

# Research on the Effects of Knowledge Management Capabilities and Knowledge Sharing Mechanisms on New Product Development Performance in Taiwan's High-tech Industries

Pang-Lo Liu and Chih-Hung Tsai<sup>†</sup>

Department of Industrial Engineering and Management  
Ta-Hwa Institute of Technology  
1 Ta-Hwa Road, Chung-Lin, Hsin Chu, Taiwan 30050, Republic of China.  
Tel: +886-3-5927700~2953, Fax: +886-3-5926848  
E-mail: ietch@thit.edu.tw

## Abstract

High-tech industries in Taiwan exist in an environment with diverse product requirements and intense cost reduction and information integration stress. They must develop new operational directions to increase industry competitiveness. Therefore, Taiwan's high-tech industries must continue R&D and creativity, establish knowledge sharing mechanisms and improve new product development (NPD) performance. This research analyzed and explored the influences of knowledge management (KM) and knowledge sharing mechanisms introduced by Taiwan's high-tech industries on new product development performance. The relationship between knowledge management capabilities and NPD performance is studied. This research considers the intervening industry and corporate position variables. Taiwan's high-tech industries have gradually entered the era of IT region integration and application with competitive advantage creation based upon core techniques. The in-depth study of knowledge management and knowledge sharing introduced by the high-tech industry revealed double meanings in academic and practical applications. The research results showed the following: (1) the stronger the knowledge management capabilities of Taiwan's high-tech industries, the more significant the NPD performance. (2) The better the knowledge sharing mechanism in Taiwan's high-tech industries, the more significant the NPD performance. (3) Corporate scale is not necessarily the critical factor in NPD success and the influence of corporate scale on NPD performance did not show significant differences. (4) The stronger the degree of leading corporate techniques, the more significant the NPD performance.

**Key Words:** Knowledge Management Capabilities, Knowledge Sharing Mechanism, New Product Development Performance

---

<sup>†</sup>Corresponding Author

---

## 1. Introduction

In the globalization process, how Taiwan's high-tech industries properly managed knowledge, plan the construction of knowledge sharing mechanisms and acquire the resources related to new techniques to increase new product development (NPD) capacity and performance and develop advantages in international competition have become extremely important research issues. With the life cycle of high-tech products greatly reduced, NPD performance becomes critically important in corporate operations. Knowledge management (KM), the position of knowledge sharing in NPD factors is increasingly important. There are close relationships among the effective techniques, the acquisition of new techniques and future possible development. In the changeable industry competition environment, the key to determining corporate competitive advantages is knowledge. In the past, studies exploring the factors influencing the NPD success, some valued exploration of the product development process. However, in the high-tech industry, which is led by techniques, although product development and sales are important, KM capabilities were more critical. The past studies rarely explored the influences of KM capabilities and knowledge sharing mechanisms on NPD in-depth. This research treats KM capabilities and knowledge sharing mechanisms as the subject of this research. This research explores the influence of KM capabilities on NPD performance in Taiwan's high-tech industries. The industry characteristics and corporate scale are treated as the intervening variables for this empirical study. The research purpose is as follows: (1) exploring if KM capabilities have a critical influence on NPD performance. (2) Exploring if different organizational knowledge sharing mechanisms lead to knowledge sharing in NPD performance. (3) Exploring if the differences in industry and corporate positions lead to different KM capabilities and knowledge sharing mechanisms in NPD performance.

## 2. Literature Review

We describe the related literatures with respect to Taiwan's high-tech industries, knowledge management capabilities, knowledge sharing mechanism and new product development performance below.

### 2.1 High-tech Industry

Chiu (2002) indicated that the characteristics of the high-tech industry in Taiwan included: (1) talent-intensive; (2) capital-intensive; (3) high technical level and complicated manufacturing process; (4) high degree of market concentration; (5) short life cycle of products. Riggs (1985) suggested that high-tech companies meant firms treating "technology" as the principal

---

competitive strategies and tools. They valued R&D functions and produced products with short life cycles, high risk capitalization and rapid change. Gould and Keeble (1984) argued that the high-tech industry should be assessed using three indicators: the proportion of R&D expense in output, the speed of technical creativity and proportion of technical and R&D personnel. Rogers and Larson (1984) suggested that the high-tech industry should have 4 conditions: (1) high proportion of scientists, engineers and technicians; (2) rapid industry growth; (3) high proportion of R&D expense; (4) global product markets. Shanklin and Ryans (1984) suggested that the firms must have a powerful base of scientific techniques. New techniques could rapidly eliminate present techniques. With the application of new techniques, both markets and demand could be constructed or changed. Bleicher and Paul (1983) suggested that the high-tech industry has high capital and technical precision that stresses professional knowledge, R&D and technology talent cultivation, a high degree of technical intensity, large economic scale, high risk and high return. In the future it is expected that Taiwan might become a technological nation, treating the high-tech industry with strategic focus oriented toward creativity. This research allocates the characteristics of Taiwan's high-tech industries into 6 categories: (1) integrated circuit industry; (2) computer and related industry; (3) communication industry; (4) optoelectronics industry; (5) precision machinery industry; (6) biotechnology industry as the targets of the questionnaire survey this research.

