

**INTERNAL CAPABILITIES, EXTERNAL LINKAGES, AND  
ORGANIZATIONAL PERFORMANCE: A STUDY ON  
TECHNOLOGY-BASED KOREAN VENTURES**

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**ABSTRACT**

This study examined the influence of internal capabilities and organizational linkages to external entities on firm performance by using data from 143 technology-based young Korean enterprises. Internal capabilities were operationalized by entrepreneurial orientation, technological capabilities and financial resources invested. External linkages were captured by partnership-based linkages and sponsorship-based ones. Partnership-based linkages were measured by strategic alliance with other firms, participation in venture associations, and collaboration with universities or research institutes. Sponsorship-based linkages consisted of financial and non-financial support from venture capitalists, commercial banks and the Korean government. Sales volume and competitiveness of products/services indicated organizational performance. Regression results showed that technological capabilities and financial resources are important predictors of organizational performance. Among external linkages, alliance with other firms and venture capital companies significantly enhances organizational performance. Several interaction terms have very significant influence on performance. Implications and directions for future research were discussed.



## INTRODUCTION

As an agent of creative destruction, technology-based young firms are one of the engines of economic development and wealth creation (Schumpeter, 1934). Technology-based young firms create new jobs (Birley, 1986) and foster technological innovations (Tushman & Anderson, 1986). However, these young firms are very prone to failure as “liability of newness” arguments suggested (Stinchcombe, 1965). As a result, scholars, policy-makers, and entrepreneurs are very concerned with factors that contribute to the success of technology-based young firms. This paper examines the influence of firm internal capabilities and firm’s linkages to external entities on the organizational performance of technology-based young firms.

What determines organizational performance is a perennial research question for organizational scholars. Many different perspectives have been developed to explain performance differential among firms. Several perspectives such as industrial organization (e.g., Caves, 1984) and population ecology (Hannan & Freeman, 1985) have emphasized industry or environmental conditions and ignored intra-industry performance differential among firms. By contrast, other perspectives have underscored the characteristics and activities of organizations rather than environmental conditions and explained intra-industry performance differential. Among those perspectives, two perspectives are very contrasting.

First, resource-based view of the firm (RBV hereafter) emphasizes firm idiosyncratic resources (e.g., Barney, 1991; Penrose, 1959; Wernerfelt, 1984). RBV regards the firm as a bundle of resources and suggests that characteristics of firm resources significantly affect the firm’s competitive advantage (Barney, 1986, 1991; Penrose, 1959; Peteraf, 1993; Wernerfelt, 1984). Firms of which resources are valuable, scarce, imperfectly tradable, and hard to imitate can have a sustainable advantage over competitors (Barney, 1986; Dierickx & Cool, 1989; Peteraf, 1993; Reed & DeFlippi, 1990). The firm resources investigated before include human resource, technological resource, financial resource, organizational culture, managerial capabilities, etc (Barney, 1986; Hall, 1991, 1993; Prahalad & Hamel, 1990).

Second, social capital theory suggests that social capital of organizations is a very important antecedent of organizational performance (Leenders & Gabbay, 1999). Recently, Organizations as an open system should mobilize external resources to produce products/services and should have ability to attract and retain customers (Burt, 1992; Pennings & Lee, 1999; Pennings, Lee, & Witteloostuijn, 1998; Uzzi, 1995). Firm’s ability to mobilize extramural resources and to attract customers is influenced by the quality of a firm’s linkages to external entities, because social relations mediate economic transactions and confer organizational legitimacy (Granovetter, 1985). While RBV has focused on resources or capabilities accumulated inside the firm, social capital theory has underscored a firm’s relational characteristics with external entities.

Drawing on the two perspectives, this paper examines the influence of internal capabilities and linkages to external entities on organizational performance in the context of technology-based young Korean enterprises. Additionally, this study investigates the joint effects of internal capabilities and linkages to external entities on organizational performance. We used survey data from 143 firms that were producing computer software, electric and

electronic products, and biotechnological products.

This study can contribute not only to field of management and organization and but to entrepreneurs. The current state of theory on technology-based young firms is in its own infancy. Theoretically, this study can test empirical validity of RVB and social capital theory on competitive advantage and can identify key success factors of venture business. More important contribution is that this study combines the two theoretical perspectives. Few studies have combined the two research streams, and to our knowledge no study has examined the joint effects of internal resources and linkages to external entities on organizational performance. Practically, this study can provide managerial implications to entrepreneurs in technology-based industries. Results of this study can suggest what kinds of internal capabilities entrepreneurs should accumulate and what kinds of external linkages entrepreneurs should develop.

## **THEORY AND HYPOTHESES**

### **Internal Capabilities and Organizational Performance**

What are the crucial internal capabilities that determine the performance of technology-based young firms? Several investigators have emphasized the attributes of entrepreneurs such as entrepreneurial attitude, education, work experience, and start-up experience as key success factors (e.g., Cooper & Bruno, 1977; Kazanjian, 1988; Miller, 1983; Mintzberg & Waters, 1987; Van de Ven, Hudson, & Schroder, 1984). By contrast, several papers such as Eisenhardt and Bourgeois (1988), Eisenhardt and Schoonhoven (1990), Goodstein and O'Reilly (1988), and Roure and Maidique (1986) have demonstrated that the attributes of top management team such as team size, joint work experience and heterogeneity in functional backgrounds of founding members were also important predictors of venture success.

