

# Effects of Innovativeness of External Networks on Corporate Innovativeness and Innovation Performance - Focusing on Comparison of Business Categories according to the Technology Level of the Manufacturing Industry -

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## Abstract

*In this study, the effect of innovativeness of external networks on the corporate innovativeness and innovation performance were explored based on web survey data collected from 230 manufacturing companies. Specifically, according to the manufacturers' business categories divided by the technology level, three groups such as advance technology (electronic/IT), mid- to high technology (automobile/machine), and low technology (textile/clothing) companies were investigated to find out which external network influences corporate innovativeness and innovation performance. In the result, textile/clothing companies were not different in company size, history, and innovation effort from advanced technology and mid- to high technology companies. Collectively, the innovativeness of external networks affected corporate innovativeness and innovation performance. In the result by a business category, innovativeness and innovation performance of textile/clothing companies were affected by the innovativeness of competitors, whereas automobile/machine companies in the mid- to high technology group were affected by suppliers. In addition, advanced technology (electronics/IT) were affected by buyers and competitors. These differences suggest that the way to use vertical networks toward upstream (e.g., suppliers) and downstream (e.g., buyers) as well as horizontal networks toward competitors can be different by the business category of manufacturers. The result would provide implications for the academia and the industry.*

*Key words : corporate innovativeness, innovation performance, external network, textile, clothing.*

## I. Introduction

Innovation has been considered as a key factor

to increase the competitiveness of a company. Therefore, many researchers<sup>1)</sup> have been interested in the issue of innovativeness of a company. Innovative companies that are open to the adop-

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1) R. J. Calantone, S. T. Cavusgil and Y. Zhao, "Learning Orientation, Firm Innovation Capability, and Firm Performance", *Industrial Marketing Management* Vol.31 No.6 (2002), pp.515-524.

J. H. M. Frans, M. Verhees and M. T. Meulenbergh, "Market Orientation, Innovativeness, Product Innovation, and Performance in Small Firms," *Journal of Small Business Management* Vol.42 No.2 (2004), pp.134-154.

A. Hausman, "Innovativeness among Small Businesses: Theory and Propositions for Future Research," *Industrial Marketing Management* Vol.34 No.8 (2005), pp.773-782.

tion of innovation and more active in seeking for an innovation, tend to have more chances to develop new products and advance processes. When some of these new innovations made by the company are successful in the market, the company would be able to have increased sales and income.

Researchers<sup>2)</sup> who studied factors affecting the innovativeness of a company, have concentrated on internal characteristics of the company such as company size, company history, targeting market, etc. There were little research devoted to the external factors such as external networks in the study of corporate innovativeness. Some researchers<sup>3)</sup> found there was a meaningful effect of the external networks on the technological innovations, however, no study dealt with the relationship between the innovativeness of external networks and the corporate innovativeness as well as the success of innovations.

External networks with diverse parties such as buyers, suppliers, and competitors would provide valuable information of new technology, market change, innovations in raw materials and parts, etc. Good relationships with innovative partners would positively stimulate the company and allow the company to have wider perspectives on the technological innovation.

However, partners who are more influential in enhancement of corporate innovativeness could be different by the business sector since each business would have its own way to cooperate with external partners. For example, advanced techno-

logy manufacturers in the field of electronics or IT are likely to have a few big buyers who are much influential in the managing vertical networks. Those big buyers might push collaborative companies to develop new technology and new products. On the other hand, low technology manufacturers in the field of textile and clothing tend to not depend much on a few big buyers and make a transaction with a variety of buyers. Also, these companies do not need a high edge technology for making new products and have a similar level of technologies with competitors so that market change and competitor movement would be key benchmarking points.

In this study, the effect of the innovativeness of external networks on the corporate innovativeness and the innovation performance would be explored. Specifically, it is studied which external partner would be influential in corporate innovativeness and the innovation performance through a comparison of business categories of manufacturers, divided by the technology level. The present study would contribute to the literature in relation of external networks to corporate innovativeness and innovation performance.

Purposes of the research are as follows.

