

Market Orientation and Technology Innovation in Korean IT SMEs : The Moderating Role of Cross-functional Cooperation and Cooperation with Outside Organizations

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Abstract

This paper investigates how Korean IT SMEs (Small and Medium Sized Enterprises) deploy their market orientation, cross-functional cooperation and cooperation with outside organizations for successful technology innovation. Specifically, this study analyses the main effects of market orientation on technology innovation as well as the interaction effects among the above variables. The survey data of 326 Korean IT SMEs were collected and integrated as the empirical base for testing the hypotheses. Empirical results showed that market orientation was an influential determinant to SMEs' technology innovation. Also, the interaction between market orientation and cross-functional cooperation had a positive and significant effect on IT SMEs' technology innovation (both of product and process innovation). And the interaction between market orientation and cooperation with outside organizations had a positive and significant effect on IT SMEs' product innovation, but not on the process innovation. The IT SMEs' innovation is a complex task and there is no single best way available for all firms. The implications of these findings, limitations, and future research directions were also discussed.

JEL Classification : O31, O53

Keywords : Korean IT SMEs, Market Orientation, Technology Innovation, Cross-functional Cooperation, Cooperation with Outside Organizations

1. Introduction

As the administrative environment is being more and more dynamic and complex as well as the unpredictability of which going higher, technology, knowledge and competitive strategy is a crucial factor for SMEs' performance [57].¹ O'Regan et al. (2006) [48] and Lee et al. (2001) [35] asserted that sustaining technology innovation is essential in order for IT SMEs to cope with shortening product life cycle and new opportunities, and further to achieve job creation, growth and long-term competitive advantage. Korean IT SMEs, however, are undergoing hardships due to low capability of technology innovation and lack of resources for investment which are necessary for securing technological capacity [35].

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¹ Lee et al. (2001) [35] mentioned about the importance of innovation for SMEs like this; SMEs fails market competition because of lack of resources, diseconomies and the absence of reputation. The way to survive is to innovate in order for competitors not to imitate.

Moreover, their limited technology makes it difficult to achieve technological advancement.²

In the meantime, there have been many studies on technology innovation. Most of them have examined influence factors of technology innovation. As a result, it has been empirically proven that size of an enterprise, degree of concentration, technological exclusiveness, cooperation with outside organization, actual exports, holdings overseas, age, cash flows and profit ratio [8, 21, 54, 56] have a salutary effect on technology innovation. But, studies focusing on market orientation and the effectiveness of technology innovation are gradually increasing. In connection with this, Lieberman and Montgomery (1988) [38] concluded that competitiveness of a firm is more dependent on strategic and effective utilization of R&D than the amount of input on R&D.

Market orientation is being reported to have an affirmative impact on technology innovation for both large enterprise and SMEs. Although many theories have been developed dealing with relation between market orientation and technology innovation [9, 27], they can't be applied to SMEs because most of them have focused merely on large firms [66]. This is more of the case with Korean firms because technology innovation of SMEs is different from that of large firms [1, 63]. Considering the significance of SMEs within Korean economy and the importance of technological innovation within SMEs, studies on market orientation and technology of IT SMEs are urgently requested. Specifically the ability to figure out and make use of external market information is necessary because product life cycle and consumer preferences within IT industry are rapidly changing [70].

On the other hand, technology innovation capacity of IT SMEs can be improved by linking internal competence and external information resources (complementary resources). Teece (1992) [62] pointed out that SMEs need to develop complementary resources which help technology innovation in order to take advantage of business opportunities.

It means that market orientation is not the sufficient condition for technological innovation. In this regard, there are many arguments which put stress on the needs to combine organization-related factors with technology innovation of SMEs [49, 48]. Lin et al. (2006) [39] also noted that technological innovation of SMEs can be effective only when complementary resources (organization-related factors) are sufficient. But previous researchers have not considered organization-related complementary resources both internally and externally in investigating the relation between market orientation and technology innovation.

Recently, cross-functional cooperation [41, 64] and cooperation with outside organizations [14, 61] are in spotlight as success factors of technology innovation of SMEs. In this viewpoint, Bulte and Moenaert (1998) [6] claimed that cross-functional cooperation and flexible cooperation with outside organization brings desirable technology innovation for SMEs. Although SMEs need to encourage flexible collaboration among R&D, marketing and manufacture divisions, Korean companies are reported to lack organic cross-functional cooperation. Besides, cooperation with outside organizations which enable complex feedback and interaction within diverse innovational subjects (market, firm, other firms, universities, research institutes, supporting agencies etc.) is important to link R&D investment to

² The reason that this research covered IT SMEs is that, in first, R&D is key factor of success, secondly, efficiency of investment is very low, and thirdly, they have many difficulties in effective knowledge transfer and commercialization of technology due to low market orientation.

successful technology innovation [30]. Conclusively, this means that SMEs should establish flexible and cooperative relation to other firms, universities, research institutes and policy supporting agencies.

Research objectives are to examine the relation between market orientation and technology innovation and to analyze the moderating effect of cross-functional cooperation and cooperation with outside organizations in relation to the case of Korean IT SMEs. In concrete terms, this paper has the three following research objectives. The first is to investigate the influence of market orientation on technology innovation. The second is to study the moderating effect of cross-functional cooperation between market orientation and technology innovation. The last is to analyze the moderating effect of cooperation with outside organizations in relation to market orientation and technology innovation.

2. Research Model and Hypothesis

In the level of organization and firm, previous studies revealed that technology innovation is affected by the environment, resources and strategy factors. Meanwhile organizational structure, leadership and organizational culture are key factors to successful technology innovation [31, 59]. To this point, this research focuses on strategy (market orientation), organizational structure (cross-functional cooperation) and corporate culture (cooperation with outside organizations). More specifically, this research tries to find the relationship between market orientation and technology innovation in Korean IT SMEs. In other words, this paper verifies if cross-functional cooperation and cooperation with outside organizations moderates the effect of market orientation on technology innovation.

The premise of this research is as follows. Market orientation has positive effects on technology innovation. Furthermore, the effect of market orientation on technology innovation will be amplified if complementary resources are combined such as cross-functional cooperation and cooperation with outside organizations. That is, cross-functional cooperation will promote technology innovation by sharing ideas and solutions. Moreover, a cooperative relationship with outside organization will strengthen the effect of technology innovation by market orientation, for it facilitates retrenchment of transaction cost, cost efficiency of technology innovation and creation of a synergy effect.

The following Figure 1 shows the model of this research.

