The Effects of IT Leveraging Competence on Firm Performance in Cross-firm Relationships: Focusing on Social Capital and Collaboration

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Abstract

Cross-firm collaboration has emerged as one of the primary management issues in the network-driven economy. Previous studies have emphasized cross-firm collaboration as a key factor in the successful attainment of corporate success in buyer-supplier relationships. However, these studies have not focused on the efficacy of IT leveraging competence and social capital with regard to collaboration. It is believed that social capital as well as IT leveraging competence has been historically accumulated as the result of long-term firm experience. In this study, we suggest that IT leveraging competence and social capital are facilitating factors of cross-firm collaboration (information sharing and cooperation), and empirically assess their impacts on collaboration and firm performance. The results of our empirical tests demonstrate that IT leveraging competence directly affects information sharing and social capital, and that social capital positively influences cross-firm collaboration. Firm performance also was determined to be affected by cross-firm collaboration. These findings showed that IT leveraging competence and social capital contributed significantly to cross-firm collaboration, and they were resources of competitive power, constituting crucial intangible assets of each firm.

1. Introduction

In today’s network-driven economy, a firm possesses limited resources within its formal boundaries, and thus firms endeavor to build collaborative networks in order to create competitive advantage [9][50]. Products are manufactured via collaboration with many companies, which produce raw materials, parts, and the finished goods. Because of this, market competition has been becoming fiercer, not only between competing companies but also between their associated company groups. Thus, collaboration and management for better relationships between firms is a key factor in business success. Many previous studies have emphasized cross-firm collaboration as a key factor in corporate success in buyer-supplier relationships [16][19][25]. However, although the importance of building networks and collaborating with other firms has been previously recognized, the manner in which these collaborative relationships are built, maintained, and improved, as well as the role of information technology during this process, has yet to be clearly elucidated. In this regard, it is crucially important to understand the process of collaborative network building and the structural relationships by which information technology improves collaboration between companies and leads to positive outcomes.

2. Research background

2.1. IT leveraging competence

From the resource-based view (RBV), in order to sustain competitive advantage, a firm’s resources or capabilities must have four attributes: value, rareness, imperfect imitability, and substitutability [4]. From the RBV perspective, capabilities are inimitable due to the idiosyncratic development of resources that have little value outside the context of a specific firm [51]. Simple IT adoption does not yield sustained competitive advantages because information technology (IT) -equipment and services- is available to all firms [12]. Thus, firms should have different resources and capabilities compared to their competing firms in order to sustain a competitive advantage through IT.

Mata et al. [31] have previously noted that IT has been recognized for its potential role in the creation
of sustained competitive advantage for firms, but it remains unclear as to whether IT might be able to create a sustained competitive advantage for firms. In their research they employed resource-based arguments to suggest four key IT attributes - access to capital, proprietary technology, technical IT skills, and managerial IT skills- which are considered to be possible sources of sustained competitive advantages. They determined that only managerial IT skills are likely to be a source of sustained competitive advantage, because managerial IT skills are developed over long periods of time, even though they are causally ambiguous and socially complex. Powell and Dent-Micallef [41] also determined that only human resources in concert with IT contributed to improved performance. Santhanam and Hartono [44] reported that firms with superior IT capability did indeed exhibit superior current and sustained firm performance as compared to average industry performance.

Pavlou and El Sawy [40] introduced and developed the construct of IT leveraging competence in new product development by drawing on the relevant IT capability literature. In previous studies, IT capability has been regarded as a complex, multidimensional construct, and the literature has proposed several specific IT-related resources that combine to form an IT capability. However, they insist that we should focus on end users leveraging dimension of IT capability, because the acquisition and deployment dimensions of IT capability are based largely on the IT investment decisions of IT executives, but more importantly, are implemented principally by IT staffs within the IT unit [40].

### 2.2. Social capital

The concept of social capital was originally used in community studies to describe relational resources embedded in personal ties within the community [23]. This concept has since been applied to a broad range of intra- and inter-organizational studies [55]. Nahapiet and Ghoshal [36] defined social capital as “the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or social unit”. Many other researchers have offered a variety of other definitions of social capital. However, although there are some differences in the components of the definition they emphasize, the definitions themselves are quite similar [1].

