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STRATEGIC AND OPERATIONAL BENEFITS OF IOS-ENABLED INTERORGANIZATIONAL INTEGRATION

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Abstract

In this study, we employ the lens of the resource-based view of the firm to examine the strategic value of IOS-enabled interorganizational integration. We first develop the key construct of IOS-enabled interorganizational integration, identifying and defining its two dimensions: interorganizational system integration and business integration. Next, we propose that while the two dimensions have positive impacts on operational performance, only interorganizational business integration has strategic value. The data for this study were collected through a survey of firms in mainland China. The results provide empirical support for our propositions. The study contributes to research by providing a clear conceptualization of IOS-enabled interorganizational integration, establishing the theoretical link between its two dimensions and operational and strategic performance, developing scales for interorganizational system integration and business integration, as well as providing data on the IOS experience of Chinese firms.

Keywords: IOSs, IOS-enabled interorganizational integration, operational performance, strategic performance

Introduction

Interorganizational systems (IOSs) have been used in business for decades. As more and more companies are involved in IOSs, the identification of critical factors that influence the benefits gained from the deployment of IOSs becomes crucial. Previous studies on IOS suggest that IOS-enabled interorganizational integration is one such critical factor (Mukhopadhyay 1993; Swatman et al. 1994; Truman 2000). However, previous studies on the impacts of IOS-enabled interorganizational integration were exploratory in nature and some lacked a strong theoretical base (Bergeron and Raymond 1997; Ramamurthy et al. 1999; Raymond and Bergeron 1996). The purpose of this study, therefore, is to further develop and operationalize the concept of IOS-enabled interorganizational integration and to theorize and test the impacts of IOS-enabled interorganizational integration on organizational operational and strategic performance.

The key research question that motivates our work is what are the implications of IOS-enabled interorganizational integration for operational and strategic performance? In this study, IOS-enabled interorganizational integration comprises two dimensions: interorganizational system integration and interorganizational business integration. This paper employs the resource-based view of the firm (RBV) to develop the theoretical links between the two dimensions of IOS-enabled interorganizational integration and

organizational performance. The RBV is useful for explaining the business value of IOS-enabled interorganizational integration as it provides theoretically grounded explanations for how and why firm-specific resources give rise to strategic advantage. The main contention of this paper is that while both interorganizational system integration and business integration have positive impacts on organizational performance, only interorganizational business integration has strategic value.

The remainder of the paper is organized as follows. In the next section, we discuss the theoretical background of the paper, including the two dimensions of IOS-enabled interorganizational integration and relevant literature of the RBV. We then present our research framework and propositions that are developed based on the RBV. Next, we describe the methodology used in the study, followed by the data analysis. The paper concludes with a discussion and implications of the study for theory and practice.

Theoretical Background

IOS-Enabled Interorganizational Integration

Consistent with previous studies (Cash and Konsynski 1985; Johnston and Vitale 1988), we define an IOS as an automated information system shared by two or more companies. This paper, following prior IOS research (McGee 1991), focuses on IOSs that support relatively structured interactions between buyers and suppliers along the supply chain. Adapted from McGee (1991), integration is defined as the extent to which the interdependent and distinct components are viewed, operated, and managed as a unified system. Here, the component may refer to information systems, work teams, functional departments, business processes, businesses, or organizations. Based on our definition of integration, *IOS-enabled interorganizational integration is defined as the extent to which two organizations that are electronically connected by IOSs are viewed, operated, and managed as a unified entity*. IOS-enabled interorganizational integration may involve multiple members along the supply chain. However, for simplicity of our theorizing, this study explores the interorganizational integration in a supplier-customer dyad.

Business integration and systems integration have been shown to form a unifying concept of organizational integration (Markus 2000). Extending this concept to the interorganizational domain, we propose that IOS-enabled interorganizational integration has two dimensions: interorganizational system integration and interorganizational business integration.

Interorganizational System Integration

Interorganizational system integration refers to the extent to which relevant information systems located in two organizations in a supplier-customer dyad are viewed, operated, and managed as unified information systems. Two dimensions of interorganizational system integration have been discussed in previous studies. First, interorganizational system integration is reflected in the extent to which various transaction types are conducted through IOSs. Transaction types are the data exchanged between trading partners. Some examples of transaction type in the insurance industry are eligibility data, enrollment data, claim payment data, claim data, and claim status data man (Truman 2000). Some companies may use IOSs to process a large variety of transaction types while others may use IOSs only to process a limited number of transaction types. Second, interorganizational system integration is also reflected in the extent to which IOSs are integrated with internal systems. Even in the situation where EDI (electronic data interchange) is installed, many users still print out computer-generated orders or invoices and then enter the information manually into their computer systems (Markus 2000). When IOSs are fully integrated with internal systems, electronically transmitted data from business partners are processed automatically with few human interventions.

