

INNOVATIVE ACTIVITIES EXECUTION FACTORS IN HIGH-TECH FIRMS

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Abstract- This study treated the high-tech industry of Taiwan as the target to probe into the relationships among leadership, level of organizational learning, type of organizational culture, level of innovative activities implementation and new product development performance. The research subjects were 670 high-tech firms in the three major science parks of Taiwan. A questionnaire survey was conducted by mail, with 89 valid samples retrieved. The respondents were the firm supervisors. According to the research findings, different types of leadership significantly and differently influence the level of innovative activities implementation. When the level of organizational learning is high, the level of innovative activities implementation is positively and significantly influenced. The levels of rational culture, hierarchical culture, consensual culture and developmental culture significantly influence the level of innovative activities implementation. Thus, the high-tech industry can enhance organizational learning using goal-oriented, caring and supportive, and innovative and adaptive leadership. By combining and adopting the characteristics of rational culture, hierarchical culture, consensual culture and developmental culture, firms can enhance the level of implementation of innovative activities in order to upgrade new product development performance.

Keywords - Innovative activities, Leadership, Organizational learning, New product development performance

I. INTRODUCTION

Under highly competitive environmental pressure, how high-tech industry selects appropriate leadership and organizational culture and includes organizational learning in innovative activities in order to rapidly introduce new products and shorten new product development and market introduction cycle time. According to related research, higher executive degree of involvement in innovative activities significantly and positively influences new product development performance (Cooper & Kleinschmidt, 1996; Gatignon & Xuereb, 1997; Kotabe, 1990). Different kinds of leadership significantly and differently influence the executive degree of involvement in innovative activities (Oldham & Cummings, 1996; Bougrain & Haudeville, 2002; Friedman et al., 2000). Degree of organizational learning significantly and positively influences the executive degree of involvement in innovative activities (Bates & Khasawneh, 2005; Joaquin & Ricardo, 2008; Weerawardena et al., 2006). In addition, different types of organizational cultures significantly and differently influence the executive degree of involvement in innovative activities (Chang & Lee, 2007; Panne et al., 2003). However, few of these empirical studies included leadership, organizational learning and organizational culture in innovative activities to explore their effects on new product development performance. Hence, this study will treat the high-tech industry as the subject and probe into the leadership effects, degree of organizational learning and type of organizational culture on executive degree of involvement in innovative activities and correlation between executive degree of innovative activities and new product development performance. The research purposes are as follows: (1) to probe into effect of leadership on executive

degree of innovative activities; (2) effect of organizational learning on executive degree of involvement in innovative activities; (3) effect of type of organizational culture on executive degree of involvement in innovative activities; (4) effect of executive degree of involvement in innovative activities on new product development performance; (5) according to the research findings, this work will serve as a reference for the high-tech industry to execute innovative activities and reinforce new product development performance.

II. LITERATURE REVIEW

1. LEADERSHIP AND EXECUTIVE DEGREE OF INNOVATIVE ACTIVITIES

Dubrin (2001) suggested that leadership means the capacity to enhance the confidence of organizational members to accomplish organizational goals. According to Tayeb (1995), leadership includes work orientation and personnel orientation. Work orientation emphasizes work performance. Personnel orientation refers to caring about and positive interactions between management and employees. Competing Values Leadership proposed by Quinn (1988) is a leadership framework based on competing values. It is a total thinking model. In the Competing Values Leadership framework leadership is classified into goal oriented, stable and conservative, considerate and supportive and innovative and adaptive. The leadership framework proposed by Quinn (1988) is based on new leadership theory and matches the leadership requirement in the high-tech industry. This study treats goal oriented, stable and conservative, considerate and supportive and innovative and adaptive as indicated by Quinn (1988) as the leadership classifications.

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Robbins & Coulter (2005) suggested that innovation means to transform creativity into useful goods, services or work methods. According to different types, innovative activities are categorized as follows: (1) product innovation: the scholars include Kelm et al.(1995) and Kochhar & David (1996). Product innovation means to introduce new goods to market (Betz, 2003). Measurement of innovative activities is based on specific goods; (2) process innovation: the scholars include Johannessen & Dolva (1994) and Scott & Bruce (1994). Damanpour & Gopalakrishnan (2001) indicated that process innovation is the method to create or improve production, service or management and operation. It aims to measure innovation by a series of process or stage; (3) product and process innovation: Lumpkin & Dess (1996) suggested defining innovative activities using dual product and process perspectives; (4) multiple innovation: Robbins (1996) and Chuang (2002) suggested that innovative activities should include product innovation techniques, process and equipment and system, policy, plan, management and service innovation. Tien et al. (2007) allocated innovative activities into management, technology, market and cultural innovative activities. Based on the classification by Tien (2007) this study explores innovative activities using four dimensions: management, technology, market and culture.

