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IS Application Capabilities and Relational Value in Interfirm Partnerships

Nilesh Saraf
Faculty of Business Administration, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia, Canada V5A 1S6, nsaraf@sfu.ca

Christoph Schlueter Langdon
Center for Telecom Management, University of Southern California, 444 South Flower Street, Los Angeles, California 90089, clangdon@marshall.usc.edu

Sanjay Gosain
Capital Group Companies, Inc., 16370 Barranca Parkway, Irvine, California 92618, gosain@gmail.com

This study examines how capabilities of information systems (IS) applications deployed in the context of interfirm relationships contribute to business performance. We propose that these capabilities augment the *relational value* that a firm derives from its business partners—channel partners and customer enterprises—in the context of the distribution channel. Two cospecialized relational assets are considered as key to realization of relational value—knowledge sharing and process coupling. Hypotheses linking two IS capabilities (IS flexibility and IS integration) to the relational asset dimensions, and ultimately to firm performance, are proposed. The research model is tested based on data collected through a survey of business units of enterprises embedded in customer and channel partner ties in the high-tech and financial services industries. We find that IS integration with channel partners and customers contributes to both knowledge sharing and process coupling with both types of enterprise partners, whereas IS flexibility is a foundational capability that *indirectly* contributes to value creation in interfirm relationships by enabling greater IS integration with partner firms. We find that two types of relational assets are significantly associated with business performance—knowledge sharing with channel partners and process coupling with customers—pointing to underlying mechanisms that differentially leverage resources of different types of channel partners. Implications for theory development and practice based on these findings are proposed.

Key words: interorganizational information systems; competitive impacts of IS; strategic management of IT; IS applications management; relational value; marketing channels
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1. Introduction

Researchers have proposed the relational view of the firm as an extension of the resource-based view. The relational view suggests that, rather than being fully housed internally, a firm's critical resources may also span its boundaries and may be embedded in interfirm routines and processes (Dyer and Singh 1998). Increasingly, IS applications are being used to enable interorganizational relationships (Hagel and Brown 2005, Schlueter Langdon 2003b). For example, firms such as Cisco and Dell have created an extended enterprise network on which they depend for their core value creation (Häcki and Lighton 2001). This network consists of a variety of external entities, including contract manufacturers, suppliers, subcontractors, and resource planners—all linked to one another through IS applications.

Our objective is to understand the sources of business value from information technology (IT) deployed in the context of interorganizational relationships. In particular, greater attention is now paid to IS applications as the layer in the IT infrastructure stack that is in most direct contact with IT users within firms (Weill and Vitale 1999). However, despite organizational efforts toward IT standardization, significant heterogeneity persists at the IS applications level because of factors such as the rapid changes in the business

environment and products markets, as well as mergers and acquisitions activity (Markus 2000). Although the role of interorganizational ISs in supporting process coordination in the extended enterprise is well understood, recent studies have also begun to characterize IS applications[1] as enabling knowledge-based process linkages with partners and thus value creation (Malhotra et al. 2005, Sambamurthy et al. 2003). To better characterize such value, we use the term *relational value* to refer to the economic rents generated within a relationship by unique combinations of complementary relation-specific resources that partnering firms bring to bear (Dyer and Singh 1998). A firm's IS applications base provides a platform for this combination of resources to occur and thus yields relational value (Bensaou and Venkatraman 1996). Given that organizations today face increasing scrutiny with respect to their IT investments, it is imperative to establish if and which specific characteristics of the IS applications contribute to better firm performance by enhancing relational value.

An emerging body of IS literature suggests the need to characterize IT investments in terms of IS *capabilities*. The IS capability of an organization is its ability to combine IS components (resources) and direct efforts toward achieving business objectives or capitalizing on business opportunities (Bharadwaj 2000). For an organization aiming to leverage its IT assets for managing its interfirm relationships, IS capabilities have to be developed to address relational challenges such as those that arise in the face of business fluctuations (e.g., changes in business partners, interfirm transaction volumes, product or process adaptations) or those that arise from the lack of integration of information across business partners.

Studies have started to examine the relational value of well-designed IS applications, but there tends to be a selective focus on specific capabilities, such as IT integration (Rai et al. 2006) or IT flexibility (Byrd and Turner 2001, Ray et al. 2005). On the one hand, research on IS in supply chains has shown that IT can lead to "electronic integration" (Hart and Estrin 1991). On the other hand, research also suggests that IS integration is not unequivocally beneficial (Gosain et al. 2004). Highly partner-specific IT investments face the risk of lock-in because they lose their value if the relationship is terminated (Hart and Estrin 1991). Therefore, apart from IS integration, particularly, in business markets, we highlight the importance of the flexibility of IS applications.

Additionally, very few studies focus on more than one type of interfirm relationship, be it with suppliers, customers, or channel partners. In reality, firms configure their relational networks to include all three types of entities; and depending on the business contingencies, they place differing emphases on generating relational value in these partnerships (Sa Vinhas and Anderson 2005). This aspect limits the generalizability of prior studies and thus limits the understanding of the role of IT in the extended enterprise. So although linking the IS applications with a single partner maybe beneficial for an enterprise, more realistically, extracting business value from IT investments in multiple business-to-business (B2B) relationships appears to be significantly more challenging. Finally, as recommended in the IS literature (Barua et al. 1995), we will identify appropriate mediating mechanisms to understand the role of IS capabilities on relational value. We pose the following research questions: *How do a firm's IS application capabilities enable relational value to be derived in conjunction with its business partners? What mediating mechanisms lead to the creation of relational value? Do these effects vary across types of business partnerships?*

The rest of the paper is organized as follows. The following section presents the theoretical development with two subsections that describe the relational assets followed by the hypotheses linking these dimensions to firm performance. The next subsection conceptualizes the capabilities of the IS applications salient to the extended enterprise and proposes hypotheses relating them to the relational assets. Section 3 describes the operationalization of constructs and data collection. Section 4 presents the results of our analysis, followed by the discussion and limitations in §5 and implications in §6.

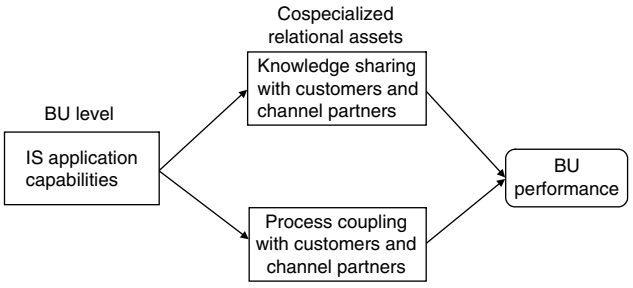
2. Theory Development

Because our study addresses value-creation activity at the interfirm level, the mediating constructs of

[1] By the term *IS application* we mean a piece of software functionality that is developed and installed on specific IT platform(s) to perform a set of one or more business tasks independently of other surrounding IS components.

interest to this study pertain to the relationship network of enterprises. The term *network* is conceptually broad, but we draw on a finer conceptualization of the relationship network (Lorenzoni and Lipparini 1996) that proposes that organizations deliberately shape and design a narrower set of tightly related partners. The intensity of exchanges is greater and the content of exchanges within this select network is richer and more varied than in other ties. In this study, these select relationships are seen as constituting the *extended enterprise* for a firm. Further, some enterprises may focus more on generating value through their customer relationships compared with their channel partner relationships, whereas others may place more emphasis on channel partner relationships (Sa Vinhas and Anderson 2005). This deliberate configuring of a relationship network also occurs in the supply chain of a firm as it maintains closer relationships with distributors and dealers of production inputs, compared with manufacturers (Weiss and Kurland 1997). Figure 1 depicts our conceptual model, which includes the two specific types of relational assets: interfirm knowledge sharing and process coupling with channel partners and customers. Relational assets mediate the link between capabilities of the IS applications and business unit (BU). It is important to note that in our theory development, we conceptualize relational value not within a (single) dyad, but we aggregate the relational value across a firm's key relationships. We do this for two reasons. One, aggregation across multiple relationships allows us to better understand the role of IS application capabilities, because IS applications are intended to help manage the vagaries of multiple relationships. Further, an "aggregate view" of relational value is also useful empirically in tracing the link between relational assets and business performance. Therefore, even though the concept of relational value was initially proposed at a dyadic level (Dyer and Singh 1998), we draw on this literature to support our theory development in the context of the favored trading partners of a focal firm.