1. Explore whether external networks collectively affect corporate innovativeness and innovation performance of manufacturing companies,
2. Explore which external network affects corporate innovativeness and innovation performance according to business categories such as:

- 1) Advanced technology manufacturers (e.g., elec-

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- 2) G. T. M. Hult, R. F. Hurley and G. A. Knight, "Innovativeness: Its Antecedents and Impact on Business Performance," *Industrial Marketing Management* Vol.33 No.5 (2004), pp.429-438.  
R. Hurley and G. T. M. Hult, "Innovation, Market Orientation, and Organizational Learning: An Integration and Empirical Examination," *Journal of Marketing* Vol.62 No.3 (1998), pp.42-54.
  - 3) H. G. Gemunden, T. Ritter and P. Hydebäck, "Network Configuration and Innovation Success: An Empirical Analysis in German High-tech Industries", *International Journal of Research in Marketing* Vol.13 No.5 (1996), pp.449-462.  
S. I. Kwak and Y. I. Chang, "An Empirical Study on the Types of Technological Networking and Innovation Performances in Korean Small and Medium Sized Firms," *The Korean Small Business Review* Vol.20, No.2 (1998), pp.51-71.  
T. K. Sung, "Firm Characteristics and Innovative Activity: With Special Reference to Schumpeterian Hypothesis," *Korean Journal of Industrial Organization* Vol.9 No.3 (2001), pp.133-155.  
T. K. Sung, "Determinants of Firm's Innovative Output: The Role of External Networks and Firm Size," *DAEHAN Journal of Business* Vol.18 No.4 (2005), pp.1767-1788.

tronics, IT)

2) Mid- to high technology manufacturers (e.g., automobile, machine)

3) Low technology manufacturers (e.g., textile, clothing)

## II. Literature Review

### 1. Corporate Innovativeness and Innovation Performance

Corporate innovativeness is considered as companies' capacity to introduce some new products, processes or ideas in the organization.<sup>4)</sup> Corporate innovativeness can be determined by the openness of organization members toward the innovation.<sup>5)</sup> Corporate innovativeness would be positively related to the innovation performance. Employees in the highly innovative companies are likely to be more active in developing new products or advancing processes. Therefore, companies with a high level of innovativeness would have more chances to develop new technology innovation on new products or services, and some of those might be successful in the market, resulting in a high level of innovation performance. Innovativeness is believed to be associated with organizational performance indeed.<sup>6)</sup>

There have been some studies<sup>7)</sup> investigating factors affecting corporate innovativeness, how-

ever, most of these studies concentrated on the internal factors of the company. Otherwise, there were a small number of studies dealing with the effect of external factors on the innovation activity of a company. Among external factors, external networks with partners were thought as an important factor impacting innovation activity of a company.<sup>8)</sup>

### 2. Effect of External Networks

#### 1) Effect of External Networks

External network is the non-hierarchical relationship among organizations to collaborate each other for the mutual goal. Through these networks, companies would obtain information for technology innovation, new business opportunity, market change that would be essential in success of new products or services.

Beliefs as that relationships with external partners are important to reinforce technology competitiveness of the company, have been strengthened in previous studies.<sup>9)</sup> Researchers agree that little company can achieve the technology innovation only with internal competences although the company has a high level of technology.<sup>10)</sup>

In Beesley and Rothwell's survey,<sup>11)</sup> it was found that 89% of small and medium sized innovative companies had at least one external network which

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- 4) R. Hurley and G. T. M. Hult, op. cit.
  - 5) G. T. M. Hult, R. F. Hurley and G. A. Knight, op. cit.
  - 6) B. L. Dos Santos and K. Rfeffer, "Rewards to Inventors in Innovative Information Technology Applications: First Moves and Early Followers in ATMs," *Organizational Science* Vol.6 No.3 (1995), pp.241-259.
  - 7) R. J. Calantone, S. T. Cavusgil and Y. Zhao., op. cit.; Frans, M. Verhees and M. T. Meulenbergh., op. cit.; Hausman, op. cit.
  - 8) H. G. Gemunden, T. Ritter and P. Hydebreck., op. cit.; Kwak & Chang, op. cit.; Sung, op. cit.
  - 9) J. N. H. Britton, "A Regional Industrial Perspective on Canada under Free Trade," *International Journal of Urban and Regional Research* Vol.17 No.4 (1993), pp.559-577.  
C. Freeman, "Networks of Innovators: A Synthesis of Research Issues," *Research Policy* Vol.20 No.5 (1991), pp.499-514.  
E. Malecki, "Entrepreneurship in Regional and Local Development," *International Regional Science Review* Vol.16 (1994), pp.119-154.  
G. Rosegger, *The Economics of Production and Innovation: An Industrial Perspective* (Boston: Butterworth-Heinemann, 1996).
  - 10) D. Jones-Evans and C. Baden-Fuller, "Small Technical Consultancies and Their Client Customers: An Analysis in North East England," *Entrepreneurship and Regional Development* Vol.7 No.1 (1995), pp.21-40.
  - 11) N. Beesley and R. Rothwell, "Small Firm Linkages in the United Kingdom," in *Innovation, Adaptation and Growth*, ed. R. Rothwell and J. Bessant (Amsterdam: Elsevier, 1987).