2.1 Market Orientation and Technology Innovation

Firms should cope with demand of market for sustaining competitive advantage and high performance as well as predict a change in market. This effort is called market orientation. Thus, market orientation is an active concept of strategy and a concrete strategy of practice. Related studies are divided into two trends: the behavioral perspective and the corporate culture perspective.

Firstly, Kohli and Jaworski (1990: 3) [34] are representative researchers who have dealt with market orientation in the behavioral perspective. According to them, market orientation is to circulate the market information which reflects customer's present and future demand and get response to it within the whole company level. They also presented three sub-concepts consisting market orientation: creation of market information in the

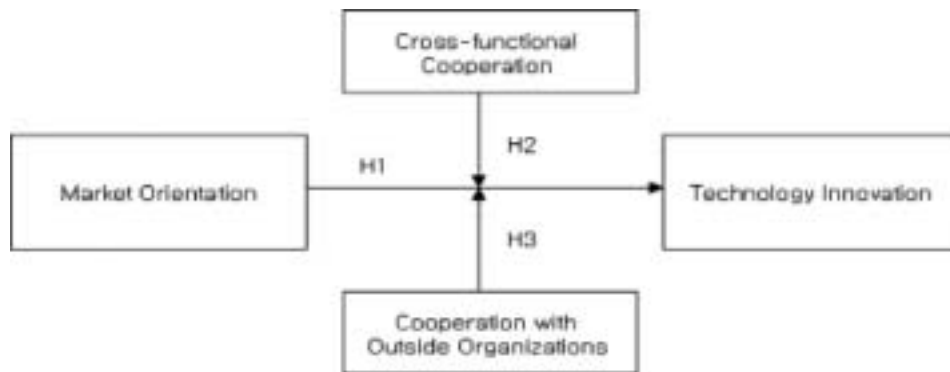


Figure 1. Research Model

whole company level, interchange of market information within the company and response to the market information. They stressed that every divisions in the company should be involved in information creating activities which includes internal and external information that affects customer's needs. To sum up, Kohli and Jaworski (1990) [35] defined market orientation focusing on behavior of individuals related with the information [23].

On the other hand, Naver and Slater (1990: 21) [45] explained market orientation in corporate culture perspective. Defining market orientation as a corporate culture which pulls necessary action for providing customers with significant value effectively and efficiently, they listed three behavior factors of market orientation: customer orientation, competitor orientation and interaction among divisions. Deng and Dart (1994) [13] added the pursuit of profits as another behavior factor. In conclusion, both Kohli and Jaworski (1990) [34] and Naver and Slater (1990) [45] viewed that market orientation improves the performance of the organization, for it encourages individuals and divisions inside organization to remain customer-oriented.

Besides, developing a new product or process is called technology innovation. To this point, Cooper (1980) [10] noted that a new product is a newly commercialized one by a specific company regardless of whether there exists similar products in the market. Yoon and Lilien (1989) [69] divided new products into original new products and improved new products. The former refer to products newly introduced to market and the latter are an expansion or a modification of products of the same kind. Consequently, technology innovation can be defined as a set of every action of developing new products or improving existing products in order to create new markets and customers or promote market share [59].

These previous studies showed that market orientation and technology innovation have a positive correlation. Basically, market orientation facilitates the process of collecting market information, creating valuable knowledge and diffusing it to related divisions and individuals ultimately to meet the needs of the market. This process has a positive influence on technology innovation [58]. Previous studies revealed the positive correlation of market orientation with new idea and innovation [20, 25] and creativity for products and marketing [26]. According to Han, Kim and Srivastava (1998) [20], a market-oriented firm can easily be innovative because market orientation requires constant and active response to customer's

needs and more application of information. Hurley and Hult (1998) [25] also insisted that market orientation helps with devising new ideas and innovation. Im and Workman (2004) [26] affirmed that market-oriented firms are advantageous to developing better technology than competitors as a result of a quicker collection of market information. In addition, they asserted that systematic analysis of the competitors' strengths and weaknesses brings distinctive technology development. Particularly, using meta-analysis, Kirca, Jayachandran and Bearden (2005) [32] proved a positive effect of market orientation on firm innovation and development of new products which result in increased performance.

Additionally, researchers in the marketing field approve that market orientation elevates a firm's innovative capacity [66]. According to them, Market-oriented firm collects information for coping with customer's needs and competitors. In this process, a market-oriented firm innovates technology for enhancing customer value and gaining competitive advantage. So, we can provide the following hypothesis.

Hypothesis 1: *Market orientation of SMEs has positive effect on technology innovation.*

2.2 Market Orientation and Technology Innovation : Moderating Effect of Cross-functional Cooperation

The basic premise of this research is that market orientation of IT SMEs will achieve technology innovation more effectively and efficiently only when it is combined with complementary resources such as cross-functional cooperation and cooperation with outside organization. This suggests that IT SMEs need to develop complementary competence of management that supports technology innovation in order not to miss a business opportunity because they can't achieve technology innovation just with market orientation [62]. Rapid change of product life cycle and consumer preference in the IT industry requires the competence which fully enables to link quickly captured market information to technology innovation. In this regard, cross-functional cooperation within IT SMEs is an important complementary resource that intensifies the effect of market orientation because, in market-oriented firms, cooperative sharing of new ideas and solutions among inside divisions causes technology innovation.

Flexible cross-functional interaction and knowledge transfer is a prerequisite for connection between market orientation and successful technology innovation.³ Cross-functional interaction and knowledge transfer, basically, is possible through cooperation. For obtaining valuable market information and converting it to organizational knowledge, informal and cooperative cross-functional interaction is important [15]. Especially, informal and cooperative cross-functional interaction is reported to be crucial in cross-functional knowledge

³ According to Luo (2005) [42], they need to strengthen the cross-functional cooperation in all 4 areas to achieve effective technology innovation. In technological level, functional divisions should share knowledge about the innovation of the product and the process. In an operational level, functional divisions should develop and share various resources for operation. In an organizational level, functional divisions should develop, share and use the organizational competence and administrative. In a financial level, functional divisions should collaborate in transfer price, currency conversion, sharing of administrative experience of cash flow, management of working capital.

transfer [55]. Communication among divisions is an informal process of knowledge transfer for achieving a purpose. Studies in the field of strategic management revealed the positive effect of cross-functional knowledge transfer on development of new products [18], organizational learning [24] and overall organizational performance [17].