Recently, several scholars have extended the antecedents of technology-based venture's success to the characteristics of organization as a whole. These characteristics include founding strategy (Romanelli, 1989), the degree of technical innovation within the core technology of the firm (Boeker, 1989; Maidique & Patch, 1982), the amount of financial expenditure after foundation (Schoonhoven et al., 1990). This paper examines the attributes of organization as a whole while controlling for founder's attributes and environmental conditions.

Review on literature of RVB and entrepreneurship combined with interviews with top executives of our sample firms suggest three important kinds of internal capabilities that significantly influence the performance of technology-based young organizations. They are entrepreneurial orientation, technological capabilities, and financial resources invested. Definitions of these variables and their relationship with organizational performance are provided as follows.

Entrepreneurial orientation. Entrepreneurs usually found a new venture to create a new market niche with new products/services or to substitute established players with better quality, cheaper price, etc. The creative destruction process calls for entrepreneurs to invest a great deal of resources in innovation (Kao, 1995; Schumpeter, 1934, 1947). Technology-based young organizations are not likely to succeed without the investment in innovation. Without



innovation, young organizations have to rely on traditional ways of doing business; traditional products/services, traditional distribution channels, usually higher price than established players. Head-to-head competition with established players is highly likely to lead the failure of new organizations due to the deficiency of many critical resources such as scale, legitimacy, network ties with resource holders such as suppliers and customers, etc. As a result, new organizations should differentiate themselves from established players by introducing innovations.

To generate innovations, entrepreneurs of technology-based young organizations should run the organization entrepreneurially (Covin & Slevin, 1991; Zahra, 1993). The term “entrepreneurial orientation (EO hereafter)” can capture the organizational processes, methods, and styles that firms use to act entrepreneurially (Lumpkin & Dess, 1996; Miller, 1983). It has been studied as a key determinant of the performance of new ventures in entrepreneurship literatures (e.g., Lumpkin & Dess, 1996). We adopted three dimensions of EO suggested by Miller (1983); innovativeness, risk-taking propensity, and proactiveness. Numerous studies have adopted or extended the conceptualization in new venture investigation (e.g., Covin & Slevin, 1989; Ginsberg, 1985; Lumpkin & Dess, 1996; Morris & Paul, 1987; Schafer, 1990). Innovativeness reflects a firm’s propensity to engage in and support new ideas, experimentation, novelty, and creative processes that may result in new products, services, new market, and manufacturing processes (Lumpkin & Dess, 1996). Risk-taking propensity of a firm is its willingness to make large and risky resource commitments (Miller, 1983). Finally, proactiveness refers to how a firm relates to market opportunities through active market research and introduction of new products/services ahead of competitors (Lumpkin & Dess, 1996; Miller & Friesen, 1978). This discussion provides following hypothesis.

*Hypothesis 1: The level of entrepreneurial orientation is positively associated with organizational performance.*

Technological capabilities. Technology-based young organizations usually were established to enter the existing market niches or create new market niches by developing and utilizing new technologies. Not surprisingly, technological capabilities have been regarded as a critical success factor that determines the performance not only of technology-based organizations (e.g., Bettis & Hitt, 1995; Henderson & Clark, 1990; Tushman & Anderson, 1986) but also of technology-based new ventures (Chandler & Hanks, 1994; Dollinger, 1995; Shrader & Simon, 1997). Technological capabilities are defined as technological knowledge, technical expertise or know-how generated by R&D (Dollinger, 1995). Especially, patents and utility models patents and designs, which are protected by patent laws and thus can be used exclusively, allow new ventures to create new products, identify market opportunities, and differentiate themselves from competitors. Technological capabilities of young organizations that are not protected by laws are very vulnerable to be imitated by competitors, especially by large established competitors. Large firms can absorb the unprotected technologies of young organizations by scouting the key technicians or researchers with a lure of thick compensation that young organizations cannot afford to provide. Patent laws cannot protect several kinds of competitiveness enhancing technological capabilities. One of them is quality control capability. Absent of other signaling indicators for product quality, quality assurances provided by domestic and international institutions enhance organizational performance by letting potential customers know the technological capabilities of new ventures.

This discussion leads us to following hypothesis.

*Hypothesis 2: Technological capabilities a new venture built is positively associated with organizational performance.*

Financial resources. Financial resources that a new venture invested before are very important predictor of venture performance (Dollinger, 1995; Schoonhoven et al., 1990; Shrader & Simon, 1997). Schoonhoven et al. (1990) argued that the amount of capital a new venture has expended before would increase the speed with which first products reach market. Technology-based young organizations usually invest all available financial capital during early development stage. However, they usually run short of financial resources that should be invested for technology development, market research and advertising, because they typically are less able to mobilize financial resources from external entities from banks than more established companies are. Young firms endowed with a large amount of capital have many advantages. They can invest more to develop products, advertise, research market, and hire experts whose capabilities are necessary for organizational success. Other things being equal, young firms that invested more in R&D, advertising, and market research are more likely to perform better in the future. This discussion leads us to following hypothesis.

