行政院國家科學委員會專題研究計畫 成果報告

組織中知識獲取及知識分享的前因與後果研究成果報告(精簡版)

計畫類別:個別型

計 畫 編 號 : NSC 97-2410-H-009-010-

執 行 期 間 : 97年08月01日至98年07月31日 執 行 單 位 : 國立交通大學管理科學系(所)

計畫主持人: 王耀德

處 理 方 式 : 本計畫可公開查詢

中 華 民 國 98年10月20日

Antecedents and Consequences of Knowledge Acquisition and Sharing in Organizations

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October, 16, 2009

Summary

This study explored the issue of how the organizational trust, affective state, expected benefit from knowledge sharing were associated with organizational members' knowledge sharing and knowledge acquisition behaviors. Questionnaire survey was conducted on a sample of 300 employees from the high-tech and manufacturing industries.

The results from statistical analyses indicated that organizational trust and perceived performance and social benefits from knowledge sharing were positively associated with knowledge sharing behaviors. Negative affect was negatively related to knowledge sharing behaviors. Perceived performance and social benefits and positive affect were positively related to knowledge acquisition behaviors. This study contributes to the literature of organizational learning by providing a validated framework to interpret in a more integrative and complete manner why an organizational member will share knowledge with his or her co-workers. Not only organizational trust but also personal affective state and perceived benefit from knowledge sharing can explain why knowledge sharing occurs in organizations.

Keywords: Knowledge Acquisition, Knowledge Sharing, Organizational Learning

摘要

本研究探討個別組織員工的組織信任、正負向情緒、感受到的知識分享效益與其知識分享與知識搜集行為之間的關聯性。本研究 300 位高科技產業與製造業員工為對象,進行資料收集與分析。

研究的結果顯示個別組織員工的組織信任、感受到的知識分享效益與其知識分享行為之間具具有正向關聯性。負向情感與其知識分享行為具有負向關聯性。正向情感與感受到的知識分享效益與其知識搜集行為之間具有正向關聯性。

本研究的貢獻在於提供一個驗證後的理論架構,協助我們更全面、更完整的去說明 組織員工為何會與組織中的其他成員分享自己的知識。不僅組織信任,組織員工個人的 正負向情緒、感受到的知識分享效益也會與其知識分享行為與知識搜集行為有關聯。

關鍵詞:知識搜集、知識分享、組織學習

I. Introduction

For adapting to the changes in environment, organizations need to continually acquire new knowledge about their products, markets, customers, and competitors. Organizations can create knowledge by themselves through R&D activities (Cohen & Levinthal, 1990) or can acquire knowledge from sources outside organization (Huber, 1992). Organizations exchange knowledge with each other, purchase knowledge from vendors, transfer knowledge from allies, get access to knowledge through technological consortia, or import knowledge from research institutes or academia (Lane & Lubatkin, 1994; Lane, Salk, & Lyles, 2001; Tsai, 2001). Though knowledge acquisition is critical to organizational learning, knowledge sharing within organization exerts an equally important influence on organizational learning. Without sharing with other organizational members, the knowledge owned by an organizational member will remain at individual rather than organizational level and thus cannot be used to improve organizational performance.

In the literature of knowledge sharing, the issue of trust has become a focus of attention in research endeavor (Levin & Cross, 2004; McEvily, Perrone, Zaheer, 2003; Szulanski & Cappetta, & Jensen, 2004; Renzel, 2008; Willem, Buelens, & Scarbrough, 2006). Trust, defined by two components—competence, a cognitive response of a knowledge provider to the perceived capability of the knowledge recipient; and benevolence, an affective response of the provider to the perceived kind intention and unlikelihood of opportunistic behaviors of the recipient—facilitates organizational learning (Chowdhury, 2005; Ingham & Mothe, 1998). The perceived competence of a knowledge recipient motivates a knowledge provider to share knowledge with the recipient because the competence perceived by the provider reduces the provider's expected cost (in terms of time and cost for disseminating knowledge) for transferring knowledge to the recipient. The benevolence of the recipient attenuates the expected likelihood for the opportunistic behaviors of the recipient (e.g., usurping the power

and status of the knowledge provider) (Andrew & Delahaye, 2000; Chowdhury, 2005). Trust has been found facilitative to intra-organizational knowledge sharing (Chowdhury, 2005; Ingham & Mothe, 1998; Levin & Cross, 2004; Renzel, 2008; Willem, Buelens, & Scarbrough, 2006).