## 2.2 Knowledge Management Capabilities

Knowledge is power. KM is a set of processes or methods with clear definitions, used to identify and manage the critical knowledge for various tasks integral in confirming a new product or strategy and strengthening human resources management to reach corporate goals. Clark and Fujimoto (1991) argued that the integration of KM required a general cross-functional integrated capacity. The strategies of NPD should be based on more general knowledge integration. Nonaka and Takeuchi (1995) suggested that knowledge creation was generated from the interaction between internal and external knowledge. Organizational knowledge creation is derived from continuous interactions between internal and external knowledge sources through some knowledge transformation model. Davenport (1996) suggested that a successful KM system constructed by firms included talent, skill and knowledge databases and an online support search system. KM success required cooperation between people. Davenport also indicated that knowledge management meant collecting information and passing on to the demanders. The activities that effectively increased the organizational knowledge asset value, such as knowledge acquisition, knowledge creation, knowledge saving and knowledge sharing were called "knowledge management." Teece *et al.* (1997) suggested that in the field of KM, the importance of Knowledge Integration was particularly stressed. Holtshouse (1998) indicated that knowledge was a kind of "flow" concept. In other words,

---

knowledge could be exchanged between knowledge suppliers and demanders. Hendrike (1999) suggested that knowledge sharing must be based on knowledge delivery between the knowledge owners and knowledge demanders. An individual might have dual identities as a knowledge owner and demander. However, the motivations for knowledge sharing are different. Nonaka *et al.* (2000) argued that regardless of knowledge creation or innovation, knowledge sharing among the people or groups involved was the start of the next knowledge spin. Harrison and Samaon (2002), Liao (2003), Liao *et al.*, (2004), Liu *et al.* (2004, 2005) suggested that many firms started to identify creativity as the key to the establishment of competitive advantages and knowledge would be the key for continuous creativity. Creativity has become an important issue. Based on the above literature review, this research treats knowledge acquisition, knowledge creation, knowledge saving and knowledge diffusion as the principal constructs of "KM capabilities."

### 2.3 Knowledge Sharing Mechanism

The study of American Productivity and Quality Center (APQC) indicated that "KM is a strategy that allows people to acquire knowledge; it is the capacity for fulfilling group intellect and further increases organizational responsiveness and creative capacities through knowledge sharing." Van den Hooff and Van Weenen (2004) argued that knowledge sharing could be divided into knowledge granting and knowledge collection. Kearns and Lederer (2003) indicated that each unit in the organization was a point and disseminating knowledge through the channels between the points could increase the performance of overall organization. Ryu *et al.* (2003) argued that knowledge sharing was a kind of delivery behavior the people in the organization acquired knowledge from others. Lee (2001) suggested that knowledge sharing was the activity transferring or disseminating knowledge from individuals, groups or organizations to others. Liebowitz (2001) suggested that knowledge sharing was confirmed to be the focus of KM. Knowledge sharing might be the force stimulating organizational knowledge creation or transfer. Lee (2001) suggested that knowledge sharing was the principal prediction factor in corporate outsourcing activity results. Hendriks (1999) argued that KM should focus on knowledge sharing. The scholars suggested that only successful knowledge sharing could increase intellectual capital and important resource sharing. Knowledge sharing is a process, activity or behavior.

Active individual knowledge sharing is the basis of successful group or corporate knowledge sharing. Active employee knowledge sharing involves employees' "actively" giving others their own knowledge and "actively" collecting knowledge needed from others. Thus, the whole organization establishes a knowledge sharing circulation system. Quinn *et al.* (1996) suggested that through knowledge sharing, the acquired information and experience acquired would assume linear growth. The research of Hong *et al.* (2004) found that there was pos-

---

itive relationship between knowledge sharing and NPD. Through knowledge sharing, organizational competitive advantages could be established. The competitive advantages might be managerial capacities or techniques that drive the lead toward organization innovative progress. Robbins (2003) suggested that the employees would have subjective perceptions toward some characteristics of the organization, such as the degree to which teamwork is valued and the support provided to employees. These positive or negative perceptions would influence the employees' performance and work satisfaction. When employee knowledge sharing in the firm establishes a culture different from other firms, the employees might acquire new knowledge through continuous interaction with others under the influence of this knowledge sharing. Employee learning capacities could be further improved and their learning motivation could also be increased because of the learning environment. Liao *et al.* (2004) found that when there was good relationship between the employees and the firms, the employees would actively and unconditionally share their knowledge and experience with other colleagues. Based on the description of the above literature, this research followed the argument of Van den Hooff and Van Weenen (2004) to divide the knowledge sharing in the organization into knowledge granting and knowledge collection.

#### **2.4 New Product Development Performance**

Song and Parry (1997) suggested treating 4 indicators to assess the relative success level of new product development: (1) comparing the quality of new products with that of rivals; (2) comparing the sales of new products with that of rivals; (3) comparing the rate of return from new products with that of rivals; (4) comparing the ratio of successful new products to the market with the expected targets on return. Calanton *et al.* (1995) treated the Ratio of Investment, Investment Growth Rate, Ratio of Sales, Market share and Market Share Growth Rate as the assessment indicators of NPD performance. Hopkins (1981) suggested the following 5 indicators to evaluate NPD performance: (1) financial assessment; (2) target assessment; (3) proportion of new products in overall sales; (4) proportion of successful new products to market; (5) overall satisfaction with NPD. Based on above literature review, this research treated 5 indicators as the constructs of NPD performance: (1) time of new products to the market; (2) quality level of new products; (3) market share of new products; (4) ratio of successful new products to the market; (5) overall satisfaction of NPD.

### **3. Research Design**

This research design included questionnaire collection, research framework, research hypotheses, data analysis, etc. The respective descriptions are below.

---

### 3.1 Questionnaire Collection

This research regarded the influences of KM capabilities and knowledge sharing mechanism on NPD performance as the research subject and selected Taiwan's high-tech industries as the population. It also selected 500 well-known and representative firms as the research samples. The researcher distributed 500 questionnaires in 2007 and there were 240 returns. The return rate was 48% and there were 200 valid returns. The valid return rate was 40%. The questionnaire of this research included 4 parts. The first to the third parts were assessed by Likert 5-point scale. The first part was KM capabilities; the second part was knowledge sharing mechanism; the third part was NPD performance; the fourth part was the basic information of firm, including (1) capital of the firm, (2) business volume of the firm, (3) number of employees, etc.