*Hypothesis 3: The amount of financial resource that a venture invested before is positively associated with organizational performance.*

### **Linkages to External Entities and Organizational Performance**

Organizations, either established larger ones or new start-ups, does not have sufficient resources needed and thus has to exchange the resources with organizational environment (Pfeffer & Salancik, 1978). Especially new start-ups that usually are established only with ideas and thus are deficient of many resources should mobilize resources from external environment. In mobilizing external resources, linkages to external entities play very important role. It is because economic actions are embedded within larger organizational networks, which not only facilitate some types of actions but also constrain actor's choices and actions transcending pure cost-benefit analysis (Granovetter, 1985). Dollinger (1985) found that financially successful entrepreneurs were particularly active in networking with business people and regulators. Hansen (1995) also found that entrepreneurial networks are positively associated with organizational growth. Networks are vital to perceive opportunities, test ideas, and garner resources to create new enterprise (Aldrich & Zimmer, 1986).

The networks among organizations have been investigated as a key factor that influences organizational actions and performance. Recently suggested term "corporate social capital" captures this effect of social networks on organizational performance (e.g., Pennings et al., 1998). Corporate social capital can be defined as "the set of resources, tangible or virtual, that accrue to a corporate player through the player's social relationships, facilitating the attainment of goals (Gabbay & Leenders, 1999: 3)."

We differentiated partnership-based linkages from sponsorship-based linkages. Partnership-based linkages are cooperative and bilateral relationships in the sense that participants in the relationship give-and-take resources for a considerable time span. Sponsorship-based linkages are unilateral relationships in the sense that external entities



provide unilateral supports to a new venture without receiving explicit rewards. Both kinds of linkages can enable a firm to mobilize resources needed for input transformation and sell the output (Baum & Oliver, 1991; Eisenhardt & Schoonhoven, 1996).

Partnership-based linkages. Partnership-based linkages to external entities can be defined as cooperative or collaborative relationships with environmental constituents (Baum & Oliver, 1991; Dollinger, 1989). Literature review and interviews with top executives of our sample firms suggest that three kinds of partnership-based linkages are crucial to enhance the performance of technology-based young organizations. They are linkages to (1) resource supplying organization including venture capitalists and consuming organizations, (2) other technology-based young organizations, and (3) universities and research institutes. Strategic alliance is used as an instrument to have a long-term relationship with suppliers and customers. Participation in venture associations and informal entrepreneurs' network help a firm to establish relationship with other young organizations. Formal R&D contracting-out provides linkages to universities and research institutes.

Strategic alliances with suppliers and customers provide a great advantage to young firms. Strategic alliance can signal enhanced legitimacy for firms (Baum & Oliver, 1991; Eisenhardt & Schoonhoven, 1996), provide opportunities for gaining new competence (Hagedoorn, 1993; Hennart, 1991), and offer specific knowledge-based resources such as manufacturing or customer information (Hamel et al., 1989; Teece, 1987). Alliance can also help firms to gain market power (Hagedoorn, 1993), move more quickly into new markets and technologies, and create option for future investment (Eisenhardt & Schoonhoven, 1996). Through strategic alliances, a firm can secure stable sources of resource supplies and sales of products/services. New ventures usually have a great difficulty in securing suppliers and customers who are questioning the long-term survival of the venture. Suppliers are reluctant to transact with a new venture especially when the transaction requires transaction-specific investments, because the investments are not likely to be recovered. Customers are also reluctant to buy products/services of new ventures, because they suspect the quality and performance of products/services produced by new ventures, and worry about repair services and value of warranty in cases of the venture's failure. Several studies have illustrated the benefit of having strong relationship with others for a venture success. For instance, Uzzi (1996) showed that strong ties with suppliers, which are very similar to strategic alliance, enhance the survival chance of new ventures.

Equity investment of venture capital companies into a new venture not only provides financial resources and management know-how but also enhances legitimacy. Since venture capital companies that invested in a new venture have a strong incentive to make the venture succeed, they provide management related know-how and refer potent professionals who can help the venture. Potential suppliers, buyers, investors and employees face a great deal of uncertainty in deciding whether they transact with the new venture or not. The equity participation of venture capital companies signals to those suspecting entities that the new venture has a high chance of success. The legitimacy and lowered perceived uncertainty enable a new venture to mobilize external resources with better terms.

By participating in venture associations and informal entrepreneurs' networks, entrepreneurs can obtain valuable information about management of venture business, new

market trends and opportunities, and potential cooperators (Pennings & Harianto, 1992). Noria (1992) linked interpersonal contacts within Route 128 business community to implications for cooperative action among firms. The networks also help entrepreneurs find right professionals such as lawyers, accountants, and venture capitalists who can help the ventures, since networks can function as powerful referring networks. The reference will be more valuable when it has a solid ground to believe the referee because of two reasons. First, information transferred through trustworthy relations is more credible and interpretable because the identity of actors and the intensity of their social ties are as important as the information itself (Uzzi, 1996). Second, the network functions as a social control mechanism, because the network diffuse information about economic actors, and the fear of reputation loss resulting from opportunistic behavior deters firms linked to the network from behaving opportunistically against each other (Raub & Weesie, 1990). Noria (1992) linked interpersonal contacts within Route 128 business community to implications for cooperative action among firms. In addition to direct interpersonal contact, status and reputation also enhance the likelihood of cooperation (Podolny, 1994) These qualities signal the skill and trustworthiness of potential partners and so facilitate cooperation, particularly when there is high uncertainty (Eisenhardt & Schoonhoven, 1996).