Interorganizational Business Integration

Interorganizational business integration refers to the extent to which relevant businesses located in two organizations in a customer-supplier dyad are viewed, operated, and managed as unified businesses. Two dimensions of interorganizational business integration have been identified. The two dimensions are: (1) communication among the two organizations, and (2) coordination of the businesses conducted by the two organizations. Business integration can be reflected by the communication of such information as feedback about performance and quality (Champy 2002) and the communication of key objectives and roles and measures (Fawcett and Cooper 2001) along the supply chain. Business integration can also be reflected by interorganizational coordination such as establishing consistent performance systems (Champy 2002), setting compatible strategic and operating goals (Fawcett and Cooper 2001), agreeing on which formats and protocols to use during the interaction (zur Muehlen et al. 2005), and removing redundancy and inconsistency from the interorganizational business processes (Hammer 2001). Coordination of

businesses spanning several organizations can take many forms, such as joint ownership (Wareham 1998) and coordinating teams (Intel 2004).

Since interorganizational system integration and business integration can be viewed as firm resources, the RBV provides a theoretical basis for predicting their impacts on organization performance. In the next section, we review relevant literature on the RBV.

Resource-Based View

The RBV considers the firm to be a bundle of resources, and it links those resources to the firm's strategic performance. Although it has been challenged by some researchers (Priem and Bulter 2001a, 2001b), the RBV dominates recent strategic management literature (Ramos-Rodriguez and Ruiz-Navarro 2004). It has also been used as a theoretical foundation for some information systems studies due to its firm roots in microeconomics, its focus on resource attributes, and its usefulness in examining the business value of information technology (Melville et al. 2004). Accordingly, the RBV serves as the primary theoretical foundation of this study.

Wernerfelt (1984) argued that, for a firm, resources and products are two sides of the same coin and he demonstrated that firms can be usefully examined from the resource side. His analysis focused on the strategic implications of resource heterogeneity. Barney (1986) clarified the nature of the market for resources (i.e., the strategic factor market) and explored how a firm can gain above-normal economic performance from better expectation about the future value of strategic resources acquired from the strategic factor market. In his classic piece on RBV, Barney (1991) argued that for a heterogeneous resource to produce competitive advantage it must satisfy the following four conditions: value, rarity, inimitability, and non-substitutability. The framework presented in his study can be readily used to assess the strategic implications of various firm resources, and accordingly it becomes one of the major theoretical underpinnings of the current study.

The following section presents the research model. We first examine the impacts of interorganizational system integration and business integration on operational performance, drawing on prior research in IOS. We then explore the impacts of interorganizational system integration and business integration on strategic performance by applying the RBV.

Conceptual Model

Our research framework includes four key variables: interorganizational system integration, business integration, operational performance, and strategic performance. Consistent with the two-stage model of benefits (Barua et al. 1995) and studies on the business value of IT (Barua et al. 1995; Mukhopadhyay and Kekre 2002; Soh and Markus 1995), we differentiate between operational performance and strategic performance. We argue that both interorganizational system integration and business integration are positively associated with operational performance. Through the lens of the RBV, we propose that only interorganizational business integration has a positive direct impact on strategic performance. The framework is shown in Figure 1.

The Influence of Interorganizational System Integration and Business Integration on Operational Performance

Malone et al. (1987) noted that interconnection technologies could offer a number of benefits, beginning with the electronic communication effect. Interorganizational system integration enables rapid transmission of information such as purchase orders, forecasting, and invoices among business partners at low cost, at high speed, and with few errors, resulting in operational improvements such as lower inventory costs. Several empirical studies have verified the operational benefits of interorganizational system integration. For example, Mackay (1993) reported that significant benefits are achievable in terms of average processing time for MRS (materials release schedule) documents once EDI has been fully integrated with internal systems. Bergeron and Raymond (1997) found that as EDI links a firm's value chain to the value chains of both its upstream and downstream partners, the firm gains operational advantage from reduced cycle times and improved service. Recently, Intel (2004) reported that higher interorganizational system integration resulted in more efficient workforce, reduced communication costs, and fewer errors. Thus, based on the above discussions, we propose that