Figure 1 Conceptual Model



Our conceptual model (Figure 1) is proposed in the context of operational relationships between firms, their customers, and their channel partners. Dyer and Singh's (1998) framework of relational value and its antecedents is general enough to apply to a variety of interfirm relationships, including scientific alliances (e.g., to share know-how) and marketing alliances (e.g., for market expansion). In IS research, these insights have been used to understand supply chain relationships, for example (Malhotra et al. 2005). Therefore, the specific context of our study allows us to exclude strategic antecedents such as complementary resources (and capabilities), effective governance of relationships, partner scarcity, resource indivisibility, and institutional environment. These antecedents are a part of Dyer and Singh's framework as well but are more salient to other types of relationships such as joint ventures and R&D collaborations. However, the relational assets in our framework closely map to Dyer and Singh's 1998 constructs: interfirm knowledge sharing routines, relation-specific assets, and interfirm asset interconnectedness. Therefore, our framework with two mediating constructs of interfirm knowledge sharing and process coupling is conveniently sparse to be tested and at the same time is theoretically grounded.

The unit of analysis in this study is a BU of a multiunit enterprise performance—where a *BU* typically focuses on a single (or select) industry segments or products of large diversified firms (per Mendelson and Pillai's [1998] definition of a BU). By focusing on a BU, we can focus on explaining variance in performance that can be specifically attributed to relational value generated through its relationships and eliminate countervailing effects that are due to aggregation across units at the corporate level that can mask underlying effects. A similar approach was taken in some earlier studies where one of the purposes behind selecting the BU level of analysis was to avoid the confounding effects of divergent business strategies (Chan et al. 1997, Massetti and Zmud 1996, Mendelson and Pillai 1998). Borrowing

from Venkatraman and Ramanujam (1986), we define business performance as organizational effectiveness of a BU in terms of its financial and operational performance relative to its competitors. In strategy literature, performance is defined depending on the stakeholder. Therefore, our theory development is based on the assumption that BUs are sufficiently independent of the corporate managers to be able to direct their IS investments and their interactions with customers and channel partners and thus influence their own performance.

2.1. Interfirm Knowledge Sharing and Firm Performance

Firms attach significant importance to knowledge sharing with business partners because they derive competitive advantage from knowledge resources embedded in their key interfirm relationships (Lorenzoni and Lipparini 1996). Depending on the business domain of the relationship, the content of knowledge exchanges varies. For instance, the major subcontractors in the Toyota network intensely exchanged knowledge about best practices and new production methods that subsequently led to a quantum improvement in the quality of Toyota products (Dyer and Nobeoka 2000). Similarly, in the sales channel context it is known that the knowledge gleaned from the key sales channel partners (distributors, logistics providers, retailers) contributes significantly to firm performance (Day 1994).

We define interfirm knowledge sharing as the extent to which an enterprise shares insights and know-how about its business context with its partners. Direct knowledge sharing with key customers will help a firm better understand market needs. Knowledge sharing with key channel partners will help the firm fine tune product offerings in conjunction with other firms that can help serve these needs (Weiss and Kurland 1997). Both these types of knowledge sharing will also lead to other outcomes, such as better responsiveness to customer needs, leading to greater customer satisfaction and loyalty (Narus and Anderson 1996), resulting in gains in long-term financial performance. Hence, we propose that:

Hypothesis 1A (H1A). *Knowledge sharing with customers positively affects BU performance.*

Hypothesis 1B (H1B). *Knowledge sharing with channel partners positively affects BU performance.*

2.2. Interfirm Process Coupling and Firm Performance

Process coupling refers to the intermeshing of activities of a focal firm with its business partners such that processes spanning firm boundaries are operationally integrated. It is an outcome of coordinated interfirm activities such that each firm works to accomplish its set of collective tasks (Van de Ven et al. 1976). This concept is similar to operational integration (Robicheaux and Coleman 1994), which is indicated by joint actions and quicker assistance with exception handling, whereas low operational integration is characterized by one-shot exchanges with reduced or no interaction or assistance after the transaction is complete.

Process coupling is derived in part from asset interconnectedness—where partners link their processes, thus adding some degree of specificity to the relationship or cospecialization in the degree to which a firm invest in assets specific to its relationships with key trading partners (Dyer and Singh 1998). A tightly coupled system consists of interdependent elements so joined that a disturbance in any one element requires a readjustment in other elements (Orton and Weick 1990). As against a *decoupled* system, tight coupling also requires a merging of the elements such that they lose their distinctiveness. Drawing from this conceptualization, a tightly coupled (or coordinated) business process between a seller and a customer is one in which the seller responds to the idiosyncrasies in the customer's processes. Process coupling, however, may or may not be associated with sharing of knowledge that is more strategic in nature.

Past studies suggest that process coupling is challenging and takes significant time and resources. If a firm wants to terminate a given relationship and initiate a relationship with another firm, it will again have to restructure its interfaces with the new partner and make the required organizational changes (Gosain et al. 2004). Further, an initial level of relation-specific investment makes additional relation-specific investment more viable. This is so especially in the key B2B relationships of firms. Such relationships involve a process of continuous enactment of routines and

thus result in experiential learning. Partners engage in "congruent sense making" processes to result in an incremental adaption of their processes (Ring and Van de Ven 1994). It is this path-dependent nature of process coupling that provides competitive advantage to firms by precluding quick imitation and replication by competitors (Dyer and Singh 1998).

Tightly coupled relationships become a source of value to partners because they form the basis on which their joint capabilities are exploited (Dyer and Singh 1998). For example, highly coupled channel partners can help a supplier launch and market newer products swiftly in response to competitive moves (Van Camp 2004), or they can provide a quick response to customer problems (El Sawy and Bowles 1997). This is not to argue that coupling processes tightly with their partners is unequivocally beneficial to firms, because that may constrain them operationally in executing their strategic plans (Gosain et al. 2004). However, overall, the importance of process coupling as a cospecialized relational asset is evident from past instances of failures of collaborative agreements, attributed to coordination or communication breakdowns at organizational boundaries (Tucker 2004).

In sales channel relationships, process coupling can take the form of channel partners setting aside inventory to satisfy preferred customers or sellers adjusting their production schedule to accommodate the demand from preferred channel partners and customers, instant rerouting of shipments, rapid repricing of product bundles to favor the customers, etc. Such adaptations take place seamlessly and without delay, as in the case of Enterprise Rent-A-Car's implementation of an automated rental management system (ARMS) (Premkumar et al. 2004). This has tangibly increased Enterprise's market share in the B2B insurance segment. Hence, we propose that:

Hypothesis 2A (H2A). *Process coupling with customers positively affects BU performance.*

Hypothesis 2B (H2B). *Process coupling with channel partners positively affects BU performance.*

2.3. IS Application Capabilities

As IT increasingly enables interfirm relationships, IS application capabilities are an obvious set of organizational variables that need to be managed. The IS literature suggests that the outcomes of myriad IS management processes—such as standardization initiatives (Dewan et al. 1995), enterprise software implementations (Markus 2000), and incremental IS development and maintenance—can be expressed in terms of the overall IS application capability constructs (Sambamurthy et al. 2003, Schlueter Langdon 2006), such as the reach-range framework (Keen 1991), interface integration in the EDI context (Truman 2000), or IT infrastructure integration (Rai et al. 2006).