The collaboration with universities and research institutes provides a means of developing technological knowledge, which cannot be developed by a new venture alone (Mapes, 1967). Universities also provide consulting assistance to a new venture and opportunities for continuing education for professional employees (Cooper, 1973). In the long run, the collaboration can enable new venture to recruit researchers with high caliber who will not join the venture otherwise. In the collaboration process, professors and researchers are personally acquainted with the venture and thus recommend their students/fellow young researchers to join the venture. In addition, graduate students who participate in the projects can get to know about the venture and its technology and are likely to join as key members of the venture when they believe the success potential of the venture. Interviews with the founders of successful technology-based Korean ventures also indicate that they actively used the collaboration with universities and research institutes for developing technology in the short term and for hiring high-quality employees. These discussions lead us to following hypothesis.

*Hypothesis 4: The partnership-based linkages to other firms, venture capital companies, venture associations, and universities/research institutes are positively associated with organizational performance.*

Sponsorship-based linkages. Sponsorship-based linkages of an organization are unilateral relationships in the sense that external entities provide supports to the organization without receiving explicit rewards. Young organizations that are supported by powerful institutes have a great advantage (Flynn, 1993). The linkages increase the amount of external resources available to a new venture, providing the opportunity for organizational growth. Reducing the potentially adverse effects that arise during vulnerable early stage of the organization (Stinchcombe, 1965), the linkages protect the new ventures from environmental threats (Hall, 1982; Miner, Amburgey, & Sterns, 1990). Young organizations can mobilize resources from those institutes free of charge or with better terms. The sponsorship of those institutes also enhances the social legitimacy and status of a new venture (Baum & Oliver,





1992; Podolny, 1993). The enhanced legitimacy and status enable a new venture to mobilize resources from other entities that are critical for venture success.

In the context of technology-based young Korean organizations, the Korean government has initiated creating a richer and more nurturing environment conducive to birth and survival of technology-based ventures. The government itself nominated several technology-based ventures as promising ones and provided research funding for technology development to those ventures. The Korean government has established a variety of promising small enterprise nomination programs. When selected as a promising small enterprise by government, a venture can obtain a developmental fund from the government and social legitimacy.

The Korean government also encouraged powerful financial institutions to provide more supports to technology-based ventures. Several commercial banks in Korea have established the promising small enterprise nomination programs. When selected as a promising small enterprise by a bank, a new venture can borrow money with an interest rate lower than market rate and also get social legitimacy. These discussions lead us to following hypothesis.

*Hypothesis 5: The sponsorship-based linkages to venture capital, commercial banks, and government agencies will increase organizational performance.*

Interactions. Above hypotheses suggest that internal capabilities and linkages to external entities individually influence organizational performance. While internal capabilities indicate organization's ability to transform inputs into outputs efficiently, corporate social capital - organization's linkages to external entities - determines ability to mobilize inputs needed for transformation and to dispose outputs (Burt, 1992). Internal capabilities help a firm to build social capital, since a firm with a higher level of distinctive capabilities is more likely to be selected as an alliance partner by other firms (Chung, Singh, & Lee, 1999). Corporate social capital also facilitates the accumulation of internal capabilities, because other firms linked to the focal firm offer access to valuable information, resources, and economic opportunities that are necessary for the accumulation of internal capabilities (Knoke, 1999).

Organization of which transformation capabilities are much greater than capabilities for garnering inputs and disposing outputs cannot fully utilize its transformation capabilities, since it has a difficulty in mobilizing necessary inputs from environment and in disposing outputs at a reasonable price. When the quality and performance of the outputs and the value of transformation capabilities can be accurately measured without substantial cost, external entities can rely on the measurement in deciding if they will transact with the focal firm. When the measurement is not easy as in the case of the output of technology-based young organizations, even a firm with a high level of transformation capabilities is not able to acquire extramural resources. It is because external entities face a great deal of uncertain in assessing the value of transformation capabilities and potential outputs.

Organization of which capabilities for garnering inputs and disposing outputs are much greater than transformation capabilities cannot acquire the inputs and dispose outputs in the long run. Social relations in which exchange between actors are not reciprocal for a long time

are likely to be broken, since one actor unilaterally sacrifices itself for the other for a long time (Chung, Singh, & Lee, 1999; Gouldner, 1960; Levi-Strauss, 1957). External entity that has exchange relations with a focal firm lacking transformation capabilities does not have strong incentive to maintain its relationship for a long time. In sum, organizations that keep the balance between internal capabilities and social capital can fully utilize them and thus can perform well. These discussions lead us to the following hypothesis.

