8-7-2011

Developing Firm Capability through IT Resources Deployed in Inter-organizational Relationships

SuJeong Choi
Chonnam National University, 95choi@hanmail.net

Developing Firm Capability through IT Resources Deployed in Inter-organizational Relationships

SuJeong Choi
Chonnam National University, Gwangju, South Korea
95choi@hanmail.net

ABSTRACT

This study attempts to explain how physical and human IT resources deployed in inter-organizational relationships (IORs) affect IT-enabled capabilities of a firm. We classify the IT enabled-capability into two types such as relational-specific knowledge management (RKM) capability and absorptive capacity. In addition, this study suggests that RKM capability and absorptive capacity lead to increased firm performance. Finally, we test the relationship of RKM capability and absorptive capacity. A total of 119 responses were used for analysis. Our results demonstrate that a firm reinforces its capabilities such as RKM capability and absorptive capacity by leveraging physical and human IT resources dedicated in IORs. This implies that IT resources in IORs play a key role in developing further capabilities related to improved firm performance. Furthermore, RKM capability developed in IORs directly affects absorptive capacity of a firm. Thus, firms make a constant effort to develop IT-enabled capabilities beyond the deployment of IT in IORs.

Keywords

Physical IT resource, human IT resource, IT-enabled capability, relationship-specific knowledge memory, absorptive capacity, inter-organizational relationships

INTRODUCTION

The use of IS in itself could not offer differential advantages to a certain firm. Researchers have emphasized additional efforts in creating differential performance through the use of IS (Melville et al., 2004; Tippins and Sohi, 2003). For example, Tippins and Sohi (2003) have suggested that organizational learning is needed to connect IT competency and firm performance. Melville et al. (2004) have also asserted that the improvement of business processes via IT resources leads to high levels of firm performance.

It is problematic to suppose that the use of IT is equivalent to improved firm performance (Dewett and Jones, 2001; Melvile et al., 2004; Tippins and Sohi, 2003). Although IT improves the efficiency of a firm, there is a limitation in sustaining competitive advantages since its competitors also could adopt the same IT in the long run (Tippins and Sohi, 2003). Accordingly, firms should make an ongoing effort to develop IT-enabled capabilities to sustain the advantages from new IT deployment (Wade and Hulland, 2004). In the same manner, to obtain differential advantages through IT resources deployed in inter-organizational relationships (IORs), much effort is required to develop idiosyncratic capabilities based on the IT resources. That is, IT resources should be considered as an important means to develop a firm's capabilities, which ultimately lead to superior firm performance.

This study suggests two types of capabilities in firms, which are enabled by IT resources deployed in IORs: *electronic relationship-specific knowledge management (RKM) capability* and *capacity capability*. RKM capability refers to the ability of a firm to build and manage an electronic relationship-specific knowledge repository which acquires and accumulates information and knowledge from IORs, creates the common knowledge by integrating and/or analyzing the stored information and knowledge, and supports sharing of the created common knowledge. This study expands the concept of relationship-specific memory suggested by Selnes and Sallis (2003), into which acquired relationship-specific knowledge is integrated (p. 83). However, they do not consider the use of IS in developing the relationship-specific memory. This study suggests that the relationship-specific memory could be supported by the IS deployed in IORs. Therefore, we call it electronic relationship-specific knowledge management capability, emphasizing the 'electronic' repository. So far, some researchers have emphasized that the common knowledge memory in IORs contributes significantly to the reinforcement of the competitiveness of a firm (Choi and Ko, 2010; Johnson et al., 2004; Selnes and Sallis, 2003; Li, 2006). They also asserted that such a memory facilitates the accumulation and sharing of various information and knowledge, best-practice, and success

and failure experiences that come from IORs. Therefore, firms engaging in IORs can improve their competitiveness by developing and managing the electronic relationship-specific knowledge memory.

As another capability considered in this study, absorptive capacity of a firm has received much attention from strategic management literature in that it is closely associated with competitive advantages such as strategic flexibility, innovation, and superior performance (Cohen and Levinthal, 1990; Zahra and George, 2002). According to Cohen and Levinthal (1990), absorptive capacity of a firm is defined as "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (p. 128). They laid great stress on the application of external knowledge to improve a firm's competitiveness. More specifically, Zahra and George (2002) have suggested four sub-dimensions of absorptive capacity including acquisition (i.e., recognizing and obtaining new valuable external knowledge), assimilation (i.e., analyzing, processing, and interpreting the obtained knowledge), transformation (i.e., combining the assimilated knowledge with prior internal knowledge), and exploitation capabilities (i.e., applying the transformed knowledge for business goals).

This study examines the relationships between IT resources and two types of firm capabilities–RKM capability and absorptive capacity- by dividing IT resources into physical IT resources and human IT resources. According to a resource-based view (RBV) by Barney (1991), all IT resources are not directly linked to firm capabilities and/or firm performance. A firm's competitive advantage can be created when IT resources meet four characteristics such as being valuable, rare, imperfectly imitable, and substitutable (Barney, 1991). This study investigates the respective effects of physical IT resources and human IT resources on the development of a firm's capabilities.