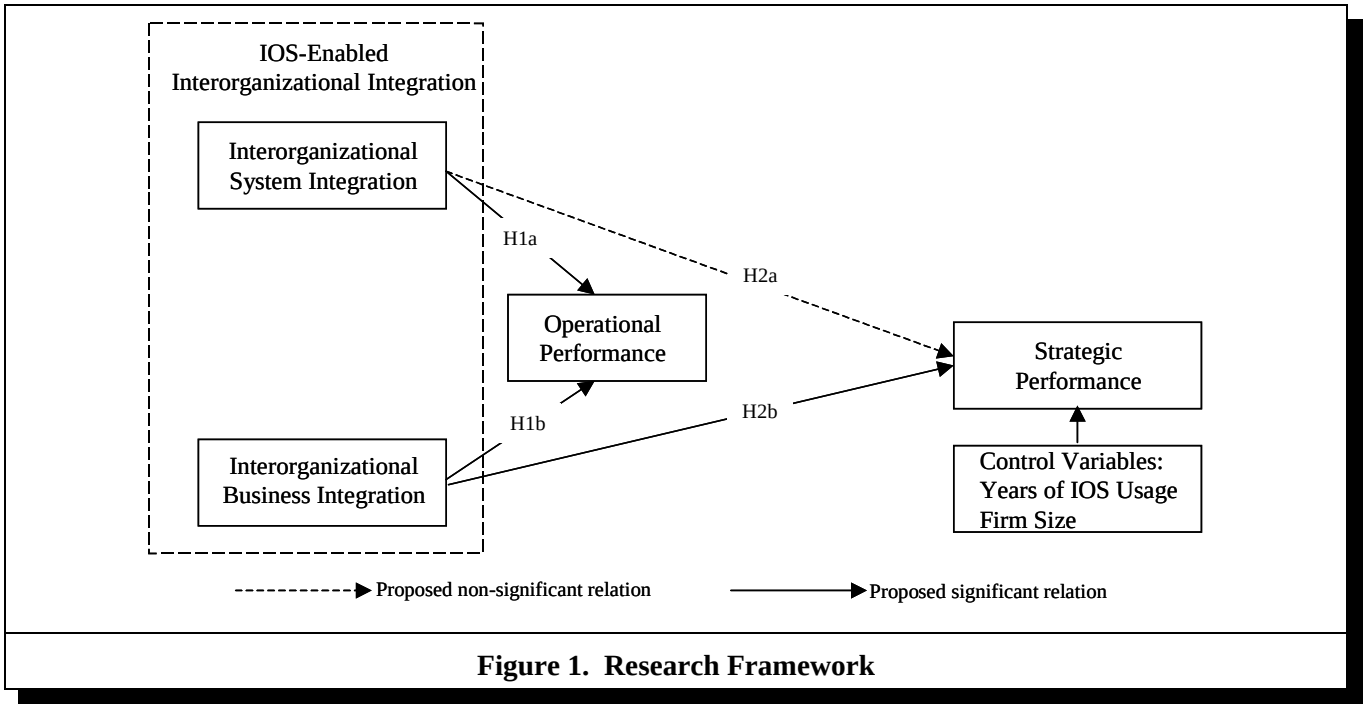

Figure 1. Research Framework

Hypothesis 1a: *Interorganizational system integration is positively associated with organizational operational performance.*

Interorganizational business integration is also likely to have a positive impact on operational performance because it enables a firm to continuously understand the changing business environment, including its business partners, and thus enables the firm to better adapt to the ever-changing environment. Such a continuous understanding enables firms to coordinate their relevant internal tasks and prevent tasks across organizations from being canceled out by each other, thus leading to cost saving and value creation. For example, Hammer (2001) showed that Geon tightly integrated its ordering and fulfillment processes with those of OxyVinyl (its primary material supplier), which led to significantly improved operational performance by reducing wasted time and improving production scheduling. Thus, we propose that

Hypothesis 1b: *Interorganizational business integration is positively associated with organizational operational performance.*

The Influence of Interorganizational System Integration and Business Integration on Strategic Performance

For any firm resource to provide strategic advantage, the resource must be heterogeneous. Heterogeneity is the prerequisite of strategic advantage (Barney 1991; Peteraf 1993). It seems that although many companies are more or less involved in inter-organizational system integration, there are significant differences across firms in terms of the extent to which they have integrated systems with their business partners. For example, in a survey of the Australian automotive industry, Mackay (1993) found that the extent to which documents (material release schedule, advance shipment notice, or just-in-time documents) from EDI systems are integrated with internal information systems (sales/order entry system, finance system, or distribution system) varies vastly across auto component manufactures. With respect to interorganizational business integration, studies have shown that there are significant and persistent differences across firms in terms of the extent to which interorganizational business integration has been achieved. For example, Markus (2000) pointed out that presenting one face to the customer and having global inventory visibility are two of the most common business integration scenarios. However, firms vary in their ability to present one face to their customers and in their global inventory visibility. She reported that Hewlett-Packard had achieved a high degree of global inventory visibility and supply chain integration while Nortel Networks was working very hard to achieve the goals.

In the following sections, we discuss the impacts of interorganizational system integration and business integration on strategic advantage, based on Barney's (1991) work. Since we have already showed that the two dimensions are valuable in that they both have positive impacts on operational performance, we proceed to examine whether the two dimensions meet the other three conditions (i.e., rarity, inimitability, and non-substitutability).