Based on Bougrain & Haudeville (2002), Transformational Leadership enhances execution of innovative activities. Using Transformational Leadership, employees treat old problems from new perspectives. It encourages employees to make efforts to enhance corporate innovative capacity. According to Friedman et al. (2000), if leadership can encourage employees' learning and support their innovation and new ideas, it will upgrade executive degree of innovative activities. Based on the previous literature review, this study proposes H1: different kinds of leadership significantly and differently influence executive degree of involvement in innovative activities.

2. DEGREE OF ORGANIZATIONAL LEARNING AND EXECUTIVE DEGREE OF INNOVATIVE ACTIVITIES

Pace (2002) suggested that organizational learning means the adjustment of organizational mechanism to respond to environment. The process is the method or procedure of organizational learning to accomplish specific goals. Templeton et al. (2002) indicated that organizational learning is the combination of a series of activities in organization, including information acquisition, information communication, information explanation and organizational memory. Pace (2002) classified organizational learning into information sharing, trend consultation, learning practice and achievement tendency. Tippins & Sohi (2003) divided content of organizational learning into information acquisition, information communication, sharing interpretation and organizational memory. This study treats four dimensions of organizational learning, information acquisition, information communication, sharing interpretation and organizational memory, proposed by Tippins & Sohi (2003) as the dimensions of organizational learning activities.

According to Bates & Khasawneh (2005), when organizations have learning culture, they will enhance innovative activities execution. Akgun et al. (2007) suggested that commitment to learning, sharing vision and open

mentality in organizations can reinforce innovation of products, services, process, market and strategies. Based on research findings of Joaquin & Ricardo (2008), organizational learning will influence product innovation performance. Weerawardena et al. (2006) indicated that organizational learning positively influences organizational innovation. Upon the previous literature view, this study proposes H2: higher degree of organizational learning positively and significantly influences innovative activities.

3. TYPE OF ORGANIZATIONAL CULTURE AND EXECUTIVE DEGREE OF INNOVATIVE ACTIVITIES

Jones & George (2007) suggested that organizational culture means the common values, regulations, behavioral criteria and expectations that influence interaction and cooperation among individuals and groups in the realization of organizational goals. The competing value framework proposed by Quinn (1988) includes four types of culture: rational culture, hierarchical culture, consensual culture and developing culture. This study treats rational culture, hierarchical culture, consensual culture and developing culture proposed by Quinn (1988) as the organizational culture classifications.

Based on Chang & Lee (2007), when organizational culture is supportive and innovative, it significantly and positively influences management innovation and technique innovation. Panne et al. (2003) suggested that organizational culture is the key success factor of innovation. When organizational culture refers to learning, supporting and encouraging innovation, it means organizations pursue the optimal long-term innovation culture in a dynamic environment (Kotter & Heskett, 1992). Based on the previous literature review, this study proposes H3: different kinds of organizational culture significantly and differently influence executive degree of involvement in innovative activities.

4. INNOVATIVE ACTIVITIES AND NEW PRODUCT DEVELOPMENT PERFORMANCE

McDonough et al. (2001) measured new product development performance using the gap between expected and actual performance. Indicators include accomplishment of goals and projects, speed of new products to market, outcome of commercialization, quality of new products, satisfaction with customers' needs and total satisfaction. According to research findings of Driva et al. (2000), firms of manufacturing industry tend to measure new product development performance by total cost of projects, punctual accomplishment of projects, gap between actual cost of projects and budget, gap between actual and expected accomplishment time and time of new products to market. Bart (1999) defined new product development performance as the difference between actual new product and goal accomplishments. According to literature review and definition of Bart (1999), this study adopts 5 indicators of new product development performance: (1) new products developed match the time to market; (2) new products developed match the expected quality; (3) new products developed match the expected market share; (4) satisfaction with percentage of successful new product development to market; (5) cost of new product development to market is within the budget.

Afuah (1998) indicated that the main purpose of innovation is to satisfy customers' needs by new products or services. Enterprises can improve product attributes or create new ones by innovative activities to provide new products or services matching customers' needs and create unique competitiveness of enterprises. Research by Gatignon and Xuereb (1997) demonstrated that innovative activities will influence the performance and cost of new product development. Based on the research findings of Kotabe (1990), there is a positive correlation between product innovation degree and new product development performance. Based on the previous literature review this study proposes H4: higher executive degree of involvement in innovative activities significantly and positively influences new product development performance.