Cooperative cross-functional knowledge sharing is essential to link market orientation to effective technology innovation [64]. Knowledge sharing encourages functional divisions to use shared knowledge together for the common interests. The reason that cross-functional knowledge sharing promotes technology is the heterogeneousness of resources each division possesses. In fact, every functional division has unique resources that help to give a competitive advantage, of which, in many cases, utility is amplified with combination with ones of other functional divisions.

According to previous studies, cross-functional cooperation appears in close relation with learning, cost retrenchment, resource sharing and innovation [41]. Functional divisions with competition have interaction with other divisions to detect the know-how of others, during which collaboration appears spontaneously [64]. According to studies of micro competitive behavior in strategy field, firms in the market with high competition have spontaneous motivation to cooperate. Studies of management of technology [67] also reported that nearly-patented knowledge are broadly being transferred as competition in a market which goes bitter. To sum up, mutual learning and interaction among competitors are more brisk.

On the other hand, cross-functional cooperation connects market orientation to effective technology innovation by enabling access to unique resources of other divisions and sharing the cost to develop new resources [3].⁴ In particular, cross-functional cooperation improves the potential for syncretic added value. According to previous studies, frequent cooperative cross-functional interaction improves the level of communication and knowledge sharing [64], furnishes information on the potentially valuable market or gaining access to this kind of knowledge [24]. Particularly, cross-functional knowledge sharing facilitates knowledge integration [65]. Moreover, cross-functional cooperation helps effective strategic decision making, as well as promotes developing and converting tacit knowledge by understanding customer's needs obtained by market orientation [47]. Cross-functional cooperation for verification, absorption and practical use of market information makes learning effective and easy [16].

Moreover, flexible connection with R&D, marketing and manufacturing divisions is requisite [6].⁵ For example, the R&D division should support the manufacturing division in order to stabilize manufacturing, and the manufacturing division should inform the R&D division about problems in the manufacturing process in their early stages. Connection with

⁴ Cross-functional cooperation is explained by a so-called resource-based view of the firm. According to this view, there are two ways for functional divisions to make use of resources. One is to utilize directly owned resources, and the other one is to use the resources of other divisions. Practically, functional divisions have different range of resources and capabilities, so cross-functional cooperation helps maximizing the combined value and creating new value [4]. Cooperation is beneficial to obtain resources and capability because it is impossible to access to tacit knowledge or know-how of other divisions.

⁵ GE's Work-out or Business Interface Institutes are representative example of getting familiar among divisions.

the marketing division is the same. Development of new products without consideration of customer's needs or the current of the market has a slim chance of success. The marketing division should provide the R&D division with information about customer's demands, competitor's strategy and market trend, while the R&D division should make sure the marketing division is notified of accurate technological competence of the firm.

Especially, market orientation is closely related with corporate strategy. According to Naver and Slater (1990) [45], market orientation has a higher correlation with product differentiation strategy than cost leadership strategy. In case of product differentiation strategy, cross-functional cooperation for information exchange and knowledge integration is indispensable. So, we can set up the following hypothesis.

Hypothesis 2: *Effect of market orientation on technology innovation of IT SMEs is extended with more cross-functional cooperation.*

2.3 Market Orientation and Technology Innovation : Moderating Effect of cooperation with outside organization

In a similar way to cross-functional cooperation, market orientation of IT SMEs will be succeeded to successful technology innovation if combined with complementary resources of cooperation with outside organization. Even though SMEs have high market orientation, effective and efficient technology innovation cannot be accomplished without cooperation with an outside organization.

Until now, the opinion that a large firm is advantageous for technology innovation due to its plentiful usable resources has been predominant [8]. Recently, however, effective use of external resources is being more important to successful technology innovation because there are abundant resources outside the organization. That is, it would be better for SMEs to pursue efficient technology innovation by cooperating with an outside organization which helps reducing the uncertainty following technology innovation and minimizing resources investment rather than securing all the necessary technology only with internal investment [52]. Korean IT SMEs are undergoing hardships due to low competence of technology innovation and lack of resources for investment which are necessary for securing technological competence. Their level of R&D investment or human resources is incomparably low. Moreover, their limited technology makes it difficult to acquire technological advance. Effect of market orientation on technology innovation of Korean IT SMEs will be boosted with the help of cooperation with outside organization.

For IT SMEs, cooperation with outside organization is known to have a positive effect on achieving new technology innovation, setting technology standards and securing an advantage over rival technologies by generating synergy among different knowledge and technology [53, 19]. It is also reported to be positive for the enhancement of competitiveness, performance and technological competence [61]. Cooperation with outside organizations is one of the important means to overcome the limit of resources insufficiency so as for SMEs to deal with change of technological environment. Especially, investment risk is reduced through cooperation with outside organization within IT industry which calls for large amount of fund for technology development [19]. Cooperation with outside organiza-

tions removes inefficiency caused by a lack of information or wrong plan during the process of technology innovation [52].

There have been many empirical studies which assert that cooperation with outside organizations promote technology innovation of SMEs. Rogers (2004) [54] found out that cooperation with outside organizations has a positive effect on technology innovation in his empirical research working with Australian manufacturing SMEs. Oerlemans et al. (1998) [51] revealed that the model including both cooperation with outside organization and internal resources accounts better than the model including only internal resources in the research working with Netherlandish SMEs. Lover and Roper (1999) [40] also discovered the positive relation between cooperation with outside organizations and the number of technology innovation. Freel (2000) [14] displayed innovation-oriented SMEs complement technological resources by cooperation with local colleges or research institutes.

There are several domestic empirical studies which evidenced the positive effect of cooperation with outside organizations on technology innovation of SMEs. Choi and Whang (2004) [7] empirically verified that cooperation with outside organizations have a positive effect on innovation of products and processes. Additionally, Lee and Lee (2004) [37] demonstrated that technological cooperation with an outside organization has a meaningful effect on technology innovation. Bae and Jung (1997) [2] also exhibited that the positive effect of technological cooperation with outside organization on technology innovation. Park and Lee (2005) [52] empirically showed that cooperation with an outside organization positively influences technology innovation as well. Conclusively, SMEs can achieve technology innovation by intimate cooperation with outside organizations even though their internal resources of technology are at a low level.

According to the theory of regional innovation system [50],⁶ on the other hand, SMEs are more likely to overcome the uncertainty following technology innovation as they build flexible and cooperative relationships with other firms, universities, research institutes, consumers and policy supporting agencies.