*Hypothesis 6. Internal capabilities and linkages to external entities will have positive interaction effect on organizational performance.*

## METHODS

### Sample and Procedures

Population of our study is technology-intensive young Korean firms. We sampled firms from those firms that were enrolled as a venture company in Korean Small & Medium Business Administration. At the end of 1998, 2043 firms were enrolled. Among them, 1012 firms were producing computer software, electric and electronic products, and biotechnological products. We sent questionnaire to all of the 1012 firms. 175 firms (19 % response rate) responded to the questionnaire. To reduce unobserved heterogeneity, we deleted 19 firms that were founded by a joint venture of large Korean conglomerates or founded before 1983. We also deleted 13 additional responding firms due to missing information. As a result, we used data from 143 firms.

The data collection procedures are as follows. First, we interviewed top executives and upper echelon managers of 50 firms to find key variables that affect the performance of our sample firms. We also pretested our questionnaire by using 11 firms in December 1998. All of the questions in the final questionnaire asked factual (not perceptual) information. Most of prior empirical studies that measure entrepreneurial orientation use the several items with Likert 5 Scales. But this subjective measurement could have some problems (Chandler & Chandler, 1994; Jennings & Lumpkin, 1989). We sent the questionnaire to the CEO or founding members. These individuals were chosen because of their extensive knowledge of their firm's organizational characteristics. Considering smallness of our sample firms and their newness, they were very likely to have correct information. Also questioning factual information rather than perceptual information would enhance the accuracy of our data. The key informant method has been commonly used in organizational research when secondary archival data were not available (Hansen & Wernerfelt, 1993). 102 firms indicated that their top executive responded the questionnaire. Remaining 46 firms pointed out that top echelon managers filled out the questionnaire. The respondents were followed by phone calls to clarify any incomplete data.

### Measurement of Internal Capabilities

We measured internal capabilities by three indicators; entrepreneurial orientation, technological resources, and financial resource invested.

Entrepreneurial orientation. Following suggestions of Miller (1983), Covin and Slevin (1991), and Stevenson and Jallio (1990), we measured entrepreneurial orientation by three



indicators: innovativeness, risk-taking propensity, and proactiveness. As Lumpkin and Dess (1996) suggested, we measured innovative activities as the number R&D employees divided by the total number of employees in 1997. We measured risk-taking propensity by two indicators; (1) the number of risk-taking R&D projects divided by total number of R&D projects in 1997 and (2) R&D expenditure per risk-taking R&D project (total risk-taking R&D expenditure / the total number of risk-taking projects in 1997). We treated a project for developing a brand new product as least in Korean industry as a risk-taking R&D project. Proactiveness were captured by three index by the ratio of market research costs to sales volume, the ratio of advertising expense to sales volume, and the ratio of the number of sales employees to total number of employees. Reliability test by using factor analysis suggested the deletion of proactiveness indicators. To create a single composite indicator for entrepreneurial orientation, we standardized an indicator of innovativeness and two indicators of risk-taking propensity by using mean and standard deviation of the corresponding indicator and added the three standardized scores.

Technological capabilities. We measured technological capabilities by three indicators; (1) the number of technologies developed by themselves, including the number of patents and patents submitted, (2) the number of utility model patents and designs that were registered to the Korean Patents Administration, and (3) the number of foreign and domestic quality assurance marks acquired. We standardized each of the indicators by using the mean and standard deviation of corresponding indicator and added them up to create a single indicator. Prior studies have used the number of patents (e.g., Miller & Shamise, 1996) or subjective indicators (e.g., Chandler & Hanks, 1994) to measure technological capabilities. Since the average age of our sample firms are 3 years and acquiring a patent usually takes three or more years, we could not use the number of patents only.

Financial resources invested. We measured financial resources invested by the amount of total R&D investment, advertising and market research investment in 1997. Schoonhoven et al. (1990) measured financial resources invested with monthly average of total costs and expenses accrued after organizational founding. The logic is that organizational performance largely depends on the amount of financial resource invested during the previous years.

### **Measurement of Linkages to External Entities**

We differentiated linkages to external entities into two kinds. First, partnership-based linkage is more explicit and reciprocal relationship with external entities. Second, sponsorship-based linkage is a kind of uni-directional relationship. External entities provide unconditional support or long-term investment.

Partnership-based linkages. We measured partnership-based linkages by three indicators. The first indicator is the number of other firms with which a focal firm has a strategic alliance for marketing or technology development. The second is the number of formal associations for entrepreneurs and informal entrepreneur's network that a focal firm participates in. The third is the number of collaborating R&D projects and technology exchange programs with universities or research institutes.

Sponsorship-based linkages. We measured sponsorship-based linkages by three

indicators. The first indicator is the number of venture capital firms that invested equity in the focal firm. The second is measured by two index; (1) the number of cases in which financial institutes named the focal firm as a promising small enterprise, and (2) the number of financial institutes from which the focal firm received a loan with a below market interest rate during 1997. We standardized each of the two indicators by using the mean and standard deviation of corresponding one and added them up to create a single indicator. The third is measured by two index; (1) the number of cases in which Korean central or local governments named the focal firm as a promising small enterprise, and (2) the number of government research projects that the focal firm executed alone or with other organizations during 1997. We standardized each of the two indicators by using the mean and standard deviation of corresponding one and added them up to create a single indicator.

