			96.59%

3.3.2 Peer review

The resulting questionnaire was peer reviewed by a panel of academic experts (eight from the IS field and three from the marketing field) who were asked to assess content validity, format, appearance, and organization. In addition, three sales practitioners and two procurement practitioners reviewed the questionnaire and commented on the content validity, terminology, clarity of instructions, and response formats. Based on their comments, the questionnaire was adjusted and re-organized.

3.3.3 Pilot test

Two versions of the instrument were formulated for different types of relationship portfolios under investigation and pre-tested with 21 procurement professionals and 29 sales professionals to assess if the construct variances were sufficiently captured by the measures. This process resulted in refinements such as modifying items and clarifying instructions. The final measurement items are presented in the Appendix.

3.4 Data collection

Though the use of multiple informants has been advocated in a study of inter-organizational relationships (Kumar et al. 1993), several issues emerge when adopting this approach. First, it is difficult to get access to multiple qualified people in one organization. Second, the requirement for matching responses from these qualified people reduces the available data points for analysis if just one of them returns the questionnaire. Finally, it is always a problem to aggregate answers across multiple respondents (Zviran 1990). Due to these issues related to using multiple informants, we followed the key informant approach to obtain information about a firm by collecting data from one person in each organization who is highly knowledgeable about the phenomena under study (Phillips and Bagozzi 1986).

To assess the appropriateness of informants and to determine whether they met the criteria of involvement and knowledgeability, as indicated by Campbell (Campbell 1955), a short list of questions to elicit information about the respondent was included in the questionnaire. These questions helped us determine the respondent's position in the firm, number of years in that position, and percentage of time spent on supplier/channel partner-related activities. In addition, using a seven-point scale, we assessed (1) the extent to which respondents were personally involved in supplier/channel partner relationships and (2) how knowledgeable they were about their firms' dealings with suppliers/channel partners (Johnson et al. 2004). In order to ensure that a single respondent could provide accurate answers to all questions including IT-related constructs, we elicited these constructs from a functional rather than a technical perspective.

Data were collected from four industries, as discussed previously. This dataset reflected a broad presence in the overall economy. In order to have a good representation of the characteristics of supplier/channel partner relationship portfolios, we collected information about the number of dominant suppliers/channel partners for the product line, average length of relationships, and average percentage of product purchased from the top four suppliers. Then the Herfindahl Index was calculated to reflect the supplier/channel partner concentration of the relationship portfolio.

3.4.1 Sample Size

Sample size is an important issue in research design since it should be large enough to ensure adequate power at the data analysis stage. We determined the necessary sample size for our study based on the research model and analysis technique (Table 3-12).

Table 3-12: Conditions for Determining Sample Size

Aspect Considered	Required for the Study
The largest N. of formative indicators	5
Effect size	Medium ($R^2 = 0.13$)

Aspect Considered	Required for the Study
Significance level	$\alpha = 0.05$
Power level	Power = 0.80
Analysis technique	Multiple correlation Split-group analysis for moderating effects

Based on our research design, Cohen (1992) and Green (1991) have suggested a minimum sample size of 91. Moreover, recent studies on sample size issues in Partial Least Square (PLS) have recommended 150-200 responses to detect path loadings as small as 0.20 (Chin and Newsted 1999; Goodhue et al. 2006). Considering that we may need to split the sample to test the moderating effects, we set the sample size to be 300 per group.

3.4.2 Choice of marketing research institution

Considering the large scale (600 data points) and broad scope (four industries) of data collection, we used a marketing research organization to provide us access to qualified informants within individual firms. E-Rewards[2] was selected based on the following three criteria.

- Panel members that are carefully recruited and maintained: E-Rewards fully complies with the Code of Standards and Ethics for Survey Research (CASRO) guidelines to recruit and maintain their panels.
- Large business panels for the sample size: E-Rewards has 8,000 procurement professionals and over 10,000 marketing professionals in its business panel, providing us a large pool of potential respondents.
- Panel demographics representative of selected industries: The demographics of E-Rewards' panels are comparable to that of industry institutions. Table 3-13 compares E-Rewards'

[2] Company website: www.e-rewards.com (accessed on March 18, 2007)

procurement panel with Institute for Supply Management (ISM), the largest supply management association in the world.

Table 3-13: Comparing E-Rewards Panel to ISM Membership

Industry[1]	2006 ISM Membership[2]	E-Rewards Procurement Panel[3]
Accommodation and food services	1.5%	1.08%
Agriculture	0.5%	0.87%
Arts, entertainment and recreation	1.2%	1.33%
Construction	2.7%	4.41%
Education	6.0%	4.89%
Finance, insurance and real estate	4.9%	3.13%
Government (Federal, State, Local)	6.3%	9.66%
Healthcare	4.4%	6.82%
Manufacturing	38.8%	35.99%
Service	11.27%	10.07%
Transportation	3.2%	2.95%
Utility/Communication	6.8%	5.45%
Others	12.43%	13.35%
Total	100.0%	100.00%

[1] Some industries have been combined for consistency of categorization.
[2] Source: http://www.ism.ws/files/membership/MemDemReport2006.pdf (accessed on January 3, 2007).
[3] Source: Provided by E-Rewards.

3.4.3 Respondents Profile

E-mail invitations stating the purpose of the research were sent by E-Rewards to its panel members. Based on their profile, members willing to participate were directed to an online survey on either supplier relationship portfolio management or customer relationship portfolio management.

To ensure the qualification of respondents, two screening questions were set up at the beginning of the survey: (1) Are supplier/customer-related activities a major task of your daily work? (2) How many suppliers/customers do you deal with for a specific product line? Those respondents

who only deal with one supplier/customer for a specific product line or those who are only marginally involved in supplier/customer management were not invited to continue with the survey. Among the 816 sales professionals and 964 procurement professionals who received the invitation, 311 (completion rate = 38.1%) and 353 completed surveys (completion rate = 36.6%) were generated from the respective groups. Table 3-14 presents the detailed information about these participants and Table 3-15 shows the demographics of the respondents.

Table 3-14: Completion Rate

Participation Status	Supplier Dataset		Customer Dataset	
Completed	353	36.6%	311	38.1%
Disqualified	432	44.8%	315	38.6%
Unwilling to Participate	179	18.6%	190	23.3%
Total Received	964	100%	816	100%

Table 3-15: Respondents Profile

Job Title

Title	Customer Dataset		Supplier Dataset	
Sales/Procurement	107	34.41%	122	34.56%
Mid-level Manager	165	53.05%	133	37.68%
Senior Executive	25	8.04%	72	20.40%
Missing	14	4.50%	26	7.37%
Total	311	100.00%	353	100.00%

Respondents' Time Spent on Customer (Supplier) Related Activities

	Customer Dataset		Supplier Dataset	
<30%	7	2.25%	72	20.40%
30% -- 50%	13	4.18%	61	17.28%
50% -- 70%	49	15.76%	95	26.91%
70% -- 90%	133	42.77%	75	21.25%
>= 90%	100	32.15%	31	8.78%
Missing	9	2.89%	19	5.38%
Total	311	100.00%	353	100.00%

Industry of the Primary Product line

	Customer Dataset		Supplier Dataset	
Automotive equipment	65	20.90%	99	28.05%
Chemical	34	10.93%	55	15.58%
Electronic equipment	87	27.97%	90	25.50%
Industrial equipment	76	24.44%	76	21.53%
Others	43	13.83%	25	7.08%
Missing	6	1.93%	8	2.27%

Industry of the Primary Product line

	Customer Dataset		Supplier Dataset	
Total	311	100.00%	353	100.00%

Sales Revenue of the Firm

	Customer Dataset		Supplier Dataset	
<10 million	60	19.29%	92	26.06%
10 - 49.9 million	55	17.68%	43	12.18%
50 - 99.9 million	36	11.58%	14	3.97%
100 - 499.9 million	30	9.65%	39	11.05%
500 - 999.9 million	13	4.18%	39	11.05%
1 - 5 billion	23	7.40%	21	5.95%
>= 5 billion	22	7.07%	30	8.50%
Missing	72	23.15%	75	21.25%
Total	311	100.00%	353	100.00%

3.4.4 Tests for non-response bias

Two kinds of test were conducted for non-response bias. First, respondents who did not complete the survey were compared with those who did, based on the number of employees and company annual revenue (Armstrong and Overton 1977) and using ANOVA (Table 3-16). We then measured the difference between the expected and observed number of respondents over their industries using a chi-square test (Table 3-17). The purpose of this test is to detect whether observed respondents are different from expected respondents in terms of the industries represented. As our main interest is in four industries, only those responses from these four industries were included in this test. Both tests show that non-response bias is not exhibited in either dataset.

Table 3-16: ANOVA Test for Group Difference between Participated and Non-Participated Respondents

	Supplier Dataset	Customer Dataset
# of Employees	0.048	0.417
Annual Revenue	0.468	0.170

Note: p-values of the ANOVA Tests were reported in the cells

Table 3-17: Chi-Square Test for Industry Representation

a: Supplier Portfolio Dataset

	Automotive	Chemical	Electronic	Industry	Total
Completed Observed	99	55	90	76	320
Completed Expected	95.16	47.19	102.83	74.82	
Chi-Square	0.16	1.29	1.60	0.02	3.07

Not Completed Observed	149	68	178	119	514
Not Completed Expected	152.84	75.81	165.17	120.18	
Chi-Square	0.10	0.80	1.00	0.01	1.91
Total	248	123	268	195	834

Total Chi-Square Value = 3.07 +1.91 = 4.98 (Critical value = 7.81 at α=0.05, df =4)

b. Customer Portfolio Dataset

	Automotive	Chemical	Electronic	Industry	Total
Completed Observed	65	34	87	76	262
Completed Expected	60.01	39.89	91.85	70.26	
Chi-Square	0.41	0.87	0.26	0.47	2.01
Not Completed Observed	99	75	164	116	454
Not Completed Expected	103.99	69.11	159.15	121.74	
Chi-Square	0.24	0.50	0.15	0.27	1.16
Total	164	109	251	192	716

Total Chi-Square Value = 2.01 +1.16 = 3.17 (Critical value = 7.81 at α=0.05, df =4)

3.4.5 Common method bias

Since the effect of common method bias is generally acknowledged to be a major validity threat in behavioral research (Doty and Glick 1998; Podasakoff et al. 2003), special attention was paid to control for method biases from the beginning of the study design. When designing the questionnaire, we incorporated the recommended procedural remedies, including the development of concise and clear items, the use of different response formats, scale endpoints for the independent and dependent variables, and scale length control (Podasakoff et al. 2003).

After data collection, Harmon's one-factor test was conducted to investigate the common method variance (Podasakoff and Organ 1986). As expected, 11 factors were extracted from both datasets, accounting for 74.4 percent and 73.2 percent respectively for the supplier and the customer survey. The first factor contributed to 32.1 percent of variance in the supplier survey and 29.7 percent in the customer survey. This pattern suggests that common method bias is not a major concern in either dataset.

To further evaluate common method bias, we triangulated our data using different formats and different sources. First, both objective and subjective measures were used to collect data for market share and profitability, and strong correlations were found between these two sets of measures in both datasets (Table 3-18). Then, the 2005 sales revenue as reported by respondents was compared with the annual revenue information collected by E-Rewards. The correlations were 0.692 for the supplier relationship dataset and 0.646 for the customer relationship dataset. The results supported the validity of our measures for competitive performance.

Table 3-18: Correlation between Subjective and Objective Measures

	Market Share	Profitability
Supplier Survey	0.317	0.241
Customer Survey	0.490	0.219

* All results are significant at α=0.01

4 MEASUREMENT VALIDATION AND HYPOTHESES TESTING

The measurement models and structural models were analyzed using partial least squares (PLS) for confirmatory factor analysis (CFA) and hypothesis testing, respectively. Unlike a covariance-based structural equation modeling method such as LISREL, PLS employs a component-based approach for estimation purposes (Lohmoller 1988), and can handle formative constructs (Chin et al. 2003). In general, PLS is better suited for explaining complex relationships as it avoids two serious problems: inadmissible solutions and factor indeterminacy (Fornell and Bookstein 1982). Table 4-1 provides an overview of our measurement validation framework and approaches to hypothesis testing.

Table 4-1: Overview of Measurement Validation Framework and Hypothesis Testing Approaches

	Statistical Analysis Technique	Informing Source
Measurement Validation (Formative Constructs)		
Content validity	• Two-stage sorting and peer review	Suggested by Rossiter (2002)
Convergent validity	• Two-stage sorting and peer review	Suggested by Rossiter (2002)
	• Examination of the factor structure	Suggested by Hair et al. (1998) (1998) and Rozeboom (1979)
Discriminant validity	• Two-stage sorting and peer review	Suggested by Rossiter (2002)
	• Examination of the factor structure	Suggested by Hair et al. (1998) and Rozeboom (1979)
Contribution of each item	• Item weights	Suggested by Petter et al. (2007)
Test of multicollinearity	• Variance inflation factors	Suggested by Petter et al. (2007)
Hypothesis Testing		
Direct effects	• Magnitude and significance of paths computed by PLS Graph	
Mediated effects	• Comparison of the full mediation model to the partial mediation model	Suggested by Hoyle and Kenny (1999), and Subramani (2004), Rai et al (2006)
	• Mediation-analysis techniques	
Moderating effects	• Moderated regression analysis (MRA)	Suggested by Sharma et al. (1981)

4.1 Measurement validation

Since we identified all the constructs in this study as formative, we adopted different approaches to ensure the validity of the measurement than those used to validate reflective constructs. Table 4-2 presents correlations among the variables from both datasets.