Rarity: Interorganizational system integration tends not be rare. First, a company can get its information systems integrated with systems of business partners through many relatively mature tools and approaches documented in the literature (Markus 2000; Markus et al. 2003). Second, consultants are readily available to integrate interorganizational systems. Third, as technologies advance, cheaper and simpler solutions will continue to appear in the market to facilitate the integration of interorganizational systems across organizational boundaries. Finally, governmental agencies increasingly are offering financial and technical support to assist companies in integrating interorganizational systems. As a result, interorganizational system integration is no longer rare.

On the contrary, interorganizational business integration seems to be rare since business integration across organizational boundaries is socially complex, unlikely to be easily acquired in the strategic factor market, and must be developed via ongoing, relationship-specific investments. Furthermore, integrating interorganizational business requires both considerable time and expertise. Because of the magnitude of organizational change typically involved, business integration often takes years to complete and thus is likely to be rare. Hammer (2001, p. 90) noted that, "No matter how tough it is to get different departments to work together, getting different companies to collaborate is even harder."

Inimitability: Some IS resources may be easier to imitate than others. Unfortunately, interorganizational system integration has high imitability because many approaches and tools are readily available. For example, Markus and her colleagues (Markus 2000; Markus et al. 2003) have documented several approaches to integration information systems. Furthermore, many mature EAI (enterprise application integration) tools such as IBM WebSphere MQ and webMethods are available in the factor market. These EAI tools act as the hub of a hub-and-spoke messaging architecture that links enterprise software packages, legacy systems, databases, etc.

In contrast, interorganizational business integration has relatively low imitability. First, a firm's interorganizational business with a business partner is likely to be intrinsically bound to the firm's unique history with the partner, resulting in low imitability of interorganizational business integration. The firm's competitors may face an unbridgeable barrier to achieve similar inter-organizational business integration with the same business partner. Secondly, interorganizational business integration normally requires interorganizational business process redesign, which involves collaboration and careful negotiation among different organizations (Markus 2000), making interorganizational business integration socially complex and imperfectly imitable.

Non-substitutability: For a resource to be a source of sustained strategic advantage, there must be no strategically equivalent valuable resources that are potentially available to a firm (Barney 1991). While it is difficult to evaluate the exact degree of substitutability of interorganizational system integration and business integration, it is argued that strategic substitutes for externally oriented resources are likely to be rare (Wade and Hulland 2004). Thus, we expect that interorganizational system integration and business integration, as externally oriented resources, are imperfectly substitutable.

The above arguments suggest that interorganizational system integration tends not to be rare, is imitable, and hence is unlikely to be associated with significant strategic advantage. On the other hand, interorganizational business integration meets all four conditions for a strategic resource, and we, therefore, argue that it will positively influence strategic advantage. This leads to the following propositions:

Proposition 2a: *Interorganizational system integration is not associated with strategic advantage.*

Proposition 2b: *Interorganizational business integration is positively associated with strategic advantage.*

Control Variables

The model incorporates two control variables: firm size and years of IOS usage with business partners. The inclusion of firm size in the model controls for such factors as relative bargaining power and size of the resource base that can affect organizational benefits (Zaheer and Venkatraman 1994). In the study, we incorporated the length of IOS usage with business partners as a control variable, which has two advantages as pointed out by Subramani (2004). First, it controls for the potential effects of IOS usage experience on organizational benefits. Second, it controls for potential recursive relationships between interorganizational system integration and business process integration and organizational performance.

Methodology

The data for this study were collected through a survey of firms in mainland China. To avoid common-method bias, information regarding interorganizational system integration, interorganizational business integration, and organizational performance were collected from different respondents in the same company. In the following paragraphs, we describe the detailed process through which the data were collected.

Measurement

Wherever possible, measurement items were adapted from existing scales. As no widely accepted measures of interorganizational system integration and business integration were found, we followed standard scale development procedures (Moore and Benbasat 1991) to develop appropriate scales for the two constructs.[1] The scale for interorganizational system integration includes items that measure the extent to which various transaction types are conducted via IOSs and items that assess the extent to which IOSs are integrated with internal systems. Such an operationalization is completely grounded on our conceptualization of interorganizational system integration. With respect to interorganizational business integration, items were adapted from previous studies or newly created to reflect the communication and coordination dimensions of business integration so that the operationalization is consistent with our two-dimension conceptualization of interorganizational business integration.