Cooperation with outside organizations improves efficiency and creativity for development of technology and product and forms flexible network through clear division of roles among participants. It helps participants in focusing their core competence on the field of their specialty. Expressly, cooperation with outside organizations improves cost efficiency through reduction of transaction cost [68] and common use of facilities and equipment and creates inter-firm innovational synergy through social capital that encourages the confidence and resource sharing among firms [5]. So, we can suggest the following hypothesis.

Hypothesis 3: *Effect of market orientation on technology innovation of IT SMEs is extended with more cooperation with outside organization.*

⁶ Cluster is gaining interest all over the world because it generates beneficial environment for promoting technology innovation and knowledge creation which are the essential source for competition. For innovative cluster, spread of entrepreneurship in the cluster, constant innovation and flexible network among diverse bodies of innovation are in need.

Table 1. Descriptive Statistics

	<i>N</i>	Min.	Max.	Average	Standard Deviation
Age(year)	326	2.00	34.00	9.6288	6.0947
Size(person)	326	5.00	281.00	28.0798	36.9607
Market Orientation	326	1.88	4.88	3.5265	.5349
Cross-Functional Cooperation	326	2.00	5.00	3.4376	.5372
Cooperation with Outside Organization	326	1.00	5.00	1.6702	1.0962
Product Innovation	326	1.00	5.00	3.0767	.8684
Process Innovation	326	1.00	5.00	3.2454	.6936

3. Research Method

3.1 Data

For this research, a survey was distributed to 875 IT SMEs in Daegu, Suwon and their outskirts from September to November 2007. From which 405 data was withdrawn (withdrawal rate : 46.3%). Among this, data from 16 firms that were judged to be unreliable and 64 firms of which the number of employees was below 5 or above 299 were excluded. 326 firms were analyzed finally. A survey sheet was sent and returned by mail, fax, e-mail or a visit because these methods help give a clear understanding and minimizes non-response [44]. The survey was designed for CEO's or high executives to respond to because they make strategic decisions and there was evidence which imply that data provided by them has more reliable and valid [60].

Statistical data of age, size, cross-functional cooperation, cooperation with outside organization and technology innovation—including product and process innovation—is as Table 1 below.

3.2 Measurement of Variables, Reliability and Validity

The variables in this research were measured as follows.

Market Orientation : Market orientation was based on Keskin (2006) [29]'s definition which reads “cultural activities of whole organization which create and satisfy customers by being concerned with the needs of market and customers in order to improve business performance”. 10 items derived from Keskin's research excluding items on policy of distribution and price measured using a 5-point Likert scale.

Technology Innovation : In this research, technology innovation was defined as “development of products that is distinguished from existing ones with originality.” 2 items on innovation of product and process are measured using the 5-point Likert scale (Lee, 2000) [36].

Cross-Functional Cooperation : Cross-functional cooperation in this research was defined as “degree of cooperation among functional divisions” [41, 43]. 3 items which Luo (2006) [41] used are measured using the 5-point Likert scale.

Cooperation with Outside Organization : Cooperation with an outside organization was defined as “degree of cooperation with outside organization for technology innovation.” Based on items derived from research of Kaufmann and Todtling (2002) [28], 4 items on the

Table 2. Results of Factor Analysis and Reliability

Variables	items	factor 1	factor 2	factor 3	Reliability (α)
Market Orientation	Our company listens to customer's voice carefully.	.742			.8889
	Our company fully applies customer's information to quality improvement.	.819			.8889
	Our company fully applies customer's information to development of new products.	.641			.8889
	Our company fully applies market information for marketing.	.774			.8889
	Our company fully applies customer's request to quality improvement.	.833			.8889
	Our company fully understands customer's needs.	.785			.8889
	Our company fully understands customer's needs for development of new products.	.617			.8889
	Our company focuses on the market field of our specialty.	.683			.8889
Cross-Functional Collaboration	There is active communication among divisions.			.795	.8698
	Employees get well with ones in other divisions.			.909	.8698
	Employees hope to keep intimate relationship with ones in the other divisions.			.854	.8698
Cooperation with Outside Organization	Relation with private firms for R&D		.901		.9253
	Relation with universities for R&D		.867		.9253
	Relation with research institutes for R&D		.919		.9253
	Relation with public institutions for R&D		.908		.9253
Eigenvalue		5.70	3.01	1.69	
Rate of Variance (%)		38.00	20.11	11.30	

level of relationship with private firms, universities, research institutes and public institutions were measured using the 5-point Likert scale.

Control Variables: According to previous studies, size has a meaningful influence on technology innovation, so firm size was controlled [11]. Size was measured in terms of the number of regular employees, which was applied to natural logarithm for the following analysis. And, age has positive effect on technology innovation [12]. Ages were measured with the number of years since establishment.

On the other hand, construct validity was examined by conducting varimax factor analysis of 10 items for measuring market orientation, 3 for cross-functional cooperation, 4

for cooperation with outside organization. In the initial result of factor analysis, 2 items—reflect of customer's needs to policy development and overall management—did not significantly fit in any factor. Thus, we conducted factor analysis again and found 3 factors.

Additionally, we calculated Cronbach alpha for verifying reliability of data and the results revealed that those were reliable which read .8889 for market orientation, .8698 for cross-functional cooperation and .9253 for cooperation with outside organization.

4. Results

4.1 Correlation

Table 3 shows the correlation of each variable. As shown, product innovation is negatively correlated with age, while positively correlated with market orientation, cross-functional cooperation and cooperation with outside organization. On the other hand, process innovation is positively correlated with size, market orientation and cross-functional cooperation.

4.2 Regression Analysis

Controlling age and size, this part tries to seek the relation between market orientation and technology innovation and, on which if any items of cross-functional cooperation and cooperation with outside organization have moderating effect.

4.2.1 Market orientation and technology innovation

As shown in Table 4 and Table 5, results of regression analysis showed that analysis model 2 and 10 are significant ($F=19.82^{***}$ and 12.63^{***}) and effect of market orientation on technology innovation is positively significant. So, market orientation of Korean IT SMEs appeared to be positively correlated with innovation of product and process, which supports the hypothesis 1.