Content Validity

Content validity assesses whether the researcher has chosen measures that appropriately capture the full domain of the construct (Straub et al. 2004a). We used peer review and two-step Q-sorting to ensure content validity (Boudreau et al. 2001). The two-step Q-sorting is useful to determine (1) if all of the facets of the construct are measured (i.e., content validity) and (2) if the measures for each construct belong together (i.e., convergent validity) and are distinguishable from measures of other constructs (i.e., discriminant validity). Based on the results of the Q-sorting that was reported in the previous section, conclusions can be drawn that the measurement items exhibit satisfactory content validity.

Table 4-2: Correlations

	Construct	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Integration		**0.624**	**0.598**	**0.428**	**0.226**	**0.316**	**0.280**	**0.364**	0.059	**0.168**	**0.154**	-0.045	**0.185**
2	Reconfiguration	**0.712**		**0.530**	**0.426**	**0.293**	**0.338**	**0.356**	**0.381**	**0.192**	**0.111**	**0.135**	-0.065	0.076
3	Process Alignment	**0.570**	**0.495**		**0.519**	**0.305**	**0.438**	**0.469**	**0.417**	**0.162**	**0.211**	**0.149**	**-0.142**	**0.202**
4	PI – Offering	**0.439**	**0.417**	**0.461**		**0.480**	**0.424**	**0.504**	**0.446**	**0.183**	**0.157**	**0.142**	**-0.132**	0.009
5	PI – Partnering	**0.310**	**0.324**	**0.298**	**0.584**		**0.292**	**0.371**	**0.333**	**0.133**	**0.169**	**0.210**	**-0.161**	**-0.121**
6	Position Exploitation	**0.409**	**0.358**	**0.520**	**0.435**	**0.329**		**0.620**	**0.456**	**0.142**	**0.213**	**0.179**	-0.082	**0.195**
7	Option Exploration	**0.460**	**0.414**	**0.412**	**0.483**	**0.402**	**0.645**		**0.524**	**0.156**	**0.289**	**0.113**	**-0.180**	**0.157**
8	Competitive Performance	**0.346**	**0.380**	**0.403**	**0.477**	**0.374**	**0.586**	**0.585**		**0.235**	**0.173**	0.065	**-0.262**	**0.152**
9	Long-Term Governance	**0.330**	**0.292**	**0.448**	**0.426**	**0.367**	**0.458**	**0.398**	**0.460**		**0.114**	0.001	0.005	-0.027
10	Environmental Turbulence	**0.238**	**0.199**	**0.255**	**0.261**	**0.193**	**0.262**	**0.299**	**0.287**	**0.331**		**0.334**	-0.062	-0.035
11	Partner Replaceability	**0.194**	**0.187**	**0.171**	**0.239**	**0.288**	**0.160**	**0.230**	**0.117**	**0.199**	**0.345**		-0.035	-0.100
12	Product Line Lifecycle	**-0.110**	-0.028	-0.058	**-0.124**	**-0.111**	-0.040	**-0.149**	**-0.251**	-0.096	**-0.125**	0.031		0.071
13	Firm Size	0.001	-0.043	0.053	**-0.141**	**-0.254**	-0.100	**-0.112**	**-0.113**	**-0.151**	-0.015	**-0.110**	**0.113**	

Note: Correlations for Supplier Portfolio Dataset

Correlations for Customer Portfolio Dataset

Bolded correlation is significant at $\alpha = 0.05$ (two-tailed)

Construct Validity

Although the literature provides few guidelines for establishing construct validity for formative constructs, we examined the formative constructs using three techniques: (1) factor structure, or patterns of item-to-construct correlation and correlations with other constructs; (2) weights of measurement items; and (3) variance inflation factors (VIF).

First, all loadings and cross-loadings for the formative constructs across the two datasets showed an adequate level of discriminant validity by having high loadings on the constructs they were intended to measure and low cross-loadings on the constructs they were not intended to measure (Tables 4-3 and 4-4). Second, all the weights for the formative measures are significant at the level of $\alpha = 0.01$ (Table 4-5), which means that each measurement item contributes significantly to the emergent construct (Bollen and Lennox 1991). Third, we assess multicollinearity among items, as high levels of multicollinearity in a formative measure can be problematic since the influence of each indicator on the latent construct cannot be distinctly determined (Bollen 1989; Law and Wong 1999). Current guidelines for the diagnosis of multicollinearity suggest that a variance inflation factor (VIF) larger than 4.0 may cause multicollinearity problems, while VIF over 10.0 means that multicollinearity is serious.[3] Our analysis shows that only the second item of Platform Integration (VIF=5.491 for the supplier portfolio dataset, VIF=4.573 for the customer portfolio dataset) and the third item of Option Exploration benefits (VIF=4.291 for the supplier portfolio dataset) have VIF larger than 4.0. Though these two items raised concerns of possible multicollinearity problems, we included them in the hypothesis testing since they cover important scopes of the latent variables, and thus should be included to "fully capture the construct's domain of interest" (Diamantopoulos and Winklhofer 2001).

[3] Instat Guide to Choosing and Interpreting Statistical Tests (http://www.graphpad.com/Downloads/InStat3.pdf, pg. 106) (accessed on March 18, 2007)

Table 4-3: Item-to-Construct Correlations for the Supplier Portfolio Dataset (N=353)

Construct	Item	PLIN	PLRG	PRAN	PROF	PRPF	PELT	OPER	CP	LTO	ENVT	REPM
Platform Integration (PLIN)	INTEG1	**0.90**	0.67	0.51	0.39	0.30	0.38	0.43	0.33	0.32	0.19	0.18
	INTEG2	**0.95**	0.67	0.57	0.42	0.28	0.39	0.42	0.32	0.30	0.23	0.21
	INTEG3	**0.90**	0.65	0.53	0.38	0.26	0.37	0.41	0.31	0.29	0.23	0.12
	INTEG4	**0.91**	0.63	0.48	0.43	0.30	0.36	0.43	0.32	0.31	0.22	0.21
Platform Reconfiguration (PLRG)	CONFIG1	0.62	**0.88**	0.43	0.41	0.35	0.33	0.40	0.35	0.31	0.13	0.18
	CONFIG2	0.68	**0.91**	0.47	0.40	0.30	0.35	0.39	0.36	0.27	0.18	0.19
	CONFIG3	0.67	**0.91**	0.48	0.34	0.23	0.33	0.39	0.33	0.27	0.22	0.12
	CONFIG4	0.55	**0.84**	0.38	0.31	0.26	0.27	0.28	0.30	0.18	0.18	0.17
Process Alignment (PRAN)	ALIGN1	0.48	0.46	**0.83**	0.33	0.20	0.46	0.34	0.34	0.42	0.21	0.09
	ALIGN2	0.48	0.41	**0.86**	0.40	0.23	0.39	0.35	0.30	0.35	0.27	0.17
	ALIGN3	0.54	0.45	**0.87**	0.45	0.28	0.49	0.41	0.39	0.39	0.22	0.20
	ALIGN4	0.40	0.34	**0.77**	0.35	0.27	0.40	0.29	0.32	0.33	0.14	0.09
Offering Flexibility (PROF)	OFFER1	0.42	0.40	0.44	**0.93**	0.54	0.40	0.48	0.46	0.42	0.26	0.22
	OFFER2	0.40	0.38	0.41	**0.93**	0.55	0.41	0.43	0.43	0.37	0.22	0.24
Partnering Flexibility (PRPF)	PART1	0.24	0.27	0.26	0.50	**0.85**	0.25	0.28	0.28	0.29	0.15	0.22
	PART2	0.28	0.29	0.27	0.51	**0.88**	0.36	0.42	0.38	0.36	0.18	0.24
	PART3	0.30	0.30	0.26	0.55	**0.93**	0.27	0.37	0.33	0.32	0.17	0.30
Position Exploitation (PELT)	EXPLOIT1	0.32	0.32	0.43	0.35	0.29	**0.83**	0.58	0.53	0.36	0.19	0.09
	EXPLOIT2	0.38	0.33	0.46	0.35	0.22	**0.87**	0.52	0.46	0.36	0.26	0.15
	EXPLOIT3	0.38	0.31	0.44	0.40	0.28	**0.90**	0.59	0.52	0.43	0.20	0.15
	EXPLOIT4	0.34	0.28	0.47	0.41	0.35	**0.86**	0.55	0.51	0.42	0.25	0.16
Option Exploration (OPER)	EXPLOR1	0.41	0.38	0.34	0.40	0.28	0.57	**0.89**	0.54	0.34	0.31	0.17
	EXPLOR2	0.40	0.36	0.35	0.41	0.36	0.55	**0.90**	0.50	0.41	0.24	0.20
	EXPLOR3	0.45	0.36	0.40	0.47	0.37	0.61	**0.93**	0.53	0.31	0.27	0.23
	EXPLOR4	0.41	0.41	0.41	0.48	0.45	0.62	**0.90**	0.56	0.39	0.27	0.25
Competitive Performance (CP)	COMPE1	0.29	0.31	0.33	0.32	0.23	0.40	0.46	**0.80**	0.31	0.18	0.08
	COMPE2	0.25	0.28	0.34	0.42	0.32	0.48	0.43	**0.85**	0.38	0.18	0.10
	COMPE3	0.25	0.24	0.30	0.41	0.31	0.46	0.43	**0.85**	0.33	0.22	0.05
	COMPE4	0.28	0.36	0.27	0.37	0.30	0.50	0.54	**0.81**	0.39	0.29	0.02
	COMPE5	0.32	0.32	0.38	0.44	0.36	0.53	0.51	**0.83**	0.39	0.28	0.19
Long-Term Orientation (LTO)	LTO1	0.13	0.16	0.31	0.22	0.17	0.33	0.22	0.28	**0.79**	0.19	0.03
	LTO2	0.15	0.20	0.33	0.22	0.20	0.33	0.21	0.32	**0.78**	0.17	0.02
	LTO3	0.20	0.17	0.38	0.29	0.23	0.38	0.29	0.38	**0.80**	0.19	0.06
Environment Turbulence (ENVT)	ENVT1	0.24	0.17	0.16	0.24	0.19	0.18	0.29	0.23	0.23	**0.78**	0.32
	ENVT2	0.14	0.14	0.19	0.15	0.07	0.18	0.09	0.09	0.24	**0.68**	0.28
	ENVT3	0.03	0.04	0.15	0.13	0.15	0.17	0.14	0.13	0.20	**0.74**	0.22
	ENVT4	0.28	0.23	0.26	0.25	0.16	0.24	0.34	0.38	0.31	**0.77**	0.20
Supplier Replaceability (REPM)	REPM1	0.15	0.15	0.17	0.26	0.30	0.18	0.21	0.13	0.23	0.34	**0.88**
	REPM2	0.17	0.17	0.15	0.21	0.21	0.13	0.22	0.11	0.17	0.33	**0.89**
	REPM3	0.20	0.17	0.13	0.17	0.24	0.10	0.18	0.06	0.12	0.24	**0.88**

Note: Shaded correlation is insignificant at $\alpha = 0.05$ (two-tailed)

Table 4-4: Item-to-Construct Correlations for the Customer Portfolio Dataset (N=311)