is technologically important. Also, Chandra and MacPherson<sup>12)</sup> found that 80% of innovative companies had at least one external network and 50% had more than two external networks.

Gemunden et al.<sup>13)</sup> pointed out the important role of diverse partners such as buyers, suppliers, competitors, distributors, research institutes, consultants and the government for technology innovation through a research generating types and performance of technology networking.

## 2) Parties of External Networks

Important external networks impacting company innovation would be suppliers, distributors, and buyers.<sup>14)</sup> In the vertical relationships, a relation can be depended on upstream (e.g., supplier) or downstream (e.g., buyer). Also, horizontal relationships would include relations with competitors.

Effective relationship with buyers allow companies to get an idea for the technology needs of the market, leading the newly developed innovation to a success. Buyers tend to request low price and high quality products with new functions, therefore, those requests work as a motivation letting companies to make better innovations to consistently satisfy with buyers' needs.<sup>15)</sup>

Technological relations with suppliers would be more effective in improving working process and reducing production cost. Quality improvement of raw materials based on reducing the cost would increase attractiveness of new products and services of the company, resulting in the reinforcement of the relationship with suppliers. Specifi-

cally, Gemunden et al.<sup>16)</sup> stated that networking with partners including suppliers would be more effective in improvement of existing products. Rothwell<sup>17)</sup> found that 55% of machine manufacturers made a significant innovation based on a linkage of buyers and suppliers whereas 10% did it based on a linkage only with buyers. The result suggests the importance of relationships with suppliers in the mid- to high technology manufacturers as the machine industry.

Actually one company can not have all resources for the innovation. Competitors targeting the similar market with similar products would have also a good level of technology for the innovation. In addition, technology collaboration between competitors could be occurred to achieve standards within the same business category with their co-developed technologies or products.

Gemunden et al.<sup>18)</sup> highlighted that collaborations with diverse external networks would contribute to the success of product innovation. Based on the literature, it can be assumed that the innovativeness of partners would affect corporate innovativeness as well as innovation performance.

## 3) Differences according to Business Categories

Although there were some research efforts were made on the effect of external networks on the corporate innovativeness or innovation performance, only a few research focused on a specific industry such as manufacturing. Furthermore, there was no research focusing on the difference of

12) B. Chandra and A. MacPherson, "The Characteristics of High-technology Manufacturing Firms in a Declining Industrial Region: An Empirical Analysis from Western New York," *Entrepreneurship and Regional Development* Vol. 6 (1994), pp.145-160.

13) H. G. Gemunden, T. Ritter and P. Hydebreck., op. cit.

14) E. Von Hippel, *The Sources of Innovation* (New York: Oxford University Press, 1988).

15) S. I. Kwak and Y. I. Chang, "An Empirical Study on the Types of Technological Networking and Innovation Performances in Korean Small and Medium Sized Firms," *The Korean Small Business Review* Vol. 20 No.2 (1998), pp.51-71.

16) Ibid.

17) R. Rothwell, "Innovation in Textile Machinery: Some Significant Factors in Success and Failure," *Paper Presented in the Science Policy Research Unit* (London: University of Sussex, 1976).

18) H. G. Gemunden, T. Ritter and P. Hydebreck., op. cit.

business category in terms of the relationship between the external networks and corporate innovativeness or innovation performance.