In literature the two capabilities of IS integration and IS flexibility can be viewed as representing efficiency and flexibility, which conceptually are considered as at odds with each other (Adler et al. 1999). This mirrors the paradox between the need for adaptability in interfirm links versus the need to maintain rich integration (Gosain et al. 2004). Therefore, considering both these constructs in our model is essential if we want to test our intuition that IS flexibility and IS integration together balance an organization's need to maintain adaptable electronic links with multiple business partners and at the same time maintain sufficient richness in the electronic links so as to support creation of relational assets.

2.4. IS Integration

We define IS integration as the extent to which the IS applications of a focal firm work as a functional whole in conjunction with the IS applications of its business partners. Whereas other prior frameworks (Broadbent et al. 1999) measure the capability of the enterprisewide infrastructure to internally integrate diverse IS components, we restrict our notion of IS integration to the interfirm interface. Also, integration is assessed in *functional* terms without reference to governance outcomes such as vertical or business integration (Zaheer and Venkatraman 1994). Further, we refer to functional IS integration at higher levels (the functional application level), which subsumes integration at the lower levels of the technology stack (such as network or hardware). Finally, there are multiple approaches with which IS integration may be achieved internally by firms (Markus 2000). The same approaches can be used for external IS integration with suppliers, customers, and other business partners. Thus, our definition of IS integration refers to

the aggregate result of a combination of any of these technological approaches, including not just technical compatibility of software applications at the code level but also IT skills that render a higher degree of IS integration at the functional levels. Unlike in the earlier decades, when external integration was achieved using primarily EDI technology, nowadays a large number of IT components support external IS integration and offer a variety of functional features (Straub and Watson 2001).

A high level of IS integration can be characterized by data, once captured by a firm, being immediately accessible by its partners. This involves not just syntactic integration between the databases or implementing a single enterprisewide database, but it also requires integration at the semantic level as well (Yang and Papazoglou 2000). It is only when such semantic integration exists that interorganizational IS applications can be integrated to process orders, collaboratively forecast sales, project earnings, or share customer data.

IS integration with customer enterprises allows a focal enterprise's business processes that deliver value to customers to be intermeshed with consumption processes at the customer end. This can be done in a variety of ways, including joint forecasting, buffering inventories for customers, managing logistics, and transportation (Rai et al. 2006). For instance, the American Hospital Supply Corporation's case (Short and Venkatraman 1992) illustrates how Baxter's hospital ordering system was used to respond to the needs of customers and improve their internal supplies management. The higher level of IS integration, achieved by the supplier (Baxter), resulted in higher efficiency of ordering, tracking, and managing supplies; in addition, it also helped customers eventually eliminate many manual steps. Hence, we expect,

Hypothesis 3A (H3A). *IS integration positively affects process coupling with customers.*

Hypothesis 3B (H3B). *IS integration positively affects process coupling with channel partners.*

The knowledge-based view of the firm emphasizes that the ability of organizations to create cross-functional and interfirm capabilities helps in knowledge integration (Grant 1996). A high level of IS integration across firms forms the basis of a critical organizational capability—that of acquiring, transforming, mixing, and matching knowledge objects across firms and business partners. The impact of IS integration on knowledge creation is well known at the firm level. In a qualitative study that explores the impact of integrated systems on cross-functional knowledge flows, D'Adderio (2003) views the activity of integrating IS as essentially promoting communication and coordination of viewpoints by imposing similar product and process representations throughout the organization or by enhancing shared meanings. Recent interfirm-level literature suggests why IS integration helps enhance knowledge sharing, and not just to automate business activities. In the context of a supply chain, Malhotra et al. (2005) describe how integration through standardized interfaces reduces the effort required to process valuable information from supply chain partners. IS applications connecting firms not only *automate* repetitive, supply chain-related tasks in real time but also provide "latitude to focus on richer, higher value-adding information exchange" (p. 10). Similarly, using the theoretical anchors of knowledge and insights, Christaanse and Venkatraman (2002) study how American Airlines' usage of its electronic reservation system enabled it to exploit the expertise of their travel agents. We propose that by making available large quantities of high-quality and reliable information through IS integration, it becomes easier for firms to harness the resources of their partners or customers and generate richer insights about the market. Hence:

Hypothesis 4A (H4A). *IS integration positively affects knowledge sharing with customers.*

Hypothesis 4B (H4B). *IS integration positively affects knowledge sharing with channel partners.*

2.5. IS Flexibility

Flexibility connotes the ability of an organization to incur relatively small penalties for departure from an optimal configuration of assets (Carlsson 1989). Depending on which functional area they are deployed for, flexible assets enable an organization to withstand fluctuations in its customer demand, changes in products or manufacturing processes, or changes in partners. In supply chains, flexible business processes may render a firm relatively immune to changes in partners (Gosain et al. 2004). We view such flexibility in terms of changing products or

partners as dimensions of organizational flexibility, defined as "the ease with which organizations' structures and processes can be changed" (Huber and McDaniel 1986, p. 583). Just as organizational flexibility is of strategic importance, our interest lies in examining the link between flexibility of IS applications and the (relational) value derived from interfirm relationships.

Flexibility has often been recognized as an important aspect of how IS applications are configured. In the IS literature, an enterprise possessing flexible IS applications lowers its IT-related costs when its products, environment, or partners change. Thus, in our paper, IS flexibility refers to the ability to quickly and economically adapt the IS applications to changing business requirements (Kumar 2004, Schlueter Langdon 2006).

However, the value of IS flexibility to organizations depends on the type of business requirements that can emerge either at the operational level or at the tactical or strategic level. For example, if the ability to switch business partners quickly is important, then IS flexibility generates business value by lowering the costs of switching business partners (Gosain et al. 2004); if the ability to scale up the volume of transactions with partners or to adapt the interfirm business processes is important, then IS flexibility can generate value by enabling such local adjustments in the IT assets. This results in better alignment of IT applications across partners. This notion of flexibility is echoed by Duncan (1995), who notes that "the ideally flexible infrastructure would be one that was designed to evolve, itself, with emerging technologies and [that] would support the continuous redesign of business and related IS processes" (1995, p. 44). We borrow the definition of IS flexibility proposed by Nelson and Ghods (1998) as "the ability of the IT assets to adapt to both incremental and revolutionary changes in the business or business process with minimal penalty to current time, effort, cost, or performance" (p. 233).

Several initiatives led by internal IT organizations underlie the flexibility of IS applications. For example, selection of standardized lower-level IT infrastructure components such as operating systems, networking components, or IT architectures (Allen and Boynton 1991, Dietrich et al. 2007) can help maintain flexibility of IS applications. These are labeled as the structural elements of the IS flexibility that pertain to the design and organization of the artifacts constituting IT in organizations (Nelson and Ghods 1998). Apart from such structural elements, IS flexibility is also enabled by the processes managed by the internal IT organization, such as expertise creation through training of IT staff or creation of governance standards that pertain to the rate of response of IT support activities (Nelson and Ghods 1998).