4.2.2 Moderation Effect of cross-functional collaboration and cooperation with outside organization between market orientation and technology innovation

For analysis of hypothesis 2 and 3, this research set each of product innovation and process innovation to dependent variables and conducted regression analysis to appreciate

Table 3. Average, Standard Deviation and Correlation Coefficient

	Mean	S.D	Age	Size(log)	Market Orientation	C-C	C-O	Product Innovation
Age	9.6288	6.0947						
Size(log)	1.2398	.3929	0.169***					
Market Orientation	3.5265	.5349	-.125**	-.010				
Cross-Functional Cooperation	3.4376	.5372	-.043	.106*	.458***			
Cooperation with Outside Organization	1.6702	1.0962	-.125**	.023	.186***	.167***		
Product Innovation	3.0767	.8684	-.141**	.059	.375***	.255***	.215***	
Process Innovation	3.2454	.6936	.019	.262***	.189***	.228***	.012	.451***

* $p < .1$, ** $p < .05$, *** $p < .01$

C-C: Cross-Functional Cooperation

C-O: Cooperation with Outside Organization

Table 4. Results of Regression Analysis on Product Innovation

Variable	Dependent Variable : Product Innovation							
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Control Variable:								
Age	-.155***	-.109**	-.109**	-.109**	-.109**	-.094*	-.094*	-.094*
Size	.085	.081	.070	.065	.067	.075	.075	.074
Independent Variable:								
Market Orientation (a)		.362***	.317***	-.272	.199**	.338***	.334***	.310***
Cross-Functional Cooperation (b)			.098*	-.525*				
Cooperation with Outside Organization (c)						.138***	.120	
Interaction item								
a×b				1.040**	.194**			
a×c							.019	.145***
Regression Analysis Result	F=4.456** R ² =.027 adj-R ² =.021	F=19.82*** R ² =.156 adj-R ² =.148 ΔR ² =.129***	F=15.66*** R ² =.163 adj-R ² =.153 ΔR ² =.007	F=13.51** R ² =.174 adj-R ² =.161 ΔR ² =.011**	F=16.06*** R ² =.167 adj-R ² =.156 ΔR ² =.011**	F=16.91*** R ² =.174 adj-R ² =.164 ΔR ² =.018***	F=13.48*** R ² =.174 adj-R ² =.161 ΔR ² =.000	F=16.88*** R ² =.174 adj-R ² =.164 ΔR ² =.018***

the effect of market orientation, interaction between market orientation and cross-functional cooperation and interaction between market orientation and cooperation with outside organization.

In the Table 4 and Table 5, VIF of a×b of interaction item in the analysis model 4 and 12 is 98.608 and that of a×c of interaction item in the analysis model 7 and 15 is 65.287, and these figures suggest possibility of distorted results by multicollinearity. To resolve this problem, we tried to analyze regression model without variables of cross-functional cooperation and cooperation with outside organization among dependent variables and model 5, 13 and 8, 16 are the results.

According to results of the moderating effect of cross-functional cooperation on the relation between market orientation and product innovation, research model was significant ($F=16.06^{***}$) and R^2 also significantly increased than analysis model 2 ($\Delta R^2=.011^{**}$). The interaction item between market orientation and cross-functional cooperation was significantly correlated with product innovation. Besides, according to results of moderating effect of cooperation with outside organization about the relation between market orientation and product innovation (analysis model 8), research model was significant ($F=16.88^{***}$) and R^2 also significantly increased than analysis model 2 ($\Delta R^2=.018^{**}$). The interaction item between market orientation and cooperation with outside organization was significantly correlated with product innovation. These results imply that the higher the level of cross-functional cooperation and cooperation with outside organization becomes, the closer market orientation and product innovation get. Thus, cross-functional cooperation and cooperation with outside organization appeared to moderate the relation between market orientation and product innovation, which supports the hypothesis 2 and 3.

For the next, research model was correlated ($F=11.63^{***}$) and R^2 also significantly increased than analysis model 10 ($\Delta R^2=.022^{**}$) according to results of the moderating effect of cross-functional cooperation about the relation between market orientation and process innovation (analysis model 13). The interaction item between market orientation and

Table 5. Results of Regression Analysis on Process Innovation

Variable	Dependent Variable : Process Innovation							
Variable	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
Control Variable :								
Age	-.026	-.002	-.001	-.001	-.001	-.006	-.004	-.005
Size	.267***	.264***	.248***	.243***	.245***	.266***	.260***	.266***
Independent Variable :								
Market Orientation (a)		.191***	.125**	-.487	-.037	.197***	.093	.200***
Cross-Functional Cooperation (b)			.145**	-.502				
Cooperation with Outside Organization (c)						-.032	-.522	
Interaction item :								
a×b				1.081**	.272***			
a×c							.524	-.024
Regression Analysis Result	F=12.03*** R ² =.069 adj-R ² =.064	F=12.63*** R ² =.105 adj-R ² =.097 ΔR ² =.036***	F=11.11*** R ² =.122 adj-R ² =.111 ΔR ² =.017**	F=9.85*** R ² =.133 adj-R ² =.120 ΔR ² =.011**	F=11.63*** R ² =.127 adj-R ² =.116 ΔR ² =.022***	F=9.54*** R ² =.106 adj-R ² =.095 ΔR ² =.001	F=7.95*** R ² =.110 adj-R ² =.097 ΔR ² =.004	F=9.49*** R ² =.106 adj-R ² =.095 ΔR ² =.001

* $p < .1$, ** $p < .05$, *** $p < .01$

*Figures in the table are standardized regression coefficient. Size is analyzed using natural logarithm.

*Difference of R² between models is examined by F test.

cross-functional cooperation was significantly correlated with process innovation. Besides, research model was significant ($F=9.49^{***}$), while the interaction item was not significantly correlated. R² did not significantly increased than analysis model 10 either ($\Delta R^2=.001^{**}$) according to results of the moderating effect of cooperation with outside organization about the relation between market orientation and process innovation (analysis model 16). These results imply not only that the higher the level of cross-functional collaboration in IT SMEs becomes, the closer market orientation and process innovation get, but also that cooperation with outside organization does not have meaningful effects on the relation between market orientation and process innovation. In sum, cross-functional collaboration positively moderates the relation between market orientation and product innovation but cooperation with outside organization did not, which supports the hypothesis 2 and partially so with the hypothesis 3.

5. Conclusion

5.1 Summary and Implication of the Research Result

Working with Korean IT SMEs, this research empirically examined the relation between market orientation and technology innovation, on which the moderating effect of cross-functional cooperation and cooperation with outside organizations. It appeared that market orientation of Korean IT SMEs is positively correlated with technology innovation. Moderating effect of cross-functional cooperation and cooperation with outside organizations on the relation between market orientation and technology innovation in the case of Korean IT SMEs appeared to be positive basically. In detail, cross-functional cooperation significantly moderated the relation with market orientation and product and process innovation. On the other hand, cooperation with outside organizations moderated the relation with

market orientation and product innovation positively and significantly, but it did not significantly moderate the relation with market orientation and process innovation. These results supported hypothesis 1, 2 and partially 3.