The literature of emotions and social exchange theory suggests that the affective state of an individual influences his or her exchange behaviors in social settings. How the affective state of an organizational member influences his or her sharing of knowledge with other organizational members is an issue seldom addressed in the literature. Furthermore, the literature of expected utility theory argues that the benefits expected from an action will determine whether a person will take the action. How the expected benefits from knowledge sharing will affect an organizational member's sharing of knowledge with other organizational members is an issue remains to be addressed in the literature of organizational learning.

The literature of knowledge sharing has so far focused mostly on the effects of organizational trust on knowledge sharing. It ignores the effects of personal affective state and of economic calculation on organizational members' knowledge sharing behaviors. The first purpose of this study is to examine the issue of how organizational members' organizational trust, affective state, and perceived benefits from knowledge sharing are related to their knowledge sharing behaviors.

The literature of knowledge acquisition has focused its attention on how and where organizational members acquire their knowledge from the sources outside organization. Why organizational members take actions to acquire knowledge is seldom investigated in the literature. Intuitive thinking suggests that organizational members seek for knowledge in order to solve the problems they encounter on their jobs. However, common sense informs us that people seek for information or knowledge constantly in their daily lives not necessarily for the purpose of solving their problems. Curiosity, as a temperament characteristic, may

spur an individual to explore and acquire knowledge from external environment. The literature of affective temperament and information processing (Forgas & George, 2001) suggests that the affective state is one of the personal temperaments that affect people's information processing behaviors. How organizational members' affective states are associated with their knowledge acquisition behaviors is an issue deserves empirical exploration.

The literature of knowledge acquisition emphasizes the benefits on performance improvement from the acquired knowledge. The motive for enhancing personal and organizational job performance can spurs an employee to acquire new knowledge. Through knowledge sharing, the acquired knowledge of an organizational member can be transformed into organization-level knowledge which can be used to improve performance at group or organizational level. However, the sharing of the acquired knowledge can also enhance one's own social status within organization. The perceived benefits from improving one's own social status as well the perceived benefits from improving organizational performance can work together to stimulate organizational members' knowledge acquisition behaviors. How these perceived benefits are related to organizational members' knowledge acquisition behaviors is an issue deserves an empirical investigation. The second purpose of this study is to examine how organizational members' affective state and their perceived benefits from knowledge sharing are related to their knowledge acquisition behaviors.

II. Literature Review and Hypotheses

(1) Organizational trust and knowledge sharing

Organizational trust refers to an organizational member's perceived benevolence and the perceived competence of other organizational members in the member's interactions with the other members (Levin & Cross, 2004). The perceived benevolence arouses an affect-based

trust that promotes social and emotional ties between two persons (Chowdhury, 2005). The perceived competence leads to a cognitive-based trust that facilitates cooperation in problem solving. Trust can be conceptualized as "expectations about other's intentions and behaviors" that include "technically competent role performance from those involved with us in social relationships" (McEvily, Perrone, & Zaheer, 2003, p.93). Trust is a "leap of faith" showing in our willingness for risking the harm from the possible opportunistic behaviors of those we are interacting with.

Organizational trust facilitates knowledge sharing within organization (Renzel, 2008; Willem, Buelens, & Scarbrough, 2006). Organizational trust motivates an organizational member to share his or her knowledge with other organizational members if these other members are perceived trustworthy. Benevolent knowledge recipients alleviate knowledge providers' risk for being taken advantage by the recipients; for example, being usurped position power after giving away one's own proprietary knowledge. Competent knowledge recipients demand less provider's time and energy needed for disseminating the knowledge. Hence,

Hypothesis 1: Organizational trust is positively related to organizational members' knowledge sharing behaviors.

(2) Negative affect and knowledge sharing

A person can experience two affective states—positive and negative (Forgas & George, 2001; Lawler & Thye, 1999; Watson & Clark, 1988). Emotion, affect is directed at a specific person, an object, or an event. However, affect is a state of feeling which is not aiming at any specific entity around a person. Affect is not as transient as mood because it can be regarded as a lasting personal temperament tendency which will reappear across multiple times and situations. Positive affect (PA) and negative affect (NA) are not