Nahapiet and Ghoshal [36] considered various aspects of social capital, studying the relationship between social capital within the organization and the creation of intellectual capital. They proposed three dimensions of social capital: structural, cognitive, and relational. Using these dimensions, Tsai and Ghoshal [52] assessed the relationship among three dimensions and the relationship between the exchange and combination of resources and value creation. They argued that each dimension of social capital is not independent, but is rather closely related.

Although many researchers have studied the effects of social capital, these studies can largely be boiled down to three benefits: information, influence-control-power, and solidarity [1]. The first benefit of social capital is information. Social capital facilitates access to broader sources of information and improves the quality, relevance, and timeliness of information [1]. This enables the members to access the desired information efficiently and also enables the companies to share information efficiently by improving visibility and reasonability and providing support. It also provides easy access to knowledge and information, and influences the process of binding and exchanging knowledge [22][32][36][52][55]. The second benefit of social capital is the influence, control, and power that derives from this information [1]. Social capital reduces the need to monitor and control people by building common norms and trust. These norms provide a standard set of “do’s and don'ts” for people, and also helps members of a group to understand, interpret, and anticipate the reactions of other members, because it makes it possible to restrain those who break the rules [46]. The third benefit of social capital is solidarity [1]. Norms, trust, and identification are three components of social capital that strengthen the solidarity within an organization. Even if a reciprocal-type solidarity does not yield a direct and immediate benefit, it does make it possible to help people through the relationship.

### 3. The research model and hypotheses

#### 3.1. The research model

The core element of cross-firm relationship is collaboration via relationship building. Therefore, we divided the collaboration between companies into the concepts of information sharing and cooperation, and focused on their precedent factors and the roles of those factors. In this study, we suggested that IT leveraging competence and social capital were the precedent factors for information sharing and cooperation. Based on the three dimensions suggested by Nahapiet and Ghoshal [36], we also suggested that social capital consists of three major
factors: strength of ties, shared language, and trust. We also assumed that information sharing and cooperation exerted direct effects on the firm performance.

3.2. Hypotheses

3.2.1. IT leveraging competence and collaboration.
According to studies regarding the relationship between information technology and firm performance, firms should have IT infrastructure including network, hardware, or related software [43][47][53], and also possess the capability to utilize it in order to achieve their goals [40]. Previous studies of cross-firm relationships have shown that IT capabilities provide visibility and ease of information access, and perform an positive function in cross-firm integration [42][53][56]. Based on the results of these studies, we formulated the following hypotheses by assuming that IT leveraging competence would exert a positive influence on information sharing and cooperation.

Hypothesis 1-1: IT leveraging competence in cross-firm relationships will be positively associated with information sharing.
Hypothesis 1-2: IT leveraging competence in cross-firm relationships will be positively associated with cooperation.

3.2.2. IT leveraging competence and Social Capital.

It remains difficult to make any clear conclusions regarding the relationship between information technology and social capital. However, a firm’s repository of data, its networking capability, and the basic functions of its information systems perform important functions in the creation of channels where members of companies can communicate with each other. Nonaka and Konno [38] referred to the place for communication as ‘Ba’. This space, which is connected by information systems, enables the members to communicate, build relationships and share their common interests. That is, information technology helps people to maintain relationships by organizing basic channels and strengthening communication. Sherif et al. [47] previously assessed the relationships between the use of knowledge management system (KMS) and the building of social capital. According to their research, the use of KMS exerts a positive effect on the capability of organizations aimed at the accumulation of social capital, and furthermore it strengthens firm’s capacities to create and transfer knowledge. But, in our model, we do not posit a direct relationship between IT leveraging competence and trust. We regard trust not as a direct product of IT leveraging competence, but rather as the consequence of building basic relationships and a sense of belonging. Therefore, we advance the hypothesis that IT leveraging competence influences the strength of ties or shared language, and exerts an indirect effect on trust. On the basis of this argument, we assumed that IT leveraging competence exerts a positive effect on social capital, and we thus developed the following hypotheses.

Hypothesis 2-1: IT leveraging competence in cross-firm relationships will be positively associated with the strength of ties.
Hypothesis 2-2: IT leveraging competence in cross-firm relationships will be positively associated with shared language.