III. RESEARCH METHOD

This study explores the correlation among leadership, organizational learning, type of organizational culture, executive degree of influence on innovative activities and new product development performance. According to literature review, this study develops hypotheses below:

H1: Different kinds of leadership significantly and differently influence execution degree of involvement in innovative activities.

H2: Higher degree of organizational learning significantly and positively influences innovative activities.

H3: Different organizational cultures significantly and differently influence execution degree of involvement in innovative activities.

H4: Higher executive degree of involvement in innovative activities significantly and positively influences new product development performance.

1. QUESTIONNAIRE COLLECTION AND DATA ANALYSIS

This questionnaire has 6 parts. Parts 1~5 are measured using the Likert 5-point scale. Part 1: leadership: (1) goal oriented; (2) stable and conservative; (3) considerate and supportive; (4) innovative and adaptive. Part 2: degree of organizational learning: (1) information acquisition; (2) information communication; (3) sharing interpretation; (4) organizational memory. Part 3: type of organizational culture: (1) rational culture; (2) hierarchical culture; (3) consensual culture; (4) developing culture. Part 4: executive degree of innovative activities: (1) innovative activities of technology; (2) innovative activities of market; (3) innovative activities of management; (4) innovative activities of culture. Part 5: new product development performance, including 5 indicators. Part 6: type of industry and business scale. Type of industry is classified into integrated circuit industry, computer and peripheral equipment industry, communication industry, photoelectric industry, precision machinery industry and biotechnology industry. According to the number of employees, business scale is divided into large-scale firms and small and medium ones. This study treats 670 high-tech firms in top three science parks of Taiwan (including 439 firms in Hsinchu Science Park, 6 firms in Central Taiwan Science Park and 165 firms in Southern Taiwan Science Park) as subjects. From March to April 2013, the researcher collected related data by mailing questionnaires. The

questionnaire respondents were current personnel or those who participated in new product development projects. Eighty-nine valid samples were retrieved. Nunnally (1978) suggested that in exploratory research, reliability above 0.7 is acceptable. As to variables in this study, Cronbach's α coefficients for all variables is above 0.7 and thus they are reliable. Data are analyzed by SPSS. The method of data analysis is analysis of variance (ANOVA).

2. MEASUREMENT OF VARIABLES

Variables include leadership, organizational learning, organizational culture, executive degree of innovative activities, new product development performance and characteristics of firms. Measurement of variables is shown as follows:

3. MEASUREMENT OF LEADERSHIP

The leadership scale in this study is based on the scales designed by Quinn (1988), Cameron & Quinn (1999) and Chou (2009). Leadership is classified into 4 types: goal oriented, stable and conservative, considerate and supportive, innovative and adaptive. The items of execution are below.

(1) Goal oriented: (a) supervisors clearly inform the employees of the goals in the firms; (b) supervisors specifically assign the duty for each member; (c) supervisors instruct the employees by SOP and correct them appropriately; (d) supervisors recognize the priority and directions; (e) supervisors are work performance oriented; (f) supervisors actively accomplish the expected goals of the firms; (g) supervisors encourage the employees to pursue better work results.

(2) Stable and conservative: (a) supervisors pay attention to details of the written documents; (b) supervisors often examine the progress of the plans; (c) supervisors often analyze the firm's situations so that employees will know how to improve; (d) supervisors establish measures to examine performance; (e) supervisors maintain normal and stable firm operation; (f) supervisors coordinate plans by budgeting; (g) supervisors establish cross-departmental teams for important items.

(3) Considerate and supportive: (a) supervisors are thoughtful for employees; (b) supervisors assist with employees' planning of career; (c) supervisors support the issues proposed by employees; (d) supervisors allow employees to fully express their views and lead to common consensus; (e) supervisors encourage employees to participate in decision making; (f) supervisors try to enhance employees' loyalty to firms; (g) supervisors actively avoid the conflict among employees.

(4) Innovative and adaptive: (a) supervisors solve the problems by creative measures; (b) supervisors clearly elaborate the vision of firms and continuously reinforce them; (c) supervisors have new attempts by new concepts and procedures; (d) supervisors encourage employees to continue improving their behavior; (e) supervisors try to maintain positive relationship with ranking managers; (f) supervisors make efforts to express opinions and concepts to external world; (g) supervisors often interact with other companies and customers to maintain positive relationship.