In sum, the principal objective of this study is threefold. The first objective is to examine the relationships between IT resources and firm capabilities-RKM capability and absorptive capacity. Secondly, this study confirms the individual effects of RKM capability and absorptive capacity on firm performance. Finally, the relationship of RKM capability and absorptive capacity is explored.

RESEARCH MODEL AND HYPOTHESIS

Research Model

As shown in Figure 1, the research model can explain the process from IT resources to firm performance via IT-enabled firm capabilities such as RKM capability and absorptive capacity of a firm. The model includes two important issues. One is that IT resources are indirectly associated with firm performance via the enhancement of firm capabilities; the other is that IT resources are different from IT-enabled capabilities.

There have been some questions regarding the issue of the effects of IT resources on firm performance. Do IT resources directly affect firm performance? Otherwise, do they indirectly affect firm performance through enhancing a firm's capabilities? Nowadays, the latter is persuasive in that it is impossible to create differential advantages over competitors in the context that IT resources deployed in IORs are widely used (Bharadwaj, 2000; Melville et al., 2004; Tippins and Sohi, 2003). Therefore, a firm attempts to develop IT-enabled capabilities beyond simply deploying and using IT resources in IORs. In other words, a firm's capabilities for connecting IT resources and firm performance are needed. For example, Bharadwaj (2000) and Melville et al. (2004) have suggested that IT resources indirectly enhance firm performance via the improvement of business processes of the firm. Tippins and Sohi (2003) have asserted that IT resources indirectly affect firm performance through organizational learning. Thus, firms can enhance firm performance by combining IT resources with prior firm capabilities.

In addition, the model explains that IT-enabled capabilities are affected by IT resources deployed in IORs. IT-enabled capabilities should be distinctive from IT resources. It is important that firms focus on IT-enabled capabilities directly related to firm performance by leveraging IT resources. In this study, IT resources are classified into two types, physical IT resources and human IT resources, based on the studies of Byrd and Turner (2000) and Melville et al. (2004). Physical IT resources include tangible IT resources (i.e., hardware and software) and application necessary for inter-organizational transactions. Human IT resources refer to the degree to which a firm has IT personnel with the knowledge and expertise on business domain. That is, human IT resources mean that IT personnel strategically utilize IT resources for a firm's business goals. By distinguishing physical IT resources from human IT resources, this model suggests that developing superior human IT resources is an important part in IT management as well as the deployment of physical IT resources.

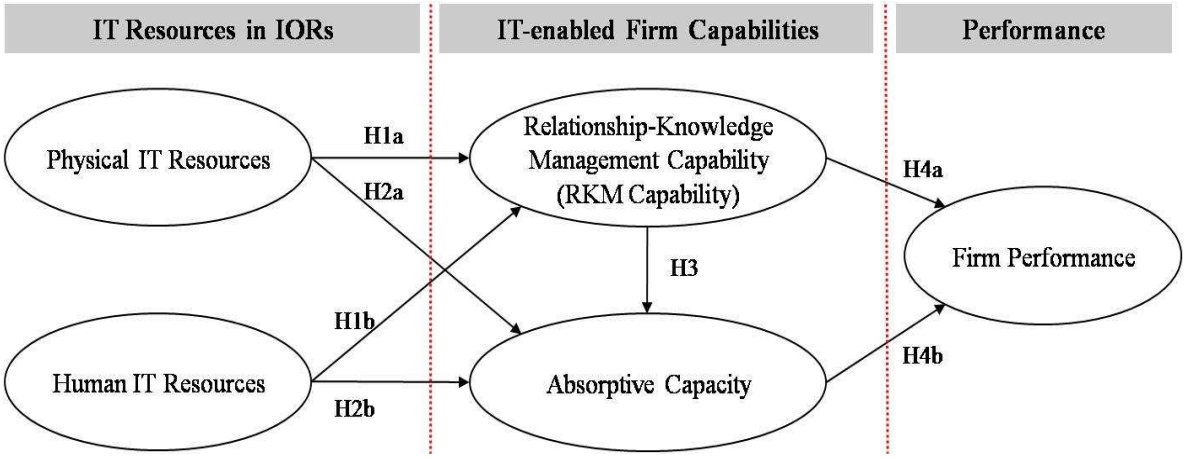

Figure 1. Research Model

IT Resources and RKM Capability

Managing knowledge is a foundation for developing a firm's capabilities (Eisenhardt and Martin, 2000; Johnson et al., 2004). This is also essential for a firm to implement organizational learning and knowledge management (Johnson et al., 2004). A firm's capability depends on the integration of internal knowledge in a firm and the acquisition of external knowledge outside the firm (Grant, 1996).

Firms attempt to build their organizational memory to acquire, accumulate, and utilize timely information and knowledge. Organizational memory of a firm provides a framework to store and categorize information and knowledge, and offers common understanding and interpretation on those information and knowledge (Moorman and Miner, 1997). Therefore, organizational memory of a firm should be built to obtain various experiences and knowledge and to share and utilize them in a timely manner among all members (Moorman and Miner, 1997).