Construct	Item	PLIN	PLRG	PRAN	PROF	PRPF	PELT	OPER	CP	LTO	ENVT	REPM
Platform Integration (PLIN)	INTEG1	**0.90**	0.54	0.54	0.43	0.23	0.30	0.28	0.34	0.10	0.20	0.15
	INTEG2	**0.94**	0.56	0.57	0.37	0.19	0.31	0.25	0.34	0.06	0.17	0.17
	INTEG3	**0.88**	0.56	0.52	0.34	0.17	0.29	0.23	0.29	0.05	0.10	0.15
	INTEG4	**0.93**	0.61	0.55	0.41	0.22	0.25	0.25	0.34	0.02	0.15	0.11
Platform Reconfiguration (PLRG)	CONFIG1	0.53	**0.86**	0.42	0.37	0.32	0.21	0.24	0.32	0.21	0.06	0.10
	CONFIG2	0.57	**0.90**	0.53	0.43	0.24	0.36	0.36	0.38	0.12	0.09	0.12
	CONFIG3	0.64	**0.87**	0.53	0.36	0.19	0.29	0.33	0.34	0.14	0.15	0.10
	CONFIG4	0.41	**0.82**	0.37	0.31	0.25	0.31	0.30	0.25	0.18	0.09	0.14
Process Alignment (PRAN)	ALIGN1	0.50	0.44	**0.83**	0.44	0.27	0.35	0.44	0.36	0.18	0.20	0.12
	ALIGN2	0.48	0.42	**0.85**	0.39	0.19	0.39	0.37	0.34	0.09	0.18	0.12
	ALIGN3	0.62	0.54	**0.88**	0.45	0.27	0.39	0.41	0.41	0.10	0.22	0.20
	ALIGN4	0.41	0.38	**0.79**	0.46	0.28	0.33	0.35	0.27	0.17	0.10	0.06
Offering Flexibility (PROF)	OFFER1	0.38	0.38	0.46	**0.91**	0.44	0.40	0.49	0.42	0.14	0.23	0.14
	OFFER2	0.39	0.40	0.48	**0.89**	0.43	0.37	0.43	0.38	0.20	0.06	0.14
Partnering Flexibility (PRPF)	PART1	0.15	0.14	0.26	0.34	**0.81**	0.19	0.26	0.25	0.04	0.12	0.16
	PART2	0.16	0.32	0.23	0.48	**0.84**	0.24	0.35	0.29	0.23	0.13	0.15
	PART3	0.25	0.30	0.28	0.41	**0.90**	0.30	0.35	0.31	0.09	0.18	0.22
Position Exploitation (PELT)	EXPLOIT1	0.27	0.29	0.38	0.34	0.26	**0.78**	0.58	0.38	0.08	0.21	0.15
	EXPLOIT2	0.27	0.27	0.41	0.39	0.26	**0.87**	0.54	0.40	0.11	0.22	0.17
	EXPLOIT3	0.27	0.31	0.33	0.38	0.24	**0.88**	0.52	0.39	0.16	0.14	0.20
	EXPLOIT4	0.25	0.27	0.35	0.32	0.22	**0.84**	0.44	0.37	0.14	0.14	0.09
Option Exploration (OPER)	EXPLOR1	0.24	0.30	0.41	0.37	0.28	0.51	**0.88**	0.42	0.14	0.26	0.06
	EXPLOR2	0.20	0.30	0.38	0.38	0.33	0.50	**0.87**	0.44	0.17	0.24	0.13
	EXPLOR3	0.28	0.30	0.42	0.51	0.34	0.59	**0.91**	0.50	0.07	0.27	0.10
	EXPLOR4	0.28	0.37	0.45	0.53	0.37	0.60	**0.90**	0.50	0.18	0.25	0.12
Competitive Performance (CP)	COMPE1	0.24	0.19	0.28	0.24	0.11	0.31	0.21	**0.73**	0.10	0.01	0.01
	COMPE2	0.29	0.33	0.32	0.35	0.23	0.34	0.39	**0.77**	0.15	0.10	0.07
	COMPE3	0.30	0.31	0.30	0.38	0.29	0.34	0.41	**0.82**	0.21	0.18	0.07
	COMPE4	0.33	0.33	0.36	0.39	0.28	0.35	0.52	**0.76**	0.23	0.26	0.06
	COMPE5	0.30	0.31	0.34	0.39	0.38	0.38	0.46	**0.78**	0.17	0.20	0.15
Long-Term Orientation (LTO)	LTO1	-0.03	0.09	0.07	0.07	0.07	0.06	0.08	0.10	**0.90**	0.07	-0.02
	LTO2	0.03	0.15	0.11	0.15	0.13	0.09	0.11	0.16	**0.92**	0.11	-0.02
	LTO3	0.14	0.26	0.25	0.26	0.16	0.23	0.21	0.36	**0.89**	0.12	0.03
Environment Turbulence (ENVT)	ENVT1	0.29	0.20	0.29	0.26	0.18	0.21	0.28	0.18	-0.09	**0.74**	0.28
	ENVT2	0.10	0.10	0.10	0.11	0.09	0.17	0.18	0.12	0.30	**0.69**	0.25
	ENVT3	-0.11	-0.08	-0.01	-0.12	0.05	-0.01	0.02	-0.02	0.01	**0.62**	0.15
	ENVT4	0.16	0.08	0.19	0.17	0.13	0.21	0.31	0.19	0.13	**0.72**	0.25
Supplier Replaceability (REPM)	REPM1	0.15	0.14	0.10	0.13	0.17	0.18	0.11	0.09	0.08	0.25	**0.86**
	REPM2	0.11	0.08	0.13	0.09	0.16	0.16	0.09	0.01	-0.03	0.29	**0.89**
	REPM3	0.14	0.13	0.16	0.15	0.22	0.14	0.09	0.06	-0.05	0.33	**0.88**

Note: Shaded correlation is insignificant at $\alpha = 0.05$ (two-tailed)

Table 4-5: Item Weights

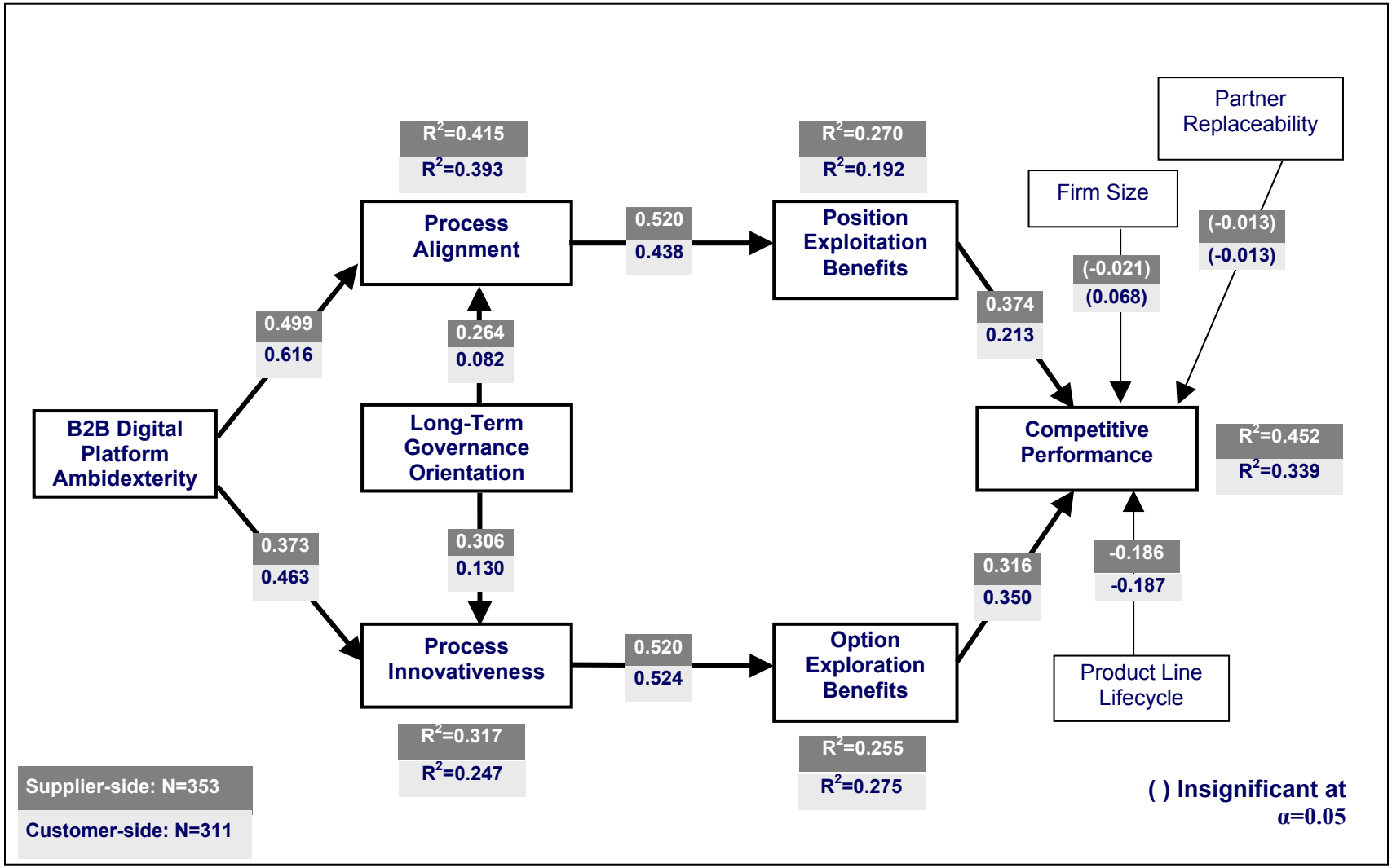
Construct	Item	Supplier Dataset*	Customer Dataset*
Platform Integration (PLIN)	INTEG1	0.2707	0.2742
	INTEG2	0.2838	0.2849
	INTEG3	0.2687	0.2666
	INTEG4	0.2727	0.2821
Platform Reconfiguration (PLRG)	CONFIG1	0.2827	0.2901
	CONFIG2	0.2913	0.3064
	CONFIG3	0.2922	0.2961
	CONFIG4	0.2699	0.2765
Process Alignment (PRAN)	ALIGN1	0.3057	0.2984
	ALIGN2	0.3121	0.3036
	ALIGN3	0.3177	0.3173
	ALIGN4	0.2701	0.2791
Offering Flexibility (PROF)	OFFER1	0.5371	0.5602
	OFFER2	0.5447	0.5682
Partnering Flexibility (PRPF)	PART1	0.3613	0.3718
	PART2	0.3749	0.3939
	PART3	0.3962	0.4162
Position Exploitation (PELT)	EXPLOIT1	0.2763	0.2664
	EXPLOIT2	0.2914	0.3032
	EXPLOIT3	0.3026	0.3135
	EXPLOIT4	0.2896	0.3003
Option Exploration (OPER)	EXPLOR1	0.2715	0.2785
	EXPLOR2	0.2754	0.2756
	EXPLOR3	0.2837	0.2878
	EXPLOR4	0.2749	0.2835
Competitive Performance (CP)	COMPE2	0.1987	0.2010
	COMPE3	0.2096	0.2187
	COMPE4	0.2116	0.2320
	COMPE5	0.1978	0.2133
	COMPE6	0.2088	0.2194
Long-Term Orientation (LTO)	LTO1	0.3651	0.3742
	LTO2	0.3709	0.3813
	LTO3	0.3631	0.3533
Environment Turbulence (ENVT)	ENVT1	0.3543	0.3743
	ENVT2	0.3059	0.3783
	ENVT3	0.3394	0.3001
	ENVT4	0.3483	0.3818
Supplier Replaceability (REPM)	REPM1	0.3758	0.3668
	REPM2	0.3841	0.3932
	REPM3	0.3782	0.3811

* All the weights are significant at $\alpha = 0.01$

4.2 Hypothesis tests

We performed hypothesis testing using data collected from surveys on the supplier relationship portfolio and the customer relationship portfolio. As PLS does not provide direct significance testing, 500 bootstrapping samples were used to estimate standard errors and to test the statistical significance of structural paths. Figure 4-1 presents the estimates of direct paths obtained from PLS analysis. The R^2 values of 0.452 for the supplier portfolio dataset and 0.339 for the customer portfolio dataset indicate that the model explains a substantial amount of variance for competitive performance. The results provide evidence for the proposed dual efficiency- real-options logic of IT value creation in relationship portfolio management. Details of the testing are reported below.

Figure 4-1: Test of the Direct Effects in DEROL Model



4.2.1 Testing direct effects in DEROL model

Hypotheses postulating direct effects among constructs (H1, H3, H4, and H6) were tested based on the magnitude and significance of paths computed by PLS.

The first two hypotheses speculated the expected effect of B2B Digital Platform Ambidexterity on Process Alignment and Process Innovativeness (Table 4-6). The results showed significant effects of B2B Digital Platform Ambidexterity on both Process Alignment and Process Innovativeness across the two datasets, thus providing support to the hypotheses.

Hypotheses H4 and H6 predicted that the more Position Exploitation Benefits and Option Exploration Benefits that can be extracted from relationship portfolio management the more competitive the firm's performance. Results showed support for the relationships across the two datasets.