Scoring is based on Likert 5-point scale. "Strongly agree" is 5 points, "agree" is 4, "neutral" is 3, "disagree" is 2 and "strongly disagree" is 1.

3.1 MEASUREMENT OF ORGANIZATIONAL LEARNING

This study treats 4 dimensions of organizational learning proposed by Tippins & Sohi (2003) as the indicators to measure degree of organizational learning. According to business of high-tech industry, organizational learning activities are classified as follows:

(1) Information acquisition: (a) the firms regularly contact with customers to find their needs and expectation; (b) firms study and confirm customers' needs; (c) firms treat customers as the sources of market information; (d) firms often inquire about the customers' needs or expectation; (e) firms often collect related information for customers' goals.

(2) Information communication: (a) members of different departments share information of customers; (b) members who need the customers' information the most can easily acquire it; (c) representatives of different departments regularly hold the conferences to discuss customers' needs; (d) different departments pass the important information obtained related to customers to other departments; (e) different departments can easily acquire related customer information.

(3) Sharing interpretation: (a) supervisors usually have consistent views about the customers' needs; (b) supervisors usually have consistent views about the way to provide customers with the most satisfying service; (c) supervisors usually share the same views regarding the effect of new information received on customers or competing firms.

(4) Organizational memory: (a) firms have the business procedure to deal with customers' orders; (b) firms learn to deal with difficult customers by past experience; (c) firms have SOP to determine customers' needs; (d) firms have standard procedure to effectively deal with customers' complaints; (e) firms recognize the customers' problems according to past experience; (f) firms have complete managerial system regarding customers' information.

Scoring is based on Likert 5-point scale. "Strongly agree" is 5 points, "agree" is 4, "neutral" is 3, "disagree" is 2 and "strongly disagree" is 1.

3.2 MEASUREMENT OF ORGANIZATIONAL CULTURE

Organizational culture scale in this study is based on organizational culture questionnaires designed by Quinn (1988), Deshpande & Farley (1999) and Parker & Bradley (2000). Organizational culture is divided into rational culture, hierarchical culture, consensual culture and developing culture as follows.

(1) Rational culture: (a) firms pay attention to the accomplishment of work performance and tasks; (b) leaders of firms instruct employees to accomplish the goals; (c) cohesion of firms is from the accomplishment of work performance and tasks; (d) organizational atmosphere is competitive and values achievement; (e) firms' rewards for employees are based on the accomplishment of goals or work performance.

(2) Hierarchical culture: (a) firms are formal organizations with hierarchy. The duty of each member is properly regulated; (b) leaders of firms expect employees to work by rules, policy or procedure; (c) cohesion of firms is based on laws, regulations and policy. The main task is to maintain

successful organizational operation; (d) firms emphasize stability and efficiency of stable operation; (e) firms award employees according to the positions.

(3) Consensual culture: (a) firms are human organizations and resemble big families; (b) leaders help employees develop their potential as teachers and friends; (c) force of cohesion is loyalty and trust; (d) firms pay attention to human resources, emphasize team work and enhance employees' morale; (e) firms treat all employees equally and have fair rewards.

(4) Developing culture: (a) firms are innovative and employees have intention to undertake risk and challenge; (b) leaders of firms encourage employees to undertake risk and innovation; (c) cohesion of firms is from innovation and R&D to be pioneers in the market; (d) firms pay attention to growth and acquire new resources to respond to new challenge at any time; (e) firms' rewards for employees are based on creativity or plans proposed by employees.

Scoring is based on Likert 5-point scale. "Strongly agree" is 5 points, "agree" is 4, "neutral" is 3, "disagree" is 2 and "strongly disagree" is 1.

3.3 MEASUREMENT OF EXECUTIVE DEGREE OF INNOVATIVE ACTIVITIES

This study adopts the innovative activities classification by Tien et al. (2007) and according to related literature review, innovative activities is classified into innovative activities of technology, innovative activities of market, innovative activities of management and innovative activities of culture. Execution items are shown below

(1) Technique innovation: (a) they develop new techniques or equipment to enhance product quality or lower cost; (b) they improve current technique or equipment to enhance product quality or lower cost; (c) they introduce new techniques or equipment to enhance product quality or lower cost;

(2) Market innovation: (a) firms use new techniques or business according to customers' needs to increase customer satisfaction; (b) firms change business process according to customers' needs to increase customer satisfaction; (c) firms develop different kinds of products according to customers' needs to enhance customer satisfaction.