Sung<sup>19)</sup> conducted the research of 1,128 manufacturing companies, finding the important effect of external networks on product and process innovation. In the research of 2,822 manufacturing companies conducted by Small & Medium Business Administration,<sup>20)</sup> manufacturing companies used external networks actively (31.3% used networks with buyers, 22.7% used networks with raw material or part suppliers and 42.2% used networks with competitors) and satisfied pretty much with these external networks. However, these research did not provide a comparison result by a business category although working process and collaboration patterns could differ from the business category. In this study, the effect of innovativeness of external networks on corporate innovativeness and innovation performance would be explored according to the business category of the manufacturing industry.

### III. Research Methods

#### 1. Data Collection

Data were collected through the web survey. Web survey method was selected since it is effective to nationally collect data from a wide range of companies and since it is a method to collect quality data in a short period of time.<sup>21)</sup>

Web survey was conducted by the I research company with volunteers who are working in the advanced technology manufacturing company (e.g., electronics, IT), mid- to high technology manufacturing company (e.g., automobile, machine), or low technology manufacturing company (e.g., textile, clothing) for more than 5 years. The voluntary respondents were selected out of the 140,000 panel members of the research company. Busi-

ness category according to the level of manufacturer's technology was referred to "Manufacturer categories according to technology level based on the OECD R&D investment concentration".<sup>22)</sup>

Survey data were collected from 230 companies (144 advanced technology, 45 mid- to high technology, and 41 low technology manufacturers). Respondents are distributed by gender (156 males and 74 females), class (84 managers, 77 general staffs, 46 department heads and 21 executives), education (136 4-year university graduates, 64 2-year university graduates and 30 graduate degree holders), duty (96 in management & planning, 51 in R&D, 33 in marketing, 32 in finance; *multiple answers*), and working years (169 working for 5-9 years, 32 working for 10-14 years, 29 working for more than 15 years).

#### 2. Pretest Interview

Questionnaire was developed by researchers based on results of web interviews with 53 companies and the literature. Pretest interviews were also conducted with a convenient sample of 53 companies in a variety of manufacturers. Open-ended questions used in the pretest interview were: 1) Do you think that the innovativeness of external networks (e.g. buyer, supplier, competitor) affects corporate innovativeness?, 2) If yes, describe reasons why you think like that with appropriate cases, 3) Do you think that the innovation performance and corporate innovativeness correlate each other?, and 4) If yes, describe reasons why you think like that with appropriate cases.

In the pretest result, the following was found. First, 83% (44 out of 53) of respondents agreed that external networks affect corporate innovativeness. Second, some important comments were obtained in terms of the reason why external networks affect corporate innovativeness as follows.

"We could expand our market globally by con-

19) T. K. Sung, op. cit.

20) *Small and Medium Business Technology Statistics Research Report* (Seoul: SMBA, 2006).

21) P. Comley, "Internet Survey: The Use of the Internet as a Data Collection Method," *Paper Presented in the ESOMAR/EMAC: Research Methodologies for the New Marketing Symposium* (New York, 2000).

22) *Small and Medium Business Technology Statistics Research Report*, op. cit.

sistently developing and maintaining the relationship with buyers." (H3; IT)

"Liason with companies providing parts and components is likely to be resulted in an innovation" (H9; Automobile)

"Leading competitors reflect the flow of the period, therefore, new technology adoption of the competitors can be a stimulus letting us to follow." (H16; Textiles)

Third, 40 out of 53 (75.5%) of respondents thought that innovation performance relates to corporate innovativeness. Fourth, although many respondents agreed that the close relationship between the corporate innovativeness and innovation performance, there were diverse opinions on this as follows.

"Innovativeness results in better good and quality goods result in good sales." (H22; Textiles)

"Although a large number of products were newly developed, market response was not good" (H17; IT)

Based on these pretest result, it is assumed that the innovativeness of external networks affects corporate innovativeness and innovation performance and that the relationship can be different by business categories of manufacturers.

### 3. Questionnaire Development and Data Analysis

Based on the pretest interview results, questionnaire for the survey was developed to further explore the relationships of innovativeness of external networks to corporate innovativeness and innovation performance. Questionnaire included: 1) 9 questions for innovativeness of external networks (3 questions such as "... is generally innovative", "... is generally active to seek for an idea", "... is willing to take risks in seeking an innovation" each for buyer, supplier and competitor), 2) 8 questions for corporate innovativeness (e.g.,

"Our company is innovative", "Our company is active in introducing new products/services in the market", "In our company, an innovative idea is easily accepted."), 3) 3 questions for innovation performance (e.g., "Newly launched product/service was successful", "Newly launched product/service received good response from the market", "Newly launched product/service would contribute to the increase of sales"). Cronbach's alpha for multiple item measures was 0.847 for buyer innovativeness, 0.806 for supplier innovativeness, 0.854 for competitor innovativeness, 0.936 for corporate innovativeness, and 0.860 for innovation performance. Based on the high reliability of multiple-item measures, mean of these items was used as a variable. In addition, questions for characteristics of the respondent and company were asked. Data were analysed through descriptive statistics, ANOVA, and linear regressions.