Table 4-6: Path Coefficients

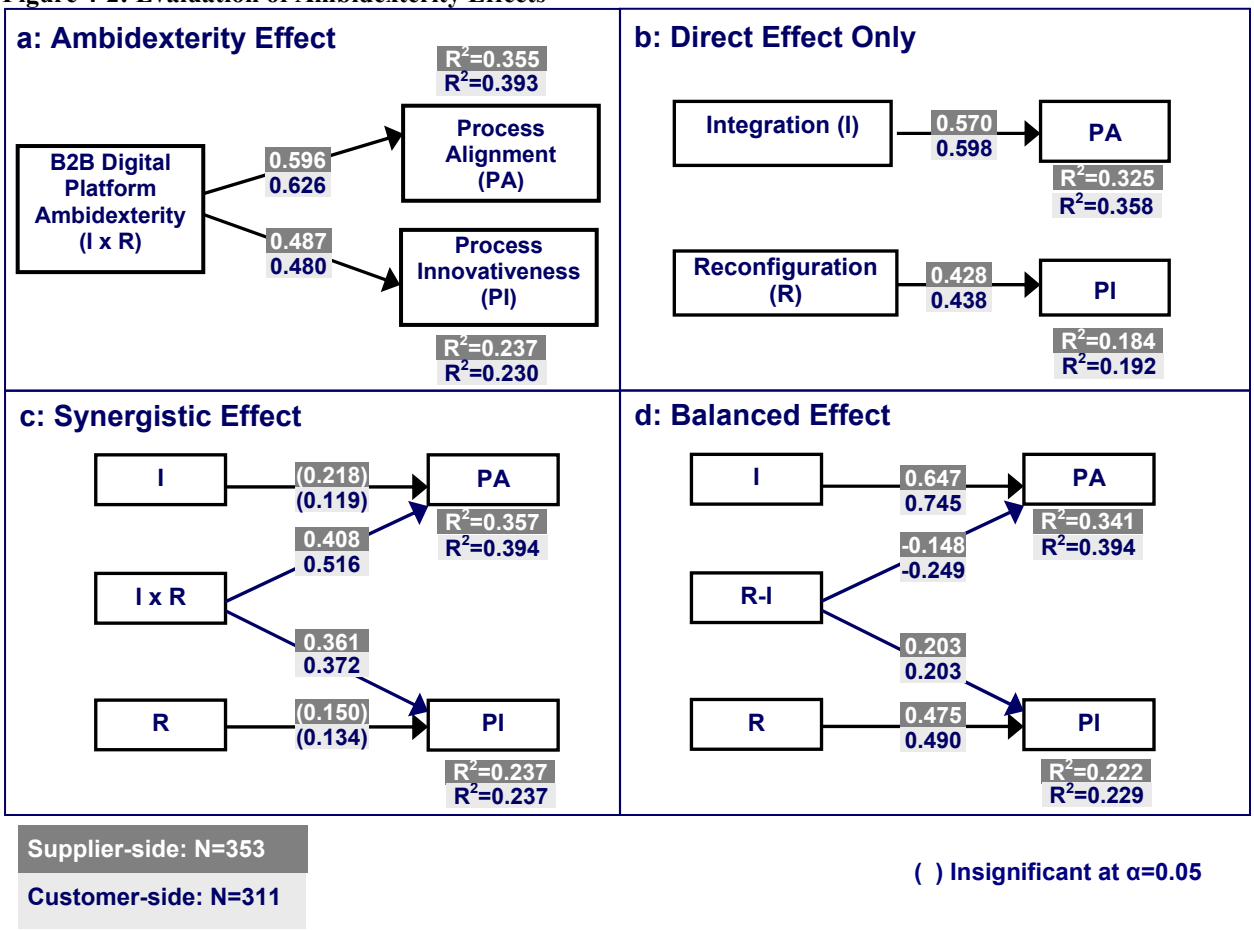
Path	Supplier Dataset (N=353)		Customer Dataset (N=311)	
	Path Coefficient	t-value	Path Coefficient	t-value
Main Effects				
Platform Ambidexterity → Process Alignment	0.499	9.96**	0.616	11.28**
Platform Ambidexterity → Process Innovativeness	0.373	5.67**	0.463	6.27**
Process Alignment → Position Exploitation	0.520	7.18**	0.438	4.18**
Process Innovativeness → Option Exploration	0.520	7.43**	0.524	5.87**
Position Exploitation → Competitive Performance	0.374	3.93**	0.213	2.38*
Option Exploration → Competitive Performance	0.316	3.61**	0.316	3.60**
Control Variables				
Firm Size → Competitive Performance	-0.021	0.41	0.068	1.28
Partner Replaceability → Competitive Performance	-0.013	0.30	-0.013	0.26
Product Line Lifecycle → Competitive Performance	-0.186	2.18*	-0.187	1.98*

Note: * = $p<0.05$, ** = $p<0.01$

4.2.2 Further evaluation of ambidexterity effects

There has been a lot of discussion and debate in the literature about the effects of ambidexterity and how it should be represented. As ambidexterity is a core concept in our research model, we conducted further analysis to evaluate its effects (Figure 4-2).

Figure 4-2: Evaluation of Ambidexterity Effects



Figures 4-2a and 4-2b compare the ambidexterity effect with direct effect. We can see that not only is the magnitude of path coefficients greater in Figure 4-2a, but the R^2 also changed a lot across both datasets. A further analysis of the R^2 changes shows that the changes are significant (Table 4-7), thus we can draw the conclusion that the ambidexterity model can better explain the variance in both process capabilities than the direct effect model. In addition, Figure 4-2c shows

that the cross-product term has significant effects on both process alignment and process innovativeness when included in the direct effect model, which provides evidence for the synergistic effects of pursuing integration and reconfiguration at the same time. Figure 4-2d shows that skewing platform capability toward reconfiguration has detrimental effects on process alignment while it increases process innovativeness.

Table 4-7: Comparison of Direct Effect Model with Ambidexterity Model

Dependent Variable	Dataset	Direct	Ambidexterity	Change in R^2	F-Test
Process Alignment	Supplier	0.325	0.355	0.030	17.45**
	Customer	0.358	0.393	0.035	18.68**
Process Innovativeness	Supplier	0.184	0.237	0.053	24.06**
	Customer	0.192	0.230	0.038	18.98**

Note: * = $p<0.05$, ** = $p<0.01$

4.2.3 Testing mediating effects

The mediation hypotheses (H2 and H5) were tested in two complementary ways. The first approach compares the research model that proposes full mediation to a competing model that proposes both direct and mediated effects, i.e., a partially mediated model of B2B digital platform ambidexterity and outcome variables. Because the two models are nested, model-comparison procedures using PLS results enable statistical conclusions to be reached regarding model fit (Baron and Kenny 1986; Hoyle and Kenny 1999). The results of this test (Table 4-8) indicated significant direct effects of B2B Digital Platform Ambidexterity on both Position Exploitation Benefits and Option Exploration Benefits in managing the supplier relationship portfolio whereas these effects were much weaker or even not significant in managing the customer relationship portfolio.

Table 4-8: Nested Model Comparison

Dataset	Direct Path	R^2 in Full Mediation	R^2 in Partial Mediation	f^2 Value[4]	Pseudo F[5]
Supplier Portfolio	Platform Ambidexterity → Position Exploitation	0.270	0.286	0.022	7.754**
	Platform Ambidexterity → Option Exploration	0.255	0.304	0.070	24.359**
Customer Portfolio	Platform Ambidexterity → Position Exploitation	0.192	0.201	0.011	3.458
	Platform Ambidexterity → Option Exploration	0.275	0.289	0.020	6.045 *

Note: * = p<0.05, ** = p<0.01

The second approach uses mediation-analysis techniques (Hoyle and Kenny 1999) to assess the significance of the mediation effects of business process capabilities on the IR portfolio management outcomes. The results of the PLS analysis – the magnitudes and the variance of the direct paths among independent variables, mediator, and dependent variables – are used to calculate the extent to which a construct mediates the relationship between the independent variable and the dependent variable. Test results indicated that Process Alignment and Process Innovativeness have strong mediation effects on the relationships between B2B Digital Platform Ambidexterity and the two types of benefits (Table 4-9).

Table 4-9: Significance of Mediated Paths from B2B Digital Platform Ambidexterity to Benefits

Dataset	Mediated Paths	Path Magnitude	Z Stat[6]
Supplier Portfolio	Platform Ambidexterity → Process Alignment → Position Exploitation	0.259	8.512**
	Platform Ambidexterity → Process Innovativeness → Option Exploration	0.188	6.865**
Customer Portfolio	Platform Ambidexterity → Process Alignment → Position Exploitation	0.269	7.888**
	Platform Ambidexterity → Process Innovativeness → Option Exploration	0.243	6.677**

Note: * = p<0.05, ** = p<0.01

[4] f^2 is calculated using the following formula: (R^2 partial mediation - R^2 full mediation)/(1- R^2 partial mediation).
[5] Pseudo $F = f^2 *$ (n-k-1). This has 1, (n-k) degree of freedom where n is the sample size and k is the number of constructs in the model.
[6] $Z = P_1 P_2 / \sqrt{P_1^2 \sigma_2^2 + P_2^2 \sigma_1^2 + \sigma_1^2 \sigma_2^2}$
(P_1 is the path coefficient of the path from x to M, P_2 is the path coefficient from M to y, and σ_1 and σ_2 are the corresponding standard deviations)

Overall, these two tests show that the effects of B2B Digital Platform Ambidexterity on the two types of benefits that can be generated from relationship management are partially mediated by Process Alignment and Process Innovativeness respectively, based on the supplier portfolio dataset. Meanwhile, data on the customer portfolios showed that the effect of B2B Digital Platform Ambidexterity on Option Exploration Benefits is partially mediated by Process Innovativeness while its effect on Position Exploitation Benefits is fully mediated by Process Alignment.

4.2.4 Testing quasi-moderating effects of long-term governance orientation

The next set of hypotheses (H7, H8a, H8b, H9, H9a, and H9b) describes the quasi moderating effects of long-term governance orientation (LTGO). In PLS, moderating effects can be tested by using subgroup analysis or interaction effects. Subgroup analysis usually causes a loss of information resulting from the artificial transformation of a continuous variable into a qualitative one (Sharma et al. 1981). The interaction effects test using PLS require a much larger sample size (Chin et al. 2003) and debate exists on how the interaction effects should be calculated in PLS and whether PLS or regression detect interaction effects better (Goodhue et al. 2007).

Due to these considerations, we switched from PLS to moderated regression analysis (MRA) to test the moderating effects (Sharma et al. 1981). This approach can maintain the integrity of a sample while providing a basis for controlling the effects of a moderating variable. Two steps are involved in this process: first, the main effects are specified in the model; second, the interaction terms are introduced. The moderating effect is manifested if the coefficients for the interaction terms are significant and the R^2 increases. Test results for the direct effects of Long-Term Governance Orientation are presented in Table 4-10, while the results of moderating effects are presented in Table 4-11.

Table 4-10: Direct Effects of Long-Term Governance Orientation (LTGO)

	Process Alignment		Offering Flexibility		Partnering Flexibility	
	Supplier	Customer	Supplier	Customer	Supplier	Customer
Constant	1.038**	2.909**	0.729	2.735**	1.408**	3.293**
LTGO	0.685**	0.248**	0.720**	0.283**	0.612**	0.200*
R^2	0.201	0.026	0.181	0.034	0.134	0.018
F	87.313**	8.259**	77.001**	10.723**	54.203**	5.560*

Note: * = p<0.05, ** = p<0.01

Table 4-11: Moderating Effects of Long-Term Governance Orientation (LTGO)

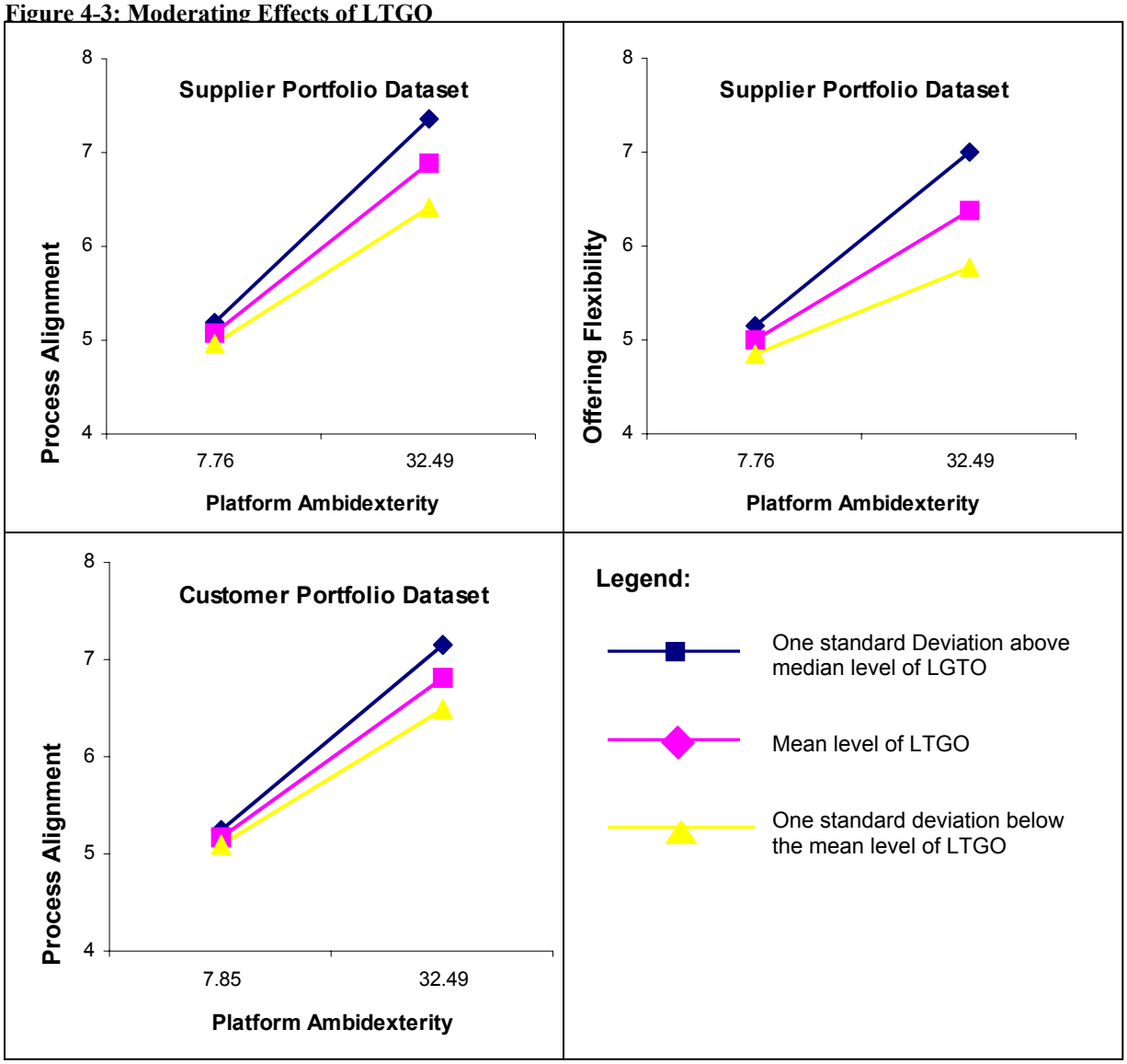
	Process Alignment		Offering Flexibility		Partnering Flexibility	
	Supplier	Customer	Supplier	Customer	Supplier	Customer
Model 1:						
Constant	4.490**	4.594**	4.535**	4.475**	4.566**	4.566**
Platform Ambidexterity	0.070**	0.064**	0.053**	0.055**	0.031**	0.409**
Model 2:						
Constant	4.514**	4.641**	4.566**	4.516**	4.580	4.580**
Platform Ambidexterity	0.073**	0.067**	0.056**	0.058**	0.034	0.426**
Ambi*LTGO	0.016**	0.012*	0.021**	0.010	0.010	-0.110
R^2	0.407	0.365	0.248	0.232	0.096	0.133
R^2 Chang	0.015	0.010	0.024	0.006	0.006	0.002
F of R^2 Chang	7.514**	5.686*	9.664**	2.629	1.870	0.703