(3) Management innovation: (a) firms introduce new managerial system to increase the capacity to undertake the orders; (b) they train the employees to use new techniques or equipment; (c) they improve business procedure to respond to customers' needs; (d) they train employees to accept new business concepts; (e) they effectively use R&D budget and obtain effectiveness.

(4) Culture innovation: (a) they encourage employees to engage in innovative activities; (b) they encourage employees to express opinions or provide suggestions; (c) supervisors discuss with employees about the method or technique to improve work; (d) employees exchange the experience and obtain the assistance.

Scoring is based on Likert 5-point scale. "Strongly agree" is 5 points, "agree" is 4, "neutral" is 3, "disagree" is 2 and "strongly disagree" is 1.

3.4 NEW PRODUCT DEVELOPMENT PERFORMANCE

Based on literature review and business characteristics of high-tech industry, this study adopts 5 indicators of new product development performance: (1) new products developed by firms meet the expected time to market; (2) new products developed by firms meet the expected quality; (3) new products developed by firms match the expected market share; (4) firms are extremely satisfied with degree of success new product development to market; (5) cost of new product development to market is controlled within the budget. Scoring is based on Likert 5-point scale.

3.5 MEASUREMENT OF CHARACTERISTICS OF FIRMS

The characteristics of firms are studied by type of industry and business scale:

- (1) Type of industry: firms in top three science parks can be classified according to address book of firms in science parks in 2013. Types of industry include integrated circuit industry, computer and peripheral equipment industry, communication industry, photoelectric industry, precision machinery industry and biotechnology industry.
- (2) Business scale: based on standard of Ministry of Economic Affairs on industrial scale in Taiwan, upon number of employees, scale of high-tech firms is divided into 2 categories. Large-scale firms: number of employees above 200; small and medium firms: number of employees below 200.

IV. RESEARCH RESULTS

1. VARIANCE ANALYSIS OF LEADERSHIP AND EXECUTIVE DEGREE OF INVOLVEMENT IN INNOVATIVE ACTIVITIES

This study divides leadership into 2 groups (high and low). According to means of executive degree of involvement in innovative activities of two groups, the researcher tries to find if there is significant difference ($p < 0.05$). Table 1 is variance analysis of leadership on executive degree of involvement in innovative activities. Research finding supports H1. According to figures, degrees of goal oriented, considerable and supportive, innovative and adaptive leadership significantly and positively influence executive degree of involvement innovative activities. However, stable and conservative leadership degree does not significantly influence executive degree of innovative activities.

2. CORRELATION BETWEEN ORGANIZATIONAL LEARNING AND EXECUTIVE DEGREE OF INVOLVEMENT IN INNOVATIVE ACTIVITIES

This study divides organizational learning into 2 groups (high and low). According to means of executive degrees of involvement in innovative activities of two groups, the researcher tries to find if there is significant difference ($p < 0.05$). Table 2 is variance analysis of organizational learning on executive degree of involvement in innovative activities. Research result supports H2. In order to enhance executive degree of involvement in innovative activities, enterprises can reinforce organizational learning degree.

3. CORRELATION BETWEEN ORGANIZATIONAL CULTURE AND EXECUTIVE DEGREE OF INVOLVEMENT IN INNOVATIVE ACTIVITIES

This study divides organizational culture into two groups (high and low). According to means of executives degree of involvement in innovative activities of two groups, the researcher tries to find if there is significant difference ($p < 0.05$). Table 3 is variance analysis of organizational culture on executive degree of innovative activities. The research finding does not support H3. Rational culture, hierarchical culture, consensual culture and developing culture degree significantly influence executive degree of involvement in innovative activities.

4. CORRELATION BETWEEN EXECUTIVE DEGREE OF INVOLVEMENT IN INNOVATIVE ACTIVITIES AND NEW PRODUCT DEVELOPMENT PERFORMANCE

This study divides executive degree of involvement in innovative activities into two groups (high and low). According to means of new product development performance of two groups, the researcher tries to find if there is significant difference ($p < 0.05$). Table 4 is variance analysis of executive degree of innovative activities on new product development performance (NPD). Research result supports H4.

5. EFFECT OF FIRM CHARACTERISTICS

By variance analysis, this study tries to find if different types of industry and business scale influence the firms' executive degree of innovative activities. Research finding shows that executive degree of involvement in innovative activities will not be different because of type of industry ($p=0.245$) and business scale ($p=0.431$).