### 3.2 Research Framework

The conceptual framework proposed by this research is shown in Figure 1. Among others,

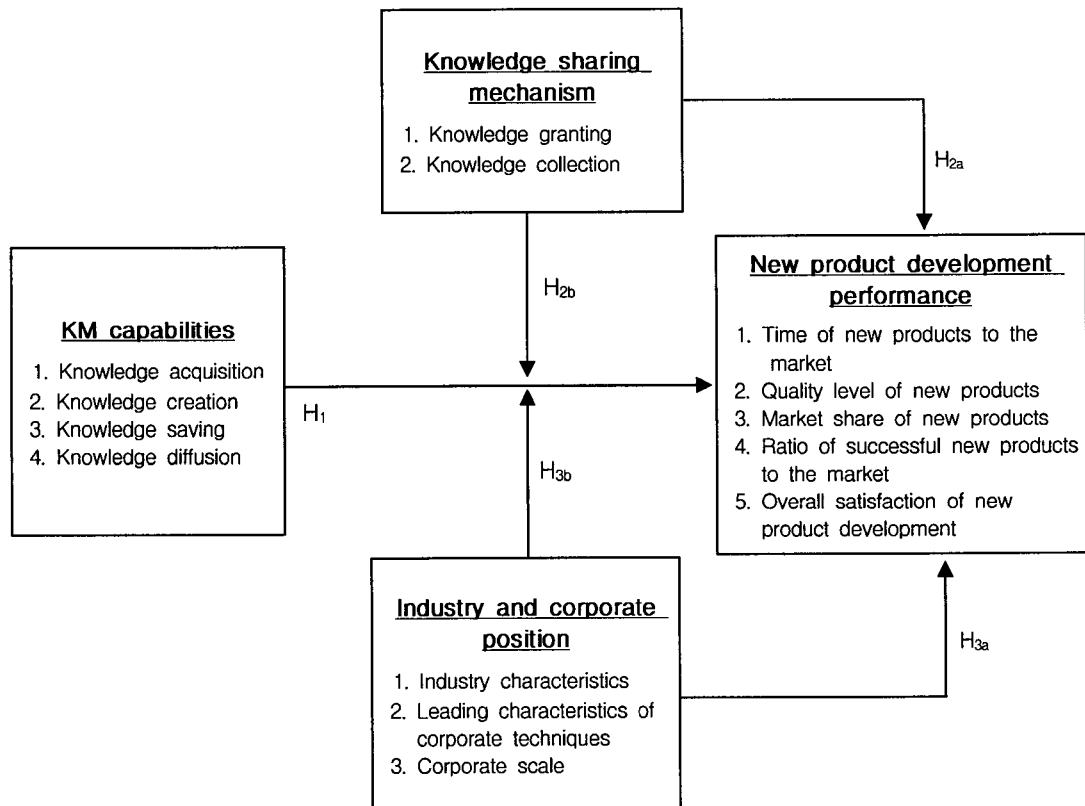


Figure 1. Research framework

the assessment construct of “KM capabilities” included knowledge acquisition, knowledge creation, knowledge saving and knowledge diffusion. The variables of “knowledge sharing mechanism” included knowledge granting and knowledge collection. The variables of “industry and corporate position” included industry characteristics, leading characteristic of corporate techniques, corporate scale, etc. The assessment construct of “new product development performance” included time of new products to the market, quality level of new products, market share of new products, ratio of successful new products to the market, overall satisfaction of NPD, etc.

### 3.3 Research Hypotheses

Through literature review and theoretical analysis, this research constructed the hypotheses as follows.

- H<sub>1</sub>: The stronger the executive degree of KM capability, the more significant the NPD performance.
- H<sub>2</sub>: The organizational knowledge sharing mechanism would influence the effect of KM capabilities and NPD performance.

**The sub-hypotheses developed upon the intervening variables were below:**

- H<sub>2-1a</sub>: The different organizational knowledge sharing mechanisms would lead to a significant difference in NPD performance.
- H<sub>2-1b</sub>: The stronger the KM capabilities, the higher the degree of organizational knowledge sharing and the more significant the NPD performance.
- H<sub>2-2a</sub>: The higher the degree of organizational knowledge granting, the more significant the influence on NPD performance.
- H<sub>2-2b</sub>: The stronger the KM capabilities, the higher the degree the organizational knowledge collection and the more significant the NPD performance.
- H<sub>3</sub>: Industry and corporate position influence NPD performance.

**The sub-hypotheses developed upon the intervening variables were below:**

- H<sub>3-1a</sub>: The characteristics of industry had a significant influence on NPD performance.
  - H<sub>3-1b</sub>: In different industry characteristics, KM capabilities led to significantly different NPD performance.
  - H<sub>3-2a</sub>: The leading characteristic of corporate techniques had significant influence on NPD performance.
  - H<sub>3-2b</sub>: The greater the leading corporate technique characteristic, the stronger the KM capabilities and the more significant the NPD performance.
  - H<sub>3-3a</sub>: Corporate scale had a significant influence on NPD performance.
-

H<sub>3-3b</sub>: In different corporate scales, KM capabilities led to significantly different NPD performance.