Note: * p<0.05, ** p<0.01

In general, Long-Term Governance Orientation has significant direct effects on process capabilities across our two datasets. However, contrary to our hypothesis that posited a negative effect of Long-Term Governance Orientation on Process Innovativeness for Partnering Flexibility, we observe a positive effect of Long-Term Governance Orientation on Process Innovativeness for Partnering Flexibility. Meanwhile, we detect more significant path coefficients in the interaction term and larger changes in R^2 for the supplier portfolio dataset than those for the customer portfolio dataset. This finding suggests that the moderating effects of Long-Term Governance Orientation on the relationship between B2B Digital Platform Ambidexterity and process capabilities are much more significant for supplier portfolio dataset than for the customer portfolio dataset. We visually present the moderating effects of Long-

Term Governance Orientation on the relationships between B2B Digital Platform Ambidexterity and process capabilities for the two datasets in Figure 4-3.

Figure 4-3: Moderating Effects of LTGO



4.2.5 Testing moderating effects of environmental turbulence

The last set of hypotheses (H9 and H10) states that the moderating effects of Environmental Turbulence on the relationships between Position Exploitation and Option Exploration benefits and Competitive Performance. Table 4-12 presents the results of the moderated regression analysis.

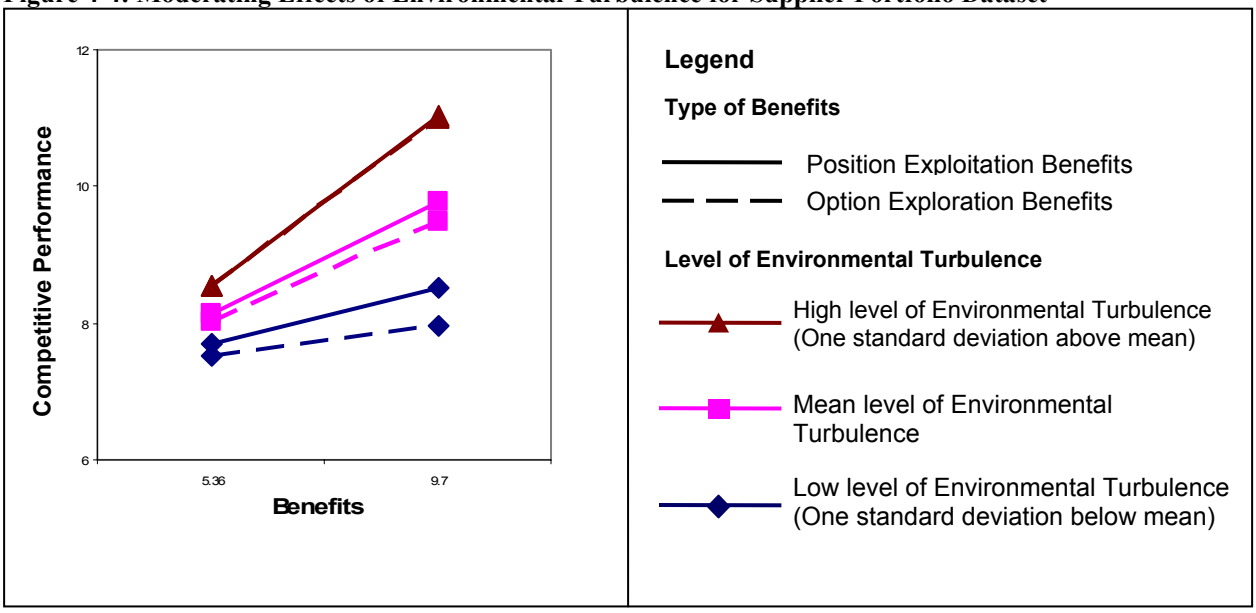
Table 4-12: Moderating Effects of Environmental Turbulence (ENV)

	Competitive Performance			Competitive Performance	
	Supplier	Customer		Supplier	Customer
Model 1:			Model 1:		
Constant	7.303**	7.537**	Constant	7.303**	7.549**
PExploit[1]	0.534**	0.367**	OExplore[2]	0.458**	0.390**
Model 2:			Model 2:		
Constant	7.306**	7.524**	Constant	7.273**	7.514**
PExploit	0.534**	0.369**	OExplore	0.460**	0.396**
PExploit*ENV	0.109*	0.026*	OExplore*ENV	0.163**	0.050
R^2	0.347	0.219	R^2	0.350	0.280
R^2 Chang	0.017	0.004	R^2 Chang	0.015	0.006
F of R^2 Chang	3.861*	1.814	F of R^2 Chang	4.176*	2.405

Note: 1. PExploit stands for Position Exploitation Benefits
2. OExplore stands for Option Exploration Benefits
3. * = $p<0.05$, ** = $p<0.01$

Based on the supplier portfolio dataset, Environmental Turbulence has a positive moderating effect on the relationship between Option Exploration Benefits and Competitive Performance. Meanwhile, Environmental Turbulence also has a positive moderating effect on the relationship between Position Exploitation Benefits and Competitive Performance, which is contrary to our hypothesized negative effect. These two moderating effects of Environmental Turbulence on the relationships between the two types of benefits and Competitive Performance are presented in Figure 4-4.

Figure 4-4: Moderating Effects of Environmental Turbulence for Supplier Portfolio Dataset



Results from the customer portfolio dataset show that the moderating effects of Environmental Turbulence are insignificant for both relationships.

4.2.6 Summary

Both the efficiency and the real options value-creation mechanisms get strong support from the supplier and customer portfolio datasets. This result provides general support for the proposed DEROL model. Tests for mediating effects indicate that Process Alignment and Process Innovativeness only partially mediate the relationships between B2B Digital Platform Ambidexterity and Position Exploitation and Option Exploration Benefits. The partially mediated effects suggest that B2B Digital Platform Ambidexterity can generate not only indirect benefits but also direct benefits. Moreover, the direct effect of B2B Digital Platform Ambidexterity is more prominent on Option Exploration Benefits than on Position Exploitation Benefits across the two datasets.

Tests for the contingent roles of Long-Term Governance Orientation and Environmental Turbulence show that these two factors have different effects on the DEROL model for the

supplier and the customer portfolio datasets. Among the three control variables, only Product Line Lifecycle has a significant effect on Competitive Performance.

5 DISCUSSION AND IMPLICATIONS

In this study, we investigated the role of B2B digital platform capabilities in a competitive environment to address firms' dual focus on exploitation and exploration benefits. Employing an ambidexterity lens and real options theory, we explored how B2B digital platform can be structured to support changing business requirements and to create value. Model testing results using empirical data collected from over four industries validated our research model. In this section, we discuss the findings of this study and their implications. We conclude our discussion with limitations and future research directions.

5.1 Summary of results

Before discussing the findings, in Table 5-1 we would like to review the overall results of the hypothesis tests.

Table 5-1: Summary of the Predictions and Results

Relationship	Hypothesis	Predicted Sign	Supplier Dataset	Customer Dataset
Platform Ambidexterity →Process Alignment (PA)	H1	+	Support	Support
Platform Ambidexterity → PA→ Position Exploitation	H2		Support	Support
Position Exploitation→ Competitive Performance	H3	+	Support	Support
Platform Ambidexterity →Process Innovativeness (PI)	H4	+	Support	Support
Platform Ambidexterity → PI→ Option Exploration	H5		Support	Support
Option Exploration → Competitive Performance	H6	+	Support	Support
Quasi Moderating Role of Long-Term Governance Orientation (LTGO)				
LTGO→ PA	H7	+	Support	Support
LTGO→ PI for Offering Flexibility	H8a	+	Support	Support
LTGO→ PI for Partnering Flexibility	H8b	-	No Support	No Support
Platform Ambidexterity × LTGO → PA	H9	+	Support	Support
Platform Ambidexterity × LTGO → PI for Offering Flexibility	H10a	+	Support	No Support
Platform Ambidexterity × LTGO → PI for Partnering Flexibility	H10b	-	No Support	No Support

Relationship	Hypothesis	Predicted Sign	Supplier Dataset	Customer Dataset
Moderating Role of Environmental Turbulence (ENV)				
ENV× Position Exploitation → Competitive Performance	H11	-	Support	No Support
ENV× Option Exploration → Competitive Performance	H12	+	Support	No Support

5.2 Findings

5.2.1 Ambidexterity effects of B2B digital platform capabilities

Previous literature suggests that the two elements constituting ambidexterity should be (i) inter-related and (ii) in tension (Abernathy 1978; He and Wong 2004; March 1991). As these two elements are inter-related, they can generate synergistic effects when pursued simultaneously. However, as they are in tension, they compete for attention and tend to drive each other out. The tendency of firms to skew their resources and attention to one side or the other can have negative effects in the long term. Drawing on the ambidexterity literature, we examined both the synergistic effect of platform integration and platform reconfiguration on process capabilities and the effect of their imbalance on process capabilities.

The test results from both datasets show that pursuing integration and reconfiguration capabilities simultaneously has a significant impact on process alignment and process innovativeness, as evidenced by strong path coefficients and high explained variances. This suggests that platform integration and reconfiguration can reinforce each other and generate synergistic effects in the long term.

We postulate that these synergistic effects come from the dynamic interactions of platform integration and platform reconfiguration, which make the platform more capable to enable, rather than constrain, the changing requirements of IR portfolio management. The options embedded in an ambidextrous digital platform generate managerial flexibility for firms to handle changes in

offering products/services and in partnering relationships. Once the options have been struck, the platform can seamlessly integrate new applications with existing functions to achieve efficiency again.

Furthermore, our results validate the imbalance effect of platform integration and platform reconfiguration. We observe that skewing the platform capability toward integration has a negative effect on process innovativeness, while skewing the platform capability toward reconfiguration has a negative effect on process alignment. Considering these two process capabilities are important for B2B digital platform capabilities to generate competitive performance, the two findings of the synergistic effect and imbalance effect of platform integration and platform reconfiguration on process capabilities provide empirical evidence on the importance of maintaining an ambidextrous B2B digital platform for sustained competitive performance.

5.2.2 The mediating role of process capabilities

The literature on IT business value specifies the mediation role of intermediate processes in realizing IT business value. For example, Soh and Markus (1995) develop a conceptual framework which posits that IT investment leads to IT assets (IT conversion process), IT assets to IT impacts (IT use process), and IT impacts to organizational performance (competitive process). Accordingly, we posited that process alignment and process innovativeness serve as important links between B2B digital platform ambidexterity and benefits that can be generated from IR portfolio management. The empirical analysis reveals that a significant portion of value from B2B digital platform ambidexterity is obtained through improved process alignment and process innovativeness.

In addition to the mediated effects, we also find that B2B digital platform ambidexterity has direct effects on both position exploitation benefits and option exploration benefits for supplier relationship management. However, for customer relationship management, this direct effect is only significant for option exploration benefits. The literature on IT business value suggests that IT can create value for organizations by automating business processes, or improving inter-process linkages, or both (Barua et al. 1995; Tallon et al. 2000). Technology can produce direct effects on performance if it automates individual business processes. If the main purpose of IT is to improve the linkages among processes, the major effects of IT should be realized through firms' capabilities to adapt their processes. Take EDI as an example. Traditionally, firms place purchasing orders by phone, fax, or even in person. EDI improves the linkages among firms by allowing them to exchange information digitally. However, its business value would be trivial if the focal firms did not have the capability to adjust the procurement processes together with their partners based on this improved information sharing ability and visibility (Clark and Stoddard 1996). As our IT artifact in this investigation is the B2B digital platform – the general technology that can support both above mentioned technology applications – it is plausible that it can generate both indirect effects through process capabilities and direct effects on performance.