V. CONCLUSION AND SUGGESTIONS

According to findings of this study different kinds of leadership significantly and differently influence the executive degree of involvement in innovative activities. Goal oriented, considerate and supportive and innovative and adaptive leadership significantly and positively influence innovative activities. Stable and conservative leadership does not significantly influence innovative activities. From the enterprise perspective, in order to enhance the executive degree of involvement in innovative activities, innovative, goal oriented and considerate measures must be adopted for employees. In addition, higher degree of organizational learning significantly and positively influences innovative activities. It demonstrates that in order to establish an organizational learning system, enterprises must save the learning outcomes in the organizational memory system using appropriate methods. By internal training systems such as internal conferences and cross-departmental learning, all employees can learn and grow to lead to continuous innovation.

According to the research findings different organizational cultures do not significantly and differently influence the executive degree of involvement in innovative activities.

Degrees of rational culture, hierarchical culture, consensual culture and developing culture significantly influence the executive degree of involvement in innovative activities. In addition, for high-tech firms, regarding the executive degree of involvement in innovative activities, technique innovation and market innovation are more significant. However, management innovation and culture innovation are inferior. It is suggested that firms can enhance management innovation and culture innovation activities. Innovative activities can reinforce new product development performance.

Higher executive degree of involvement in innovative activities significantly and positively influences new product development performance. High-tech industry can strengthen degree of organizational learning by goal oriented, considerate and supportive and innovative and adaptive leadership. It can combine and adopt rational culture, hierarchical culture, consensual culture and developing culture to enhance executive degree of innovative activities and finally upgrade new product development performance.

Table 1 Variance analysis of leadership on executive degree of innovative activities

		Innovative activities of technology	Innovative activities of market	Innovative activities of management	innovative activities of culture
Goal oriented	Low#	3.48	3.55	2.93	2.94
	High#	4.19	4.17	3.96	3.89
	F-value	14.552	14.244	44.222	31.071
	P-value	<0.001	<0.001	<0.001	<0.001
Stable and conservative	Low#	3.47	3.45	3.04	3.04
	High#	4.23	3.77	3.96	3.89
	F-value	3.054	2.872	3.790	0.891
	P-value	0.084	0.094	0.055	0.348
Considerate and supportive	Low#	3.81	3.80	3.39	3.23
	High#	4.25	4.26	4.05	4.13
	F-value	6.960	9.783	19.601	41.191
	P-value	0.010	0.002	<0.001	<0.001
Innovative and adaptive	Low#	3.61	3.70	3.23	3.02
	High#	4.23	4.19	3.96	3.99
	F-value	13.482	10.159	22.703	44.090
	P-value	<0.001	0.002*	<0.001	<0.001

Note: Low#: the average score lower than 3.50; High#: the average score higher than 3.50

Table 2 Variance analysis of organizational learning on executive degree of innovative activities

		Innovative activities of technology	Innovative activities of market	Innovative activities of management	innovative activities of culture
Information acquisition	Low#	3.43	3.48	2.91	2.88
	High#	4.20	4.19	3.94	3.89
	F-value	17.180	18.312	42.403	36.003
	P-value	<0.001	<0.001	<0.001	<0.001
Information communication	Low#	3.80	3.81	3.42	3.32
	High#	4.32	4.31	4.09	4.13
	F-value	9.630	11.035	19.907	29.481
	P-value	0.003	0.001	<0.001	<0.001
Sharing interpretation	Low#	3.79	3.82	3.33	3.34
	High#	4.29	4.26	4.15	4.04
	F-value	9.350	8.568	34.152	20.364
	P-value	0.003	0.004	<0.001	<0.001
Organizational memory	Low#	3.48	3.61	3.10	3.02
	High#	4.20	4.16	3.91	3.88
	F-value	16.066	10.981	23.505	24.682
	P-value	<0.001	0.001	<0.001	<0.001

Note: Low#: the average score lower than 3.50; High#: the average score higher than 3.50

Table 3 Variance analysis of organizational culture on executive degree of involvement in innovative activities

		Innovative activities of technology	Innovative activities of market	Innovative activities of management	innovative activities of culture
Rational culture	Low#	3.54	3.55	3.15	2.93
	High#	4.27	4.27	3.99	4.04
	F-value	20.290	25.430	33.810	70.478
	P-value	<0.001	<0.001	<0.001	<0.001
Hierarchical culture	Low#	3.71	3.71	3.27	3.17
	High#	4.16	4.17	3.91	3.89
	F-value	6.408	8.250	15.922	18.829
	P-value	0.013*	0.005*	<0.001	<0.001
Consensual culture	Low#	3.65	3.76	3.21	3.07
	High#	4.26	4.20	4.03	4.05
	F-value	14.391	8.340	33.752	50.715
	P-value	<0.001	0.005*	<0.001	<0.001
Developing culture	Low#	3.60	3.70	3.24	3.03
	High#	4.25	4.20	3.96	4.00
	F-value	15.008	10.811	21.923	45.907
	P-value	<0.001	0.001*	<0.001	<0.001