uni-dimensional. They are two different states of affective feeling. PA is a state of high energy, full concentration, and pleasurable mental engagement; on the other hand, NA is a state of distress, unpleasant feeling, anger, guilt, fear, and nervousness (George & Brief, 1992; Watson, Clark, & Tellegen, 1988). Low PA is characterized by sadness and lethargy and low NA is a state of calmness and serenity (George & Brief, 1992; Watson, Clark, & Tellegen, 1988). In social interactions, negative affect was found to be associated with troubled and unpleasant interpersonal relationships (Watson & Clark, 1984; Watson, Clark, & Tellegen, 1988). In terms of information process, Forgas and George (2001) argued that negative affect can prime a person to seek for information in social situations that confirms one's negative feeling. In organizational situations, an employee with negative affect will involve less in interpersonal interactions with the co-workers. And the negative affect will also prime the employee to think in a negative direction about the interactions. The negative feeling and mistrust with the interactions will prevent the employee from sharing his or her knowledge with co-workers.

We do not suggest a relationship between positive affect and knowledge sharing because positive affect has been found to be associated with general social and physical activities, not with interpersonal activities (Forgas & George, 2001; Watson & Clark, 1988). Positive affect arouses curiosity and makes one's cognitive style open and flexible, a state relates more to knowledge seeking and acquiring and less to knowledge sharing. Thus, we propose the following hypothesis.

Hypothesis 2: Negative affect is negatively associated with organizational members' knowledge sharing behaviors.

(3) Perceived benefit and knowledge sharing behaviors

The tasks performed on jobs by different organizational members are more or less interdependent with each other. Without co-workers' providing information or knowledge,

an organizational member will not be able complete his or her tasks. Organizational members also work together to solve problems in teams. The knowledge from each team member is needed for deriving solutions for problems (Okhuysen & Eisenhardt, 2002). Knowledge sharing can enhance personal as well as team performance. Knowledge sharing can also create social benefits for organizational members. Sharing knowledge with one's colleagues will win their respect and trust, reinforce the friendship with them, and also solicit a reciprocated payback from them in future. The expected performance benefit and social benefit will entice an organizational member into sharing knowledge with other organizational members. We propose that

Hypothesis 3: Both perceived performance benefit and social benefit from knowledge sharing are positively associated with organizational members' knowledge sharing behaviors.

(4) Positive affect and knowledge acquisition

Positive affect is associated with general social and physical activities (Watson, Clark, & Carey, 1988; Watson & Pennebaker, 1989). Positive affect provides the energy that activates general social interactions or physical activities. In organizational research, it is found that positive affect promoted organizational members' engagement in spontaneous organizational behaviors, self-development activities, and goodwill acts (Forgas & George, 2001; George & Brief, 1994). In information processing, it is suggested that positive affect can promote generative, open, and flexible cognitive style in social situations (Forgas & George, 2001). Organizational members take actions to acquire knowledge from their social and physical environments. To acquire knowledge, they need to be proactive in attending to new knowledge. Positive affect provides people with the energy for engaging in interactions with their environment. Furthermore, to take in and assimilate new knowledge, people need to be open and flexible in their cognitions. Positive affect revitalizes people by making them

curious for new knowledge and open to different perspectives. Thus, the following is proposed.

Hypothesis 4: Positive affect is positively associated with organizational members' knowledge acquisition behaviors.

(5) Perceived benefit and knowledge acquisition

To share knowledge with colleagues, an organizational member needs to possess the knowledge that is not-yet-known by the colleagues. Organizational members need to create or acquire knowledge that can be added into the repertoire of new knowledge for sharing. If the perceived performance benefit and the perceived social benefit from knowledge sharing can motivate an employee's knowledge sharing behaviors, they can also stimulate the employee's knowledge acquisition behaviors. To realize the benefits from knowledge sharing, the employee needs to acquire new knowledge first, lest there is no knowledge for sharing with co-workers. Thus, the following hypothesis is posited.

Hypothesis 5: Both perceived performance benefit and social benefit from knowledge sharing are positively associated with organizational members' knowledge acquisition behaviors.

III. Method

(1) Sample

Three hundred employees from 89 semi-conductor, communication, information, software, IC-design, computer, electronics, machinery, and automobile companies participated in the questionnaire survey. Two hundred and ninety-three of them provided complete data. One hundred and sixty-nine are male and 124 are female. One hundred and

seventy-three are operative employees and 120 are low, middle, or top managers. Seventy-five of them are from R&D or technical function, 85 from marketing or sales function, 71 from finance, administrative, or HR function, and 63 from other staff functions. Twenty-two percent of them have at least 3 years of tenure in their companies. Seventy-eight percent of them have a tenure ranges from 3 to more than 20 years.