3.2.3. The relationships within the constructs of social capital

Although each of the dimensions of social capital have been divided for purposes of analysis, they are actually closely related to one another [26][39][52]. Tsai and Ghoshal [52] previously noted that the structural dimension of social capital influences the relational dimension of social capital. Previously, network-related studies have reported on the relationships between trust and strength of ties [27]. Trust between members of a network emerges when they share common objectives and values with each other. Tsai and Ghoshal [52] reported that members of an organization can feel a sense of unity and can trust one another. These common values and shared vision can help to build trust. Thus, we have developed the following related hypotheses.

Hypothesis 3-1: Strength of ties will be positively associated with trust.
Hypothesis 3-2: Strength of ties will be positively associated with shared language.
Hypothesis 3-3: Shared language will be positively associated with trust.

3.2.4. The relationship between social capital and collaboration.

Social networks perform a function as a channel for information and resources, which reduces the investment cost and time required to collect the necessary resources [36][52]. The members can have access to the resources of other members through reprehensive action and can use these resources when they work in their firms. Collaborative action between members of the company can help to break
down the boundary between divisions [52]. If this logic is expanded to cross-firm relationships, it can be expected to help break down the boundaries of firms. These collapses of boundaries may facilitate the exchange of information and cooperation between companies, and can help to foster common thinking. Lane and Lubatkin’s study [28] of relationships in pharmaceutical and biotech firms shows that when a 'student' firm understands or shares the assumptions underlying the 'teacher' firm's systems, learning will be facilitated. Cohen and Prusak [13] reported that shared value and objectives between community members could be achieved through cooperation. Chiu [8] noted that shared language is crucially important for the sharing of ideas and to enhance community efficiency. Additionally, trust is a key factor emphasized by many researchers, and is known as an important element which facilitates the quality of mutual relationships and mutual participation [10][16][48]. Thus, we formulated the following related hypotheses.

**Hypothesis 4-1a:** Strength of ties will be positively associated with information sharing.

**Hypothesis 4-1b:** Strength of ties will be positively associated with cooperation.

**Hypothesis 4-2a:** Shared language will be positively associated with information sharing.

**Hypothesis 4-2b:** Shared language will be positively associated with cooperation.

**Hypothesis 4-3a:** Trust will be positively associated with information sharing.

**Hypothesis 4-3b:** Trust will be positively associated with cooperation.

#### 3.2.5. The relationship between collaboration and firm performance.

Collaboration is a joint effort by more than two organizations to increase the possibility of reaching goals that would difficult to achieve if the organizations acted singly. Many studies of cross-firm relationships have asserted that information sharing and collaboration exert a positive effect on firm performance [11][14][29][34]. Shared information in supply chains such as inventory and order status information improve the efficiency of management for all participants associated with the supply chains. On the other hand, proprietary and relation-specific information in cross-firm relationships contributes to the creation of new knowledge. Thus, information sharing between buyer and supplier can be understood as the key factor in cross-firm knowledge transfer [54]. Additionally, information sharing increases joint efforts and coordination, which reduce inefficiency in the business process. The more proprietary it is, the more cooperative activities occur in cross-firm relationships [37]. A study conducted by Choi and Ko [11] also showed that electronic information sharing exerts a positive effect on electronic collaboration and the firm’s operational performance, and electronic collaboration exerts a positive effect on strategic performance. Based on these arguments, we formulated the following related hypotheses.

**Hypothesis 5:** Information sharing will be positively associated with cooperation.

**Hypothesis 6-1:** Information sharing will be positively associated with firm performance.

**Hypothesis 6-2:** Cooperation will be positively associated with firm performance.

#### 3.3. Operational definitions and measurement items of the research variables

Operational definitions and measurement items were developed on the basis of previous studies. Related constructs and questionnaire items in the existing literature were converted into suitable forms for use in this study. On the basis of the operational definitions, the questionnaires were developed adopting a seven-point Likert scale, ranging from "strongly disagree" to "strongly agree", and were reviewed by two professors and two Ph.D. students in the Business Administration department. Our measures are shown in the Appendix.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>Items</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT lever-aging competence</strong></td>
<td>The degree to which a firm has the ability to effectively utilize IT functionalities to support cross-firm activities</td>
<td>ite1-ite6</td>
<td>[40][45]</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td>The degree to which a firm has compatible systems and networks required to manage external information and knowledge</td>
<td>con1-con4</td>
<td>[51][53]</td>
</tr>
<tr>
<td><strong>Strength of ties</strong></td>
<td>The degree to which firms have close relationships with each other</td>
<td>tie1-tie4</td>
<td>[8][20][55]</td>
</tr>
<tr>
<td><strong>Shared language</strong></td>
<td>The degree to which business partners can use common terms and understand each other in communication</td>
<td>sli-sli4</td>
<td>[8][36]</td>
</tr>
<tr>
<td><strong>Trust</strong></td>
<td>Firm's belief that another company will perform actions that will result in positive outcomes for the firm, and not take unexpected actions that would result in negative outcomes for the firm</td>
<td>tru1-tru5</td>
<td>[2][8][10][48][52]</td>
</tr>
<tr>
<td><strong>Information Sharing</strong></td>
<td>The degree to which companies actually share their transaction or inventory-related information</td>
<td>inf1-inf3</td>
<td>[11][54]</td>
</tr>
</tbody>
</table>