The final scale for interorganizational system integration includes five reflective items. The scale for interorganizational business integration includes seven reflective items. The scale for operational performance was designed as a subjective measure, consisting of four items. Strategic performance was measured with four items that reflect the focal firm's performance relative to its major competitors. (See Appendix A.) We measured all of these constructs using a seven-point Likert scale, anchored at "strongly disagree" (1), "strongly agree" (7), and "neutral" (4). To measure firm size, the respondents were asked to indicate whether their company is small, medium, or large.[2] We also asked the respondents to indicate how many years their company had used IOSs with their chosen customer enterprises.

Survey Administration

The data used in this study were collected from Chinese companies through a questionnaire. We gained access to these companies through the executive MBA students in a Shanghai-based university. To avoid common-methods bias, for each firm, the assessment of interorganizational system integration was obtained from the IT manager or CIO, the assessment of interorganizational business integration was obtained from the business manager or vice president for business, and the assessment of operational and strategic performance was obtained from the financial manager or CFO. Accordingly, the whole questionnaire was divided into three parts. The first part included scales used to measure interorganizational system integration and questions regarding IT usage and was completed by the IS manager or CIO. The second part included scales used to operationalize interorganizational business integration and was completed by the business manager or the vice president for business. The third part included scales used to measure operational and strategic performance and was completed by the financial manager or CFO.

In the survey, items used to operationalize interorganizational system integration and business integration were designed to evaluate the aspects of the focal company relative to one of its customer organizations. As noted by Subramani (2004), prior work focused largely on the benefits derived from IOSs by network leaders and little attention was paid to the benefits derived from IOSs by suppliers and to the mechanisms that enable suppliers to realize benefits. Our study, built on previous studies that examine IOS issues from the suppliers' perspective, enhances our understanding of this. Thus, a customer organization, along with its CIO and business manager, was first identified by the MBA participants. This enabled the IS department manager and the business manager to evaluate their company's interorganizational system and business integration with the *same* company. In addition, the customer organization had to meet two conditions. First, some form of interorganizational systems had to be in use between the respondent company and its customer organization. Second, there had to be

[1]An expanded description of the scale development process, including the initial item pool and the results from the multiple rounds of sorting and validation, are available from the authors upon request.

[2]Respondents were instructed to evaluate firm size based on the Standard 2003-No.17 issued by the Chinese National Bureau of Statistics. According to the standard, firm size is determined by the firm's industry, sales, number of employees, and total assets.

regular working relationships between the respondent company and its customer organization. We used firm X to refer to the identified customer throughout the three parts of the survey.

In all, we distributed 291 questionnaire packages. Three sets of sub-surveys addressed to the IT manager, the business manager, and the financial manager respectively were included in each package. We asked the MBA participants to help forward the survey to and collect completed surveys from relevant managers and then return the surveys to us. Two rounds of follow-up emails and calls were made to the students. Following the two reminders, 71 completed responses were received with a response rate of 24 percent. The 71 completed sets of surveys returned were scrutinized for data reliability. As a result of this scrutiny, 5 questionnaires were discarded because the survey was incomplete or because the survey had clear response patterns, resulting in 66 completed sets of useful surveys for data analysis (for a response rate of 22 percent).

Nonresponse bias was assessed by comparing the early and late respondents. Early respondents were identified by selecting those that responded in the first two weeks; 56 percent were classified as early respondents. A comparison of early and late respondents using a t test ($p < 0.10$) revealed no significant differences in firm size between the two groups. They did not differ in years of association with the chosen customer or years of IOS usage with the chosen customer. In addition, "days to respond" was used as an independent regression variable to predict primary variables of interest as suggested by Lindner et al. (2001). Results show that "days to respond" does not predict any primary research variable in our study.

Data Analysis

Structural equation modeling (SEM) was used to perform a simultaneous evaluation of both the measurement model and the structural model. Partial least squares, as implemented in PLS Graph version 3.00 Build 1126, was chosen and used for hypothesis testing primarily because PLS Graph provides the ability to model latent constructs even under conditions of non-normality and small- to medium-size samples (Chin et al. 2003).

Informant and Sample Demographics

The majority of the organizations that responded were from the manufacturing industry (42.42 percent), IT (21.21 percent), and finance (13.64 percent) industries. Of the responding companies, 45 percent were large companies, 32 percent were medium-sized companies, and 23 percent were small-sized companies. Nearly 60 percent of the responding companies were either joint ventures (40.91 percent) or private companies (19 percent) while state-owned enterprises and collectively owned companies accounted for less than 30 percent. The majority (around 90 percent) of the responding companies had multiple years of association with their chosen business partner. The average of the length of association is 4.8 years with the minimum 1 year and maximum 15 years of association. The majority (about 80 percent) of the responding companies had 3 or fewer years of IOS usage with the chosen business partner, with the mean 1.5 years, minimum 1 year, and maximum 6 years. This indicates that IOSs are quite new to companies in mainland China and most companies began using IOSs only recently. In terms of IOS usage, 31.82 percent of the responding companies used EDI to transfer data with their chosen business partner, while 16.67 percent use ERP-to-ERP solution to transfer data.