## IV. Result and Discussion

### 1. Characteristics of Companies

Characteristics of companies were summarized in <Table 1>. The business categories did not indicate a significant difference in year of establishment, annual sales, annual net income, number of employees, number of R&D (Research & Development) workforce, number of new product/service and number of newly changed process within the last 3 years. The results mean that low technology manufacturer such as textiles and clothing companies were not different from advanced technology manufacturers (e.g., electronics, IT) and mid- to high technology manufacturers (e.g., automobile, machine) in terms of business size and innovation adoption. The result provides an evidence to solve the problem of sampling bias generated from differences of company characteristics, raised by Sung.<sup>23)</sup>

Based on the mean results, it is inferred that a typical company responded to the survey was established in 1991, has about 1,273 billion won

23) T. K. Sung, *op. cit.*

〈Table 1〉 Characteristics of Companies

Business Category \ Variable	Year of Establishment		Annual Sales*		Annual Net Income*		No. of Employees		No. of R&D Workforce		No. of New Product/Service within the Last 3 Years		No. of Newly Changed Process within the Last 3 Years	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total (N=230)	1991	14.75	12729	74072	813	5680	3526	15364	572	5365	21.45	82.03	94.89	750.33
Advanced Tech. Manufacturer (ET/IT) (N=144)	1992	14.36	14214	82416	1108	7024	3353	14699	787	6733	26.55	100.94	106.19	852.19
Mid- to High Tech. Manufacturer (Automobile/Machine) (N=45)	1987	18.68	20141	81166	603	2804	7221	22388	403	1414	14.91	36.04	140.91	755.59
Low Tech. Manufacturer (Textile/Clothing) (N=41)	1994	9.86	65	139	28	77	76	161	6	18	11.12	26.02	5.54	10.75
F-value	2.527		0.840		0.610		2.372		0.364		0.738		0.389	

\* Unit is 0.1 Billion Won.

of annual sales, 3,526 employees in total, and 95 people for the R&D workforce, and developed 21.45 new products/services and changed 94.89 processes in the last 3 years.

## 2. Effects of External Networks on the Corporate Innovativeness and Innovation Performance

### 1) Descriptive Results on Variables

Before exploring the effects of external networks on the corporate innovativeness and innovation performance, correlations among variables were examined. Correlations among all research variables were significant at the level of  $p < 0.001$  (See Table 2). Mean value of each variable was arranged between 3.657 and 3.804, suggesting that those values were a little bit above 3.5 which is the median of the 6-point likert scale. Again, companies can be assumed to have a slightly higher level of innovativeness of external networks, cor-

porate innovativeness, and innovation performance.

As indicated in 〈Table 3〉, there were no significant differences among business categories in terms of innovativeness of buyer, supplier, and competitor as well as in terms of corporate innovativeness in total and innovation performance. The results mean that textile and clothing companies are not different in the innovativeness of external networks such as buyer, supplier, and competitor, compared to other business categories such as electronic/IT and automobile/machine.

### 2) Effects of External Networks on the Corporate Innovativeness

Effects of external networks on the corporate innovativeness were examined through the regression analysis. The VIF (Variance Inflation Factor) examining collinearity diagnostics was arranged between 3 and 4, much lower than 10 which is the evidence of a collinearity problem. There-

**〈Table 2〉** Pearson's Correlations among Research Variables

Variable	Mean	S.D.	Buyer Innovativeness	Supplier Innovativeness	Competitor Innovativeness	Corporate Innovativeness	Innovation Performance
Buyer Innovativeness	3.657	0.904	1.000				
Supplier Innovativeness	3.568	0.885	0.780*	1.000			
Competitor Innovativeness	3.620	0.911	0.782**	0.765**	1.000		
Corporate Innovativeness	3.714	0.948	0.683**	0.707**	0.782**	1.000	
Innovation Performance	3.804	0.970	0.664**	0.653**	0.809**	0.765**	1.000