**Table 1. Operational definitions and measures**
4. Research Method

4.1. Data Collection

To empirically assess the proposed research model and hypotheses, we conducted a survey. For the pilot test, data was collected from the firms participating in the 'Photonics Korea 2007’ (2007.9.4–9.6) exhibition, which was hosted by the Korea Association for Photonics Industry Development. We also recognized the problems of the questionnaires and revised their items. The primary survey was conducted using the snowballing technique over a 10-week period (2007.9.15–11.30). A snowballing technique has been successfully employed in other organizational buying research, and has been suggested as a method for the prevention of the predictive accuracy and validity problems normally associated with single-informant studies [5].

We explained the intentions of our study to firms, associations, and relevant agencies which could recommend personnel in charge of collaboration with related companies. We then asked each of them to respond to the survey and to recommend a purchaser or a sales manager from another company. In this fashion, we repeated the process, sending an e-mail to the recommended individuals and asking them to recommend other subjects.

A total of 132 questionnaires were collected and 121 questionnaires were used in the final analysis after excluding 11 copies. Descriptive profiles of the respondents are provided in [Table 2].

### Table 2. Profile of the respondents

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Frequency (n=121)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photonics</td>
<td>37</td>
<td>30.58%</td>
</tr>
<tr>
<td>Electronics</td>
<td>36</td>
<td>29.75%</td>
</tr>
<tr>
<td>Automotive/ Machinery</td>
<td>18</td>
<td>14.88%</td>
</tr>
<tr>
<td>IT</td>
<td>7</td>
<td>5.79%</td>
</tr>
<tr>
<td>Food</td>
<td>7</td>
<td>5.79%</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>2</td>
<td>1.65%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of products/serv- ices supplied</th>
<th>Construct</th>
<th>3</th>
<th>1.65%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td>12</td>
<td>10.00%</td>
<td></td>
</tr>
<tr>
<td>End products</td>
<td>49</td>
<td>40.50%</td>
<td></td>
</tr>
<tr>
<td>Work-in-process products</td>
<td>47</td>
<td>38.84%</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>5</td>
<td>4.13%</td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>17</td>
<td>14.05%</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>2.48%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Less than 50</th>
<th>49</th>
<th>48.76%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51–100</td>
<td>12</td>
<td>9.92%</td>
</tr>
<tr>
<td></td>
<td>101–500</td>
<td>22</td>
<td>18.18%</td>
</tr>
<tr>
<td></td>
<td>501 and above</td>
<td>20</td>
<td>16.33%</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>8</td>
<td>6.61%</td>
</tr>
</tbody>
</table>

| Department of respondents | General management | 14 | 11.57% |
|                          | Sales dep.       | 22 | 18.18% |
|                          | Purchasing dep.  | 57 | 47.11% |
|                          | Finance          | 5  | 4.13%  |
|                          | Operation        | 6  | 4.96%  |
|                          | Computing        | 6  | 4.96%  |
|                          | Others           | 11 | 9.09%  |

| Occupation of respondents | Staff | 10 | 8.26% |
|                          | Assistant manager | 46 | 38.02% |
|                          | Manager          | 24 | 19.83% |
|                          | Deputy General Manager | 11 | 9.09% |
|                          | General manager  | 9  | 7.44%  |
|                          | Director/CEO     | 17 | 14.05% |
|                          | Others           | 4  | 3.31%  |