### 3.4 Data Analysis

This research treated Taiwan's high-tech industries as the empirical targets. When distributing the questionnaires, the researcher selected the more well-known firms with KM and NPD experience as the sample. The questionnaire respondents should have complete understanding toward the NPD process. The researcher regarded the NPD project managers, experienced product planning personnel, experienced R&D managers and KM executives in the firms as the questionnaire target to increase the validity of the questionnaire. He (She) calculated Cronbach's  $\alpha$  of each question in each construct to test the reliability of the questions in the questionnaires. The larger Cronbach's  $\alpha$  was, the higher the internal consistency and reliability of the questions of the construct were. Nunnally (1978) suggested that in basic study, as long as reliability was at least 0.7, it was considered acceptable. Reliability of this research was more than 0.7. Thus, the reliability was reliable. Reliability and confirmatory factor analysis of the variables in this research were shown in Table 1. This research analyzed the data by SPSS 12.0 for Windows statistical software. The analytical content for research confirmatory analysis included t-test, Two-way ANOVA, factor analysis, correlation analysis and multiple-regression-analysis.

**Table 1.** Reliability, validity and confirmatory factor analysis of the constructs

Variables and Constructs		Cronbach's $\alpha$	GFI	AGFI	RMR	CR	T value
KM capabilities	Knowledge acquisition	0.89	0.96	0.84	0.03	0.66	13.84~18.89
	Knowledge creation	0.87				0.65	13.12~18.14
	Knowledge saving	0.88				0.67	15.13~18.43
	Knowledge diffusion	0.92				0.68	13.21~19.05
Knowledge sharing mechanism	Knowledge granting	0.89	0.95	0.90	0.04	0.72	15.16~18.55
	Knowledge collection	0.88				0.89	12.35~18.87
NPD performance	Time of new products to the market	0.87	0.93	0.85	0.03	0.84	16.98~19.89
	Quality level of new products	0.86				0.86	16.75~19.83
	Market share of new products	0.89				0.85	16.35~19.75
	Ratio of successful new products to the market	0.90				0.87	16.33~19.45
	Overall satisfaction of NPD	0.89				0.82	16.31~19.21



This research managed reliability, validity and confirmatory factor analysis on KM capabilities, knowledge sharing mechanism and NPD performance to access to the propriety of the scale in the test model. As to reliability, Cronbach's  $\alpha$  of each construct was more than 0.7, Composite Reliability (CR) was more than 0.6 which met the view of the scholars Bagozzi and Yi (1988) who emphasized that CR should be at least more than 0.6. With regard to propriety, GFI and AGFI were respectively between 0.93 and 0.96 and between 0.83 and 0.90. RMR was less than 0.05. It showed that the questionnaire scale was relatively consistent. With regard to validity, T values of all questions in each construct were significantly more than 2. It showed that there was good converged validity.

## 4. Research Results and Analysis

### 4.1 T-test of the Influence of Organizational KM Capabilities on NPD Performance

In 4 constructs of KM, according to the average of overall KM capabilities, this research allocated the firms of high-tech industry in Taiwan into "strong KM capabilities" (with average more than 0.5) and "weak KM capabilities" (with average less than 0.5) and managed t-test with regard to their influences on NPD performance as Table 2. ( $P = 0.000$ ) meant the stronger the KM capabilities of Taiwan's high-tech industries were, the more significant the NPD performance was. The test demonstrated that stronger KM capabilities substantially helped the NPD performance of Taiwan's high-tech industries. The research result supported  $H_1$ .

**Table 2.** The t-test of the influence of KM capabilities on NPD performance

	Weak KM capabilities	Strong KM capabilities	t value	P value
NPD performance	0.0823	0.6826	-5.58	0.000***

Note: \* means  $p < 0.1$ , \*\* means  $p < 0.05$ , \*\*\* means  $p < 0.001$ .

### 4.2 T-test of the Influence of Organizational Knowledge Sharing Mechanism on NPD Performance

According to Table 3, ( $P = 0.000$ ) showed that the organizational knowledge sharing mechanism of the industry had a certain influence on NPD performance and the stronger the organizational knowledge sharing mechanism was, the more significant the influence on NPD performance was. This research allocated the firms into strong and weak knowledge sharing mechanisms. When the average was more than 0.5, it was considered strong and when the average was less than 0.5, it was considered weak. The research result supported  $H_2$ ,  $H_{2-1a}$ ,  $H_{2-2a}$ ,  $H_{2-1b}$  and  $H_{2-2b}$ .

**Table 3.** T-test of the influence of organizational knowledge sharing mechanism on NPD performance

NPD performance	Average of weak knowledge sharing mechanism	Average of strong knowledge sharing mechanism	t value	P value
Average of overall performance	0.1715	0.5458	-3.38	0.000***
NPD performance	Low knowledge granting level	High knowledge granting level	t value	P value
Average of overall performance	0.0842	0.5397	-4.69	0.000***
NPD performance	Low knowledge collection level	High knowledge collection level	t value	P value
Average of overall performance	0.0885	0.5336	-4.51	0.000***

Note: \* means  $p < 0.1$ , \*\* means  $p < 0.05$ , \*\*\* means  $p < 0.001$ .

#### 4.3 The Influences of Corporate Scale and Leading Degree of Corporate Techniques on NPD Performance

Although the influence of corporate scale on NPD has been the controversial issue, this research found that corporate scale was not necessarily the key factor in the NPD result. According to the definition of this research, corporate scale with over 500 million US dollars was considered as large-scale firm whereas less than 500 million US dollars was considered as small scale firm. The research result is shown in Table 4 ( $P = 0.159$ ). It demonstrated that the large-scale and small-scale firms did not reveal significant difference in terms of overall NPD performance. This research found that the leading degree of corporate techniques had significant influence on overall NPD performance ( $P = 0.000$ ) which demonstrated that higher leading degree of corporate techniques showed a significantly positive influence on

**Table 4.** T-test of the influences of corporate scale and leading degree of corporate techniques on NPD performance

NPD performance	average of small-scale firms	Average of large-scale firms	t value	P value
Average of overall performance	0.2167	0.5534	-1.32	0.159
NPD performance	Low leading degree of corporate techniques	High leading degree of corporate techniques	t value	P value
Average of overall performance	0.0814	0.5487	-4.83	0.000***

Note: \* means  $p < 0.1$ , \*\* means  $p < 0.05$ , \*\*\* means  $p < 0.001$ .