Despite the importance of IS flexibility to business operations, we argue that flexibility per se does not directly lead to the creation of relational assets; rather it facilitates integration—making IS applications specific to each partner. Such incremental change and improvement, also termed as adaptation, of IT applications for specific partners is important because it is the relationship-specific nature of assets that leads to relational value for partnering firms (Dyer and Singh 1998). That is, we propose that the link from IS flexibility to relational assets is mediated by IS integration with customer and channel partners.

However, just because IS flexibility can help achieve higher IS integration at the application level does not mean that partner organizations will attempt to maintain these linkages. For this to happen, the organizations have to be *willing* to link their IS applications electronically. We argue that such incentives are created because flexible IS applications lower the risk to a focal firm that it will be locked into an unprofitable relationship because of partner-specific IT deployments. In transaction costs literature the risk that partner-specific investments pose to organizations is that its value will be lost once the relationship is terminated (Williamson et al. 1996). This renders firms vulnerable to opportunism by their partners. Therefore, we propose that higher IS flexibility increases not only the ability, but also the willingness of organizations to integrate the applications more tightly. Specifically,

Hypothesis 5A (H5A). *IS flexibility positively affects IS integration with customers.*

Hypothesis 5B (H5B). *IS flexibility positively affects IS integration with channel partners.*

2.6. Control Variables

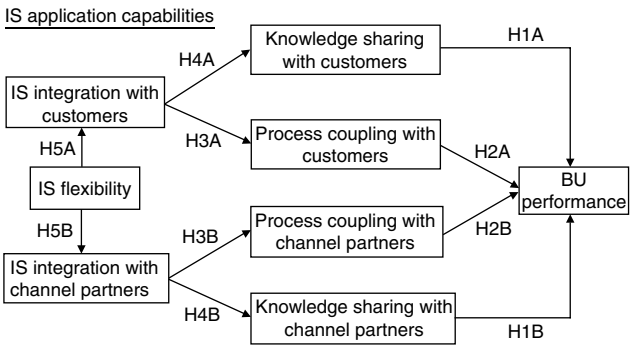
We also control for market orientation and firm size in explaining business unit performance.

2.6.1. Market Orientation. Past literature suggests that market-oriented firms can be expected to perform better than other firms (Kohli and Jaworski 1990). It is important to control for market orientation in the sales channel context because organizations differ in their tendency to derive value from their selling activities. For example, some firms may place more emphasis on quality improvements and cost cutting in their supply chains than on generating revenues from their sales channels. Market orientation is the organizationwide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organizationwide responsiveness to it (Santos and Eisenhardt 2004). A consistent view is that market orientation is a "state of mind" of the organization or its philosophy of business management, or, alternately, it is *recognition of* the importance of customer focus and intelligence gathering. A highly market-oriented organization is likely to have a significant stock of market intelligence and to recognize the importance of reaching and retaining customers, either directly or indirectly through channel partners.

2.6.2. Firm Size. Larger firms have a higher level of resources that can lead to differences in relative performance. Multi-unit firms with significantly larger revenues have considerable clout to coerce their partners in sharing knowledge; they also have significant slack to outperform competitors.

Figure 2 illustrates the research model.

Figure 2 Research Model



3. Research Design

A questionnaire was developed for a single-respondent, cross-sectional survey-based data-collection effort with the BU as the level of analysis. Our research employs an *embedded* design (Phillips and Bagozzi 1986) in which the BU is seen as embedded in a network of relationships that impact its performance. Though a multiple-respondent, longitudinal study would provide a stronger basis to claim our hypothesized effects, a single-respondent, cross-sectional design was chosen to maintain an acceptable response rate.

B2B sales executives were targeted for answering our survey because we framed our research model in the sales channel context. Specifically, the selected respondents were mid-level managers; they are the ones who are most likely to be aware of tactical as well as operational details. This follows the key informant approach, where the individual within the organization who is most knowledgeable about the aspects of the topic is selected (Sabherwal and Chan 2001, Wall et al. 2004). Because our model addresses the interfirm level, and in the marketing context business partners can be either customers or channel partners, we used two sets of questions, with one set referring to the channel partnerships and the other referring to the customer relationships. To ensure that a single respondent could provide accurate answers to all questions, we kept the questions as broad as possible, and the IT-related constructs were elicited from a functional rather than a technical perspective. Those who did not have sufficient knowledge about *both* types of relationship and the BU's IS applications were asked to leave the questionnaire incomplete and were then excluded from further analysis. A pretest of our survey instrument was carried out with practitioners and doctoral students.

3.1. Measures

Most of the scales were adapted from prior literature. For measuring all constructs (except for IS flexibility, market orientation, and performance), the respondents were asked to keep in mind only those customers (channel partners) most important to their BUs. This helped avoid respondents' "averaging" their responses across *all* partners (see Table 1 for scales). Further, considering that the target respondents were from the high-tech and financial services-

Table 1 Construct Operationalization

Construct name Abbreviation Composite reliability Type of scale	Indicators [VARIABLE NAME] (Item loadings in PLS output) (1 = *Strongly disagree,* 2 = *Somewhat disagree,* 3 = *Neutral,* 4 = *Somewhat agree,* 5 = *Strongly agree*)
Business unit performance (PERFORM) 0.910 Reflective	Over the past 3 years, our BU's financial performance has exceeded our competitors'. [PERFORM1] (0.9051) The past 3 years have been more profitable than our competitors'. [PERFORM2] (0.9292) Over the past 3 years, our BU's sales growth has exceeded our competitors'. [PERFORM3] (0.7973)
Market orientation (MORT) 0.864 Reflective	Business strategies are driven by the goal of increasing customer value. [MORT1] (0.9351) We emphasize "putting customers first" throughout our BU. [MORT2] (0.7178) Our philosophy of doing business is driven by the need of putting customers first. [MORT3] (0.8107)
Please indicate the extent to which you agree or disagree with the following statements describing your BU's ties with its large accounts and channel partners only. Examples can include remote maintenance, systems monitoring, etc.	
Process coupling with customers (PROCCST) 0.865 Reflective	Our way of doing business is closely linked with our customers'. [PROCCST1] (0.7977) The business procedures and routines of our business unit are highly coupled with the ones of our customers. [PROCCST2] (0.8571) Some of our operations are closely connected with the ones of our customers. [PROCCST3] (0.8286) To operate efficiently, we rely on procedures and routines of our customers. [PROCCST4] (0.6469) *Dropped item:* To facilitate operations, our BU's business procedures and routines are linked with the ones of our customers.
Process coupling with channel partners (PROCCP) 0.90 Reflective	To facilitate operations, our BU's business procedures and routines are linked with the ones of our channel partners. [PROCCP1] (0.81111) Our way of doing business is closely linked with our channel partners. [PROCCP2] (0.8644) The business procedures and routines of our business unit are highly coupled with the ones of our channel partners. [PROCCP3] (0.8108) Some of our operations are closely connected with the ones of our channel partners. [PROCCP4] (0.7413) To operate efficiently, we rely on procedures and routines of our channel partners. [PROCCP5] (0.7774)
Questions below pertain to your BU and its relationships with channel partners and customers. Please indicate the extent to which you agree or disagree with the following statements about your largest channel partners and large accounts.	
Knowledge sharing with customers (KSCST) 0.863 Reflective	We frequently share knowledge about our business environment (e.g., other business relationships) with our customers. [KSCST1] (0.7999) Knowledge about all of our channel partners, competitors, etc., is shared with our other customers. [KSCST2] (0.8972) Business insights are exchanged between us and our other customers. [KSCST3] (0.7672)
Knowledge sharing with channel partners (KSCP) 0.912 Reflective	We frequently share knowledge about our business environment (e.g., other business relationships) with our channel partners. [KSCP1] (0.8811) Knowledge about all of our channel partners, competitors, etc., is shared with our other channel partners. [KSCP2] (0.9041) Business insights are exchanged between us and our other channel partners. [KSCP3] (0.8547)
Because the questions in this section pertain to your IS capabilities, we welcome the inputs of your IS personnel in answering this section. Please indicate the extent to which you agree or disagree with the following statements: In terms of channel partners and customers, only consider your largest ones.	
IS integration with customers (INTCST) 0.797 Reflective	Data are entered only once to be retrieved by most applications of our customers. [INTCST1] (0.6181) We can easily share our data with our customers. [INTCST2] (0.7737) We have successfully integrated most of our software applications with the ones of our customers. [INTCST3] (0.8572) *Dropped items*: (i) Most of our software applications work seamlessly across our customer. (ii) Software applications on multiple machines of multiple vendors are interoperable with each other across our customers.
IS integration with channel partners (INTCP) 0.897 Reflective	Data are entered only once to be retrieved by most applications of our channel partners. [INTCP1] (0.7433) We can easily share our data with our channel partners. [INTCP2] (0.7529) We have successfully integrated most of our software applications with the ones of our channel partners [INTCP3] (0.8367) Most of our software applications work seamlessly across our channel partners [INTCP4] (0.8631) Software applications on multiple machines of multiple vendors are interoperable with each other across our channel partners [INTCP5] (0.7829)
Flexibility (FLEX) 0.932 Reflective	The manner in which the components of our information systems are organized and integrated allows for rapid changes. [FLEX1] (0.8607) Our information systems are highly scalable. [FLEX2] (0.8474) Our information system is designed to support new business relationships easily. [FLEX3] (0.8922) Our information systems are designed to accommodate changes in business requirements quickly. [FLEX4] (0.9161)