4.2. Data analysis and results

The Partial Least Squares (PLS) [6] method is considered to be a powerful method of analysis as compared to traditional statistical methods (e.g., regression and path analysis) and other structural equation modeling techniques (e.g., LISREL, EQS, and AMOS). We used the partial least squares (PLS) approach to test our model, because it has several advantages over other approaches. PLS does not require a large sample size and does not require multivariate normality distributions for the underlying data [17], and is thus ideally suited to the early stages of theory development. PLS also allows for a mix of constructs with reflective and formative indicators [33]. SEM techniques such as LISREL attempt to account for all the covariance between its measures. All items must be reflective in order to be consistent with the statistical algorithm that assumes that the correlations among indicators for a particular latent variable are caused by that latent variable [7]. Thus, attempts to explicitly model formative indicators in an SEM analysis have been shown to result in identification problems, with efforts to work around them proving generally unsuccessful [30]. One way around this problem is to apply the partial least squares (PLS) method, which can model formative indicators [3][7][17][24].
Present research uses both reflective and formative indicators developed from the existing literature, with an exploratory attempt to assess relationships between IT leveraging competence and social capital. It is worth noting that the sample size in this study was 121 respondents, which does not fully meet the scholarly requirements of a 10:1 ratio of sample size to the number of estimated parameters. Thus, the PLS approach appears to be an appropriate choice for our study. Our study used PLS-Graph Version 3.00 for the validation of both the measurement and structural models.

4.2.1. Test of the measurement model. In order to validate the measurement model, internal consistency and three types of validity were assessed: content validity, convergent validity, and discriminant validity. In addition, the construct – IT leveraging competence (ITC) – was a second-order factor which was measured by items from subordinate variables, and thus latent variable scores drawn from the first-order factor analysis were used as its measurement item. Content validity was confirmed by interviewing experts in the academic fields and by pilot-testing the instrument. Internal consistency and convergent validity were assessed by examining the Composite Scale Reliability index (CSRI) and the average variance extracted (AVE) from the measures. All CSRI and AVE values were greater than the threshold recommended in previous research (0.7 for CSRI and 0.5 for AVE) [6][18]. Finally, the discriminant validity was confirmed by looking at the square root of the AVE for each construct to determine whether it was greater than the inter-construct correlations. [Table 3] and [Table 4] show the descriptive statistics, AVE, CSRI, the square root of AVE (shaded numbers in the diagonal), and correlations between constructs.

Table 3. Reliability and Validity of ITC

<table>
<thead>
<tr>
<th></th>
<th>AVE</th>
<th>CSRI</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT exploit</td>
<td>0.747</td>
<td>0.946</td>
<td>0.864</td>
<td></td>
</tr>
<tr>
<td>Connectivity</td>
<td>0.75</td>
<td>0.923</td>
<td>0.563</td>
<td>0.866</td>
</tr>
</tbody>
</table>

Table 4. Reliability and Validity of latent variables

<table>
<thead>
<tr>
<th></th>
<th>AVE</th>
<th>CSRI</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITC</td>
<td>0.781</td>
<td>0.877</td>
<td>0.8884</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIES</td>
<td>0.794</td>
<td>0.939</td>
<td>0.519</td>
<td>0.891</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lang.</td>
<td>0.77</td>
<td>0.91</td>
<td>0.509</td>
<td>0.465</td>
<td>0.877</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td>0.727</td>
<td>0.93</td>
<td>0.410</td>
<td>0.578</td>
<td>0.480</td>
<td>0.853</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Info.S</td>
<td>0.836</td>
<td>0.939</td>
<td>0.534</td>
<td>0.528</td>
<td>0.655</td>
<td>0.463</td>
<td>0.914</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coop.</td>
<td>0.712</td>
<td>0.937</td>
<td>0.530</td>
<td>0.494</td>
<td>0.602</td>
<td>0.575</td>
<td>0.613</td>
<td>0.844</td>
<td></td>
</tr>
<tr>
<td>Perf.</td>
<td>0.787</td>
<td>0.937</td>
<td>0.53</td>
<td>0.460</td>
<td>0.586</td>
<td>0.565</td>
<td>0.527</td>
<td>0.727</td>
<td>0.887</td>
</tr>
</tbody>
</table>

4.2.2. Test of the structural model. Based on the adequate measurement model, the proposed hypotheses were tested by assessing the structural model. The posited hypotheses were tested with PLS via a bootstrap re-sampling method (500 re-samples). The suggested research model and results of the analysis are shown in Figure 1.