Additionally, we observe that B2B digital platform ambidexterity has more significant direct effect on option exploration benefits than on position exploitation benefits across both datasets. Just as Taudes et al. (2000) illustrated in their options analysis of software platform decisions, investing in SAP R/3 opened the studied firm up to additional opportunities to introduce applications based on EDI, workflow management, document management, and e-commerce. When being struck, options embedded in the digital platform allow the focal firm to directly gain option exploration benefits, including responsiveness to new market demand and the capture of

new business opportunities. Meanwhile, though investing in SAP R/2 could still satisfy the current business needs of the focal firm, it constrained the firm's capability to keep pace with the development of technology and thus reduced the possibility that the firm could capture emerging opportunities. While Taudes et al. demonstrate the value of options through the use of mathematical models, our finding extends their work by empirically validating the value of establishing an ambidextrous B2B digital platform with embedded options.

5.2.3 Quasi-moderating role of governance strategy

Inter-organizational relationship management literature specifies relationship governance strategy as an important factor for firms to obtain benefits from their relationships with partners (Anderson and Weitz 1989; Dyer and Singh 1998). Based on the literature, we examined the quasi-moderating role of long-term governance orientation in both building process capabilities and shaping the relationships between digital platform and process capabilities.

Results from both datasets show that long-term governance orientation has significant effects on both process alignment and process innovativeness. In general, this suggests that governance orientation is an institutional structure that guides the behavior of the focal firm in the management of IR portfolio. When the focal firm has a long-term governance orientation, it tends to focus more on achieving process alignment with its partners, because a well-aligned process can generate efficiency benefits. In addition, the expectations for future cooperation and gain-sharing make the firm's dominant partners willing to accommodate changes in product or services offerings.

However, contrary to our posited hypothesis that long-term governance orientation has a negative effect on partnering flexibility, long-term governance orientation increases, rather than

reduces, the firms' capability to innovate processes for partnering flexibility. The literature on alliance formation may shed light on this contradictory result. This literature states that firms tend to rely on information from prior alliances to identify and choose new partners (Gulati and Gargiulo 1999). As long-term governance orientation cultivates trust between the firm and its partners, the focal firm may be in a good position to gain private and accurate information about possible candidates through its partners. These common third parties can also facilitate the process changes required to establish the new connections by sharing their valuable experiences with the new comers (Reagans and McEvily 2003).

Long-term governance orientation has mixed moderating effects on the relationships between B2B digital platform ambidexterity and the process capabilities. While higher long-term governance orientation enables firms to better exploit their digital platform's capability to achieve higher process alignment and higher process innovativeness for offering flexibility, this governance orientation does not significantly moderate the relationship between B2B digital platform ambidexterity and process innovativeness for partnering flexibility. Two issues may explain this lack of significant moderation. First, firms that want to maintain long-term relationships with suppliers may not consider exploring their technology capability for partnering flexibility. Second, since the effect of B2B digital platform ambidexterity on option exploration benefits is only partially mediated by process innovativeness, the moderating role of long-term governance orientation on how the B2B platform is leveraged may be too weak to be detected.

5.2.4 Moderating effects of environmental turbulence

The literature on strategic management states that diverse environments tend to value exploitation and exploration benefits differently. In accordance with this literature stream, we specified environmental turbulence as a moderating variable in our study.

The results from the supplier relationship dataset suggest that environmental turbulence has positive effects on the relationships between the two types of intermediate benefits, i.e. position exploitation benefits and options exploration benefits, and competitive performance. Though we did not detect the hypothesized negative effect of environmental turbulence on the relationship between position exploitation benefits and competitive performance, we observe larger positive effects of environmental turbulence on the relationship between option exploration benefits and competitive performance. This finding suggests that compared to position exploitation benefits, option exploration benefits contribute more to competitive performance in environments with high turbulence. Accordingly, we suggest that exploitation benefits remain very important under high environmental turbulence since intensified competitive pressures mandate firms to be efficient at any time. For example, since the launch of the iTunes music store in April 2003, other companies including Sony and Wal-Mart have started to build online stores to sell music by replicating the iTunes model. Under such rapid moves from competitors, firms that have established capabilities for innovation must also establish complementary capabilities for cost-efficiency to sustain competitive performance.

Results from the customer relationship dataset show that environmental turbulence does not influence the relationship between either type of benefits and competitive performance. Given the lack of support for these interaction effects, we speculate that environmental turbulence may not have so much influence on managing customer relationship portfolio as on managing supplier relationship portfolio. Previous studies demonstrate that customers are demanding more value, customized to their exact needs, at less cost, and as quickly as possible (El Sawy and Malhotra 1999). Our results echoed this viewpoint that the focal firms are challenged to generate

both position exploitation and option exploration benefits to achieve competitive performance from their customer relationship management no matter the level of environmental turbulence.

5.2.5 Dual logic of efficiency and real options

Drawing from the literature on IT business value and real options, we posited that a B2B digital platform could generate both position exploitation benefits through process alignment and option exploration benefits through process innovativeness.

The results from both datasets suggest that both efficiency and real options mechanisms are important to create value from B2B digital platform capabilities. Complementing the efficiency mechanism with the real options mechanism increases the explained variance of competitive performance (R^2) from 0.397 to 0.452 for the supplier relationship dataset and from 0.226 to 0.339 for the customer relationship dataset. This finding indicates that the real options logic contributes significantly to firms' competitive performance. If we neglect the options embedded in the B2B digital platform, we would then under-evaluate the business value of the technology.

Interestingly, we observe that these two mechanisms work differently for the two types of IR portfolios that we studied. In managing supplier relationship portfolios, the efficiency mechanism contributes more to firms' competitive performance, as suggested by higher path coefficients relative to the path coefficients of the real-options mechanism. Meanwhile, the real-options mechanism contributes more to firms' competitive performance in managing customer relationship portfolios. A plausible explanation for this different focus on the value creation mechanism is that customers are the drivers of innovation (Von Hippel 2005). Those firms that can better satisfy the changing preferences and requirements of customers by embedding options

in their B2B digital platform and process capabilities can outperform their counterparts who focus more on improving efficiency.

The result from the supplier relationship dataset reflects the reality in today's business world: the major initiatives in supply relationship management, including vendor managed inventory (VMI) and efficient consumer response (ECR), are all focused on improving the efficiency of the supply network. As the B2B digital platform is the supporting technology that enables these initiatives, it is reasonable that firms focus more on the efficiency mechanism when investing in and using the platform to manage their supplier relationship portfolio.

5.3 Theoretical contributions

Five primary theoretical contributions can be drawn from this study. Table 5-2 provides a summary of these contributions.

Table 5-2: Summary of Theoretical Contributions

Contribution	Explanation	Beneficiary Group
1. Generates new insights on the role of IT in relationship management by adopting a relationship portfolio approach	Firms need to maintain a portfolio of IR instead of a single one to achieve competitive performance. Unlike a single relationship, IR portfolio is more complicated and dynamic in nature. This approach provides a comprehensive and holistic view about the role of IT in relationship management.	• IS scholars who are interested in the business impact of information systems, and in theory building. • Management scholars who are interested in firms' competitive performance enabled by modern technology. • Marketing scholars who are interested in IR management.
2. Develops a dual logic of efficiency and real options for IT-enabled value creation from relationship portfolio management	The existing IT business value model focuses on the efficiency benefits of IT in a stable environment. Real options theory complements it by showing how options embedded in resources and capabilities can generate value in dynamic environment. The proposed model thus provides comprehensive evaluation of IT value creation mechanisms.	
3. Theorizes and empirically validates ambidexterity effects of B2B digital platform capabilities	Taking a dual-focused view, we argue that B2B digital platform should strike a balance between integration and reconfiguration. This viewpoint has been supported by both the supplier and customer survey, in which platform integration and reconfiguration exhibit synergistic and imbalance effects.	
4. Theorizes and empirically validates the role of process innovativeness and alignment	The results from both datasets confirmed the mediation role of process innovativeness and alignment in extracting position exploitation and	

Contribution	Explanation	Beneficiary Group
for competitive performance	option exploration benefits from IR portfolio management.	
5. Generates insights on the contingency role of governance orientation and environmental turbulence in IR portfolio management	In managing IR portfolio, long-term governance orientation has both direct and indirect effects on the establishment of process capabilities.	

While past research has focused on the management of dyadic relationships and the design of inter-organizational systems (IOS) to support them, we suggest that the focus should be on the relationship portfolio and on developing process capabilities and digital platform capabilities for managing the portfolio. This is because firms are usually involved in multiple relationships for their business processes. Compared to dyadic relationships, the IR portfolio is more dynamic in nature: partnerships themselves need to be established, maintained or terminated, while the relationship with the same partner is also subject to changes in content and strength.

All these changes in partners or partnering conditions require continuous integration and re-configuration of resources and capabilities. Thus, a simplistic approach of mapping IT integration to process alignment or mapping IT reconfiguration to process innovativeness overlooks the essential dynamic nature of IR portfolio management that the B2B digital platform should enable. By adopting a holistic relationship portfolio approach, we evaluated how technology can be leveraged within and across relationships. In so doing, we provided a more comprehensive view on the role of IT in relationship management.

Based on the need for a more dynamic approach for managing IR portfolios, we developed the DEROL model that integrates both efficiency and real options mechanisms to create value from IR portfolios. Although the literature has addressed how the integration capability of IT can generate efficiency benefits, this mechanism is inadequate to profile the B2B platform and the process capabilities that are required to manage the IR portfolio in dynamic environments. The

consolidated approach of considering both the efficiency mechanism and real options mechanism enriches our understanding of the value creation mechanisms of IT. We discover that both mechanisms represent important causal pathways for firms to achieving competitive performance, yet their effects vary in different contexts. While the efficiency mechanism contributes more to competitive performance in managing supplier relationship portfolio, the real options mechanism has larger effects on competitive performance in managing customer relationship portfolio.

Our conceptualization of the B2B digital platform with a focus on the underlying technological properties responds to the call to theorize IT artifacts (Orlikowski and Iacono 2001) and to explore these artifacts in social and organizational contexts in which they are embedded. We espouse a dynamic view of IT, where the B2B digital platform for IR portfolio management can be refined, expanded, or changed over time, as opposed to a straightforward, unchanging, and discrete technical view. By adopting a real-options perspective, we underscore the path dependency and uncertainty into the development of the options embedded in B2B platforms, and the business value that can be generated from these options in IR portfolio management. Furthermore, we find that platform integration and platform reconfiguration can generate synergistic effects when pursued together and imbalance effects when skewing the platform capability to either integration or reconfiguration. These findings highlight the value of establishing an ambidextrous digital platform that can simultaneously integrate and reconfigure IT resources in IR portfolio management.

The DEROL model is based on the premise that to capitalize on the benefits from B2B digital platforms, firms and their portfolio of partners must develop business process capabilities. In

this study, we identify two distinct process capabilities that firms should possess, i.e., process alignment and process innovativeness. The findings from both the supplier and the customer portfolio datasets indicate that an ambidextrous B2B digital platform generates a considerable portion of exploitation and exploration benefits through process alignment and process innovativeness, respectively. In addition to their role in enabling these dual mechanisms of IT value creation, the distinction between process alignment and process innovativeness calls for different resources and management attention.

Finally, we generate insights on the contingent role of governance orientation and environmental turbulence on IT business value in the context of IR portfolio management. We show that long-term governance orientation to an IR portfolio creates the conditions that favor process alignment with partners, promote offering flexibility by coordinating innovation and responsiveness, and facilitate partnering flexibility by learning about potential partners through existing partners. The findings also suggest that a long-term governance orientation promotes the appropriation of B2B digital platform capabilities for process alignment and offering flexibility. In addition to the role of governance orientation in shaping IT and process capabilities, we discover that environmental turbulence increases the value of exploration benefits in managing supplier relationship portfolio while this effect does not manifest itself in managing customer relationship portfolio. This finding suggests that firms should evaluate the environment differently whether managing the supplier or customer relationship portfolio.

5.4 Practical implications

Our findings lead to specific guidance for practice. We summarize these practical implications in Table 5-3 and elaborate them in the following pages.

Table 5-3: Summary of Practical Implications

Implications	Explanation	Beneficiary Group
1. Assess deficiencies in process innovativeness and process alignment across IR portfolio for major product lines	Process innovativeness is an important link to turn investment on B2B digital platform capabilities into competitive performance. Firms should evaluation their process capabilities to identify any deficiencies.	• Information systems designers. • Decision makers on IT investments • Supply chain management (SCM) and channel partner relationship management professionals
2. Evaluate B2B digital platform for imbalances in integration and reconfiguration capabilities	As imbalances in the integration and reconfiguration capabilities of the B2B digital platform have detrimental effects on long-term performance, firms should adopt a dual-focused view when investing on B2B digital platforms.	
3. Complement traditionally emphasized integration capability with options to develop, to abandon and redeploy, to switch, and to change scale	We identified four types of options in B2B digital platform that can bring managerial flexibilities in the future. Firms should incorporate these options in their B2B digital platform to achieve exploratory benefits.	
4. Apply the DEROL framework to isolate misalignments among B2B digital platform capabilities, governance strategies, and environmental uncertainty	There is no omnipotent digital platform that can satisfy all organizations. Firms should consider the environment they operate in and their strategic goals of IR portfolio to structure proper B2B digital platform capabilities.	