Although managing knowledge from IORs is also an important issue (Dyer and Singh, 1998), there has been relatively little empirical research. Lane et al. (1998) have maintained that firms enhance their capabilities through inter-organizational learning intended to obtain external knowledge in IORs. Powell et al. (1996) have emphasized the ability of a firm to acquire the external knowledge that the firm does not have through the networks of learning in IORs. Christiaanse and Venkatraman (2002) have suggested that the capability to develop IT-enabled expertise is important to create competitive advantages of a firm by utilizing knowledge assets in vertical IORs. Selnes and Sallis (2003) have suggested relationship-specific memory as one of the inter-organizational learning dimensions, and they emphasized the exchange of common knowledge.

It is important that a firm engages in building and managing relationship-specific knowledge memory to accumulate and share various information and knowledge, experiences, and best practices coming from IORs (Johnson et al., 2004; Li, 2006; Selnes and Sallis, 2003). This is because the memory is positively related to a firm's competitiveness (Johnson et al., 2004). This memory represents the levels at which a firm has information and knowledge, various success and failure experiences (Moorman and Miner, 1997). In this study, the capability of relationship-specific knowledge management is defined as the ability of a firm to develop and manage an electronic relationship-specific knowledge repository in which the firm acquires and accumulates the information and knowledge obtained from IORs. Besides, the repository facilitates the creation of common knowledge by integrating and/or analyzing the acquired information and knowledge and sharing of the created common knowledge.

IT resources can play a critical role in developing RKM capability. IS researchers have suggested that building electronic knowledge memory is enabled by IT resources (Grant, 1996; Kankanhalli et al., 2005; Tippins and Sohi, 2003). IT resources enable a firm to codify, share, assimilate, and store and retrieve knowledge easily, and they especially, contribute to the integration of explicit knowledge (Grant, 1996). In addition, IT resources facilitate interpretation of new information on the basis of stored knowledge and integration of new information with prior knowledge, as well as easily acquiring and accumulating knowledge and offering accessibility to the stored knowledge (Tippins and Sohi, 2003). The issue of

knowledge memory is also considered by researchers exploring knowledge management. For example, Kankanhalli et al. (2005) focused on determinants affecting the use of electronic knowledge memory developed as a core means for knowledge management.

This study hypothesizes that physical and human IT resources in IORs are positively related to RKM capability. Physical IT resources will offer a firm the electronic repository needed to acquire and accumulate knowledge from IORs, and they facilitate accessibility to the knowledge and sharing of the knowledge. In addition, human IT resources will contribute to grasping and acquiring valuable knowledge, to integrating the knowledge into the electronic memory, and to creating common relationship-specific knowledge. That is, RKM capability would be enhanced when they have IT personnel with high levels of knowledge and expertise in their business domain.

H1a. Physical IT resources will increase RKM capability.

H1b. Human IT resources will increase RKM capability.

IT Resources and Absorptive Capacity

To utilize knowledge embedded in IORs, it is important that firms enhance absorptive capacity for acquiring new knowledge and combining it with internal knowledge (Cohen and Levinthal, 1990; Koka and Prescott, 2002; Malhotra et al., 2005; Uzzi and Lancaster, 2003). Absorptive capacity refers to the ability of a firm to recognize the value of new information, to assimilate it into internal business procedures, and to utilize it for business goals of the firm (Cohen and Levinthal, 1990). Zahra and George (2002) have divided absorptive capacity into four types of capabilities, and emphasized realized absorptive capacity including transformation capability of new information into internal business processes in a firm and application capability of the information for the firm's business goals in comparison with potential absorptive capacity including acquisition and assimilation capabilities of new knowledge. That is, the utilization and application of new knowledge is more important than the acquisition and assimilation of the knowledge. Absorptive capacity of a firm is a source of creating competitive advantages in that every firm has its own unique ways to develop the absorptive capacity.

We posit that physical IT resources enhance absorptive capacity by increasing the ability of a firm to acquire and disseminate information. Malhotra et al. (2005) have asserted that absorptive capacity is affected by memory systems for inter-organizational activities and interpretation systems for inter-organizational information. In addition, human IT resources also will contribute to enhanced absorptive capacity of a firm. IT personnel can figure out business opportunities and solve business problems via utilization of IT resources (Ross et al., 1996). Melville et al. (2004) have highlighted that IT personnel should have managerial skills to solve business problems as well as technical skills to deal with IS. We expect that human IT resources will increase absorptive capacity of a firm by effectively managing new knowledge obtained from IORs as well as internal knowledge in the firm.

H2a. Physical IT resources will enhance absorptive capacity of a firm.

H2b. Human IT resources will enhance absorptive capacity of a firm.

RKM capability and Absorptive Capacity

Relationship-specific knowledge memory in IORs can be a source for a firm to obtain knowledge from outside a firm. This memory enables a firm to develop new capabilities by utilizing the accumulated experience and knowledge. Many firms have been building electronic knowledge repositories to store the large volume of information and knowledge drawn from IORs. However, the ability of a firm to recognize the value of knowledge in the repository and to utilize the knowledge for business goals is distinguished from the matter of building up the repository. Although a firm obtains knowledge from relationship-specific memory in IORs, they have limitations on the creation of differential advantages if they do not utilize the knowledge into their internal procedures or do not integrate the knowledge with internal knowledge. Similarly, Christiaanse and Venkatraman(2002) have emphasized that it is more important that firms develop the ability to combine internal procedures with external knowledge obtained from the system, given that knowledge management systems are deployed in vertical IORs. This ability helps a firm obtain differential advantages which are difficult for competitors to imitate. Thus, a firm should attempt to develop the ability to evaluate and utilize new knowledge in order to obtain further firm performance

beyond building relationship-specific knowledge repository in IORs. To explain such ability, this study employs absorptive capacity of a firm from strategic management literature.