Among the hypotheses linking antecedent factors to collaboration (H1, H4), H1-1, H4-1a, H4-2a, H4-2b, and H4-3b were supported, but H1-2, H4-1b, H4-3a were not supported. Among the hypotheses linking IT leveraging competence to social capital (H2), H2-1, H2-2 were supported, and hypotheses of interrelationship of social capitals (H3), H3-1, H3-2, H3-3 were supported. Finally, the hypothesis between information sharing and cooperation (H5) was supported, and the hypothesis linking collaboration to firm performance (H6) was supported.

5. Summary and discussion

In this paper we suggested that IT leveraging competence and social capital were facilitating factors of cross-firm collaboration, and we empirically assessed their effects on collaboration and firm performance. On the basis of the relationships among IT leveraging competence, social capital, collaboration and performance, we developed the research model and its corresponding hypotheses. The study results show that IT leveraging competence is positively associated with firm performance, through collaboration and social capital. Also, the study emphasized the importance of cooperation between companies by showing that the process of cooperation is positively associated with firm performance, whereas the simple exchange of operational information does not exert a direct influence on firm performance.

The results of the study can be summarized as follows: First, cooperation was related positively to firm performance in cross-firm relationships. In this study, the cross-firm collaboration dimension was classified into information sharing and cooperation. The results of the study demonstrated that cooperation directly influenced firm performance, but information sharing did not. These results are consistent with previous findings that information sharing does not exert positive impacts on performance [10][54], but does have positive and significant impacts on cooperation [10]. We interpret
our results as follows: In Korea, companies inevitably have to use supply chain management systems for trade built by large companies for cross-firm trade, especially for trades with large conglomerates. In this circumstance, the majority of operational information for cross-firm trade is shared through the system. In this regard, many people may think that automatic information sharing naturally brings benefits. Additionally, the study shows that operational information, which is the essential condition that all companies naturally are supposed to share for trades, results in an enhancement of corporate performance by building relation-specific knowledge and fostering collaboration. This result is similar to the findings of previous studies which demonstrate that the acquisition and sharing of knowledge, learning, and cooperation are crucial for firm performance [10][14][51][52][55].

Second, social capital was identified as the important antecedent variable in cross-firm collaboration. The strength of ties directly affected information sharing, but did not affect cooperation. This means that high-level interaction between companies enables the companies to utilize information in a reasonable amount of time, and increases motivation for the exchange and processing of information, thus improving task performance. However, when the relationship between companies becomes closer, they tend to expect their partner companies to provide the necessary information and knowledge whenever they request them. This expectation may result in a decrease in the motivation to engage in active knowledge sharing or cooperation, and might then exert a negative effect on the collaboration process. Thus, it should prove meaningful to attempt to determine what level of relationship will bring the most benefits in cross-firm relationships via additional analyses into the intensity of the relationship and cross-firm knowledge/information sharing. Trust also affected cooperation but not information sharing. This finding can be interpreted to mean that the operational information required for cross-firm relationships must be shared, whether trust is built or not. This result supports the findings of previous studies demonstrating that trust exerts a positive influence on the exchange of knowledge and coordination [10][15][16][52]. Shared language influenced both information sharing and cooperation.

Third, the strength of ties was identified as a statistically significant factor for the formation of shared language and trust, and shared language is positively related with trust. In other words, trust is built when each firm has a close relationship and shared interpretation with other firms. Fourth, IT leveraging competence directly impacted information sharing, but did not affect cooperation. In the previous study[21] it was stated that knowledge should be distinguished from information, and knowledge cannot be exchanged with the help of IT itself, due to the differences in information by origin (i.e., sticky and tacit characteristics) [54]. In other words, information which is required for cross-firm relationships may be shared by automation, but cooperative activities (including knowledge sharing), which require additional efforts for formation, are influenced by other factors, such as effective communication processes. The existing arguments that information technology influences knowledge sharing or cooperation are predicated on the assumption that the information or knowledge to be shared has already been documented or can be documented. However, it is difficult to document the knowledge required for task performance, and in many cases, the knowledge is delivered directly through the process of collaboration. It appears that, in this regard, IT leveraging competence exerts no direct influence on cooperation.