The Measurement Model

Following the two-step analytical procedures, we first examined the measurement model, and then the structural model. Psychometric properties of the interorganizational system integration and business integration, operational performance, and strategic performance were assessed in terms of discriminant validity, convergent validity, and internal consistency.

Factor analysis was performed to ascertain that interorganizational system integration, interorganizational business integration, operational performance, and strategic performance are distinct constructs. One item (IOSI-2) was deleted from the interorganizational system integration scale because of its low loading on the target construct and high loading on other constructs. IOBI-1 was deleted from the interorganizational business integration because its loading on IOBI was low and it also loaded on another construct.

The validity of the measurement model was then assessed by examining the loadings and cross-loadings of indicators in Table 1. The results shown in Table 1 indicate that the latent variable component score predicts each indicator in its block better than indicators in other blocks because the loadings for the indicators in each block are higher than any other indicators from other

Table 1. PLS Results of Factor Loadings and Cross-Loadings				
	IOSI	**IOBI**	**OP**	**SP**
IOSI-1	0.83	0.60	0.34	0.27
IOSI-3	0.89	0.49	0.34	0.13
IOSI-4	0.90	0.56	0.55	0.21
IOSI-5	0.71	0.39	0.24	0.40
IOSI-6	0.83	0.46	0.22	0.46
IOBI-2	0.60	0.90	0.50	0.19
IOBI-3	0.43	0.74	0.28	0.34
IOBI-4	0.47	0.87	0.37	0.24
IOBI-5	0.48	0.76	0.18	0.17
IOBI-6	0.37	0.65	0.25	0.20
IOBI-7	0.47	0.74	0.26	0.53
OP-1	0.29	0.19	0.74	0.46
OP-2	0.39	0.33	0.81	0.51
OP-3	0.41	0.42	0.86	0.46
OP-4	0.35	0.38	0.84	0.89
SP-1	0.19	0.33	0.52	0.86
SP-2	0.41	0.36	0.41	0.81
SP-3	0.22	0.29	0.51	0.89
SP-4	0.29	0.30	0.62	0.34
Composite reliability	0.92	0.90	0.89	0.92

blocks. We then proceeded to examine the discriminant validity by calculating the square root of average variance extracted (AVE) and comparing it to the correlations among constructs. Table 2 provides this information with the square root of AVE given in the diagonals. The facts that all square root of AVE is greater than 0.707 and that the square root of AVE is greater than the correlations among the latent variables suggest discriminant validity was established. The PLS results confirm that each of these constructs is distinct and that all items used to operationalize a particular construct load onto a single factor. As a measure of internal consistency, composite reliability was calculated for all the constructs. Results show that the composite reliability of all constructs is higher than 0.85.

In sum, these results provide strong empirical support for the reliability and the discriminant and convergent validity of the scales used in this study. The means, standard deviation, and correlation of constructs are shown in Table 2.

Table 2. Inter-Construct Correlations and Average Variance Extracted						
	IOSI	**IOBI**	**OP**	**SP**	**IOS Usage**	**Firm Size**
IOSI	0.83					
IOBI	0.60	0.78				
OP	0.40	0.37	.081			
SP	0.30	0.34	0.60	0.86		
IOS Uszge	0.29	0.05	0.29	0.30	1.00	
Firm Size	0.24	0.27	0.04	0.07	0.18	1.00
Mean	4.29	4.32	5.07	5.03	2.52	
Standard Deviation	1.30	1.09	0.84	1.11	1.53	

Notes: 1. IOSI = Interorganizational System Integration, IOBI = Interorganizational Business Integration, OP = Operational Performance, SP = Strategic Performance, IOS Usage = Years of IOS Usage with the Chosen Business Partner, Firm Size = Firm Size.
2. Figures in shaded areas are values of square root of the average variance extracted.