Basically these results proved the following premise right: "Market orientation which makes individuals or divisions inside devote to create value for customers has positive effects on technology innovation. Furthermore, the effect of market orientation on technology innovation will be amplified if complementary resources are combined such as cross-functional cooperation and cooperation with outside organizations. That is, cross-functional cooperation in the process during which market information obtained by market orientation is distributed within the organization will promote technology innovation by sharing ideas and solutions. Moreover, cooperative relationship with outside organizations will strengthen the effect of technology innovation by market orientation, for it facilitates retrenchment of transaction costs, cost efficiency of technology innovation and creation of synergy effect."

On the other hand, the results provide the theoretical and practical significance and suggestions. Most of all, the results of previous studies which suggested the positive effect of market orientation on technology innovation were applicable to Korean IT SMEs in the same manner. That is, it appeared that market orientation of Korean IT SMEs can be succeeded by technology innovation during the process of spread of newly generated market information and knowledge to related divisions and individuals [58].

Constant and active response to customer's needs, use of a wide range of information [20, 25], quicker collection of market information and systematic analysis on competitor's strength and weaknesses [26] appeared to be positive to technology innovation. These are meaningful results in that it verified the validity of previous studies on the relation between market orientation and technology innovation and the applicability of which to Korean IT SMEs. Thus, managers of Korean IT SMEs should lift up the degree of market orientation for competence improvement of technology innovation along with allocation of resources for more systematic understanding of competitor's strategic activities.

Second, it showed that technology innovation is achieved more effectively and efficiently when market orientation is combined with complementary resources of cross-functional cooperation in Korean IT SMEs. That is to say, it gave proof to the perspective that IT SMEs need to develop complementary competence of management that supports technology innovation in order not to miss business opportunity because they can't achieve technology innovation just with market orientation. Previous research showed that cross-functional cooperation has closely related with learning, cost retrenchment, resources sharing and innovation and also found the followings were important for linking market orientation of SMEs with successful technology innovation: active interaction and knowledge transfer by cross-functional cooperation, cooperative knowledge sharing, informal and collaborative interaction and communication, flexible relationship with R&D, manufacture and marketing divisions [6, 41, 64]. Plus, previous research revealed that the cross-functional cooperation leads effective technology innovation by enabling access to unique resources of other divisions and sharing costs to develop new resources, promoting development and conversion of tacit knowledge [47] and helping effective strategic decision making [3]. This research

proved that these results are applicable to Korean IT SMEs as well. Thus, managers in charge should make an administrative effort to knowledge transfer, knowledge sharing, interaction and communication through cross-functional cooperation in order to get the maximum of the effect of market orientation on technology innovation.

Third, according to the research, cooperation with outside organizations of Korean IT SMEs has positive moderating effects on the relation between market orientation and product innovation, but not on the relation between market orientation and process innovation. For the relation between market orientation and product innovation, cooperation with an outside organization is considered to have a positive moderating effect due to following reasons: elimination of the uncertainty, efficiency of use of resources, synergy among different knowledge or technology, setting technology standards and securing an advantage, reduced investment risk and transaction cost, cost efficiency by common use of facilities and equipment, innovative synergy among firms [19, 53, 68]. So, this research proved that cooperation with outside organizations has positive moderating effect in the relation between market orientation and product innovation. Thus, managers need to concentrate on administrative competence in order for product innovation by market orientation.

Cooperation with outside organizations, however, appeared not to have a positive moderating effect in the relation between market orientation and process innovation. This is due to the following reasons. First, in the case of Korean IT SMEs, there is the possibility that process innovation is not a more important administrative assignment than product innovation. Process innovation cannot be of important concern because competence in Korean IT SMEs is mostly from the patent level. Even if process innovation is required, it is likely not to cooperate with outside organizations. Second, the cost for cooperation with outside organizations surpasses the benefit of process innovation. Accordingly, it would be better to depend on cross-functional cooperation than cooperation with outside organizations for process innovation. Third, Korean IT SMEs possibly use another method for process innovation with the exception of cooperation with outside organization. So, managers of IT SMEs should devise other ways for process innovation through market orientation.

5.2 Future Research

In spite of these implications, this research has some limitations which call for follow-up research. First, research sample influences the results of market orientation, technology innovation and its theoretical and practical significance. The degree of market orientation and technology innovation differs according to the type of the industry [22]. This research is limited to IT SMEs. Second, according to studies of industrial economics, industrial structure influences technology innovation of SMEs [46]. In this regard, previous studies have reported that technology innovation of SMEs is influenced by industrial factors (external factors) such as degree of concentration, technological transfer. Thus, future research should consider the effect of industrial structure on technology innovation.

Third, previous research showed that technological opportunity has a positive impact on technology innovation [33]. The disparity of technological opportunity makes a difference of expenses on technology innovation among SMEs so that technological opportunity affects the diversity and type of technology which SMEs gets access to. Fourth, CEO's leadership,

entrepreneurial and learning orientation should be studied besides the effect of market orientation on technology innovation. Integrated research dealing with complex effects of those variables and various moderating factors such as organization culture are also required. Fifth, factors of influence and moderation might differ according to the type of technology innovation such as radical or incremental innovation. Lastly, this research did not cover the effect of technology innovation on competitiveness and financial performance of SMEs. The ultimate goal of technology innovation is the improvement of competitiveness and financial performance. Therefore, the effect of technology innovation on overall competitiveness and financial performance is left to be analyzed empirically.