### **Measurement of Organizational Performance**

How can we measure the performance of technology-based young enterprises? Profitability such as ROI (return-on-investment) may not be an appropriate performance indicator for those firms, because many of them are usually in the stage of product development (Hart, 1995). In addition, it is very difficult to gather accurate accounting data, since many of those firms did not establish an accurate formal accounting system yet. We could not use the speed of shipping first product for revenues after foundation (Schoonhoven et al, 1990), organizational growth (Eisenhardt and Schoonhoven, 1990) or organizational survival (Brüderl, Preisendörfer, & Ziegler, 1992), since we did not have firm level data from the founding. After interviewing top managers of our sample firms and considering prior studies on technology-based young enterprises, we selected two indicators; sales volume and the competitiveness of products/services.

Sales volume. Sales volume is the amount of sales during 1998. Entrepreneurs are very interested in sales volume and it is not sensitive to accounting methods that the focal firm adopted (Chandler & Hanks, 1994).

Competitiveness of products/services. We developed the second measure to reflect the fact that entrepreneurs usually found new firms with the objectives of outcompeting or replacing existing companies or creating a new market niche. To measure the competitiveness of products/services, we asked five questions about the competitiveness of products/services that the focal firm sold in 1998; (1) the number of products/services of which performance or quality was improved in 1998, (2) the number of products/services of which production cost competitiveness was enhanced in 1998, (3) the number of products/services that created a new market niche in 1998, (4) the number of products/services that penetrated established market successfully in 1998, and (5) the number of products/services that substituted significantly import from foreign countries in 1998. We divided the five numbers by the total number of products/services that the focal firm was selling, and then we computed the average of the five ratios. The average ratio indicates the percentage of products/services that had or improved competitiveness. Since the ratio itself does not inform us financial contribution to the focal firm, we multiplied the ratio and sales volume. Sales volume data for each of products/services with competitiveness would be more desirable, but we could not gather those data. Therefore, we estimated the sales volume from products/services with competitiveness. The measurement error would produce less significant coefficients for



independent variables, and likely to generate conservative bias in interpreting results.

### **Control variables**

We controlled for variables that may affect performance indicators. Controlled variables include firm size measured by the total number of employees in 1997. We controlled for the average growth rate of market that the focal firm participated in during 1997 and the number of competing firms in 1997, since they can indicate environmental munificence (Chandler & Hanks, 1994; Schoonhoven et al. 1990). Also controlled is the length of founder's industry experience that would have positive effects on organizational performance (Brüderl, Preisendörfer, & Ziegler, 1992). We also controlled for organizational age that is the number of years elapsed after founding since it would positively influence performance as "liability of newness" arguments suggest (Stinchcombe, 1965).

### **Analysis**

We employed ordinary least squares (OLS) regression to analyze the data. As we already mentioned in measurement section, we lagged the effect of independent variables at least one year. Two dependent variables were the organizational performance in 1998, while independent variables were either 'stock' indicators at the end of 1997 or 'flow' indicators before the end of 1997. We selected the length of lagging effect on the basis of interviews with top executives. The lagged dependent variable model would be a more rigorous test of the effects of firm characteristics on firm performance (Mosakovski, 1993).

In order to test the additive effects of internal capabilities, external linkages, and the interaction between internal capabilities and external linkages, we ran four different models for each dependent variable. The first model with only control variables is a benchmark against which to test the effects of internal capability on organizational performance. The second model has both control variables and internal capabilities in order to test positive global effects of complementarity in comparison to the first model. The third adds external linkages to the second model. The last model is a full model that includes control variables, internal capabilities, external linkages and interaction terms. It tests the additive effects of interaction terms on alliance formation relative to the third model.

## **RESULTS**

Table 1 provides the means, standard deviations, and correlations of all variables. Positive and significant correlations between internal capability indicators and social capital indicators suggest that internal capabilities can help the development of social capital and vice versa. Also notable are positive and significant correlations among social capital indicators. Table 2 and 3 reports the results of four regression models explaining sales volume and competitiveness of services/products respectively.

### **Insert Table 1 about Here**

**Global tests.** We conducted a series of global tests comparing successive models by using incremental F-test, as shown in the bottom of Table 2 and 3. The first global test indicates that Model II, which includes internal capabilities, as well as control variables,

explains the sales volume and the competitiveness of services/products significantly better than Model I, which has control variables only ( $p < .001$ ). Also, the second global test indicates that Model III, which uses external linkages, explains the dependent variables significantly better than Model II ( $p < .001$ ). The final global test shows that addition of interaction terms significantly improves explaining power of the model ( $p < .001$ ). These global tests indicate that we have to consider internal capabilities, external linkages, and their interaction terms together to explain the performance of technology-based young organizations better.

**Insert Table 2 about Here**

**Insert Table 3 about Here**

Internal capabilities. We can test each of the hypotheses on the basis of the Model IV results. Hypothesis 1 suggests that internal capabilities of organization is positively associated with organizational performance. As the hypothesis predicts, financial resources invested positively influence both indicators of organizational performance. Entrepreneurial orientation does not have any significant effect on the dependent variables in Model IV. Contrary to the hypothesis, technological capabilities significantly decrease both indicators of organizational performance in Model IV. While the variable has significant and positive effect on the dependent variables in the other models, the positive coefficient becomes negative one when we introduce interaction terms in Model IV. Hypothesis 1 is not supported.