The support for the DEROL model that we obtained from the supplier and the customer relationship datasets indicates that both efficiency and real options mechanisms are vital for firms to sustain competitive performance. Our research suggests that firms can create value not only by aligning processes across their IR portfolio but also by making these processes adaptable to achieve flexibility in offering new products/services and adjusting relationships with partners. Firms traditionally have focused on process alignment to gain exploitation benefits that are more certain and reliable. However, our results suggest that top managers should carefully assess their capability to change their processes, as this can help them achieve exploration benefits. Facing increased competition and globalization, firms are better off by focusing on exploitation and exploration benefits to sustain competitive performance through IR portfolio management.

Concerning the role of B2B digital platform capabilities for achieving competitive performance, managers should embrace the dual-focused view since our findings indicate that great potential

can be realized from combining seemingly opposite forces. Our research suggests that when pursued together, the two seemingly contradictory platform capabilities, integration and reconfiguration, can generate synergistic effects. These effects come from the capability of the ambidextrous B2B digital platform to dynamically integrate – reconfigure – re-integrate IT resources and assets to support the changing requirements of IR portfolio management. Therefore, companies need to evaluate to what extent they need to invest in both platform integration and platform reconfiguration. However, they cannot ignore one or the other at any point.

To establish an ambidextrous B2B digital platform, we identify four types of options: option to develop, option to abandon and redeploy, option to switch, and option to change scale. We observe that these options enable offering flexibility and partnering flexibility when embedded in a B2B digital platform. Moreover, these options allow firms to explore opportunities with their partners and to realize competitive gains from such exploration. Based on these results, we suggest that top managers and IT practitioners should consider the appropriateness of including these options when making investment decisions related to B2B digital platforms.

Finally, the validated research model provides a basis to identify misalignments among B2B digital platform capabilities, governance orientation, and operating environment. The findings on the contingent role of governance orientation and environmental turbulence indicate that different B2B digital platform capabilities and process capabilities are required in various contexts and for different goals. Firms should understand their environmental context and governance strategy so that they can better align their IT and process capabilities to improve their performance.

5.5 Limitations and future research

While we rooted our research model in a sound and rich theoretical base and validated it with reliable survey instruments and data for both supplier and customer relationship management, certain limitations still exist.

First, we collected data from four industries that have a broad presence in the overall economy. However, these four industries are all manufacturing-related. To increase the generalizability of our research model, the model should be tested under more contexts. The context of service industries is a good candidate for future research since digitally enabled relationship management is an important component of their operations and innovations, and consequently for their long-term success.

Second, for the purpose of parsimony, we limited our attention to B2B digital platform capabilities, process capabilities, governance orientation, and environmental turbulence and their impacts on benefits. Other factors may influence the value creation mechanisms of IT in managing relationship portfolios. Recent literature suggests that culture can be an important issue for firms to consider in shaping relationships and obtaining benefits (Leidner and Kayworth 2006). This issue has attracted more and more attention as offshore outsourcing becomes a popular practice in the business world (Walsham 2002). Accordingly, future research should explore the role of culture in shaping the dual causal pathways of value from IR portfolios. This would generate great insights for those firms dealing with international suppliers and customers.

Finally, we argued that the B2B digital platform should possess both integration and reconfiguration capabilities to obtain value from IR portfolio management. However, we did not explore in detail how these two types of capabilities can be established simultaneously in B2B

digital platforms. This would be an important and interesting research topic, as we have provided solid evidence that an ambidextrous B2B digital platform can generate more value from IR portfolio management.

5.6 Conclusion

Increasingly, firms realize that maintaining a dual focus on both revenue growth and cost reduction is the only way to remain competitive. To support this dual focus, it is no longer enough for information technology to be used to simply align existing business processes across partners based on the current positioning strategy of firms. Moreover, it should be reconfigurable to respond to changing business requirements and to capture emerging opportunities.

In this study, we drew on IT business value literature and real options theory to explore how a B2B digital platform can be structured to generate both position exploitation and option exploration benefits in managing inter-organizational relationship portfolios. Using data collected from four industries, we indicate that an ambidextrous B2B digital platform, with both integration and reconfiguration capabilities, enables the focal firm to achieve competitive performance through process alignment and process innovativeness. The results further emphasize the importance of B2B digital platform ambidexterity in achieving option exploration benefits. While the basic tenets of our research model were supported, we do observe that the two causal mechanisms assume different levels of importance under various governance strategies, types of relationship portfolio, and environments. These results imply that managers involved in IT investment and relationship management should understand the dynamic nature of relationship portfolio management, evaluate their environment and strategic goals, and carefully

consider the four types of options that can be embedded in a digital platform to achieve competitive performance.

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Appendix: Questionnaires

Questionnaire for Supplier Relationship Management

Dear Sir/Madam:

You are invited to participate in our survey on supplier relationship management. The purpose of this survey is to explore how inter-organizational systems, or the B2B digital platform, can help firms to achieve both efficiency and flexibility in managing their relationship with suppliers. It will take approximately 15-20 minutes to complete the questionnaire.

As a procurement professional with years of experience in supplier relationship management, you can help us to understand how information technology and managerial practices interplay to extract benefits from supplier relationship management. Moreover, the results from this study can also provide guidelines for firms to develop proper technology and process capabilities to gain value from their relationship management.

Your responses are valuable to us and we will guarantee your confidentiality. If you have questions at any time about the survey or the procedures, you may contact Xinlin Tang at 404-463-9306 or by email at xinlin.tang@ceprin.gsu.edu. Thank you very much for your time and support.

Once you have completed the study, please allow up to 7-10 business days for your e-Rewards credit to appear in your e-Rewards account. Please start with the survey now by clicking on the Continue button below.

Xinlin Tang
Center for Process Innovation
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Atlanta, GA 30302

Georgia State University

Center for Process Innovation

Informed Consent

Title: Study on Inter-organizational Relationship Management

Principal Investigator: Arun Rai; Xinlin Tang

I. Research Purpose:

This research intends to understand the important aspects in inter-organizational relationship management. You have been invited to share your experience on relationship management.

II. Procedures:

After agreeing to this consent form, you will be asked to answer questions related to your company, your position with the company, and your managerial practice. It may take you 15-20 minutes to finish the questionnaire.

III. Risks:

There are no expected risks or discomforts associated with this study.

IV. Benefits:

Your involvement will help us to understand some important issues on inter-organizational relationship management which we hope will be helpful to you and your company in your relationship management practices with other firms.

V. Voluntary Participation and Withdrawal:

Participation in research is voluntary. You have the right to refuse to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or discontinue participation at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Your name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and reported in group form. You will not be identified personally.

VIII. Contact Persons:

Call Dr. Arun Rai at 404-651-4011 or Xinlin Tang at 404-463-9306 if you have questions about this study.

If you have questions or concerns about your rights as a participant in this research study, you may contact Susan Vogtner in the Office of Research Integrity at 404-463-0674 or svogtner1@gsu.edu.

IX. Copy of Consent Form to Subject:

Please print a copy of the consent form as record.

If you are willing to volunteer for this research, please click the "Agree" button below.

Screening Questions

1 How many suppliers do you deal with for a specific product line?

○ One ○ More than one

2 Is supplier-related activity a major component of your daily work?

○ Yes ○ No

In the following questions, please focus on the strategic business unit (SBU) you work for if you are in a large enterprise or multi-division company.

Kick-off Questions

1 Please list one primary product line that:
(a) generate a significant portion of your company/SBU's revenue, and
(b) you are most familiar with.

_____

2 Number of main suppliers for this product line.

_____

Please indicate on a seven-point scale with 1 for very litter or none, and 7 for very much

1 The extent to which you are personally involved in supplier relationships for this product line.

Very Little/None ○ ○ ○ ○ ○ ○ ○Very Much

2 How knowledgeable are you about your firm's dealings with these suppliers?

Very Little/None ○ ○ ○ ○ ○ ○ ○Very Much

All the following questions are based on your relationships with main suppliers for the primary product line you identified.

B2B Digital Platform: This refers to the base of technology capabilities that supports information exchange activities between your main suppliers and your company.

Please indicate the extent to which you agree/disagree with the following statements about your B2B digital platform.

Integration

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Our platform easily accesses data from our suppliers systems.	❑	❑	❑	❑	❑	❑	❑
2. Our platform provides seamless connection between our suppliers' systems and our systems (e.g., forecasting, production, manufacturing, shipment, etc.)	❑	❑	❑	❑	❑	❑	❑
3. Our platform has the capability to exchange real-time information with our suppliers.	❑	❑	❑	❑	❑	❑	❑
4. Our platform easily aggregates relevant information from our suppliers' databases (e.g., operating information, supplier performance, and cost information).	❑	❑	❑	❑	❑	❑	❑

Reconfiguration

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Our platform is easily adapted to include new suppliers.	❑	❑	❑	❑	❑	❑	❑
2. Our platform can be easily extended to accommodate new applications or functions.	❑	❑	❑	❑	❑	❑	❑
3. Our platform employs standards that are accepted by most current and potential suppliers for this product line.	❑	❑	❑	❑	❑	❑	❑
4. Our platform consists of modular software components, most of which can be reused in other business applications.	❑	❑	❑	❑	❑	❑	❑

Process Alignment

Please indicate the extent of your agreement with the following statements about your business processes.

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. We closely coordinate interdependent processes with our suppliers.	❑	❑	❑	❑	❑	❑	❑
2. The interdependent operating procedures and routines (e.g., manufacturing, bar-coding, packaging, shipping, etc.) are highly visible among our suppliers and us.	❑	❑	❑	❑	❑	❑	❑
3. Related operating processes are jointly optimized with our suppliers.	❑	❑	❑	❑	❑	❑	❑
4. Exceptions and errors that occur during daily operations are shared with our suppliers in a timely manner.	❑	❑	❑	❑	❑	❑	❑

Process Innovativeness

For Offering Flexibility

In comparison with industry norms, please assess your process capabilities to do the following things in conjunction with your suppliers:

	Extremely Difficult	Difficult	Slightly Difficult	Neutral	Slightly Easy	Easy	Extremely Easy
1. Rapidly phase out old products and introduce new ones.	❑	❑	❑	❑	❑	❑	❑
2. Rapidly respond to change in demanded product volumes.	❑	❑	❑	❑	❑	❑	❑

For Partnering Flexibility

In terms of making the required process changes, how easy would it be for your company to do the following things:

	Extremely Difficult	Difficult	Slightly Difficult	Neutral	Slightly Easy	Easy	Extremely Easy
1. Terminate a relationship for this product line when market changes.	❑	❑	❑	❑	❑	❑	❑
2. Add an eligible new supplier that you want to do business with for this product line.	❑	❑	❑	❑	❑	❑	❑
3. Replace a current supplier with a new one for this product line.	❑	❑	❑	❑	❑	❑	❑

Position Exploitation Benefits

Please indicate how much benefits you have received as a result of your general relationships with main suppliers of this product line.

	Little/No Benefit ========== ==========➔Great Benefit 0%	10	20	30	40	50	60	70	80	90	100%
1. Lower operation costs	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
2. Higher inventory turns	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
3. Shorter order-to-deliver cycle times	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
4. Higher order fulfillment accuracy	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Option Exploration Benefits

Please indicate how much benefits you have received as a result of your general relationships with main suppliers of this product line.

	Little/No Benefit ========== ==========➔Great Benefit 0%	10	20	30	40	50	60	70	80	90	100%
1. Innovate/enhance products	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
2. Identify new business opportunities	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
3. Rapidly commercialize innovations	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
4. Be responsive to new market demands	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Competitive Performance

Compared with the product line of key competitors, our product line

	0%	10	20	30	40	50	60	70	80	90	100%
1. Has low market share ➔Extremely high market share	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
2. Is not profitable ➔Extremely profitable	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
3. Is shrinking ➔Growing fast	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
4. Is not innovative ➔Very innovative	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
5. Is not so efficient ➔Very efficient	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Long-term Governance Orientation

Please indicate the extent of your agreement with the following statements.

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Maintaining long-term relationships with our suppliers is important to us.	❑	❑	❑	❑	❑	❑	❑
2. We believe that goodwill and trust are important in solving conflicts with our suppliers.	❑	❑	❑	❑	❑	❑	❑
3. We focus on long-term goals in our relationship with our suppliers.	❑	❑	❑	❑	❑	❑	❑

Environmental Turbulence for This Product Line

Please indicate the extent of your agreement with the following statements.

1. Customer preferences change rapidly for this product market.	❑	❑	❑	❑	❑	❑	❑
2. There is intensive competition for market share in this product market.	❑	❑	❑	❑	❑	❑	❑
3. Forecasting demand for this product market is very difficult.	❑	❑	❑	❑	❑	❑	❑
4. Technological innovations have brought many new product ideas to this product market in the recent past.	❑	❑	❑	❑	❑	❑	❑

Supplier Replaceability

Please indicate the extent of your agreement with the following statements.