\*\* $p < 0.01$ .**〈Table 3〉** Differences in Means of Variables among Business Categories

Variable Business Category	Buyer/Customer Innovativeness		Supplier Innovativeness		Competitor Innovativeness		Corporate Innovativeness		Innovation Performance	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Advanced Tech. Manufacturer (ET/IT) (N=144)	3.667	0.918	3.567	0.913	3.699	0.924	3.741	0.999	3.850	1.047
Mid- to High Tech. Manufacturer (Automobile/Machine) (N=45)	3.689	0.851	3.585	0.817	3.704	0.877	3.625	0.857	3.770	0.834
Low Tech. Manufacturer (Textile/Clothing) (N=41)	3.585	0.930	3.553	0.881	3.675	0.926	3.713	0.869	3.683	0.820
F-value	0.164		0.014		0.013		0.256		0.503	

fore, there is no collinearity problem in the following regression analysis.

Effects of external networks on the corporate innovativeness were summarized in 〈Table 4〉. While examining  $F$ -values and adjusted  $R$  squares, it could be said that companies in total and all business categories indicated the effect of external networks on corporate innovativeness. Companies in total indicated that buyer innovativeness ( $\beta = 0.269$ ,  $p < 0.01$ ) and supplier innovativeness ( $\beta = 0.387$ ,  $p < 0.001$ ) significantly affected corporate innovativeness. Advanced technology manufacturers revealed that the innovativeness of all three external networks affected corporate in-

novativeness at the level of  $p < 0.05$ . Mid- to high technology manufacturers showed that supplier and competitor innovativeness affected corporate innovativeness. Low technology manufacturers indicated that only the competitor innovativeness affected corporate innovativeness.

Results imply that companies are affected by external networks. Specifically, textile and clothing companies in the low technology sector, tend to be affected more by competitors than by buyers or suppliers. It may be resulted that there is no specific big buyer, rather, there are so many similar-scale competitors in the textile and clothing market. On the contrary, electronic and IT mar-



**<Table 4>** Effects of External Networks on the Corporate Innovativeness

Independent Variable \ Dependent Variable	Corporate Innovativeness							
	All (N=230)		Advanced Tech. Manufacturer (ET/IT) (N=144)		Mid- to High Tech. Manufacturer (Automobile/Machine) (N=45)		Low Tech. Manufacturer (Textile/Clothing) (N=41)	
	Std. $\beta$	t-value	Std. $\beta$	t-value	Std. $\beta$	t-value	Std. $\beta$	t-value
Buyer Innovativeness	0.269**	3.352	0.418***	4.077	0.053	-0.646	-0.008	-0.045
Supplier Innovativeness	0.387***	4.986	0.221*	2.289	0.957***	4.064	0.331	1.846
Competitor Innovativeness	0.143	1.842	0.190*	2.057	0.344*	2.483	0.482*	2.302
F-Value	92.257***		69.447***		19.094***		17.364***	
Adj. R <sup>2</sup>	0.545		0.589		0.552		0.551	

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .**<Table 5>** Effects of External Networks on the Innovation Performance

Independent Variable \ Dependent Variable	Innovation Performance							
	All (N=230)		Advanced Technology Manufacturer (ET/IT) (N=144)		Mid- to High Technology Manufacturer (Automobile/Machine) (N=45)		Low Technology Manufacturer (Textile/Clothing) (N=41)	
	Std. $\beta$	t-value	Std. $\beta$	t-value	Std. $\beta$	t-value	Std. $\beta$	t-value
Buyer Innovativeness	0.274**	3.263	0.361**	3.320	0.147	0.815	0.034	0.171
Supplier Innovativeness	0.242**	2.984	0.163	1.595	0.604**	3.167	0.101	0.522
Competitor Innovativeness	0.258**	3.170	0.272**	2.768	0.038	0.198	0.605*	2.671
F	78.166***		56.556***		12.391***		13.006***	
Adj. R <sup>2</sup>	0.503		0.538		0.437		0.474	

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

kets are led by a few important key conglomerate buyers, therefore, vertical networks linking with buyers would be stronger than the textile and clothing market. Textile and clothing companies do not necessarily depend much on a few key buyers or big suppliers, rather, they can be more flexible and autonomous in developing new products. It is not needed to adopt cutting-edge technologies in developing new products in textile and clothing

companies but required to adapt existing technologies to better fit to the market needs. These difference of business categories might result in a difference of the result.