related sectors, we expected their actual business context to be highly diverse, such that creating a formative scale grounded in their actual decision context was not possible. Our extensive review of literature did not lead to any past scale suitable for our purposes. Therefore, we created reflective scales that leave room for the respondents to interpret the items in their specific context before responding. During pretests and face-to-face interviews with professionals, these scales were further refined prior to finalizing the survey instrument.

3.1.1. Business Performance (PERFORM). We refer to business performance in terms of the overall financial performance relative to competitors. Because of a diversity of industries in our sample, there is no single objective measure comparable across the entire sample. Perceptual measures afford comparability across firms (during data analysis) and accordingly can be considered appropriate proxies for objective measures (Chan et al. 1997, Grewal and Tanushaj 2001, Homburg and Pflesser 2000, Matsuno et al. 2002). To address the sales channel context of this study, we included items that captured the extent to which a respondent's BU performed better than its competitors in terms of sales growth, profits, overall financial performance, company reputation, and return on investment. This initial set of five items was adapted from a survey of prior studies (Hansen 2002, Tsai 2002).

3.1.2. Knowledge Sharing (KSCST and KSCP). Knowledge sharing entails sharing insights and understanding of the business context with business partners. Scales for knowledge-related constructs need to be very specific to the context. A number of prior studies helped us to develop the five-item reflective scale. Examples scales are interunit knowledge sharing (Dyer 1996), degree of information sharing (Monczka et al. 1998), and information sharing (Cannon and Perreault 1999, Robicheaux and Coleman 1994). However, to avoid semantic overlap with the scale items for IS integration, the items for the knowledge sharing were worded so as to capture the intelligence aspect of the exchange rather than exchange of raw sales data.

3.1.3. Process Coupling (PROCCST and PROCCP). A reflective scale was developed from prior literature on operational-integration in the sales channel context (Hasselbring 2000, Yang and Papazoglou 2000). The items were developed keeping in mind the conceptual difference between knowledge sharing and process coupling. Care was taken not to word the scale exclusively in terms of information-based coordination but in terms of operational procedures and routines.

3.1.4. IS Integration (INTCST and INTCP). Five reflective scale items were initially identified based on the literature on workflow and Internet-based applications that stresses interoperability and from Truman's (2000) EDI-related scale on internal integration. The dimensions most referred to in the current literature on integration are application and data integration (Markus 2000), which are captured by our measures. The scale items essentially focus on the seamlessness with which data and applications interoperate across BU boundaries and channel partners or customers. It is to be noted that rather than capturing the list of various technological solutions implemented by organizations to integrate their BUs (e.g., ERP, EAI, data warehousing), we used outcome-based measures to capture the degree of IS integration.

3.1.5. IS Flexibility (FLEX). A four-item reflective scale was constructed that captures the extent to which the IS applications can be adapted quickly to the changes in business requirements, including partnerships and volume of business. The items broadly cover three aspects of flexibility: operational, tactical, and strategic. The operational dimension pertains to short-run business requirements, tactical dimension refers to scalability, and strategic dimension refers to changing products or relationships (Carlsson 1989).

Market orientation was operationalized using a reflective scale based on past research (Kohli and Jaworski 1990, Slater and Narver 1995). The high-level construct of market orientation has three dimensions: customer focus, competitor focus, and interfunctional coordination. Because our objective is to use this construct as a control variable, and because customer orientation is the "heart of market orientation" (Slater and Narver 1994), two of our scale items tap the customer dimension. The third item taps the strategic effort that a firm exerts to satisfy its customers' needs. We excluded the intelligence-gathering dimension from this scale so as not to overlap with the knowledge-sharing construct. The scale items were therefore created solely to measure the overall

importance a firm attaches to its selling goals. Firm size was operationalized in terms of revenue at the corporate level.

3.2. Data Collection

Data collection for this study was done in three waves and targeted BUs of enterprises mainly in the high-tech (computing) and the financial services sector. A sample was drawn from three different sources: (i) a respondent database maintained by an academic research center, (ii) a database of member companies of the Cellular Telecommunications Industry Association (CTIA), and (iii) a database maintained by a market research agency. The sample excluded companies whose revenue figures were very small (less than $15 million). Most respondents varied in their designations, and included director of marketing, vice president of marketing, sales executives, sales managers, and new product development manager. One of the coauthors spoke briefly to each of them before seeking their response to the questionnaire. We found that being users of various types of marketing and sales ISs, most respondents were knowledgeable about the customer and channel partner-related IS applications and data-level integration issues. Those who denied being knowledgeable were not administered the questionnaire or directed the questionnaire to others within their departments. Thirty-four respondents who were contacted denied being knowledgeable and did not have a colleague respond to the survey (13, 15, and 6, respectively, for each of the three data sources mentioned earlier, that is, the academic research centre, CTIA member list, and market research agency).