External Links. Hypothesis 2 suggests that linkages to external entities is positively associated with organizational performance. As the hypothesis predicts, linkages to other enterprises and venture capital companies have positive and significant influence on both indicators of organizational performance. Contrary to the hypothesis, linkages to commercial banks significantly decrease both indicators of the dependent variables. Linkages to government significantly decrease sales volume but significantly increase product competitiveness. Linkages to universities/research institutes do not have any effect on sales volume but have significantly negative effect on product competitiveness.

Interactions. The effect of interaction terms are mixed in general. Several interaction terms have positive influence on organizational performance, while other terms have negative influence on the dependent variables.

## **DISCUSSION AND CONCLUSIONS**

This study provides several theoretical and practical implications for researchers and managers who are concerned with technology-based young organizations. First of all, this study showed the importance of financial capital invested and technological capabilities. Financial resources invested are as important as technological resources in determining organizational performance in the context of technology-based young organizations. The venture managers have to accumulate technological capabilities and to accurately assess market opportunities for venture success.

Second, the results of this study showed that linkages to external entities are very important for venture success as social capital theory suggested. Among various linkages, strategic alliances with venture capital companies, suppliers and customers are critical for



venture success. Sponsorship-based relationships are not so important for enhancing organizational performance.

Third, this study showed that there are very strong interaction effects of internal capabilities and linkages to external entities. The result suggested that organizations should simultaneously develop internal capabilities and social capital.

The weakness in the present study provide some suggestions for future research. First, this study focused on the formal inter-organizational relationships. Future research needs to consider informal inter-organizational relationships or social network such as entrepreneur's and founding team's personal networks (Dubini & Aldrich, 1991; Ostgaard & Birley, 1994). The study of analyzing both of them could reveal the dynamics of external resource mobilization through social networks and furnish comprehensive results about external resource mobilizing of capabilities.

Second, future research can examine conditions under which the interaction effects of internal capabilities and corporate social capital are more prevalent. We claimed that difficulty in evaluating the outputs of a firm and the firm itself increases the strength of interaction effects. The results of this study showed that the interaction effects are very strong in the current setting, but did not showed that they are not strong in other less uncertain conditions.

Third, we could not use longitudinal methodology due to limitations in collecting data. Future research can collect data from the founding of sample firms and investigate other kinds of performance indicators such as survival, growth rate, and time interval between founding and the shipment of first commercial product for generating revenue.

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**Table 1**

**Descriptive Statistics and Correlation Matrix (N=143)**

Note :  $p < .05$  if  $|r| > .13$

Variables	Mean	S.D.	1	2	3	3-1)	3-2)	3-3)	4.	5.	6.	7.	8.	9.	10.	11	12	13	14	15	
1. Sales Volume in 1998	42.4118	103.5793																			
2. Product Competitiveness in 1998	15.5392	43.8540	.69																		
3. Entrepreneurial Orientation of the firm	0.0727	0.4763	.05	.21																	
1) Innovativeness	41.4083	23.3601	-.12	.03	.72																
2) Risk-taking	0.0675	0.6281	.30	.28	.43	-.17															
3) Proactiveness	0.0336	0.9630	-.16	-.10	.20	.27	-.07														
4. Technological resource	-0.052	0.6209	.49	.52	.00	-.10	.21	-.07													
5. Financial resource	569.60	1287.93	.91	.53	.07	-.03	.21	-.09	.36												
6. Linkages to other enterprise	3.0070	5.3214	.01	-.03	-.06	.04	-.21	-.05	.00	-.00											
7. Linkages to venture networks	0.9580	1.1313	.06	.16	.05	.07	-.08	-.02	.18	.54	.11										
8. Linkages to universities	1.9021	1.9548	.12	.15	.01	.09	-.14	.15	.35	.07	.33	.20									
9. Linkages to venture capital	0.4965	1.1313	.71	.55	.07	.03	-.04	-.14	.35	.66	-.01	.18	.16								
10. Linkages to financial institutes	-0.0295	0.8267	.31	.36	-.12	-.11	-.10	-.05	.43	.21	.03	.23	.16	.35							
11. Linkages to government	-0.0257	0.9344	.32	.33	-.10	-.06	-.14	-.10	.49	.27	.07	.34	.13	.39	.62						
12. Organizational size	30.7692	43.6321	.78	.40	-.16	-.30	.12	-.18	.44	.73	-.02	.07	-.00	.64	.50	.54					
13. Organizational age	4.5944	3.3802	.34	.17	-.22	-.35	.06	-.14	.35	.23	.06	.09	.05	.25	.27	.28	.46				
14. Entrepreneur's experience	14.4406	7.2991	.09	.08	-.04	-.06	.01	.14	.18	.08	.01	-.06	.11	.05	.10	.17	.16	.36			
15. Market growth rate	89.2132	265.5017	.03	.06	.27	.25	.02	.82	.04	.02	-.07	-.05	.15	-.03	-.01	-.07	-.05	-.08	.18		
16. Number of competitors	10.3038	17.4774	.14	.06	.05	.17	.02	-.09	.00	.14	.03	-.02	-.06	.13	.09	.10	.11	.04	.13	.04	