Note: Low#: the average score lower than 3.50; High#: the average score higher than 3.50

Table 4 Variance analysis of executive degree of involvement in innovative activities on NPD performance

		New product development performance
Innovative activities of technology	Low#	2.95
	High#	3.46
	F-value	9.224
	P-value	0.003
Innovative activities of market	Low#	3.01
	High#	3.44
	F-value	5.944
	P-value	0.017
Innovative activities of management	Low#	2.85
	High#	3.60
	F-value	30.316
	P-value	<0.001
Innovative activities of culture	Low#	2.93
	High#	3.58
	F-value	18.034
	P-value	<0.001

Note: Low#: the average score lower than 3.50; High#: the average score higher than 3.50

REFERENCES

- [1] Afuah, A., 1998, Innovation Management: Strategies, Implementation, and Profits, New York: Oxford University press.
- [2] Akgun, A. E., Keskin, H., Byrne, J. C. and Aren, S., 2007. Emotional and learning capability and their impact on product innovativeness and firm performance. *Technovation*, 27(9), 501-513.
- [3] Bart, C.K., 1999. Controlling new products: a contingency approach, *Journal of Technology Management*. 18 (5/6/7/8), 395-413.
- [4] Bates, R. and Khasawneh, S., 2005. Organizational learning, learning climate and perceived innovation in Jordanian organizations. *International Journal of Training and Development*, 9(2), 96-109.
- [5] Betz, 2003, *Managing Technological Innovation: Competitive Advantage from Change*. New York: Wiley-Interscience.
- [6] Bougrain, F. and Haudeville, B., 2002. Innovation, Collaboration and SMES Internal Research Capacities. *Research Policy*, 31, 735-747.
- [7] Calantone, R.J., Cavusgil, S.T. and Zhao, Y., 2002. Learning orientation, firm innovation capability and firm performance. *Industrial Marketing Management*, 31(6), 515-524.
- [8] Cameron, K. S. and Quinn, R. E., 1999, *Diagnosing and Changing Organizational Culture—Based on the Competing Values Framework*. New York: Addison-Wesley.