(2) Definition and measurement of variable

Organizational trust is defined as an organizational member's perceived benevolence and competence of other organizational members. If the people in an organization have a shared perception of high benevolence and competence on each other, then the organization will be characterized as a trustful organization. We used the scale developed by Huff and Kelley (2003) to measure organizational trust. The scale contains 8 items and 7 of them were selected to compose the measure through factor and reliability analyses.

Knowledge sharing behaviors refer to the actions of an organizational member's sharing of knowledge with other organizational members (Andrews & Delahye, 2000; Chowdhury, 2005). It is a process of distributing knowledge to others inside an organization (Huber, 1991). It is essential to building organizational learning on the basis of individual learning. If the people in an organization are willing to share with each other what they have already learned, then the organization, at collective level, will achieve a higher degree of learning. We adapted the scale developed by Chowdhury (2005) for measuring knowledge sharing between an organizational member and his or her co-workers. Eleven items were selected through factor and reliability analysis for assessing this variable.

Knowledge acquisition behaviors concern the activities of importing knowledge from sources external to one's own organization (Andrews & Delahye, 2000; Huber, 1991; Zahra & George, 2002). An organization can rely on many different external sources for acquiring knowledge that is useful for innovation (Huber, 1991; Jones & Craven, 2000). We used the

scale developed by Wang, Wang, and Horng (2005) to measure knowledge acquisition behaviors. Five items were used to measure knowledge acquisition from business associates (business knowledge acquisition), including suppliers, customers, colleagues in the same business group, associates in other companies, and associates in other industries. Three items measured knowledge acquisition from research institutes, training organizations, and consulting companies (basic knowledge acquisition). Three items measured knowledge acquisition from the industrial publication, data bases, and industrial conferences (industrial knowledge acquisition).

Positive and negative affects are defined as lasting temperaments of a person which will reappear across multiple times and situations. PA is a state of high energy, full concentration, and pleasurable mental engagement; on the other hand, NA is a state of distress, unpleasant feeling, anger, guilt, fear, and nervousness (George & Brief, 1992; Watson, Clark, & Tellegen, 1988). We used the PANAS scales developed by Watson, Clark, and Tellegen (1988) to measure the respondents' experiences of positive affect and negative affect in the past several weeks. Ten of the scale items measure positive affect and another 10 items measure negative affect.

Perceived performance benefit from knowledge sharing is defined as the knowledge provider's perceived benefits from knowledge sharing on knowledge provider's own performance, knowledge recipient's performance, department or organizational performance. Perceived social benefit refers to the knowledge provider's perceived benefit from knowledge sharing on the respect and trust from knowledge recipient, improvement on interpersonal relationship with knowledge recipient, reward given by superiors, and reciprocated knowledge exchanged from knowledge recipient. We used 3 items to measure the perceived performance benefit and 5 items to measure the perceived social benefit.

(3) Analysis

At first, all the measures except the positive and negative affect were submitted for factor analysis and reliability analysis. The items that were grouped into the same factor and that could enhance the overall reliability were selected for each variable. The affective scale has been used in the literature as a standardized measurement tool. All the original items were used without any screening from factor or reliability analysis. At the second stage, step-wise regressions were used to test the five hypotheses. We entered into regression analysis first the control variables including size of the company, gender, educational and position level of the respondent, and the dummy coding of the functional job area of the respondent. We then entered organizational trust to examine their associations with knowledge sharing and knowledge acquisition behaviors. In the third step, we entered positive and negative affects; and finally, we entered the perceived social and performance benefits to examine their associations with knowledge sharing and knowledge acquisition behaviors.

IV. Results

Because the respondents provided measures of all the variables, we used Harman's single-factor analysis described in Podsakoft, MacKenxie, Lee, and Podsakoft (2003) to test the possible common-source bias. Because there is no single one factor was found in the analysis, no indication for the existence of common-source bias in the present study. The means, standard deviations, reliabilities, and the inter-correlations of the variables are reported in Table 1. Organizational trust, positive affect, and the two perceived benefits from knowledge sharing are all positively associated with knowledge sharing and business, basic, and industrial knowledge acquisition behaviors. Negative affect is negatively associated with knowledge sharing behaviors.