NPD performance. This research treated Taiwan's high-tech industries as the research targets. High-tech industry was the leading industry in Taiwan and it had more vigorous market growth, R&D involvement and product creativity. This research demonstrated that industry characteristics, leading degree of corporate techniques and corporate scale indeed had significant influence on NPD performance. The test result supported  $H_{3-2a}$ ,  $H_{3-2b}$ ,  $H_{3-3a}$  and  $H_{3-3b}$ .

#### 4.4 Two-way ANOVA of the Influence of Industry and Corporate Positions and KM Capabilities on NPD Performance

Since "industry and corporate positions" was the intervening variable in this research, the researcher managed Two-way ANOVA on the influence of the previous two groups with strong and weak KM capabilities on NPD performance in different corporate scales as Table 5. ( $P = 0.367$  and  $P = 0.605$ ) demonstrated that the interaction between two parties did not reach significance, which showed that in different corporate scales, the influence of KM capabilities on NPD performance did not reveal a significant difference. However, after using the same analysis, we found that the principal and overall effects of KM capabilities both revealed significance ( $P = 0.000$ ). The  $H_3$ ,  $H_{3-1a}$  and  $H_{3-1b}$  were thus confirmed.

**Table 5.** Two-way ANOVA of the influences of corporate scale and KM capabilities on NPD performance

Sources of variance	F value	P value	Significance
Principal effect of KM capabilities	24.12	0.000	***
Principal effect of supplier scale	0.85	0.367	N.S.
Interactive effect	0.29	0.605	N.S.
Overall effect	10.63	0.000	***

Note: \* means  $p < 0.1$ , \*\* means  $p < 0.05$ , \*\*\* means  $p < 0.001$ .

#### 4.5 Correlation Analysis

According to the result in Table 6, the average of KM capabilities was between 3.92 and 3.96. The knowledge sharing mechanism average was between 3.85 and 3.89. The NPD average performance was between 3.76 and 3.88. Generally speaking, the KM capability average was higher, which demonstrated that the research targets had better KM capabilities. According to Table 6, KM capabilities had a positive correlation with all constructs. In other words, when the employees had more frequent KM behavior, NPD performance revealed positive correlation. In addition, the knowledge sharing mechanism showed a significantly positive correlation with NPD performance. In other words, when the employees had a better knowledge sharing mechanism, NPD performance showed the positive correlation.

**Table 6.** correlation coefficient matrix of research variables

Constructs	average	standard error	1	2	3	4	5	6	7	8	9	10	11
1. knowledge acquisition	3.96	0.55	(0.89)										
2. knowledge creation	3.93	0.51	0.73	(0.87)									
3. knowledge saving	3.92	0.62	0.38	0.33	(0.88)								
4. knowledge diffusion	3.95	0.61	0.36	0.35	0.61	(0.92)							
5. knowledge granting	3.89	0.72	0.37	0.36	0.62	0.51	(0.89)						
6. knowledge collection	3.85	0.73	0.35	0.33	0.66	0.50	0.51	(0.88)					
7. time of new products to the market	3.76	0.68	0.34	0.35	0.68	0.51	0.62	0.66	(0.87)				
8. quality level of new products	3.78	0.66	0.35	0.36	0.61	0.55	0.63	0.63	0.66	(0.86)			
9. market share of new products	3.88	0.63	0.38	0.38	0.60	0.53	0.65	0.65	0.63	0.61	(0.89)		
10. ratio of successful new products to the market	3.86	0.61	0.39	0.33	0.63	0.54	0.63	0.63	0.67	0.62	0.91	(0.92)	
11. overall satisfaction of NPD	3.87	0.62	0.38	0.35	0.61	0.55	0.65	0.66	0.66	0.61	0.81	0.88	(0.89)

Note:  $p < 0.05$ , ( ) was Cronbach's  $\alpha$  of each factor.

#### 4.6 Multiple-Regression-Analysis of KM Capabilities, Knowledge Sharing Mechanism and NPD Performance

Multiple-regression-analysis was the extended application of a simple correlation that was used mainly to access the straight line relationship between a set of prediction variables and a criterion variable. The Multiple-regression-analysis in this research is shown in Tables 7 and 8. According to the figures of Table 7 and Table 8, the assumptions of B value, Beta value and t value all reached the positive and significant level. Beta values of Model 1 (see Table 7) were respectively 0.182, 0.239, 0.146 and 0.328 and the model was  $y_i = 0.328x_1 + 0.238x_2 + 0.158x_3 + 0.287x_4 + e_i$ , (knowledge acquisition was  $x_1$ , knowledge creation was  $x_2$ , knowledge saving was  $x_3$  and knowledge diffusion was  $x_4$ ) which showed positive and significant relationships. Adjusted R was 0.797 and the explanatory power of all variables was considerably high. Beta values of Model 2 (see Table 8) were respectively 0.188 and 0.627

**Table 7.** Multiple-regression-analysis of KM capabilities and NPD performance

Variables	Model 1			
	B	Std. E	Beta	T value
Knowledge acquisition	0.328	0.109	0.182	1.307
Knowledge creation	0.238	0.126	0.239	1.932
Knowledge saving	0.158	0.108	0.146	1.031
Knowledge diffusion	0.287	0.102	0.328	2.834
Adjusted R	0.797			

**Table 8.** Multiple-regression-analysis of knowledge sharing mechanism and NPD performance

Variables	Model 2			
	B	Std. E	Beta	T value
Knowledge granting	0.128	0.078	0.188	1.582
Knowledge collection	0.607	0.083	0.627	7.383
Adjusted R	0.788			

and the model was  $y_2 = 0.128x_5 + 0.607x_6 + e_2$ , (knowledge granting was  $x_5$  and knowledge collection was  $x_6$ ) which revealed positive and significant correlation. Adjusted R was 0.788 and the explanatory power of all variables was considerably high. Thus, the correlation among KM capabilities, knowledge sharing mechanism and NPD performance in this research was confirmed.