**TABLE 2**  
**Results of OLS Models : Sales Volume in 1998 (N = 143)**

Variables	Model I	Model II	Model III	Model IV
Intercept	-10.473 ( 12.837)	-4.456 ( 7.805)	-8.166 ( 9.098)	-18.512 ( 7.109)
Organizational size	1.870*** ( .142)	.424*** ( .123)	.455*** ( .145)	.544*** ( .118)
Organizational age	-.127 ( 1.953)	2.087* ( 1.148)	1.791 ( 1.125)	.103 ( .815)
Entrepreneur's experience	-.689 ( .830)	-.644 ( .473)	-.490 ( .466)	-.154 ( .322)
Market growth rate	.0292 ( .021)	.0839 ( .012)	.0674 ( .012)	.0406 ( .009)
Number of competitors	.319 ( .318)	.112 ( .182)	.114 ( .178)	.115 ( .123)
Entrepreneurial orientation		7.114 ( 7.232)	5.597 ( 7.101)	.894 ( 5.002)
Technological capabilities		24.694*** ( 5.753)	28.632*** ( 6.447)	-40.976*** ( 10.527)
Financial resource		.0568*** ( .004)	.0509*** ( .004)	0.0737*** ( .007)
Linkage to other enterprise			.351 ( .618)	2.042*** ( .572)
Linkage to venture networks			-1.926 ( 2.955)	2.307 ( 2.265)
Linkage to universities			.293 ( 1.887)	1.613 ( 1.649)
Linkage to venture capital			11.534*** ( 3.912)	10.585*** ( 3.011)
Linkage to financial institutes			3.254 ( 5.007)	-11.600** ( 4.514)
Linkage to government			-12.270*** ( 4.830)	-6.965* ( 4.058)
Technological resource x Linkage to other enterprise				10.963*** ( 1.401)
Financial resource x Linkage to other enterprise				-0.0056*** ( .002)
Technological resource x Linkage to venture networks				18.382*** ( 2.719)
Financial resource x Linkage to financial institutes				.0421*** ( .006)
Technological resource x Linkage to government				-39.250*** ( 5.110)
Financial resource x Linkage to universities				-.0112*** ( .002)
Technological resource x Linkage to venture capital				20.073*** ( 5.037)
Adj. R2	.605	.872	.881	.946
Incremental F-test		80.284***	2.655***	114.585***

Note: Standard errors are in parentheses.

\* p < .10; \*\* p < .05; \*\*\* p < .01

**TABLE 3**  
**Results of OLS Models : Product Competitiveness in 1998 (N = 143)**

Variables	Model I	Model II	Model III	Model IV
Intercept	1.649 ( 8.040)	10.011 ( 7.085)	15.288 ( 8.098)	1.735 ( 3.813)
Organizational size	.410*** ( .089)	-.0513 ( .112)	-.324** ( .129)	.119* ( .063)
Organizational age	-.267 ( 1.223)	-.0794 ( 1.042)	-.0395 ( 1.002)	-.152 ( .428)
Entrepreneur's experience	.0807 ( .520)	0.0014 ( .430)	.149 ( .415)	-.0245 ( .170)
Market growth rate	.0129 ( .013)	-.0015 ( .011)	.0024 ( .011)	.0032 ( .005)
Number of competitors	.0170 ( .199)	.0119 ( .165)	-.0927 ( .158)	.135** ( .065)
Entrepreneurial orientation		15.811** ( 6.565)	11.966* ( 6.321)	1.972 ( 2.652)
Technological capabilities		28.301*** ( 5.222)	25.627*** ( 5.738)	-6.221* ( 3.278)
Financial Resource		.0141*** ( .003)	.0132*** ( .004)	.0124*** ( .004)
Linkage to other enterprise			.0674 ( .550)	1.108*** ( .350)
Linkage to venture networks			.360 ( 2.631)	.702 ( 1.184)
Linkage to universities			-2.284 ( 1.680)	-3.149*** ( .863)
Linkage to venture capital			12.136*** ( 3.482)	3.443** (1.605)
Linkage to financial institutes			10.406** ( 4.457)	-5.559** (2.405)
Linkage to government			.121 (4.299)	4.723* (2.814)
Financial resource x Linkage to universities				.0069*** (.001)
Financial resource x Linkage to other enterprise				-.0040*** (.001)
Financial resource x Linkage to financial institutes				.0225*** (.003)
Technological resource x Linkage to venture networks				10.805*** (1.360)
Financial resource x Linkage to government				-.017*** (.003)
Technological resource x Linkage to venture capital				7.582*** (2.213)
Financial resource x Linkage to venture capital				-.0012** (.001)
Adj. R2	.135	.412	.474	.916
Incremental F-test		22.514***	3.615***	291.937***

Note: Standard errors are in parentheses.

\* p < .10; \*\* p < .05; \*\*\* p < .01