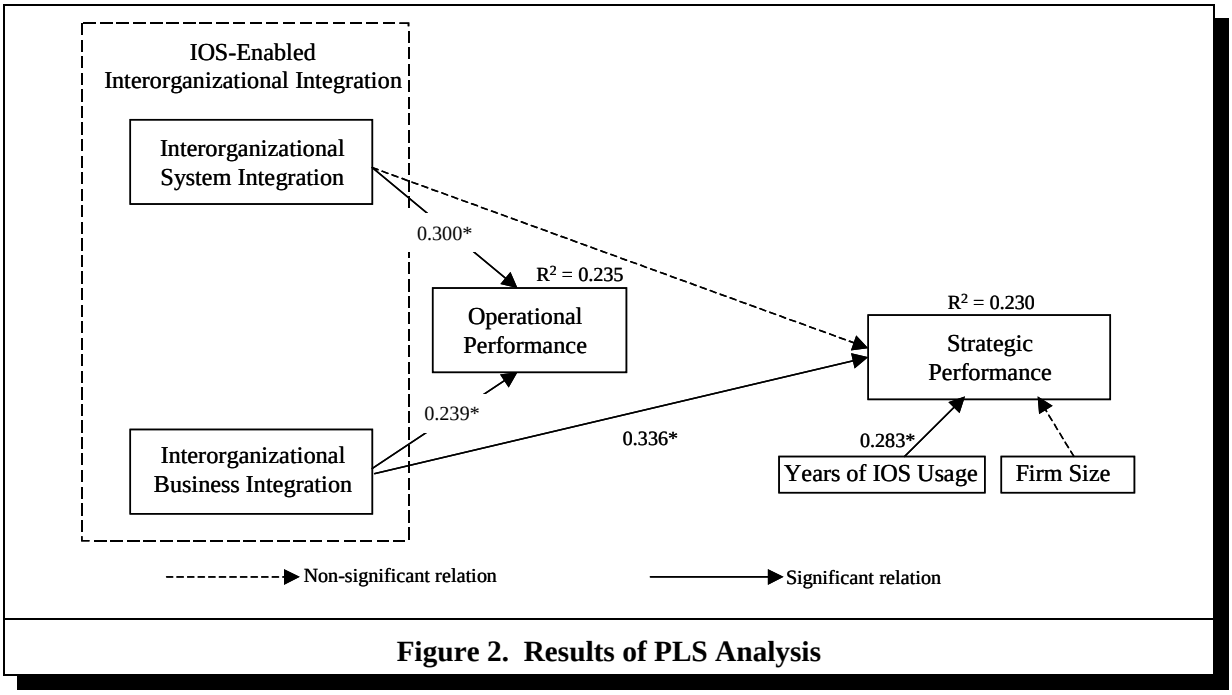

Figure 2. Results of PLS Analysis

The Structural Model and Hypothesis Testing

The data were analyzed using PLS Graph Version 3.00 Build 1126 to test our research model. After we considered the trade-off between computational time and efficiency (Chin 1998), bootstrap resampling (500 resamples) was chosen since computational time was not a problem for us and we pursued higher efficiency. The path coefficients and explained variances for the research model are shown in Figure 2.

As shown in Figure 2, both interorganizational system integration and business integration have significant impacts on operational performance. The two constructs explain 23.5 percent of the variance in operational performance. As we expect, only interorganizational business integration has a significant impact on strategic performance. The impact of interorganizational system integration on strategic performance is not significant. Between the two control variables, the length of IOS usage is positively associated with strategic performance. The impact of firm size on strategic performance is not significant. Overall, the antecedents of strategic performance explain 23 percent of the variance.

Contribution and Conclusions

Motivated by the need to better understand how companies can derive superior benefits from IOS deployment, this study examined the influences of interorganizational system integration and business integration on operational and strategic performance through the lens of the RBV. Our study suggests that only interorganizational business integration has a significant impact on strategic performance. These results have several implications for theory and practice, which will be discussed in the following paragraphs.

Implications for Research and Practice

The study contributes to theory in the following ways. First, this study offers a clear conceptualization of IOS-enabled interorganizational integration. We go deeper into the concept of IOS-enabled interorganizational integration by identifying and defining its two important dimensions (i.e., interorganizational system integration and business integration) to reflect the broad domain of IOS-enabled interorganizational integration.

Second, this study predicts and tests the strategic implications of interorganizational system integration and business integration from the theoretical perspective of the RBV. Our results confirm the strategic value of interorganizational business integration as expected based on the RBV. Our finding is consistent with the observation by Malhotra et al. (2005) that the locus of value creation is no longer within the boundaries of a single firm but rather occurs at the nexus of relationships between a variety of parties that contribute to the production function. Our finding is also consistent with recent developments in the RBV arguing that strategic benefits can be gained from interfirm resources (Lavie 2002) and outside-in resources (Wade and Hulland 2004).

Third, this study also contributes to research by operationalizing interorganizational system integration and business integration at the dyadic level. Our results provide strong empirical support for the high reliability and validity of both scales, which provides a foundation on which empirical studies examining the operational and strategic implications of interorganizational system integration and business integration can be conducted.

Finally, the study used data collected from China to empirically test the research model, which contributes to efforts within the field to understand information technology phenomena in the Chinese business context. It is interesting to note that while the RBV originated and has been refined largely in the North American context, our study suggests that it is applicable also in the Chinese context, particularly with regard to the IOS-related resource. Although IOSs are relative new in China, companies can still gain strategic advantage from the deployment of IOSs. The study thus enriches the literature with data from Chinese firms that are part of mainland China's transformation to a market economy.