#### 4.7 LISREL Model Analysis

With regard to the propriety of the whole model, the scholars have proposed many indicators and judgment principles. Bagozzi and Yi (1988) suggested that  $GFI > 0.9$ ,  $NFI > 0.9$ ,  $CFI > 0.9$ ,  $RMR > 0.05$ ,  $RMSEA < 0.05$  referred to the criterion indicator of model propriety. The purpose of this research was to explore the relationships among different constructs. The research framework was based on one-hierarchy model. It (partial intervening model) is shown in Table 9 and the propriety indicators were below.  $GFI = 0.92$ ,  $NFI = 0.91$ ,  $CFI = 0.93$ ,  $RMR = 0.06$  and  $RMSEA = 0.04$ . The propriety situations all reached the standard argued by the previous scholars. In fact, a set of research data included various propriety models. Certain propriety model was not necessarily the best model. This research proposed complete and partial intervening models for comparison. The research found that  $GFI = 0.99$ ,  $NFI = 0.98$ ,  $CFI = 0.96$ ,  $RMR = 0.06$  and  $RMSEA = 0.00$  of complete intervening model was the optimizing path. In the constructs of this research, the optimizing path relationship is shown in Figure 2.

**Table 9.** Propriety indicators of assumed model and competition model

MODEL	GFI	NFI	CFI	RMR	RMSEA
Partial intervening model	0.92	0.91	0.93	0.06	0.04
Complete intervening model	0.99	0.98	0.96	0.06	0.00

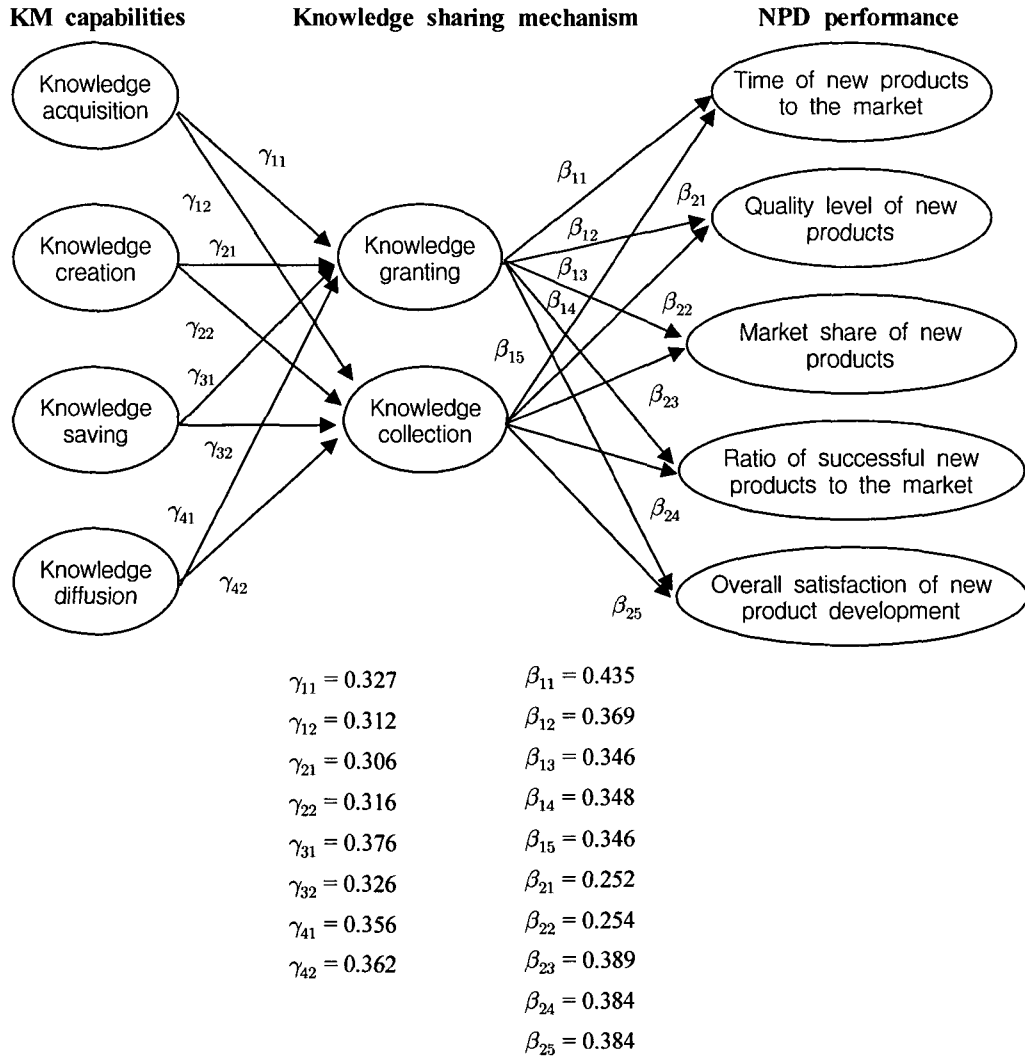


Figure 2. Optimizing model path (complete intervening model)

#### 4.8 Confirmation of Results

##### (1) The influences of KM capabilities and knowledge sharing mechanism

KM capabilities had significant influence on knowledge granting and knowledge collection as shown in Figure 2 ( $\gamma_{11} = 0.327$ ;  $\gamma_{12} = 0.312$ ;  $\gamma_{21} = 0.306$ ;  $\gamma_{22} = 0.316$ ;  $\gamma_{31} = 0.376$ ;  $\gamma_{32} = 0.326$ ;  $\gamma_{41} = 0.356$ ;  $\gamma_{42} = 0.362$ ). In other words, when the knowledge sharing among the colleagues was more frequent, the employees' knowledge granting and knowledge collection were more likely to be upgraded. This research suggested that when the employees actively shared the knowledge their coworkers needed, they voluntarily increased the recipients' re-

lated technical or business capacities. In addition, when the knowledge sharing behavior led to an organizational culture or environment, the employees might also be influenced by this kind of learning environment and their knowledge granting and knowledge collection mechanisms could be further upgraded. Thus, H<sub>2</sub> was supported.