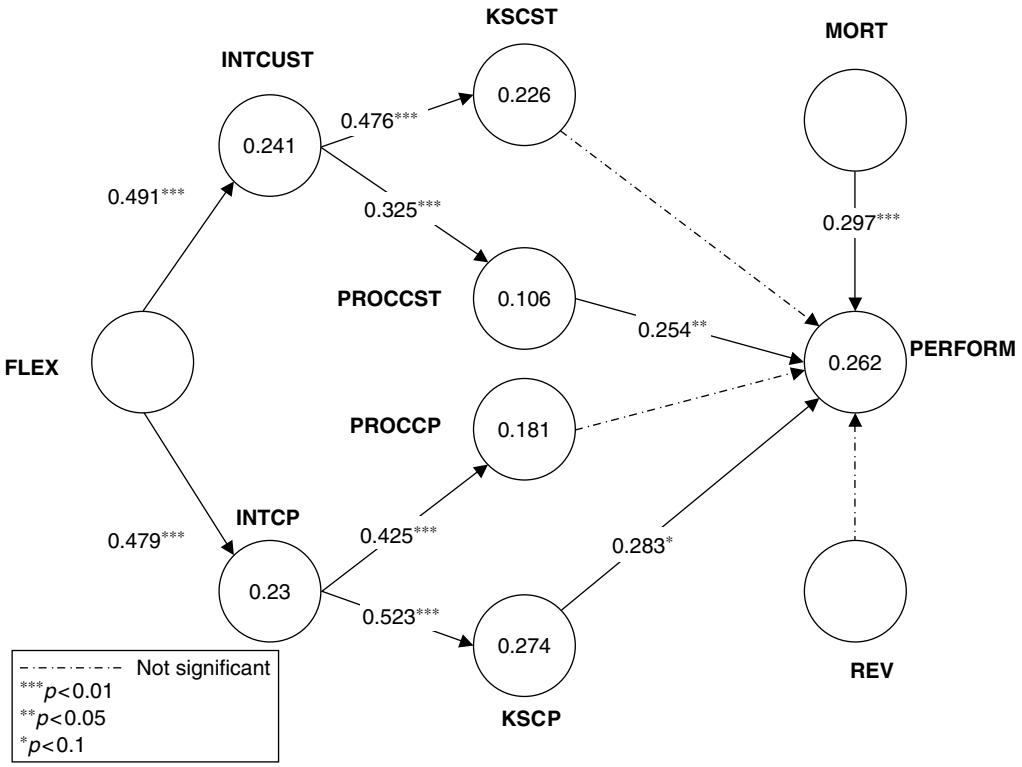
There were 18 missing values in the data set, which is less than 0.5% of the total number of values. We performed Little's MCAR test (Little and Rubin 1987) and found that these values were missing completely at random ($p > 0.05$). Therefore, a multiple imputation method was applied (Hair et al. 1998) to create a complete data set of 63 observations. The final sample has 11, 41, and 11 distinct companies each from the three waves of data collection, for a total of 63 responses. The data collection was complete within four months and the three waves overlapped in time. The response rate was 27%, 18%, and 24% for each wave. There were 46 respondents in the high-tech computing sector and 17 in the financial services-related sector. The overall response rate was 23%.

The average number of key channel partners was 33 (standard deviation, −161) and the average number of key customer accounts was 580 (standard deviation, −3,369). The sales revenues for the enterprises to which the BUs belonged were acquired from secondary sources. Though some respondents provided BU-level revenues, others declined for confidentiality reasons. For many of these enterprises, BU-level financial results are not reported. Fifty percent of the multiunit organizations in our sample had revenue of at least US$764 million, the minimum revenue was US$19 million, and the highest revenue was US$31 billion. About 95% of the responses were collected in the first attempt and the rest in the second callback. Further, the callbacks indicated that nonrespondents did not participate largely because of the lack of time. These reasons are unrelated to the survey variables and thus reduce the possibility of nonresponse bias (Colombo 2000). To test for nonresponse bias, ANOVA and t-tests indicated absence of such bias ($p = 0.42$ for sales revenue and 0.64 for employee size). ANOVA tests to check for differences across subsamples (data collection waves) yielded no significant differences. Tests for differences in means again revealed no significant difference in revenue or survey response items across the subsamples. The results of the PLS structural model also remain unchanged after including two dummy variables in the model to account for the subsamples.

We also analyzed the data for halo effects using Harmon's one-factor test (Harmon 1967). Accordingly, a principal components analysis of all constructs in our model yielded 11 factors that had eigenvalues greater than 1.0 and accounted for 80% of the total variance, with no single factor accounting for more than 11.1% of the variance. This suggests that a significant level of common method bias does not appear to be present (Podsakoff and Organ 1986). To further eliminate the confounding effects of the common factor, we tested the "method" model, which did not yield any evidence of common method bias (see Appendix B in the online version).[2]

[2] An online supplement to this paper is available on the *Information Systems Research* website (http://isr.pubs.informs.org/ecompanion.html).

Figure 3 PLS Analysis



Note. *R*-square values are inside the circles.

4. Results

The research model was tested using partial least squares (PLSGraph version 3.0) (Chin 1998b) because of the lower requirement for sample size, unlike in other structual equation modeling (SEM) techniques such as LISREL. Heuristics suggest that the sample size is adequate for our data analysis. For PLS the required sample size should be 10 times the maximum number of paths leading into any one construct in the structural equation model (Tabachnick and Fidell 1989). For our model, a sample size greater than 60 (6 incoming paths × 10) affords sufficient power, considering that a maximum of six constructs are hypothesized to lead to PERFORM (see Figure 3).

4.1. Measurement Model

The mean, range, and standard deviation for each construct are reported in Table 2. Path loadings for all items are significant at 1% level. For multi-item reflective constructs, the composite reliability estimates are above 0.8 for all constructs (Table 1), indicating good internal consistency (Fornell and Larcker 1981). The constructs were also assessed for reliability using a standardized Cronbach's alpha, which is above 0.75 for all constructs (Cronbach 1971). Preliminary checks of data such as the normal Q-Q plot of construct scores do not indicate any deviation from a normal distribution. The results from the PLS analysis also support the convergent and discriminant validity of our constructs (Table 2).[3] Discriminant validity is established when the square root of the average variance extracted (AVE) by each construct is larger

[3] Because the correlation between KSCP and KSCST is 0.609, additional steps were taken to check whether multicollinearity is suppressing the significance of path estimate of KSCST. Considering that the PLS algorithm is a series of iterated multiple regressions (Chin 1998b), we used the latent variable scores from PLSGraph to run a multiple regression with PERFORM as the dependent variable and the six constructs in Figure 3 (those loading on PERFORM) as the independent variables. We find that the highest variance inflation factor (Hair et al. 1998) is 2.23, which is significantly less than the threshold of 10 normally considered the point beyond which multicollinearity is a concern.

Table 2 Construct Means, Standard Deviations, and Interconstruct Correlations ($N = 63$)

	Mean	Std.	1	2	3	4	5	6	7	8	9	10
1 PERFORM	3.67	1.02	0.879									
2 KSCST	3.40	0.91	0.089	0.823								
3 KSCP	3.45	0.92	0.294	0.609	0.880							
4 PROCCST	3.79	1.15	0.307	0.381	0.229	0.787						
5 PROCCP	3.47	0.87	0.271	0.149	0.428	0.474	0.802					
6 INTCST	3.07	0.95	0.217	0.476	0.347	0.325	0.198	0.756				
7 INTCP	2.93	0.92	0.285	0.378	0.523	0.182	0.425	0.698	0.797			
8 FLEX	3.45	1.04	0.272	0.127	0.065	0.190	−0.078	0.491	0.479	0.880		
9 MORT	4.08	0.90	0.419	0.222	0.357	0.323	0.302	0.211	0.387	0.297	0.826	
10 REV	6.54	2.20	−0.049	−0.111	−0.118	0.071	0.092	−0.279	−0.329	−0.157	0.002	1.00

Note. Square root of AVE is shown along the diagonal.

than the interconstruct correlations (Chin 1998a). This is also ascertained by comparing the correlations of each indicator variable with its own construct (i.e., path loading) and with its correlations with other constructs (Table 3, Appendix A in the online version). We note that all the cross-loadings for the individual construct items are less than construct-specific loadings, which supports the convergent and discriminant validity of our main constructs.