### 3) Effects of External Networks on the Innovation Performance

Effects of external networks on innovation performance were explored (see Table 5). In the reg-

ression results, it can be said that external networks significantly affected innovation performance in all business categories.

In the analysis of all companies, all external networks affected innovation performance ( $p < 0.01$ ). Advanced technology manufacturers revealed that both buyer and competitor innovativeness affected innovation performance while mid- to high technology manufacturers indicated that only supplier innovativeness affected innovation performance and low technology manufacturers suggested that only competitor innovativeness affected innovation performance.

The results imply that innovativeness of external networks affecting the success of a new product/service were different according to the technology level of business category. Specifically, textile and clothing companies are benefited from competitor innovativeness in making success of a new product/service while automobile and machine companies are benefited from supplier innovativeness. Again, textile and clothing companies are more easily affected by competitors, which may result in a success of a new product/service. Textile and clothing businesses are very trendy so that companies that tend to be more sensitive to the new change in competitors' products and be more quickly adapt to competitors' new products, in order to achieve success of a new product.

## V. Conclusions

Important findings were generated based on analysis of survey data. First, textile and clothing companies were not different in terms of company characteristics such as year of establishment, annual sales, annual net income, number of employees, number of R&D workforce, number of new product/service developed within the last 3 years, and number of newly changed process within the last 3 years. These results imply that textile and clothing companies categorized as the low technology manufacturer are not inferior at all in terms of business size, business performance, and even in terms of the R&D investment and Innovation performance from electronics/IT

and automobile/machine manufacturers. The result was also confirmed at the comparison of innovativeness indicators by proving no difference among three business categories. Considering the result, stereotypes on the textile and clothing companies as those do not concern much on R&D and innovation as others should be reconsidered.

Second, innovativeness of external networks affected corporate innovativeness and innovation performance overall. However, there was a difference in a kind of external network affecting corporate innovativeness and innovation performance. In the case of textile and clothing companies, the competitor factor was significant in affecting corporate innovativeness and innovation performance. On the other hand, supplier innovativeness is a factor affecting automobile and machine manufacturers. In addition, innovativeness of advanced technology manufacturers such as electronics and IT were affected by innovativeness of all the external networks though only buyer and competitor innovativeness affected innovation performance.

The result may reflect that working and communicating patterns with collaborating partners would be different according to the business category, therefore, these could result in a difference in an influencing party. Trendy concepts reflecting market tastes rather than much advanced technology which is hard to catch up in a short period of time would be more important in developing new products of textile and clothing companies. Also, new products are quickly introduced to the market so that companies can be able to develop new products, observing early response toward the new product of the competitor. However, electronics and IT companies require a much advanced level of technology for a new product since new function of the new product would only be able to be generated from the high technology. Therefore, all kinds of networks would be important for corporate innovativeness for those. In addition, new products of automobile and machine are likely to come from an innovation of a part. Therefore, suppliers suggesting innovative automobile and machine parts would be able to contribute to enhancing innovativeness and inno-

vation performance of the automobile and machine manufacturers.

Based on results, some conclusions were generated. First, textile and clothing companies are not different in company size and R&D investment from electronic/IT and automobile/machine manufacturers. Second, according to the technology level, external networks influencing corporate innovativeness and innovation performance would be different.

Study results provided implications for manufacturers in diverse business sectors. In order to enhance corporate innovativeness and innovation performance, building good relationships with innovative partners is very important. Specifically, textile and clothing manufacturers need to build good networks with key and leading competitors for enhancement of innovation performance which is a success of a new product in the market. Also, automobile and machine manufacturers would be helpful in developing good relationships with innovative suppliers providing new and inventive parts for them. Finally, electronics and IT companies would be benefited much from good relationship with innovative buyers and competitors.

One of the limitations of the present study was the small and unequal number of sample size by each business category obtained through a convenient sampling. In the future study, data collected from more companies would help to increase the credibility of results. Also web survey method depended upon a research company's panel may limit the generalizability of the result. In the future research, the present data can be compared to data obtained through the traditional data collection method.

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