## (2) Influences of knowledge sharing mechanism and NPD performance

The employees' knowledge granting had significant influence on NPD performance are shown in Figure 2, ( $\beta_{11} = 0.435$ ;  $\beta_{12} = 0.369$ ;  $\beta_{13} = 0.346$ ;  $\beta_{14} = 0.348$ ;  $\beta_{15} = 0.346$ ). In other words, the higher the employees' knowledge granting mechanism, the better the corporate NPD performance. The employees' knowledge collection had significant influence on the NPD performance ( $\beta_{21} = 0.252$ ;  $\beta_{22} = 0.254$ ;  $\beta_{23} = 0.389$ ;  $\beta_{24} = 0.384$ ;  $\beta_{25} = 0.384$ ). That was to say, the higher the employees' knowledge collection mechanism was, the better the corporate NPD performance was. Thus, H<sub>2-1a</sub>, H<sub>2-1b</sub>, H<sub>2-2a</sub> and H<sub>2-2b</sub> were supported.

## 5. Conclusions

### 5.1 Conclusions

This research treated KM capabilities, knowledge sharing mechanism and NPD performance as the constructs. Through statistical analysis, it accessed the correlation among KM capabilities, knowledge sharing mechanism and NPD performance for empirical study. Based on theoretical and literature review, the researcher developed the theoretical model affecting the relationship and managed questionnaire survey and empirical analysis of Taiwan's high-tech industries. The research result found that there were substantially positive influences by KM capabilities and knowledge sharing mechanism on NPD performance. In other words, the hypothesis that "the better the KM capabilities and knowledge sharing mechanism were, the better the NPD performance was" would be significantly confirmed in terms of statistics. Therefore, in order to pursue survival and sustainable operation, the firms should value the internal corporate KM capabilities and knowledge sharing mechanism to increase the corporate NPD performance. The description of their relationship is shown below:

1. KM capabilities and NPD performance: The research result found that when the employees were willing to effectively share or transform their skills and knowledge to the coworkers in need, they would increase the corporate NPD performance. Thus, the employees' proper sharing in KM in the firms led to direct benefits to the corporate operational management and NPD performance.
2. Knowledge sharing mechanism and NPD performance: The research result found that in the developing process, the employees' knowledge sharing mechanism played critical

role with respect to NPD performance which had positively significant influence on the predication of the organizational NPD performance.

3. KM capabilities and knowledge sharing mechanism: The research result found that there was a significant correlation between the corporate KM capabilities and corporate knowledge sharing mechanism development. In other words, when the employees in the organization transferred the knowledge into the development beneficial for the firms, they could create continuous corporate competitive advantages.

## 5.2 Meaning of Managerial Practice

According to the research results, the influence of corporate introduction of KM on the upgrading of overall effect of NPD performance was confirmed more clearly. Based on the research results, this research reorganized the practical content of management and described it as follows:

1. As to KM capabilities: the research result revealed that corporate KM capabilities could increase the corporate knowledge sharing mechanism; thus, the firms should encourage the KM and knowledge sharing mechanism among the employees to upgrade the corporate competitiveness.
  2. As to knowledge sharing mechanism: the research result revealed that knowledge sharing mechanism could influence the corporate NPD performance; the firms should encourage the employees to contribute their own skills and knowledge to the organization to create more prominent corporate value.
  3. As to the relationship among KM capabilities, knowledge sharing mechanism and NPD performance: Through the employees' active knowledge and skill granting, the corporate KM capabilities and knowledge sharing mechanism could make the employees to devote to the production and upgrade the organizational operational performance.
  4. As to KM capabilities and corporate scale: The influence of corporate scale on KM capabilities has been a controversial issue. This research demonstrated that the corporate scale was not necessarily the key factor affecting the NPD performance. Large-scale and small-scale firms had their own respective advantages. Thus, NPD performance did not reveal significant difference. Generally speaking, it seemed that the average level of large-scale firms' NPD performance was slightly higher than that of the small-scale firms which was a subject worthy of future researchers' further exploration. In fact, with different industry backgrounds and corporate positions, the companies would adopt different technical creativity strategies. Thus, the weight setting on KM capabilities would be certainly different. The KM capabilities not only influenced NPD performance in Taiwan's high-tech industries, but is also closely connected with the core development techniques of Taiwan's high-tech industries.
-



Through knowledge sharing mechanism, the employees of Taiwan's high-tech industries will help the vigorous development of Taiwan's high-tech industries. The managers of Taiwan's high-tech industries should encourage employees to actively grant their knowledge and increase their knowledge sharing through guidance or the establishment of a reward system that will effectively upgrade the NPD performance of Taiwan's high-tech industries.