- [9] Chang, S.C. and Lee, M.S., 2007. The Effects of Organizational Culture and knowledge Management Mechanisms on Organizational Innovation: An empirical study in Taiwan. *The Business Review*, Cambridge, 7(1), 295-301.
- [10] Chuang, L.M., Study on Construction and Validation of Organizational Innovation Model: Using Information Electronic Industry in Taiwan as an Example, doctoral dissertation, Graduate Institute of International Business, National Cheng Kung University, 2002.
- [11] Chou, L.H., Study on Application of Competing Value Leadership in Dispatched Personnel on Organizational Justice, Organizational Commitment and Organizational Efficacy, master's thesis, Graduate Institute of Business Administration, National Chung Cheng University, 2009.
- [12] Cooper, R.G. and Kleinschmidt, E.J. 1996. Winning Businesses in Product Development: Critical Success Factors. *Research Technology Management*, 39(4), 18-29
- [13] Damanpour, F. and Gopalakrishnan, S. 2001. The Dynamics of the Adoption of Product and Process Innovations in Organizations. *Journal of Management Studies*, 38(1), 45-65.
- [14] Deshpande, R. and Farley, J.U., 1999. Executive Insights: Corporate culture and market orientation: Comparing Indian and Japanese firms. *Journal of International Marketing*, 7(4), 111-127.
- [15] Driva, H., Pawar, K.S. and Menon, U., 2000. Measuring Product Development Performance in Manufacturing Organizations. *International Journal of Production Economics*, 63(2), 147-159.
- [16] Dubrin, A.J., 2001, *Leadership – Research Finding, Practices, and Skills*, Third Edition, Houghton Mifflin Company Boston New York.
- [17] Friedman, H.H., Langbert, M. and Giladi, K, 2000. Transformational leadership: Instituting revolutionary change in your accounting firm. *The National Public Accountant*, Washington.
- [18] Gatignon, H. and Xuereb, J.M., 1997. Strategic Orientation of the Firm and New Product Performance. *Journal of Marketing Research*, 34(1), 77-90.
- [19] Johannessen, J.A. and Dolva, J.O., 1994. Competence and Innovation: Identifying Critical Innovation Factors. *Entrepreneurship, Innovation and Change*, 3(3), 209-222.
- [20] Jones, G.R. and George, J.M., 2007. *Essentials of contemporary management* (2nd ed.), Boston: McGraw-Hill.
- [21] Joaquin, A. and Ricardo, C., 2008, Assessing the impact of organizational learning capability on product innovation performance: An empirical test, *Technovation*, 28(6), 315-326.
- [22] Kelm, K.M., Narayanan, V.K. and Pinches, G.E., 1995. Shareholder Value Creation During R&D Innovation and Commercialization Stages. *Academy of Management Journal*, 38(3), 770-786.
- [23] Kochhar, R. and David, P., 1996. Institutional Investors and Firm Innovation: A Test of Competing Hypotheses. *Strategic Management Journal*, 17(1), 73-84.
- [24] Kotabe, M., 1990. Corporate Product Policy and Innovation Behavior of European and Japanese Multinationals: An Empirical Investigation. *Journal of Marketing*, 54(1), 19-33.
- [25] Kotter, J.P. and Hoskett, J.L., 1992. *Corporate culture and performance*. New York: The Free Press.
- [26] Lumpkin, G.T. and Dess, G.G., 1996. Clarifying the Entrepreneurial Orientation Construct and Linking it to Performance. *Academy of Management Review*, 21(1), 135-172.
- [27] McDonough, E.F., Kahn, K.B. and Barczak, G., 2001. An Investigation of the Use of Global, Virtual, and Collocated New Product Development Teams. *The Journal of Product Innovation Management*, 18(2), 110-120.
- [28] Nunnally, J., 1978. *Psychometric Theory* (2d ed). New York: McGraw-Hill.
- [29] Oldham, G.R. and Cummings, A. 1996. Employee creativity: personal and contextual factors at work. *Academy of Management Journal*, 39(3), 607-634.
- [30] Pace, R.W., 2002. The Organizational Learning Audit. *Management Communication Quarterly*, 15 (3), 458-465.
- [31] Panne, G., Beers, C. and Kleinknecht, A. 2003. Success and failure of innovation: A literature review. *International Journal of Innovation Management*, 7(3): 309-338.
- [32] Parker, R. and Bradley, L., 2000. Organizational culture in the public sector: Evidence from six organizations. *International Journal of Public Sector Management*, 13(2), 125-141
- [33] Quinn, R.E., 1988. *Beyond Rational Management: Mastering paradoxes and competing demands of high performance*. Jossey-Bass, San Francisco.
- [34] Robbins, S.P. 1996. *Organization Behavior: Concepts, Controversies and Applications*. Englewood Cliffs, N.J.: Prentice-Hall.
- [35] Robbins, S. P., 2001, *Organizational Behavior*. Upper Saddle River, NJ: Prentice Hall Inc.
- [36] Robbins, S. P. & Coulter, M., 2005. *Management*, (8th ed.), Upper Saddle River, New Jersey: Pearson Prentice Hall.
- [37] Scott, S.G. and Bruce, R.A. 1994. Determinants of Innovative Behavior: A Path Model of Individual Innovation in the Workplace. *Academy of Management Journal*, 37(3), 580-607.
- [38] Tien, S.W., Chiu, C.-C., Chung Y.-C. and Tsai, C.-H., 2007. The Impact of Innovation Management Implementation on Enterprise Competitiveness among Taiwan's High-Tech Manufacturers. *International Journal of Technology Management*, Vol. 40, Nos. 1/2/3, pp.7-44.
- [39] Tayeb M., 1995, Supervisory Style and Cultural Contexts: a Comparative Study. *International Business Review* , 4(1), 75-89.
- [40] Templeton, G.F., Lewis B.R. and Snyder, C.A., 2002. Development of a measure for the organizational learning construct, *Journal of Management Information Systems*, 19 (2), 175–218.
- [41] Tippins, M. and Sohi, R. 2003. IT competency and Firm Performance: Is Organizational Learning a Missing Link?. *Strategic Management Journal*, 24(8), 745-761.
- [42] Weerawardena, J., O'Cass, A. and Julian, C., 2006. Does industry matter? Examining the role of industry structure and organizational learning in innovation and brand performance. *Journal of Business Research*, 59, 37-45.