1. Many suppliers can provide the same products for this product line as the current ones.	❑	❑	❑	❑	❑	❑	❑
2. Many suppliers can provide the same margin levels as the current ones for this product line.	❑	❑	❑	❑	❑	❑	❑
3. Many suppliers can provide the same support we need for this product line.	❑	❑	❑	❑	❑	❑	❑

Primary Product Line

Please provide the following information for the primary product line that you focused your responses on.

1 How many years has this product line been in operation? _____

2 What percent of your SBU/company's total revenue is generated by this product line? _____%

3 Market share of this product line. _____%

4 Gross profit margin of this product line. _____

5 How important is this product line to your SBU/company (in terms of revenue)?

Not important at all ○ ○ ○ ○ ○ ○ ○Extremely important

6 Please indicate the term that best describes the state within the product lifecycle of the product line.

○ Introduction: The products from this product line are newly introduced into market.

○ Growth: Revenue has been rising in the past three years.

○ Maturity: Revenue has been stable, without much fluctuation, in the past three years.

○ Decline: Revenue has been declining in the past three years.

Supplier Relationship

Please answer the following questions based on the primary product line you identified at the beginning of the questionnaire.

1 Average relationship length in years _____

2 Please indicate the density of your suppliers for this product line. (High density means purchasing a large amount of products from a small number of suppliers)

○	○	○	○	○	○	○
Extremely low Density			Neutral			Extremely high density

3 For the four largest suppliers (in terms of your total purchasing value) for this product line, please indicate the percentage purchased from each of them.

	Percentage of Products (in terms of your total purchasing value) Purchased from Suppliers					
Supplier #1	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%
Supplier #2	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%
Supplier #3	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%
Supplier #4	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%

Personal Profile

Please answer the following questions about yourself

1 Your current job title in the SBU/company _____

2 Number of years in this position _____

3 Approximately what percentage of your time per day is spent on all supplier-related activities? _____

Company Profile

Finally, please tell us the following about your company. If you are in a large enterprise or multi-division company, please focus on the strategic business unit (SBU) you work for.

1 Enter the name of the industry in which your SBU/Company operates in, _____. If possible, please also provide the four-digit Standard Industrial Classification (SIC) code of your SBU/company. _____

2 2005 sales revenue (in millions). _____

3 Number of employees _____

4 Please provide the SBU/company name _____

Thank You!

Thank you for your participation!

Your answers are really valuable to us. If you would like a copy of results, please call us at (404)463-9306, or send us an email to xinlin.tang@ceprin.gsu.edu.

Questionnaire for Business Customer Relationship Management

Dear Sir/Madam:

You are invited to participate in our survey on business customer/downstream distribution partner relationship management. The purpose of this survey is to explore how inter-organizational systems, or the B2B digital platform, can help firms to achieve both efficiency and flexibility in managing their relationship with business customers or downstream distribution partners. It will take approximately 15-20 minutes to complete the questionnaire.

As a marketing professional with years of experience in managing business customer/downstream distribution partner relationships, you can help us to understand how information technology and managerial practices interplay to extract benefits from customer relationship management. Moreover, the results from this study can also provide guidelines for firms to develop proper technology and process capabilities to gain value from their relationship management.

Your responses are valuable to us and we will guarantee your confidentiality. If you have questions at any time about the survey or the procedures, you may contact Xinlin Tang at 404-463-9306 or by email at xinlin.tang@ceprin.gsu.edu. Thank you very much for your time and support.

Once you have completed the study, please allow up to 7-10 business days for your e-Rewards credit to appear in your e-Rewards account.Please start with the survey now by clicking on the Continue button below.

Xinlin Tang
Center for Process Innovation
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Atlanta, GA 30302

Georgia State University

Center for Process Innovation

Informed Consent

Title: Study on Inter-organizational Relationship Management

Principal Investigator: Arun Rai; Xinlin Tang

II. Research Purpose:

This research intends to understand the important aspects in inter-organizational relationship management. You have been invited to share your experience on relationship management.

II. Procedures:

After agreeing to this consent form, you will be asked to answer questions related to your company, your position with the company, and your managerial practice. It may take you 15-20 minutes to finish the questionnaire.

III. Risks:

There are no expected risks or discomforts associated with this study.

IV. Benefits:

Your involvement will help us to understand some important issues on inter-organizational relationship management which we hope will be helpful to you and your company in your relationship management practices with other firms.

V. Voluntary Participation and Withdrawal:

Participation in research is voluntary. You have the right to refuse to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or discontinue participation at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Your name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and reported in group form. You will not be identified personally.

VIII. Contact Persons:

Call Dr. Arun Rai at 404-651-4011 or Xinlin Tang at 404-463-9306 if you have questions about this study.

If you have questions or concerns about your rights as a participant in this research study, you may contact Susan Vogtner in the Office of Research Integrity at 404-463-0674 or svogtner1@gsu.edu.

IX. Copy of Consent Form to Subject:

Please print a copy of the consent form as record.

If you are willing to volunteer for this research, please click the "Agree" button below.

Screening Questions

1 How many business customers/distribution partners do you deal with for a specific product line?

○ One ○ More than one

2 Is customer-related activity a major component of your daily work?

○ Yes ○ No

In the following questions, please focus on the strategic business unit (SBU) you work for if you are in a large enterprise or multi-division company.

Kick-off Questions

1 Please list one primary product line that:
(a) generate a significant portion of your company/SBU's revenue, and
(b) you are most familiar with.

_____

2 Number of main business customers/distribution partners for this product line.

_____

Please indicate on a seven-point scale with 1 for very litter or none, and 7 for very much

1 The extent to which you are personally involved in business customer relationships for this product line.

Very Little/None ○ ○ ○ ○ ○ ○ ○Very Much

2 How knowledgeable are you about your firm's dealings with these business customers?

Very Little/None ○ ○ ○ ○ ○ ○ ○Very Much

All the following questions are based on your relationships with main business customers/distribution partners for the primary product line you identified.

B2B Digital Platform: This refers to the base of technology capabilities that supports information exchange activities between your main business customers and your company.

Please indicate the extent to which you agree/disagree with the following statements about your B2B digital platform.

Integration

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Our platform easily accesses data from our business customers systems.	❑	❑	❑	❑	❑	❑	❑
2. Our platform provides seamless connection between our business customers' systems and our systems (e.g., forecasting, production, manufacturing, shipment, etc.)	❑	❑	❑	❑	❑	❑	❑
3. Our platform has the capability to exchange real-time information with our business customers.	❑	❑	❑	❑	❑	❑	❑
4. Our platform easily aggregates relevant information from our business customers' databases (e.g., operating information, business customer performance, and cost information).	❑	❑	❑	❑	❑	❑	❑

Reconfiguration

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Our platform is easily adapted to include new business customers.	❑	❑	❑	❑	❑	❑	❑
2. Our platform can be easily extended to accommodate new applications or functions.	❑	❑	❑	❑	❑	❑	❑
3. Our platform employs standards that are accepted by most current and potential business customers for this product line.	❑	❑	❑	❑	❑	❑	❑
4. Our platform consists of modular software components, most of which can be reused in other business applications.	❑	❑	❑	❑	❑	❑	❑

Process Alignment

Please indicate the extent of your agreement with the following statements about your business processes.

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. We closely coordinate interdependent processes with our business customers.	❑	❑	❑	❑	❑	❑	❑
2. The interdependent operating procedures and routines (e.g., manufacturing, bar-coding, packaging, shipping, etc.) are highly visible among our business customers and us.	❑	❑	❑	❑	❑	❑	❑
3. Related operating processes are jointly optimized with our business customers.	❑	❑	❑	❑	❑	❑	❑
4. Exceptions and errors that occur during daily operations are shared with our business customers in a timely manner.	❑	❑	❑	❑	❑	❑	❑

Process Innovativeness

For Offering Flexibility

In comparison with industry norms, please assess your process capabilities to do the following things in conjunction with your business customers:

	Extremely Difficult	Difficult	Slightly Difficult	Neutral	Slightly Easy	Easy	Extremely Easy
1. Rapidly phase out old products and introduce new ones.	❑	❑	❑	❑	❑	❑	❑
2. Rapidly respond to change in demanded product volumes.	❑	❑	❑	❑	❑	❑	❑

For Partnering Flexibility

In terms of making the required process changes, how easy would it be for your company to do the following things:

	Extremely Difficult	Difficult	Slightly Difficult	Neutral	Slightly Easy	Easy	Extremely Easy
1. Terminate a relationship for this product line when market changes.	❑	❑	❑	❑	❑	❑	❑
2. Add an eligible new business customer that you want to do business with for this product line.	❑	❑	❑	❑	❑	❑	❑
3. Replace a current business customer with a new one for this product line.	❑	❑	❑	❑	❑	❑	❑

Position Exploitation Benefits

Please indicate how much benefits you have received as a result of your general relationships with main business customers of this product line.

Little/No Benefit ========== ==========➔Great Benefit

	0%	10	20	30	40	50	60	70	80	90	100%
1. Lower operation costs	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
2. Higher inventory turns	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
3. Shorter order-to-deliver cycle times	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
4. Higher order fulfillment accuracy	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Option Exploration Benefits

Please indicate how much benefits you have received as a result of your general relationships with main business customers of this product line.

Little/No Benefit ========== ==========➔Great Benefit

	0%	10	20	30	40	50	60	70	80	90	100%
1. Innovate/enhance products	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
2. Identify new business opportunities	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
3. Rapidly commercialize innovations	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
4. Be responsive to new market demands	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Competitive Performance

Compared with the product line of key competitors, our product line

	0%	10	20	30	40	50	60	70	80	90	100%
1. Has low market share ➔Extremely high market share	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
2. Is not profitable ➔Extremely profitable	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
3. Is shrinking ➔Growing fast	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
4. Is not innovative ➔Very innovative	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
5. Is not so efficient ➔Very efficient	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑

Long-term Governance Orientation

Please indicate the extent of your agreement with the following statements.

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1. Maintaining long-term relationships with our business customers is important to us.	❑	❑	❑	❑	❑	❑	❑
2. We believe that goodwill and trust are important in solving conflicts with our business customers.	❑	❑	❑	❑	❑	❑	❑
3. We focus on long-term goals in our relationship with our business customers.	❑	❑	❑	❑	❑	❑	❑

Environmental Turbulence for This Product Line

Please indicate the extent of your agreement with the following statements.

1. Customer preferences change rapidly for this product market.	❑	❑	❑	❑	❑	❑	❑
2. There is intensive competition for market share in this product market.	❑	❑	❑	❑	❑	❑	❑
3. Forecasting demand for this product market is very difficult.	❑	❑	❑	❑	❑	❑	❑
4. Technological innovations have brought many new product ideas to this product market in the recent past.	❑	❑	❑	❑	❑	❑	❑

Business Customer Replaceability

Please indicate the extent of your agreement with the following statements.

1. Many business customers need the same products for this product line as the current ones.	❑	❑	❑	❑	❑	❑	❑
2. Many business customers can provide the same margin levels as the current ones for this product line.	❑	❑	❑	❑	❑	❑	❑
3. Many business customers can provide the same support we need for this product line.	❑	❑	❑	❑	❑	❑	❑

Primary Product Line

Please provide the following information for the primary product line that you focused your responses on.

1 How many years has this product line been in operation? _____

2 What percent of your SBU/company's total revenue is generated by this product line? _____%

3 Market share of this product line. _____%

4 Gross profit margin of this product line. _____

5 How important is this product line to your SBU/company (in terms of revenue)?

Not important at all ○ ○ ○ ○ ○ ○ ○Extremely important

6 Please indicate the term that best describes the state within the product lifecycle of the product line.

○ Introduction: The products from this product line are newly introduced into market.

○ Growth: Revenue has been rising in the past three years.

○ Maturity: Revenue has been stable, without much fluctuation, in the past three years.

○ Decline: Revenue has been declining in the past three years.

Business Customer Relationship

Please answer the following questions based on the primary product line you identified at the beginning of the questionnaire.

1 Average relationship length in years _____

2 Please indicate the density of your business customers for this product line. (High density means a that a small number of business customers purchases a large amount of products)

○	○	○	○	○	○	○
Extremely low Density			Neutral			Extremely high Density

3 For the four largest business customers (in terms of your total purchasing value) for this product line, please indicate the percentage purchased from each of them.

	Percentage of Products (in terms of your total purchasing value) Purchased from Business customers					
Business customer #1	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%
Business customer #2	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%
Business customer #3	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%
Business customer #4	○<1%	○1-5%	○5-10%	○10-25%	○25-50%	○>50%

Personal Profile

Please answer the following questions about yourself

1 Your current job title in the SBU/company _____

2 Number of years in this position _____

3 Approximately what percentage of your time per day is spent on all business customer-related activities? _____

Company Profile

Finally, please tell us the following about your company. If you are in a large enterprise or multi-division company, please focus on the strategic business unit (SBU) you work for.

1 Enter the name of the industry in which your SBU/Company operates in, _____. If possible, please also provide the four-digit Standard Industrial Classification (SIC) code of your SBU/company. _____

2 2005 sales revenue (in millions). _____

3 Number of employees _____

4 Please provide the SBU/company name _____

Thank You!

Thank you for your participation!

Your answers are really valuable to us. If you would like a copy of results, please call us at (404)463-9306, or send us an email to xinlin.tang@ceprin.gsu.edu.