## References

1. Baggozzi, R. P. and Yi, Y.(1988), On the evaluation of structure equation models, *Academic of Marketing Science*, Vol. 16, pp. 76-94.
  2. Bleicher, F. and Paul, H.(1983), Managerial Framework for Innovation Responses in High-Tech Organization. *Business Horizons*, pp. 69-78.
  3. Calanton, R., S. Vickery and Deoge, C.(1995), Business Performance and Strategic New Product Development Activities: An Empirical Investigation. *Journal of Product Innovation management*, Vol. 12, No. 3, pp. 214-223.
  4. Chiu, C. B.(2002), The Management of Fabrication Plant Building up for TFT-LCD and IC Industry. the Master Thesis of National Chiao-Tung University, Taiwan.
  5. Clark, Kim B. and Takahiro, Fujimoto.(1991), *Product Development Performance: Strategy, Organization, and Management in the World Auto Industry*. Harvard Business School Press, Boston, Mass.
  6. Davenport, T. H., Sirlila, L. Jarvenpas. and Michael, C. Beers.(1996), Improving Knowledge work Process. *Sloan Management Review*, pp. 53-65.
  7. Gould, A. and Keeble, D.(1984), New Firms and Rural Industrialization in East Anglia, *Regional Studies*, Vol. 18, No. 3, pp. 189-201.
  8. Harrison, N. and Samaon, D.(2002), *Technology management: Text and international cases*. New York: McGraw-Hill.
  9. Hendrike, P.(1999), Why share Knowledge? The influence of ICT on motivation for Knowledge sharing. *Knowledge and Process Management*, Vol. 6, No. 2, pp. 91-100.
  10. Holtshouse, D.(1998), Knowledge Research Issues. *California Management Review*, Vol. 43, No. 3, pp. 277-280.
  11. Hopkins, D. S.(1981), New Product Winners and Losers. *Research Management*, Vol. 12, No. 1, pp. 12-17.
  12. Hong, P., Doll, W. J., Nahm, A. Y., and Li, X.(2004), Knowledge sharing in integrated product Development. *European Journal of Innovation Management*, Vol. 7, No. 2, pp. 102-112.
  13. Kearns, G. S. and Lederer, A. L.(2003), A resource-based view of strategic IT alignment
-

= now knowledge sharing creates competitive advantage. *Decision science*, Vol. 34, No. 1, pp. 1-29.

14. Lee, J. N.(2001), The impact of knowledge sharing, organizational capacity and partnership quality on IS outsourcing success. *Information & Management*, Vol. 38, pp. 323-335.
  15. Liao, S. H.(2003), Knowledge management technologies and applications: A literature review from 1995 to 2002. *Expert Systems with Applications*, Vol. 25, No. 2, pp. 155-164.
  16. Liao, S. H., Chang, J. C., Cheng, S. C., and Kuo, C. M.(2004), Employee relationship and knowledge sharing: A case study of a Taiwanese finance and securities firm. *Knowledge Management Research & Practice*, Vol. 2, pp. 24-34.
  17. Lee, J. N.(2001), The impact of knowledge sharing, organizational capacity and partnership Quality on IS outsourcing success. *Information & Management*, Vol. 38, pp. 323-335.
  18. Liebowitz, J.(2001), Knowledge management and its link to artificial intelligence. *Expert System with Applications*, Vol. 20, pp. 1-6.
  19. Liu, P. L., Chen, W. C., and Tsai, C. H.(2004), An Empirical Study on the Correlation between Knowledge Management Capability and Competitiveness in Taiwan's Industries. *Technovation*, Vol. 24, No. 12, pp. 971-977.
  20. Liu, P. L., Chen, W. C., and Tsai, C. H.(2005), An Empirical Study on the Correlation between the Knowledge Management Method and New Product Development Strategy on Product Performance in Taiwan's Industries. *Technovation*, Vol. 25, No. 6, pp. 637-644.
  21. Nonaka Ikujiro and Hirotaka Takeuchi.(1995), *The Knowledge-creation Company*, Oxford University Press, New York.
  22. Nonaka I., Toyama, R., and Konno, N.(2000), SECI, 13a and Leadership: A Unified Model of Dynamic Knowledge Creation. *Long Range Planning*, Vol. 33, pp. 5-34.
  23. Nunnally, J. C., 1978. *Psychometric theory* (2<sup>nd</sup> Ed.). New York, McGraw-Hill.
  24. Quinn, J. B., Anderson, P., and Finkelstein, S.(1996), *Managing professional intellect: Marking the most of the best*. *Harvard Business Review*, Vol. 74, pp. 71-80.
  25. Riggs, E. H.(1985), *Managing High-Tech companies*. Van Nostrano Reinhold, N.Y.
  26. Robbins, S. P.(2003), *Organization Behavior* (10<sup>th</sup> Ed.). New Jersey: Prentice Hall.
  27. Rogers, E. M. and Larson, J. K.(1984), *Silicon Valley fever: growth of high-technology culture*. N. Y.: Basic Books.
  28. Ryu, S., Ho, S. H., and Han, I.(2003), Knowledge sharing behavior of physicians in hospitals. *Expert Systems with Application*, Vol. 25, pp. 113-122.
  29. Shanklin, W. L. and Ryans, K. J.(1984), *Organizing for High-Tech Marketing*. *Harvard Business Review*, Vol. 62, No. 6, pp. 164-171.
  30. Song, X. M. and Parry, M. E.(1997), *A Cross-National Comparative Study of New*
-

Product Development Processes: Japan and the United States. *Journal of Marketing*. Vol. 61, No. 2, pp. 1-18.

31. Teece, D. J., Pisano, G., and Shuen, A.(1997), Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, Vol. 18, No. 7, pp. 509-533.
  32. Van den Hooff, B., and Van Weenen, F. de L. de L.(2004), Committed to share: Commitment and CMC use as antecedents of knowledge sharing. *Knowledge and Process Management*, Vol. 11, No. 1, pp. 13-24.
-