While this study has several interesting implications for research, it is also relevant for practitioners. First, mere adoption of an IOS, without further system and/or business integration is unlikely to yield significant operational benefits. Hence firms should at the very least invest in integrating IOS with their internal systems across a range of transactions.

Second, our study also suggests that only interorganizational business integration has strategic value for organizations. Although interorganizational system integration has a significant impact on operational performance, it does not have strategic value for organizations. These findings suggest that companies should strive to integrate interorganizational business with business partners. The deployment of IOSs and the integration of interorganizational systems lay the foundations for integrating inter-organizational businesses. Clark and Stoddard (1996) reported that interorganizational process innovation provides greater benefits than interorganizational technological innovation. Combing the findings from our study and with those of Clark and Stoddard, we argue that it is advisable for companies to take into account how IOSs can enable interorganizational business process innovation and integration at the outset of IOS implementation to harvest strategic benefits from the deployment of IOSs.

Limitations and Directions for Future Research

This study suffers from several limitations. First, an ideal empirical design for testing the strategic value, especially long-term strategic value, of firm resources would be a longitudinal study. Longitudinal studies can be conducted in the future to understand the long-term strategic implications of interorganizational system integration and business integration.

Second, although our sample size is large enough to empirically test the research model, we would have preferred a larger sample size.

Third, we use the data collected from China to test our research framework. Thus, researchers should be cautious when generalizing our findings to other situations. Future study can validate our findings in other business environments.

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Appendix A. Measurement

Interorganizational System Integration (IOSI)

Item No.	Item	Adapted from
IOSI-1	My firm and firm X maintain integrated databases and access methods to facilitate information exchange between us.	Bowersox et al. 1999
IOSI-2	Data from firm X must be rekeyed, as they are used and reused by different employees within my firm.	Truman 2000
IOSI-3	For at least some data fields, there are data standards imposed and enforced across most of the information systems that span my firm and firm X.	Truman 2000
IOSI-4	A large variety of transaction sets (transaction sets refer to the data exchanged between trading partners, such as order data, shipment data, invoice data, remittance advice data, etc.) can be exchanged between my firm and firm X using interorganizational systems such as EDI, Internet-based IOSs, etc.	Massetti and Zmud 1996
IOSI-5	My firm and firm X use interorganizational systems such as EDI, Internet-based IOSs, etc. to exchange most of the transaction sets.	Massetti and Zmud 1996
IOSI-6	Data exchanged with firm X via interorganizational systems such as EDI, Internet-based IOSs, etc. are integrated into my firm's various internal information systems.	Massetti and Zmud 1996

Interorganizational Business Integration (IOBI)

Item No.	Item	Adapted from
IOBI-1	My firm and firm X place personnel at the business facilities of each other to facilitate cooperation.	Min and Mentzer 2004
IOBI-2	Feedbacks about the performance and quality at one point in the interorganizational business processes across my firm and company X are communicated to other points in the processes timely	Champy 2002
IOBI-3	An inter-functional team from our business unit, together with the teams from firm X, has meetings to figure out how to serve our mutual customers better	Min and Mentzer 2004
IOBI-4	Members in my firm and firm X understand how individual efforts contribute to the whole our interorganizational business processes	Hammer and Stanton 1999
IOBI-5	The performance systems regarding the interorganizational business processes across my firm and firm X are consistent	Fawcett and Cooper 2001
IOBI-6	One of us owns one of the interorganizational processes (e.g., manufacturing, transportation, warehousing, distribution, marketing, etc.) for the rest of us	Min and Mentzer 2004
IOBI-7	Redundant activities have been moved from our interorganizational business processes that cross my firm and firm X	Champy 2002

Operational Performance (OP)

Item No.	Item	Adapted from
OP-1	As a result of my firm's relationship with Firm X, my firm's capacity utilization increases	Kohli and Devaraj 2003
OP-2	As a result of my firm's relationship with Firm X, my firm's inventory turnover increases	Kohli and Devaraj 2003
OP-3	As a result of my firm's relationship with Firm X, my firm's productivity increases	Ravichandran and Lertwongsatien 2002
OP-4	As a result of my firm's relationship with Firm X, my firm's cost efficiency increases	Subramani 2004

Strategic Performance (SP)

Item No.	Item	Adapted from
SP-1	Firm X's purchases from my firm are increasing	Subramani 2004
SP-2	In firm X's purchases in the category of my firm's products, my firm's market share is increasing	Subramani 2004
SP-3	My firm has gained a strategic advantage relative to our major competitors in the business with firm X	Newly Created
SP-4	My firm's development of new business opportunities with firm X exceeds our major competitors' development of new business opportunities with firm X	Subramani 2004