Relationship-specific knowledge memory can play a key role in enhancing absorptive capacity of a firm. According to Cohen and Levinthal (1990), absorptive capacity is "largely a function of the level of prior related knowledge" (p. 128). Absorptive capacity is significantly increased when the relational knowledge basis has high levels of inter-relatedness, which contributes to evaluating and utilizing external knowledge (Lane and Lubatkin, 1998). Van den Bosch et al. (1999) described that absorptive capacity depends on combinative capabilities, which refers to the integration and application of new knowledge into prior knowledge. Zahra and George (2002) contended that a firm obtains knowledge from various sources outside the firm as well as within the firm, which especially affects acquisition and assimilation capabilities of absorptive capacity's four dimensions. A Knowledge repository affects knowledge acquisition and dissemination activities among firms in supply chain IORs (Hult et al., 2004). Thus, the capability of a firm to mange relational knowledge memory contributes to increasing absorptive capacity of the firm.

Systematically managing relationship-specific knowledge in IORs would affect the ability of the firm to evaluate the new knowledge and apply it for the purpose of business, that is, absorptive capacity. In other words, it is necessary that firms embed available knowledge to internal business procedures.

H3. RKM capability will enhance absorptive capacity of a firm.

IT-enabled Firm Capabilities and Firm Performance

It has been emphasized that a firm develops and manages relationship-specific knowledge and expertise drawn from IORs which are associated with competitive advantages of the firm (Christiaanse and Venkatraman, 2002; Rai et al. 2006). Christiaanse and Venkatraman (2002) have found that the use of knowledge management systems deployed in IORs contributes to the development of expertise exploitation capabilities which refer to the ability of a firm to combine the information and knowledge embedded in internal business procedures as well as to exchange the information and knowledge from the systems. Rai et al. (2006) have verified that IT infrastructures play a key role in developing the ability to integrate resource flows among firms in IORs. Such an ability facilitates firms' sharing and integration of information including forecasting and planning, order and stock, and logistics with trading partners. Therefore, effective knowledge management in IORs is directly linked to the competitiveness of a firm.

The capability of managing relationship-specific knowledge enabled by IT is positively related to firm performance. Research focusing on the organizational memory of a firm has reported that information and experience accumulated in the memory affects firm performance (Tippins and Sohi, 2003). Although Tippins and Sohi (2003) have focused on the mediating effect of organizational learning in the relationship between IT competency and firm performance, the results have showed that organizational memory is related to firm performance. Moorman and Miner (1997) have showed that it is possible for firms to create new product development when they have great levels of organizational memory. Johnson et al. (2004) have asserted that relational knowledge stores lead to relational effectiveness and relational quality in IORs. As such, firm performance will be affected by RKM capability.

Researchers have reported that absorptive capacity of a firm is positively associated with strategic flexibility, adaptation to environment, innovation, and firm performance (Cohen and Levinthal, 1990; Zahra and Geroge, 2002). Malhotra et al. (2005) found that absorptive capacity of a firm affects firm efficiency and the creation of market knowledge. Thus, absorptive capacity to utilize and apply new knowledge for a firm's business goals contributes to increased firm performance.

H4a. RKM capability will increase firm performance.

H4b. Absorptive capacity of a firm will increase firm performance.

METHODS

Data Collection

This study conducted an online-based survey on the firms with membership of the Korean Callcenter Industry Resources Center (KCIRC) which has run with the financial support of the Korean government. KCIRC has a database including a list of more than 4,200 members across a variety of industries. We requested that the members engage in the online survey via the newsletters including a link to the survey. A total of 130 responses were collected. We utilized a total of 119 for the analysis, excluding 11 questionnaires with incomplete responses. The reason why response rate was low was that a total of 483 members verified and opened the survey request email. In other words, only 11.5 percent of the total members participated in the survey (483/4200). Thus, the real response rate on email is about 26.9% (130/483). This study used part of the data used in Choi and Ko (2010) to measure RKM capability and firm performance.

As a result of the demographic analysis of the sample, by gender, the respondents consist of 43 managers (37.4 %), 29 staff members (25.2%), 23 general managers (20%), 15 CEOs (13%), and 5 others (4.4%). As to the firm's size of respondents, the firms with over 300 employees accounted for 63.7 percent and the rest were firms with 300 employees or less and accounted for 37.4 percent. In Korea, a firm is classed into two groups, a small-medium enterprise and a large enterprise, by the number of full-time employees. When a firm has more than 300 full-time employees, it is classified as a large enterprise (Choi and Ko, 2010). Thus, our sample is composed mainly of large enterprises. By industry, the petroleum and chemicals industry accounted for 27.1 percent, the computer/IT industry accounted for 25.4 percent, and the service industry accounted for 24.6 percent. By the type of IS used in IORs, the respondents are composed of 29 percent electronic data interchange (EDI), 26 percent Internet-based systems, 18 percent dedicated supply chain systems, and 14 percent e-marketplace.