Insert Table 1 about here

According to the results of the regression analysis in Table 2, organizational trust and performance benefit are positively related to knowledge sharing; however, the negative affect is negatively related to knowledge sharing. Hypotheses 1 and 2 are supported. Hypothesis 3 is supported only on the prediction concerning the association between the performance benefit and knowledge sharing.

Insert Table 2, Table 3, Table 4, and Table 5 about here

From Models 2, 3, and 4 in Table 2, we can find that organizational trust contributes 9% of variation in knowledge sharing behaviors, the two affective states contribute 4%, and the perceived benefits contribute 22% of the variation. From the Model 4 in Table 3, we can find that positive affect, social benefit, and performance benefit are positively related with the business knowledge acquisition. The results from Models 2, 3, and 4 show that organizational trust contributes only 1% of variation in the business knowledge acquisition, the two affective states contributes 5%, and the two benefits contribute 10%. Model 4 in Table 4 shows that positive affect and performance benefit are positively associated with consultation knowledge acquisition. Model 2 of the table indicates that organizational trust contributes 4% of variance in basic knowledge acquisition, the two affects contribute 5%, and the two benefits also contribute 5%. Model 4 in Table 5 shows that positive affect and performance benefit are positively associated with industrial knowledge acquisition. Model 2 of the table indicates that organizational trust contributes 1% of variance in knowledge acquisition, the two affects contribute 5%, and the two benefits contribute 13%. According to the results is Tables 3, 4, and 5, we can infer that Hypothesis 4 is supported. Positive affect is positively associated with all three kinds of knowledge acquisition behaviors. Hypothesis 5 is supported on both the business and industrial knowledge acquisition behaviors; however, it is only partially supported on the basic knowledge acquisition. Only

the perceived performance benefit is associated with basic knowledge acquisition.

V. Discussion

This study contributes to the literature of organizational learning in the following ways. First, this study provides us a validated framework that is more integrative and complete than the current theories for understanding why organizational members want to share their knowledge with their colleagues. Affective state and utility calculation, the two forces that influence individuals' behaviors, have been neglected in the literature of knowledge sharing. This study informs us that in addition to organizational trust, the negative affect and the expected social and performance benefits from knowledge sharing also are related to organizational members' knowledge sharing behaviors. Second, research in the literature of knowledge acquisition focuses mostly on the performance benefit from knowledge acquisition. Affective state and the expected social benefit from knowledge sharing are neglected. This study demonstrates to us that these latter two factors are also positively related to knowledge acquisition behaviors. Third, this study notifies us how the different affective states are associated with the different aspects of learning behaviors. Negative affect is related to knowledge sharing and positive affect to knowledge acquisition. Such a finding coincides with the argument of the bi-dimensional theory of affective state. Negative affect is directed more at interpersonal interactions. Knowledge sharing occurs in interpersonal interactions and thus subsumes itself more to the impact of negative affect. On the other hand, positive affect is directed more at general social and physical activities. Knowledge acquisition is a proactive activity performed in general social and physical environments, which requires curiosity, energy, and an open, flexible cognition, and thus is subjected more to the influence of positive affect.

Table 1: Means, Standard Deviations, Reliabilities, and Cronbach α Among the Variables

	Mean	SD	1	2	3	4	5	6	7	8	9
1.Organization Trust	3.10	0.77	(0.90)								
2.Positive Affect	3.13	0.63	0.47**	(0.88)							
3.Negative Affect	2.40	0.70	-0.26**	-0.14**	(0.88)						
4.Social Benefit	3.29	0.74	0.22**	0.27**	0.07	(0.86)					
5.Performance Benefit	3.46	0.82	0.29**	0.43**	-0.08	0.59**	(0.88)				
6.Knowledge Sharing	3.78	0.72	0.33**	0.38**	-0.18**	0.38**	0.63**	(0.93)			
7.Business Knowledge	3.26	0.86	0.12*	0.34**	0.00	0.38**	0.42**	0.41**	(0.92)		
8.Basic Knowledge	2.80	0.93	0.23**	0.32**	-0.01	0.27**	0.33**	0.26**	0.55**	(0.79)	
9.Industrial Knowledge	3.34	0.89	0.14*	0.34**	-0.07	0.37**	0.46**	0.44**	0.63**	0.57**	(0.80)

N=293; α is in parentheses.