References

- [1] Audretsch, D.B., "Research Issues Relating to Structure, Competition, and Performance of Small Technology-Besed Firms," *Small Business Economics*, vol. 19, No. 1, 2001, pp. 37-51.
- [2] Bae, J.T. and J.W. Jung, "A Study on the Technology Collaboration Activities and Performance in Korean SMEs," *The Korean Small Business Review*, Vol. 19, No. 2, 1997, pp. 273-296.
- [3] Bengtsson, M. and S. Kock, "Competition in Business Network : to Cooperate and Compete Simultaneously," *Industrial Marketing Management*, Vol. 29, No. 5, 2000, pp. 411-426.
- [4] Borys, B. and D.B. Jemison, "Hybrid Arrangements as Strategic Alliance," *Academy of Management Review*, Vol. 14, No. 2, 1989, pp. 234-249.
- [5] Braczyk, H.J., P. Cooke and M. Heidenreich (Eds.), "Regional Innovation Systems," *The Role of Governances in a Globalized World*, London, UCL Press, 1998.
- [6] Bulte, C.V. and R.K. Moenaert, "The effects of R&D Team Co-location on Communication Patterns among R&D, Marketing, and Manufacturing," *Management Science*, Vol. 44. No. 11, 1998, pp. 1-18.
- [7] Choi, Y.H. and W.I. Hwang, "Technology Innovation and University-Industry-Institution Network," *The Korean Venture Management Review*, Vol. 7, No. 2, 2004, pp. 3-23.
- [8] Cohen, W., "Empirical Studies of Innovative Activity," in P. Stoneman (ed.), *Handbook of the Economics of Innovation and Technological Change*, Oxford : Blackwell Publishing, 1995, pp. 182-264.
- [9] Connor, T., "Customer-Led and Market-Oriented : A Matter of Balance," *Strategic Management Journal*, Vol. 20, No. 12, 1999, pp. 1157-1163.
- [10] Cooper, R.G., "Project Newprod : Factors in New Product Success," *European Journal of Marketing*, Vol. 14(5-6), 1980, pp. 277-291.
- [11] Cosh, A. and A. Hughes, *British Enterprise in Transition*, Department of Applied Economics, Univ. of Cambridge, 2000.
- [12] Deeds, D.L. and C.W.L. Hill, "Strategic alliances and the rate of new product development : an empirical study of entrepreneurial biotechnology firms," *Journal of Business Venturing*, Vol. 11, 1996, pp. 41-45.
- [13] Deng, S. and J. Dart, "Measuring Market Orientation : A Multi-Item Approach," *Journal of Marketing Management*, Vol. 10, No. 8, 1994, pp. 725-742.
- [14] Freel, M.S., "External Linkages and Product Innovation in Small Manufacturing Firms," *Entrepreneurship and Regional Development*, Vol. 12, No. 3, 2000, pp. 245-266.
- [15] Granovetter, M.S., "Economic Action and Social Structure the Problem of Embeddedness," *American Journal of Sociology*, Vol. 91, No. 3, 1985, pp. 481-510.
- [16] Grant, R.M., "Prospering in Dynamically-Competitive Environments : Organizational Capability as Knowledge Integration," *Organization Science*, Vol. 7, No. 4, 1996, pp. 375-387.
- [17] Gray, P.H. and D.B. Meister, "Knowledge Sourcing Effectiveness," *Management Science*, Vol. 50,

- No. 6, 2004, pp. 821-834.
- [18] Griffin, A. and J.R. Hauser, "Patterns of Communication Among Marketing, Engineering, and Manufacturing : A Comparison Between Two New Product Teams," *Management Science*, Vol. 38, No. 3, 1992, 360-373.
 - [19] Hagedoorn, J., "Understanding the Rational of Strategic Technology Partnering : Interorganizational Modes of Cooperation and Sector Differences," *Strategic Management Journal*, Vol. 14, No. 5, 1993, pp. 371-385.
 - [20] Han, J.K., N. Kim and R.K. Srivastava, "Market orientation and organizational performance : Is innovation a missing link ?," *Journal of Marketing*, Vol. 62, October 1998, pp. 30-45.
 - [21] Hobday, M., *Innovation in East Asia*, Aldershot : Edward Elgar, 1995.
 - [22] Hoffman, K., P. Milady, B. John and L. Perren, "Small Firms, R&D, Technology and Innovation in the UK : A Literature Review," *Technovation*, Vol. 18, No. 1, 1998, pp. 39-55.
 - [23] Hong, S.J., "Market Orientation and Firm Performance : Mediating Effect of Market Knowledge Management and Innovation," *Korean Journal of Commodity Science and Technology*, Vol. 25, No. 1, 2007, 51-63.
 - [24] Huber, G.P., "A Theory of the Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making," *Academy of Management Review*, Vol. 15, No. 1, 1990, pp. 47-71.
 - [25] Hurley, R.F. and G.T.M. Hult, "Innovation, market orientation, and organizational learning : An integration and empirical examination," *Journal of Marketing*, Vol. 62, July 1998, pp. 42-54.
 - [26] Im, S. and J.P. Workman Jr, "Market Orientation, Creativity, and New Product Performance in High-Technology Firms," *Journal of Marketing*, Vol. 57, July 2004, pp. 53-71.
 - [27] Jaworski, B., A.K. Kohli and A. Sahay, "Market-driven versus driving markets," *Journal of the Academy of Marketing Science*, Vol. 28, No. 1, 2000, pp. 45-54.
 - [28] Kaufmann, A. and F. Todtling, "How Effective is Innovation support for SMEs? An Analysis of the Region of Upper Austria," *Technovation*, Vol. 22, 2002, pp. 147-159.
 - [29] Keskin, H., "Market orientation, learning organization, and innovation capabilities in SMEs : An extended model," *European Journal of Innovation Management*, Vol. 9, No. 4, 2006, pp. 396-417.
 - [30] Kim, S.B., "Industrial Policy Model for the Regional Innovation System," *Regional Studies*, Vol. 17, No. 2, 2001, pp. 79-97.
 - [31] Kimberly, J.R. and M.J. Evanisko, "Organizational innovation : The Influence of individual, organizational and contextual factors on hospital Adoption of technological and administrative innovation," *Academy Management Journal*, Vol. 24, 1981, pp. 689-714.
 - [32] Kirca, A.H., S. Jayachandran and W.O. Bearden, "Market Orientation : A Meta-Analytic Review and Assesment of Its Antecedents and Impact on Performance," *Journal of Marketing*, Vol. 54, April 2005, pp. 1-18.
 - [33] Klevorick, A.K., R.C. Levin, R.R. Nelson and S.G. Winter, "On the Sources and Significance of Interindustry Differences in Technological Opportunities," *Research Policy*, Vol. 24, No. 2, 1995, pp. 185-205.
 - [34] Kohli, A.K. and B.J. Jaworski, "Market orientation : The construct, research propositions and managerial implications," *Journal of Marketing*, Vol. 54, No. 2, 1990, pp. 1-18.
 - [35] Lee, C., K. Lee and J.M. Pennings, Internal Capabilities, "External Networks, and Performance : A Study on Technology-based Ventures," *Strategic Management Journal*, Vol. 22, No. 6-7, 2001, pp. 615-640.
 - [36] Lee, J.H., *International Comparative Study on the Success and Failure Factors in New Product Development*, Doctoral Dissertation, KAIST, 2000.
 - [37] Lee, K.J. and D.S. Lee, "Technology Innovation Type and Determinants in Pusan District Area," *Economy Studies*, Vol. 22, No. 4, 2004, pp. 173-199.
 - [38] Lin, B.W., Y. Lee and S.C. Hung, "R&D Intensity and Commercialization Orientation Effect on