Finally, on the basis of the results of our examination of the relationship between IT leveraging competence and social capital, IT leveraging competence was shown to significantly influence the strength of ties and shared language, and IT was a precedent variable of social capital. These results partially support the findings of Sherif et al. [47].

The results demonstrated that IT leveraging competence and social capital contributed significantly to firm performance, and these two factors should be considered the sources of competitive power, in that they are crucial intangible assets of each firm. Based on the results of our empirical testing, we were able to propose the several following important implications: First, it is necessary for a firm to exchange relation-specific knowledge and to make an effort toward cooperation to improve firm performance, in addition to exchanging information with its partners. Second, it is necessary for a firm to make an effort to build social capital to improve firm performance in cross-firm relationships. Third, it is crucial for a firm to develop IT leveraging competence. In other words, this study emphasizes that each firm should expand IT infrastructure, reinforce cross-firm linkages, and enhance IT competence by effectively utilizing the adopted system in order to improve firm performance.

6. Limitations and future research
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Our study provides some preliminary understanding of the role of IT leveraging competence and social capital in cross-firm relationships, but there are several limitations that should be considered for future research. Firstly, the data presented in this study are cross-sectional, whereas the development of social capital is an ongoing phenomenon. Social capital-related factors were measured at a static point rather than during continuous observations over their development. Thus, our explanations lack time richness. Future research should involve a longitudinal study in order to better explain the formation and maintenance processes of social capital. In addition, we collected data regarding only one aspect of a buyer or a supplier. Future research could collect data from both buyers and suppliers, and this will enhance our understanding of cross-firm collaboration and its effects on firm performance.

7. Reference


IT leveraging competence

IT exploitation (ite1~ite6)

- Our firm is skilled at collecting information about our customer via computer-based systems.
- We utilize computer-based systems to store and process customer information.
- Our firm is skilled at analyzing information about our customers via computer-based systems.
- We utilize computer-based systems for decision support.
- We have the ability to collect customer information using computer-based systems.
- We have the ability to analyze customer information via computer-based systems.

<Appendix>

IT leveraging competence

IT exploitation (ite1~ite6)

- Our firm is skilled at collecting information about our customer via computer-based systems.
- We utilize computer-based systems to store and process customer information.
- Our firm is skilled at analyzing information about our customers via computer-based systems.
- We utilize computer-based systems for decision support.
- We have the ability to collect customer information using computer-based systems.
- We have the ability to analyze customer information via computer-based systems.
Connectivity/Compatibility (con1~con4)
- Our firm's application for transaction processing is well-aligned with this customer.
- Our firm's communication application is well-aligned with this customer.
- Our firm's networks have no errors.
- Our applications are compatible with each other.

Strength of ties (tie1~tie4)
- We maintain close social relationships with this customer.
- We spend a lot of time interacting with this customer.
- We have frequent communication with this customer.
- We know this customer’s people on a personal level.

Shared Language (sl1~sl4)
- Our firm and this customer use common terms in communication.
- We have understandable jargon, abbreviations, and terminology in our communications. (item dropped)
- Our firm and this customer utilize understandable communication patterns during discussions.
- Our firm and this customer use understandable narrative forms to post messages or articles.

Trust (tru1~tru5)
- In this relationship, both sides avoid making demands that could seriously damage the interests of the other.
- This customer always keeps its promises to us.
- This customer did not leak or abuse confidential information drawn from the relationship.
- This customer did not demand that we do something unreasonable, exploiting the information drawn from the relationships.
- We expected this customer to help us upon request.

Information Sharing (inf1~inf3)
- We share transactional (order/logistics/inventory) information with this customer.
- We share product and component information with this customer.
- We share scheduling information with this customer.

Cooperation (co1~co6)
- Our firm and this customer cope with problems that arose in the course of the relationship together.
- Our firm and this customer are committed to improvements that may benefit the relationship as a whole.
- Our firm and this customer make an effort to improve the quality of products/services together.
- We share knowledge (e.g., know-how, experience, expertise) for improving performance with this customer.
- We share knowledge to improve decision-making with this customer.
- We share technological knowledge (e.g., know-how, expertise) related to our products/services with this customer.

Performance (perf1~perf4)
- Costs of products/services were decreased.
- Quality of products/services was improved.
- Lead-time for products/services was decreased.
- Effectiveness and flexibility were improved.

Figure 1. Research model and results of PLS analysis