Instrument Development

To measure the items, we used a seven-point Likert scale that ranged from 1 point (*very strongly disagree*) to 7 points (*very strongly agree*). The details of measures are provided in Appendix. We utilized the measures drawn from prior research.

Evaluating Measurement Model

This study used partial least squares (PLS) to assess the measurement model, using Visual PLS program. PLS is a widely used information system research in theory testing. PLS is a method used to test the relationships of latent variables and their indicators as well as to simultaneously test the structural model (Barclay et al., 1995). Besides, PLS has minimal demands on measurement scales, sample size, and residual distributions (Chin, 1998). Thus, this study used PLS because of a small sample size.

The results of measurement model are shown in Table 1 and Table 2. As to the reliability of our constructs, the coefficient of Cronbach's *a* was found to be above Nunnally (1978)'s threshold of 0.7. Composite reliability was also above 0.8 which exceeded the recommended the value of 0.7 (Fornell and Larcker, 1981). These results demonstrate that our constructs have reliability.

In terms of construct validity, all factor loadings are greater than 0.7 and every item has the highest loading on its corresponding construct. In addition, AVE was greater than the recommendation of 0.5 and the square root of the AVE was greater than the any correlation with other latent variables (Chin 1998; Fornell and Lacker, 1981). Therefore, the constructs meet the criteria for convergent and discriminant validity.

Constructs	Items	Ave.	S.D.	Cronbach *a*	Composite reliability	Communality	Redundancy
Physical IT resource	6	5.131	1.081	0.940	0.954	.7739	.0000
Human IT resource	9	5.100	0.957	0.951	0.958	.7197	.0000
RKM capability	6	4.973	1.170	0.952	0.962	.8098	.4233
Absorptive capacity	4	5.221	1.024	0.946	0.961	.8607	.2960
Firm performance	5	4.775	0.830	0.860	0.898	.6377	.1475

Note. S.D.: standard deviation.

Table 1. Descriptive Analysis

Construct		AVE	A	B	C	D	E
A	Physical IT resource	0.774	**0.880**				
B	Human IT resource	0.720	0.753	**0.848**			
C	RKM capability	0.810	0.631	0.707	**0.900**		
D	Absorptive capacity	0.861	0.524	0.516	0.525	**0.928**	
E	Firm performance	0.638	0.452	0.478	0.438	0.398	**0.799**

Note. All the values of correlation coefficient are significant at the 0.01 level. Diagonal line is the value of square root of the AVE.

Table 2. Construct Correlation and AVE

Testing Structural Model and Hypothesis

To assess the statistical significance of the overall loadings and the standardized path coefficients, this study applied the bootstrapping procedure which generated multiple samples by drawing from the original sample with replacement. Except for the relationship of human IT resource and absorptive capacity, the remaining relationships were significant at the 0.05, as shown in Figure 2 and Table 3.

With regard to criteria for the assessment of the structural model, the R^2 values are estimated. According to Chin (1998), an R^2 of 0.15 shows only weak explanatory power, whereas 0.35 is considered moderate and 0.67 is considered substantial. Thus, our model has almost moderate explanatory power.

Secondly, a global criterion of goodness-of-fit (GoF) proposed by Tenenhaus et al. (2005) represents an index for assessing the PLS model globally. This GoF measure is the geometric mean of the average communality and the average R^2. The average communality is computed as a weight average of the different communalities with the number of manifest variables or indicators of every construct as weights (Vinzi et al., 2010). For our model, GoF was 0.407, indicating it was highly satisfactory.

The final way to assess structural model, the Stone-Geisser Criterion Q2 (measured by the cross-validated redundancy index) (Chin, 1998) was also used to test predictive relevance. Q2 represents another measure of how well observed values are reconstructed by the model and its parameter estimates. A Q2 > 0 implies that the model has predictive relevance, whereas a Q2 < 0 represents a lack of predictive relevance (Chin, 1998). As a result, our structural model has predictive relevance (see. Table 1).