^{*} P < 0.05; ** P < 0.01; *** P < 0.001

Table 2: Step-wise Regression of Control and Independent Variables on Knowledge Sharing

	Knowledge Sharing					
Variables	Model 1	Model 2	Model 3	Model 4		
Control Variables						
Gender	-0.07	-0.03	0.01	0.00		
Education	0.14*	0.14*	0.10	0.04		
Position	0.13**	0.10**	0.06	0.02		
Firm Size	0.00	0.01	0.01	-0.01		
Functional Area						
R&D / Technology	-0.11	-0.04	-0.04	0.00		
Sales / Marketing	-0.05	0.07	0.08	0.06		
Administration	-0.16	-0.09	-0.09	-0.02		
Independent Variables						
Organization Trust		0.30**	0.19**	0.11*		
Positive Affect			0.26**	0.07		
Negative Affect			-0.08	-0.10*		
Social Benefit				0.02		
Performance Benefit				0.47**		
F value	3.35**	31.07**	7.07**	56.17**		
R^2	0.08	0.17	0.21	0.43		
$\operatorname{Adj} R^2$	0.05	0.14	0.18	0.41		

^{*} P < 0.05; ** P < 0.01; *** P < 0.001

Table 3: Step-wise Regression of Control and Independent Variables on Business Knowledge Acquisition

	Business Knowledge						
Variables	Model 1	Model 2	Model 3	Model 4			
Control Variables							
Gender	-0.10	-0.09	-0.06	-0.08			
Education Level	0.13	0.14	0.09	0.05			
Position Level	0.22**	0.21**	0.18**	0.15**			
Firm Size	0.00	0.00	-0.00	-0.01			
Functional Area							
R&D / Technology	-0.15	-0.13	-0.12	-0.11			
Sales / Marketing	0.01	0.05	0.04	0.03			
Administration	-0.26	-0.24	-0.22	-0.15			
Independent Variables							
Organization Trust		0.09	-0.02	-0.09			
Positive Affect			0.35**	0.22**			
Negative Affect			0.11	0.07			
Social Benefit				0.22**			
Performance Benefit				0.21**			
F value	6.15**	1.82	9.46**	19.03**			
R^2	0.13	0.14	0.19	0.29			
$Adj R^2$	0.11	0.11	0.16	0.26			

^{*} P < 0.05; ** P < 0.01; *** P < 0.001

Table 4: Step-wise Regression of Control and Independent Variables on Basic Knowledge Acquisition

	Basic Knowledge				
Variables	Model 1	Model 2	Model 3	Model 4	
Control Variables					
Gender	0.09	0.12	0.15	0.14	
Education level	0.19*	0.20*	0.15	0.12	
Position level	0.14**	0.12*	0.10	0.08	
Firm Size	0.00	0.01	0.00	0.00	
Functional Area					
R&D / Technology	0.08	0.14	0.15	0.16	
Sales / Marketing	-0.19	-0.09	-0.10	-0.11	
Administration	0.09	0.14	0.17	0.22	
Independent Variables					
Organization Trust		0.25**	0.15*	0.10	
Positive Affect			0.35**	0.24**	
Negative Affect			0.14	0.12	
Social Benefit				0.11	
Performance Benefit				0.20**	
F value	2.80**	12.36**	8.22**	8.14**	
R^2	0.06	0.10	0.15	0.20	
$Adj R^2$	0.04	0.08	0.12	0.16	

^{*} P < 0.05; ** P < 0.01; *** P < 0.001

Table 5: Step-wise Regression of Control and Independent Variables on Industrial Knowledge Acquisition

	Industrial Knowledge					
Variables	Model 1	Model 2	Model 3	Model 4		
Control Variables						
Gender	0.02	0.03	0.08	0.06		
Education level	0.16*	0.17*	0.11	0.06		
Position level	0.20**	0.19**	0.15**	0.12**		
Firm Size	0.01	0.01	0.01	-0.01		
Functional Area						
R&D / Technology	0.33*	0.36**	0.37**	0.39**		
Sales / Marketing	0.00	0.05	0.05	0.04		
Administration	-0.04	-0.01	0.00	0.08		
Independent Variables						
Organization Trust		0.13*	0.01	-0.08		
Positive Affect			0.38**	0.22*		
Negative Affect			0.03	-0.01		
Social Benefit				0.17*		
Performance Benefit				0.31**		
F value	5.69**	3.98*	8.48**	24.59**		
R^2	0.12	0.13	0.18	0.31		
Adj R ²	0.10	0.11	0.15	0.28		

^{*} P < 0.05; ** P < 0.01; *** P < 0.001

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