4.2. Structural Model

To assess the significance of the path coefficients in the structural model, PLSGraph was used to generate 200 samples using a bootstrapping technique (Chin 1998b). The full model has an R^2 of 26.2% for the business performance construct. R^2 for the mediating constructs ranges from 10.6% (PROCCST) to 27.4% (KSCP) (see Figure 3).

The results indicate broad support for most of the hypothesized effects in the research model. Knowledge sharing with channel partners and process coupling with customers is found to contribute to firm performance (H1B and H2A). However, process coupling with channel partners is not found to be significantly linked to performance (H2B is not supported), and knowledge sharing with customers is also not found to be significant (H1A). Of the two dimensions of the IS application capability, we find that IS integration is positively associated with process coupling and knowledge sharing in the customer as well as channel partner relationships (H3A, H3B, H4A, H4B). Both the hypothesized effects of IS flexibility are supported. Thus, IS flexibility is positively associated with IS integration with customers (H5A) and channel partners (H5B). Finally, the control variable, market orientation, is significant, thus validating its importance as indicated in the prior literature; organizational size is not significant. The *R*-square of the entire model excluding market orientation is 19.2%. The results for the structural model did not differ when a dummy variable representing the industry was included in the model.[4]

The mediating effects of knowledge sharing and process coupling were tested using two different procedures. As recommended by Baron and Kenny (1986), first, a sparser model was tested that included only customer-related constructs (PROCCST and KSCST) and paths only between INTCST and PERFORM. The coefficient of INTCST is significant and positive. When the paths between KSCST and PROCCST with PERFORM are also included, then the direct link between INTCST and PERFORM becomes nonsignificant, whereas the link between PROCCST becomes significant. Similar analysis was done for the other two constructs, INTCP and FLEX. We found support for full mediation of IS integration constructs; i.e., INTCP and INTCST are completely mediated by knowledge sharing and process coupling. However, we find that FLEX is only partially mediated—the path coefficient between FLEX and PERFORM is positive and significant in the full model. Following Rai et al. (2006), we also compared the hypothesized model with competing models that propose partial mediation of IS integration and IS flexibility.

[4] Post hoc analysis also yielded similar estimates (and nonsignificance) for KSCST and PROCCP when the structural model excluded KSCP and PROCCST in turn.

For this, we computed pseudo F statistics for each of the three competing models formulated by adding a direct link between IS capabilities and performance (INTCST → PERFORM, INTCP → PERFORM, FLEX → PERFORM) in the hypothesized model. The pseudo F statistics are computed in a way similar to that for testing the significance of moderating effects (Carte and Russell 2003).[5] The pseudo F statistics ($F(1,55)$) are 1.84, 0.755, and 0.45, all of which are not significant at $p = 0.1$ level. This supports full mediation of IS capabilities by the two constructs, knowledge sharing with channel partners, and process coupling with customers.

5. Discussion

The findings yield a rich set of insights. First, our expectation that IS integration yields a higher-order benefit by providing a substrate for richer information exchange and greater process coupling are confirmed. This is because on the one hand integrated ISs strengthen the information processing capacity at the interorganizational level (Rai et al. 2006) and thus facilitates coordination of interfirm business processes. Tight coordination is possible because information is available in real time and in an interpretable format throughout the supply chain, spanning partnering firms. On the other hand, integrated data formats and applications facilitate communication of viewpoints by imposing similar product or process representations (D'Adderio 2003, Tenkasi and Boland 1996). Thus, IS integration also creates a second-order benefit by establishing a common semantic platform that facilitates reinterpretation of information from diverse sources and thus sharing of knowledge with customers and channel partners.

However, even though the link between IS integration and all four relational value dimensions is strong, only two are significantly associated with performance—knowledge sharing with channel partners and process coupling with customers. This implies that while IS integration with customers may lead to an increase in knowledge sharing with customers; this may not result in higher performance. Similarly, IS integration may also strengthen the process coupling with channel partners, but, against our expectations, we do not find that this translates into significantly higher performance.

Results strongly support the hypothesized effects of IS flexibility. That is, IS flexibility enhances the integration of the IS applications across customers and channel partners. Intuitively, the challenge of maintaining high IS flexibility is at odds with maintaining high IS integration—and is therefore viewed as a trade-off. This intuition is rooted in the EDI context where, to maintain high IS integration, enterprises had to create highly partner-specific EDI links that afforded minimal flexibility in reconfiguring the IT linkages (Hart and Estrin 1991, Hart and Saunders 1998). Contemporary IT advancements such as standardized and modular software components (e.g., Web services and extensible markups) may render higher IS flexibility, which in turn can enable a higher degree of IS integration (Hagel and Brown 2001). This suggests that the conventional views of an IS integration—flexibility trade-off—may be less applicable to contemporary information technologies, particularly when firms need to forge and maintain ties with a multitude of partners.

The results that show that the two mediating constructs, knowledge sharing with channel partners and process coupling with customers, lead to higher performance is interesting. They suggest that channel partners are the tactically and strategically important partners of an enterprise, e.g., for gaining insights to respond to markets needs. Channel partners help to collect important market-related information that can be recombined by the focal firm to general deeper insights into the market (Cohen and Levinthal 1990, Lorenzoni and Lipparini 1996). These knowledge elements in turn will enable a firm to better respond to current customers or acquire additional customers, thus resulting in better performance (Narus and Anderson 1996, Weiss and Kurland 1997). The product-innovation literature also illustrates the importance of external partners. It finds that a significant number of innovations can be traced back to customers and suppliers (von Hippel 1994).

[5] The formula used for computing the f^2 statistic was (R^2 Partial mediation $- R^2$ Full mediation)/(1 $- R^2$ Partial mediation)/($n - k - 1$) where $n - k - 1$ is the degrees of freedom of the partial mediation model, n, the sample size, k – the number of constructs in the hypothesized model linked to firm performance.

The mediation analysis reveals that the effect of IS integration on business performance is fully mediated by the relational assets, whereas the effect of IS flexibility is only partially mediated. Although a complete theoretical explanation is beyond the scope of our model, the partial mediation could perhaps be caused by conceptualization of integration in *relationship-specific* terms. Apart from strengthening IS integration simultaneously with multiple customers and channel partners, IS flexibility can also potentially generate economies of scope across relationships by transferring knowledge and resources, a key capability in business networks (Anderson et al. 1994). Therefore, in the extended enterprise we suggest that the positive link between IS flexibility and performance can be explained not only by the mediated pathways hypothesized in this study but also by alternative explanations grounded in the literature on transaction costs and opportunism (Williamson 1985) or social exchange theories (Anderson et al. 1994). It is also possible that the direct positive link between IS flexibility and performance appears because of internal factors such as scope economies, instead of relational factors.

The role of the market orientation is consistent with prior empirical studies establishing its impact on performance. This construct captures about 8% of the variation in the performance construct and thus, not surprisingly, is the most significant of the independent variables. This effect is likely to be strong in relatively turbulent contexts of the high-tech and financial services-related companies, where customers are a valuable resource and market shares can change rapidly. Kohli and Jaworski (1990) predicted that market orientation would have a stronger relationship with business performance in more turbulent markets, which was confirmed by Narver and Slater (1990) through their empirical study. Our study has confirmed that market orientation is significant even after we control for process coupling and knowledge sharing, two key relational assets.