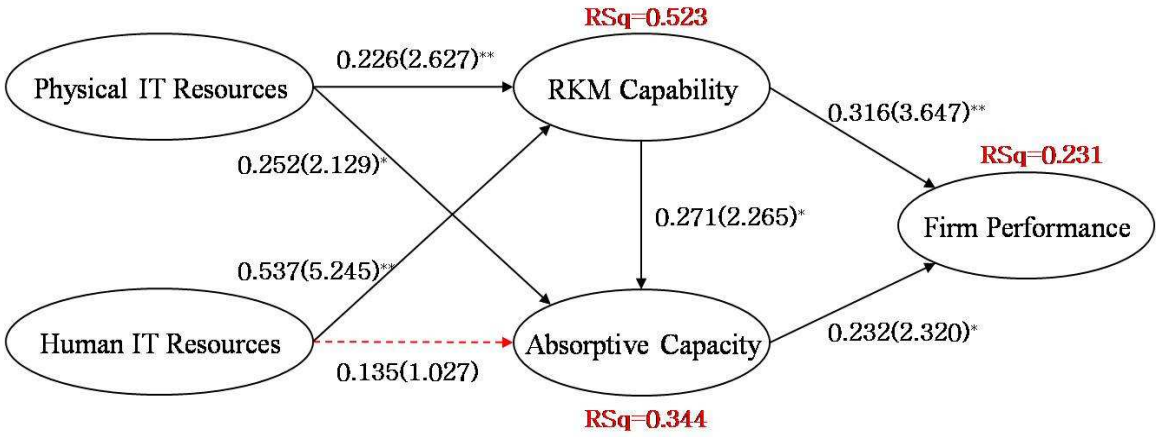

Figure 2. Result of Structure Model

Hypothesis / Path		Path coefficients	*t*-value	Result
H1a	Physical IT resource → RKM capability	0.226	2.6271	Accepted
H1b	Human IT resource → RKM capability	0.537	5.2445	Accepted
H2a	Physical IT resource → Absorptive capacity	0.252	2.1294	Accepted
H2b	Human IT resource → Absorptive capacity	0.135	1.0269	Rejected
H3	RKM capability → Absorptive capacity	0.271	2.2647	Accepted
H4a	Absorptive capacity → Firm performance	0.232	2.3198	Accepted
H4b	RKM capability → Firm performance	0.316	3.6473	Accepted

Table 3. Results of Hypothesis Testing

CONCLUSION AND IMPLICATION

Our results indicates that it is important for a firm to reinforce its capabilities such as RKM capability and absorptive capacity through leveraging physical and human IT resources dedicated in IORs. The results can offer one explanation why many firms have failed to obtain differential advantage over competitors although the firms make a huge investment on the IT resources for the IORs. This is because of a lack of a firm's capabilities to leverage IT resources. Therefore, the results imply that a firm should be constantly striving to create unique IT-enabled capabilities through cooperation with trading partners based on collaborative IORs, beyond the deployment of IT resources. Particularly, it is important to note that systematically managing and sharing the relational relationship-specific information and knowledge from IORs via IT resources plays a key role in developing further firm capability and improving firm performance of participating firms. The specific results are discussed as follows.

Firstly, physical IT resources are positively associated with RKM capability and absorptive capacity. This result supports the hypothesis that physical IT resources are a major means to build up electronic relationship-specific repository, to manage information and knowledge from IORs, and to share the information and knowledge among firms. Furthermore, physical IT resources affect the absorptive capacity of a firm to recognize the value of new knowledge, to apply it into its internal business procedures, and to utilize it for the firm's business purposes. The results suggest that physical IT resources offer a foundation for creating further capabilities to a firm by offering information and knowledge helpful to the firm's decision-making. Physical IT resources should be considered as important tools. However, it is important to note that IT resources should be further utilized for the creation of a firm's capabilities beyond the simple use or deployment in IORs.

Secondly, human IT resources have a positive effect on RKM capability whereas the effect on absorptive capacity has turned out to be non-significant. That is, human IT resources are effective in building and managing relationship-specific knowledge via electronic repository, however, it has a limitation on enhancing the absorptive capacity of a firm which emphasizes the application and utilization of the knowledge within the firm. Nevertheless, human IT resources directly affect absorptive capacity by facilitating a firm's enhancement of RKM capability. These results can be interpreted as meaning that absorptive capacity depends on the level of obtained knowledge rather than IT people.

Thirdly, RKM capability positively affects absorptive capacity. To utilize the information resources embedded in IORs, it is important that firms enhance the ability to acquire new information and combine the new information with internal information for the purpose of a business goal. This result confirms the notion suggested by Cohen and Levinthal (1990), Koka and Prescott (2002), and Uzzi and Lancaster (2003). If a firm has low levels of absorptive capacity, they could not grasp and obtain the valuable information from outside the firm like electronic relationship-specific memory. Therefore, firms try to enhance absorptive capacity to improve the management of knowledge. In order to do so, firms should expand their knowledge-resource sources, for example, by building up common relational relationship-specific knowledge memory in IORs. Relationship-specific knowledge memory can be a major source for a firm to acquire relationship-specific information and knowledge, and best practices created from the IORs.

Finally, firm capabilities such as RKM capability and absorptive capacity directly and positively affect firm performance. In addition, RKM capability directly affects firm performance via the enhancement of absorptive capacity. The results strongly support the argument that IT-enabled capabilities are more effective in increasing firm performance, rather than IT in itself

(Bharadwaj, 2000; Christiaanse and Venkatraman, 2002; and Melville et al., 2004). Furthermore, it is expected that RKM capability reinforces the value of inter-organizational collaboration.

In conclusion, our results demonstrate that systematically managing the large amount of knowledge obtained from IORs is important in leading to further firm capability and better firm performance for the firm participating in the IORs. Therefore, a firm makes a great effort to develop IT-enabled capabilities beyond the deployment between IT in IORs. This study confirms that IT resources in IORs are the major infrastructure which helps transactions and acts as the foundation to develop further capabilities; however, IT in itself could not assure superior firm performance. Depending on IT-enabled capabilities, firms can obtain different firm performance. Our study has only considered two types of capabilities as focusing on the management of information and knowledge in IORs. However, more studies are needed to explain what capabilities firms can develop based on inter-organizational collaboration.