- Financial Performance," *Journal of Business Research*, Vol. 59, No. 6, 2006, pp. 679-685.
- [39] Lieberman, M. and D. Montgomery, "First-mover Advantages," *Strategic Management Journal*, Vol. 9, No. 1, 1988, pp. 41-58.
- [40] Lover, J. and S. Roper, "The determinants of innovation, R&D, technology transfer and networking effects," *Review of Industrial Organization*, Vol. 15, No. 1, 1999, pp. 43-64.
- [41] Luo, X., R.J. Slotegraaf and X. Pan, "Cross-Functional copetition: The Simultaneous Role of Cooperation and Competition within Firms," *Journal of Marketing*, Vol. 70, April 2006, pp. 67-80.
- [42] Luo, Y., "Toward copetition Within a Multinational Enterprise: A Perspective from Foreign Subsidiaries," *Journal of World Business*, Vol. 40, No. 2, 2005, pp. 71-90.
- [43] Luo, Y., "A copetition Perspective of Global Competition," *Journal of World Business*, Vol. 42, No. 2, 2007, pp. 129-144.
- [44] Miller, D. and P.H. Friesen, "Structural Change and Performance: Quantum vs. Piecemeal-Incremental Approaches," *Academy of Management Journal*, Vol. 25, 1982, pp. 867-892.
- [45] Narver, J.C. and S.F. Slater, "The effect of market orientation on business profitability," *Journal of Marketing*, Vol. 54, No. 4, 1990, pp. 20-35.
- [46] Nieto, M. and O. Pilar, "Absorptive Capacity, Technological Opportunity, Knowledge Spillovers, and Innovative Effort," *Technovation*, Vol. 25, 2005, pp. 1141-1157.
- [47] Nonaka, I., "A Dynamic Theory of Organizational Knowledge Creation," *Organization Science*, Vol. 5, No. 1, 1994, pp. 14-37.
- [48] O'Regan, N. and A. Ghobadian, "Innovation in SMEs: The impact of strategic orientation and environmental perceptions," *International Journal of Productivity and Performance Management*, Vol. 54, No. 2, 2006, pp. 81-97.
- [49] O'Regan, N., A. Ghobadian and M. Sims, "Fast tracking innovation in manufacturing SMEs," *Technovation*, Vol. 26, No. 2, 2006, pp. 251-261.
- [50] OECD, *Managing National Innovation System*, Paris 1999.
- [51] Oerlemans, L.A.G., M.T.H. Meeus and F.W.M. Boekema, "Do networks matter for innovation? The usefulness of the economic network approach in analyzing innovation," *Journal of Economic and Social Geography*, Vol. 8, No. 3, 1998, pp. 298-309.
- [52] Park, S.M. and B.H. Lee, "External Resource Application and Technology Innovation Performance," *Working Paper*, Summer, Korean Association for Strategic Management, 2005, pp. 63-83.
- [53] Powell, W.W., K.W. Koput and S.D. Laurel, "Interorganizational collaboration and the locus of innovation: Networks of learning on biotechnology," *Administrative Science Quarterly*, Vol. 41, No.1, 1996, pp. 116-145.
- [54] Rogers, M., "Networks, Firm Size and Innovation," *Small Business Economics*, Vol. 22, 2004, pp. 141-153.
- [55] Ruekert, R. and O. Walker, "Marketing's Interaction with Other Functional Units: A Conceptual Framework and Empirical Evidence," *Journal of Marketing*, Vol. 51, January 1987, pp. 1-19.
- [56] Schumpeter, J.A., *Capitalism, Socialism, and Democracy*, New York: Harper, 1942.
- [57] Scott, M.C., *Reinspiring the Corporation*, Wiley, Chichester, 2000.
- [58] Slater, S.F. and J.C. Naver, "Market Orientation and the Learning Organization," *Journal of Marketing*, Vol. 51, July 1995, 63-74.
- [59] Song, S.H., "Organizational Contingency Factors and Technological Innovation in Korean Telecommunication Industry: A Contingency Approach," *Korean Journal of Management*, Vol. 14, No. 2, 2006, pp. 177-213.
- [60] Spanos, Y.E. and S. Lioukas, "An Examination unto the Casual Logic of Rent Generation," *Strategic Management Journal*, Vol. 22, No. 10, 2001, pp. 907-934.
- [61] Stuart, T.E., "Interorganizational alliances and the performance of firms: a study of growth and innovation rates in a high-technology industry," *Strategic Management Journal*, Vol. 21, 2000, pp. 791-811.

- [62] Teece, D.J., "Competition, cooperation and innovation : Organizational arrangements for regimes of rapid technological progress," *Journal of Economic Behavior and Organization*, Vol. 18, No. 1, 1992, pp. 1-25.
- [63] Tether, B.S., "Small and Large Firms : Sources of Unequal Innovations?," *Research Policy*, Vol. 27, No. 7, 1998, pp. 725-745.
- [64] Tsai, W., "Social Structure of competition Within a Multiunit Organization : Coordination, Competition, and Intraorganizational Knowledge Sharing," *Organization Science*, Vol. 13, No. 2, 2002, pp. 179-190.
- [65] Uzzi, B., "The Sources and Consequences of Embeddedness for the Economic Performance of Organizations : The Network Effect," *American Sociological Review*, Vol. 61, August 1997, pp. 674-698.
- [66] Verhees, F.J.H.M. and M.T.G. Meulenbergh, "Market Orientation, Innovativeness, Product Innovation, and Performance in Small Firms," *Journal of Small Business Management*, Vol. 42, No.2, 2004, pp. 134-154.
- [67] Von Hippel, E., *The Sources of Innovation*, New York : Oxford University Press, 1987.
- [68] Williamson, O.E., *Markets and Hierarchies : Analysis and Antitrust Implications*, New York : Free Press, 1985.
- [69] Yoon, E. and G.L. Lilien, "Determinants of new industrial product performance : a strategicre-examination of the empirical literature," *Engineering Management*, Vol. 36, No. 1, 1989, pp. 3-10.
- [70] Yoon, J.H., "Technology Policy Effect Analysis by Industrial type," *Working Paper*, Summer, The Korean Association for Local Government Studies, 2006, pp. 29-48.