5.1. Limitations

In applying the insights from this study, it is important to recognize some of its limitations. First, we did not use formative measures of knowledge sharing such as technology transfer, sharing of product designs, customer profiles/tastes, etc., which would have more pointedly captured the interorganizational context. Second, to maintain higher response rates, we used cross-sectional data from survey responses provided by single respondents. This did not provide more accurate data, as is gathered using multiple respondent surveys. A multirespondent survey would have helped to avoid the bias in our sample because we excluded respondents who did not have sufficient technical knowledge to answer the IT-related questions. As a result this may have limited us to firms whose business partners were most likely to have established process and knowledge linkages. Third, a smaller sample size also precluded us from testing a more comprehensive multitheoretic model that includes the entire range of benefits and limitations of IS application capabilities. For example, the model can conceptualize constructs to represent the losses an enterprise faces from opportunism arising from partner-specific IS integration and flexibility. Fourth, we have limited ourselves to the contexts of the sales channel relationships in the high-tech and financial services-related sectors. Finally, because the sample is drawn from member companies of a research center and the clients of a market research agency, these firms are more likely to represent firms closer to the leading edge of practice.

It is also important to point out that interpersonal trust plays a critical role as an enabler of relational exchanges. Organizations that trust each other may undertake joint activities that exhibit a level of risk that would preclude others from doing so (Ghoshal and Moran 1996). Interpersonal trust may also lead partners to be proactive in exploring opportunities for increased collaboration (Dyer and Singh 1998). Given our research goals, we have implicitly controlled for trust between partners by restricting our analysis to a focal firm's closest long-term partners, where there is evidence of a continuing association.

6. Implications

6.1. Implications for Theory

The main theoretical implications of our findings lie in two areas. First, we uncover the interrelationships between two key IS characteristics, showing that IS flexibility is a foundational capability that contributes to integration with channel partners and

customers; and IS integration is the proximal antecedent of co-specialized relational assets. Second, our findings suggest a need to consider not only value creation, but also value appropriation as the end goals of firms' IT investments. The antecedents in our model, process coupling and knowledge sharing, are mechanisms by which relational value is created, whereas the performance construct in our model measures to what extent the value has been appropriated by the focal firm. We find that not all relational assets are equally valuable. In dynamic industry contexts, knowledge sharing with customers may not confer competitive insights, and process coupling with channel partners may not allow the firm to react to new opportunities. We discuss these issues in the following section.

The finding that IS integration can enhance relational assets and thus contribute to performance suggests that IS integration can play a strategic value in the extended enterprise. Although the role of IS integration in enabling process efficiencies is well understood in IS literature, its role in enhancing knowledge sharing and recombination across enterprises needs to be further explored using more granular constructs.

Our findings suggest that the flexibility of the IS applications is a critical foundational capability underlying IS integration. This is not to suggest that flexibility does not benefit an enterprise in other ways. For example, by helping enterprises to curb opportunism arising from their partner-specific IT investments, IS flexibility may enable a firm to retain its bargaining power vis-à-vis its partners (Bakos and Brynjolfsson 1993) and thus enjoy higher prices or better service. However, this can only be ascertained by a holistic, multitheoretic model that factors in governance and appropriability concerns (Gulati et al. 2005). Further, the benefits of flexibility may be better assessed with a longitudinal study than with snapshot measures. Indeed, our analysis reveals that the relational assets—knowledge sharing and process coupling—do not fully mediate the effect of IS flexibility on performance, which implies that other theoretical arguments (in addition to the logic of relational value) can link IS flexibility to performance.

The result that only two of the four relational assets, knowledge sharing with channel partners and process coupling with customers, lead to higher performance is interesting. This suggests that it is the channel partners that are strategically important partners to an enterprise in terms of sharing knowledge to create business value (Achrol 1999). Knowledge about the market environment is important, but the negative (but not significant) link of knowledge sharing with customers and performance being in line with the recent literature suggests that deep relationships with customers are even likely to generate myopia and may be detrimental to firms (Danneels 2003). Thus, our results may be indicative of a counter-productive relationship, where the knowledge gathered from deep relationships with customers does not contribute to competitive performance. This is consistent with the theory of weak ties (Granovetter 1973), which suggests that under certain circumstances strong ties lead to misdirected efforts by an organization and thus may be detrimental to its performance (Uzzi 1997).[6] The customers in our study are the largest customers of the focal enterprises and therefore are the ones with whom the focal enterprise may have the strongest ties. Along similar lines, the recent literature in organization theory suggests that only firms that employ organizational features that push the firm toward exploration and pull it toward stability tend to have high performance (Rivkin and Siggelkow 2003). Further, dynamic structural changes such as reintegration of "temporarily decentralized" organizational units have been shown to allow the firm to avoid poor-performing activity configurations and to eventually coordinate across its divisions (Siggelkow and Levinthal 2003).

Our study contributes an interenterprise perspective to extend the above idea that business value can be enhanced by balancing conflicting needs by strategically developing IS capabilities. Thus, high IS integration achieved by customizing IS applications to an individual customer can result in higher efficiency through tight coordination; but when the goal is to coordinate processes and share knowledge with

[6] We suggest that the weak-tie argument does not apply as well to channel partner relationships directly because they play a more active role as an aggregator of rich, market-related information for enterprises. The study by Uzzi (1997) is in the buyer-supplier networks similar to the customer ties in our context.

a number of different partners, the role of flexibility as a critical foundational capability comes into play. Theoretically, IS integration across *multiple* relationships can therefore be viewed as an "ambidextrous" capability (Gibson and Birkinshaw 2004), and its empirical elaboration can be a basis for future studies.

Our findings suggest that the value of strong customer ties lies not in conveying richer knowledge about the market, but more in facilitating quicker adaptation by enterprises to customer needs and thus faster response in the face of uncertainty. However, unexpectedly, process coupling with channel partners was not found to be significantly associated with business performance. This unexpected result may be caused by a "loosely coupled" coordination paradigm employed in the industry setting. By modular structuring of interfirm interfaces, dependencies among channel partners may be minimized, resulting in a lower need to couple processes (Gosain et al. 2004). A similar explanation may not apply to customer relationships because perhaps it is less feasible to codesign modular process interfaces with customer enterprises. Although this difference in modularity across relationship types is a possible reason (because suppliers are generally more dependent on customers than on channel partners), the argument needs to be tested in future empirical studies. We also have not measured modularity in this study and therefore recognize this as a limitation to testing the above conjecture.

6.2. Implications for Practice

Our study reveals several findings that have important implications for the design of the IT applications of a firm that aims to harness the resources embedded in its relationship network. To our knowledge, no past study has tested a model linking multiple dimensions of the IS application capability to business-level outcomes. This study directs managers to focus on the flexibility of their IS applications as a foundational capability that will aid IS integration across multiple and simultaneous relationships with key customers and channel partners. Further, the business case for IS flexibility has to be made by highlighting the performance impacts based on relational value generated from a number of relationships, rather than considering ties in isolation.

Another important implication for managers lies in a nuanced understanding of how IT investments link to business value through mediating constructs. Appreciation of this causal pathway is likely to help managers devise IT investment policies directed toward functional ends that are likely to bear greater gains in business performance. For instance, we propose that managers conceive of knowledge sharing with channel partners and process coupling with customer enterprises as value-generating assets that will lead to improved business performance in the longer term. In recent work, Hagel and Brown (2005, p. 158) suggest: "Companies that master techniques required to accelerate capability building across broad networks of enterprises will be in the best position to generate superior returns." Our study highlights specific IT-focused pathways to hone such capabilities, particularly in light of current evidence that contemporary technologies are being used to a significant extent in interenterprise IT infrastructures (The McKinsey Quarterly 2007).

7. Electronic Companion

An e-companion to this paper is available as part of the online version that can be found at http://isre.pubs.informs.org/.

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