LIMITATIONS AND FUTURE RESEARCH

We can provide some directions for future research by discussing several limitations of our research. First, this study tried to measure RKM capability by employing the concept of relationship-specific memory to suggest the importance of the management of common information and knowledge created from IORs. However, the RKM capability is a preliminary variable in IS literature so that much research is still required to elaborate on it. In addition, research can be approached from various perspectives including learning and knowledge management literature. For example, Selnes and Sallis (2003) considered relationship-specific knowledge memory as one of the dimensions of inter-organizational learning. Secondly, although the relationship of human IT resource and absorptive capacity was found to be non-significant, more research is needed on the role of human IT resource, in enhancing IT-enabled capabilities of a firm. Finally, this study assumed the indirect effect of IT resources on firm performance by focusing the role of IT-enabled capacity. That is, this study viewed IT resources as one of the common infrastructures which enhances a firm's capabilities. However, we did not test the mediation effects of IT-enabled capabilities in the relationships of IT resources and firm performance, via establishing alternatives model. This leads to further research.

REFERENCES

1. Barney, J. B. and Hansen, M. H. (1995) Trustworthiness as a source of competitive advantage, *Strategic Management Journal*, 15, 175-190.
2. Bharadwaj, A. S. (2000) A resource-based perspective on information technology capability and firm performance: An empirical investigation, *MIS Quarterly*, 24, 1, 169-196.
3. Byrd, T. A. and Turner, D. E. (2000) Measuring the flexibility of information technology infrastructure: exploratory analysis of a construct, *Journal of Management Information Systems*, 17, 1, 167-208.
4. Chin, W. (1998). Issues and opinion on structural equation modeling, *MIS Quarterly*, 22, 1, 7-16.
5. Choi, S. and Ko, I. (2010) The effects of electronic collaboration on interorganizational learning and firm performance, *Proceedings of the Forty-third Hawaii International Conference on System Sciences*, January 5-8, Kauai, Hawaii, USA.
6. Christiaanse, E., and Venkatraman, N. (2002) Beyond SABRE: An empirical test of expertise exploitation in electronic channels, *MIS Quarterly*, 26, 1, 15-38.
7. Cohen, W. M. and Levinthal, D. A. (1990) Absorptive capacity: A new perspective on learning and innovation, *Administrative Science Quarterly*, 35, March, 128-152.
8. Dewett T, and Jones, G. R. (2001) The role of information technology in the organization: A review, model, and assessment, *Journal of Management*, 27, 313–346.
9. Dyer, J. H., and Singh, H. (1998) The relational view: Cooperative strategy and sources of interorganizational competitive advantage, *Academy of Management Review*, 23, 3, 660-679.
10. Hult, G. T. M., Ketchen, JR. D. J., and Slater, S. F. (2004) Information processing, knowledge development, and strategic supply chain performance, *Academy of Management Journal*, 47, 2, 241-253.
11. Eisenhardt, K. M. and Martin, J. A. (2000) Dynamic capabilities: What Are they? *Strategic Management Journal*, 21, Oct.-Nov., 1105-1121.

12. Grant, R. (1996) Prospering in dynamically competitive environments: Organizational capability as knowledge integration, *Organization Science*, 7, 4, 375-387.
13. Johnson, Jean L., Sohi, Ravipreet S., and Grewal, R. (2004) The role of relational knowledge stores in interfirm partnering, *Journal of Marketing*, 68, July, 21-36.
14. Kankanhalli, A., Tan, B. C.Y., and Wei, K. (2005) Understanding seeking from electronic knowledge repositories: An empirical study, *Journal of the American Society for Information Science and Technology*, 56, 11, 1156-1166.
15. Koka, B. R. and Prescott, J. E. (2002) Strategic alliances as social capital: A multidimensional view, *Strategic Management Journal,* 23, 9, 795-816.
16. Lane, P. J. and Lubatkin, M. (1998) Relative absorptive capacity and interorganizatinal learning, *Strategic Management Journal*, 19, 461-477.
17. Li, L. (2006) Relationship learning at trade shows: Its antecedents and consequences, *Industrial Marketing Management*, 35, 166-177.
18. Malhotra, A., Gosain, S., and EL Sawy, O. A. (2005) Absorptive capacity configurations in supply chains: gearing for partner-enabled market knowledge creation, *MIS Quarterly*, 29, 1, 145-187.
19. Melville, N., Kraemer, K., and Gurbaxzni, V. (2004) Review: Information technology and organizational performance - An integrative model of IT business value, *MIS Quarterly*, 28, 2, 283-322.
20. Moorman, C. and Miner, A. S. (1997) The impact of organizational memory on new product performance and creativity, *Journal of Marketing Research*, 34, Feburary, 91-106.
21. Mukhopadhyay, T. and Kekre, S. (2002) Strategic and operational benefits of electronic integration in B2B procurement processes, *Management Science*, 48, 10, 1301-1313.
22. Powell, T. C. and Dent-Micallef, A. (1997) Information technology as competitive advantage: The role of human, business, and technology resources, *Strategic Management Journal*, Vol. 18, No. 5, 1997, pp. 375-405.
23. Powell, W. W., Koput, K. W., and Smith-Doerr, L. (1996) Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology, *Administrative Science Quarterly*, 41, 116-145.
24. Rai, A., Patnayakuni, R., and Seth, N. (2006) Firm performance impacts of digitally enabled supply chain integration capabilities, *MIS Quarterly*, 30, 2, 225-246.
25. Ross, J. W., Beath, C. M., and Goodhue, D. L. (1996) Develop long-term competitiveness through IT assets, *Sloan Management Review*, Fall, 1-42.
26. Selnes, F. and Sallis, J. (2003) Promoting relationship learning, *Journal of Marketing*, 67, 80-95.
27. Subramani, M. and Venkatraman, N. (2003) Safeguarding investments in asymmetric interorganizational relationships: Theory and evidence, *Academy of Management Journal*, 46, 1, 46-62.
28. Tenenhaus M., Vinzi E. V., Chatelin Y. M., and Lauro C. (2005) PLS path modeling, *Computational Statistics and Data Analysis*, 48, 1, 159-205.
29. Tippins, M. J. and Sohi, R. S. (2003) IT competency and firm performance: Is organizational learning a missing link, *Strategic Management Journal*, 24, 745-761.
30. Uzzi, B. and Lancaster, R. (2003) Relational embeddedness and learning: The case of bank loan managers and their clients, *Management Science*, 49, 4, 383-399.
31. Van den Bosch, F. A.J., Volberda, H. W., and de Boer, M. (1999) Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities, *Organization Science*, 10, 5, 551-568.
32. Vinzi, V. E., Chin, W. W., Henseler, J., and Wang, H. (2010) *Handbook of partial least squares: Concepts, methods, and applications*, Springer.
33. Wade, M. and Hulland, J. (2004) Review: The resource-based view and information systems research: Review, extension, and suggestions for future research, *MIS Quarterly*, 28, 1, 107-142.
34. Zahra, S. A. and George, G. (2002) Absorptive capacity: A review, reconceptualization, and extension, *Academy of Management Review*, 27, 2, 185-203.

APPENDIX.

Constructs	Items	Factor Loading	Prior Research
Physical IT Resource	1. The degree to which IT and IS are available in IORs.	0.865	Byrd and Turner (2000), Powell and Dent-Micallef (1997)
	2. The degree of available hardware and software for IORs	0.918	
	3. The degree of electronic linkage via network in IORs.	0.879	
	4. The degree to which IOIS supports a variety of business functions.	0.902	
	5. The degree to which IOIS can adjust to support new business functions.	0.905	
	6. The degree of adjusting IOIS to meet a user's needs.	0.852	
Human IT Resource	1. IT personnel understand business environments.	0.896	Byrd and Turner (2000), Powell and Dent-Micallef (1997), Ross et al. (1996)
	2. IT personnel understand business domains.	0.884	
	3. IT personnel understand the production and logistics of their firms.	0.869	
	4. IT personnel have the business knowledge to predict and understand problems in IORs.	0.859	
	5. IT personnel have the ability to solve the technical problems coming from IORs.	0.868	
	6. IT personnel have the ability to develop software and programming.	0.804	
	7. IT personnel and business managers have a mutual understanding on the necessity of IS for IORs.	0.856	
	8. IT personnel and business managers are in sympathy with the fact that IT can support business in IORs.	0.800	
	9. IT personnel and business managers discuss business issues as well as technical issues in IORs.	0.864	
Absorptive Capacity	1. Our company has the ability to grasp the value of new information occurred in IORs.	0.902	Lane (1998), Zahra and George (2002)
	2. Our company has the ability to assimilate the information coming from IORs into its internal operation.	0.954	
	3. Our company has the ability to transform the information coming from IORs for the decision-making on its internal operation.	0.938	
	4. Our company has the ability to apply its information for the development of new products and markets.	0.948	
RKM Capability	1. We store information in electronic relational knowledge memory.	0.909	Choi (2008), Hult et al. (2004), Li (2006), Malhotra et al. (2005), Moorman and Miner (1997)
	2. We frequently update information in electronic relational knowledge memory.	0.898	
	3. We can search and retrieve information from electronic relational knowledge memory.	0.904	
	4. We have electronic relational knowledge memory (i.e., common database) to acquire and store common information coming from IORs.	0.920	
	5. We accumulate best practice and success/failure experiences in electronic relational knowledge memory.	0.898	
	6. We have a variety of information and knowledge in electronic relational knowledge memory.	0.916	
Firm Performance	2. Overall business process is improved due to improving or adjusting preset business processes.	0.737	Choi (2008), Mukhopadhyay and Kekre (2002)
	3. Profitability is increased.	0.835	
	4. Learning opportunities about product/service, trading partners, and markets are increased.	0.884	
	5. Opportunities for improvement of current products and development of new products are increased.	0.790	
	6. Opportunities for new business are increased.	0.773	

Note. Item 1 of Firm performance was deleted (Transaction costs are reduced due to electronic collaboration and sales growth.) in that the factor loading of the item was lower than 0.7.