African Journal of Business Management Vol. 5(22), pp. 9665-9675, 30 September, 2011
Available online at http://www.academicjournals.org/AJBM
DOI: 11.5897/AJBM11.1480
ISSN 1993-8233 ©2011 Academic Journals

Full Length Research Paper

Knowledge transfer and innovation performance of competitive knowledge communities: Case of a high-tech firm in Taiwan

Chun-Yu Chen[1] and Kuo-Hung Tseng[2]*

[1]Department of Business Administration, Meiho University, Pingtung, Taiwan.
[2]Graduate Institute of Business and Management, College of Business and Management, Meiho University, Pingtung, Taiwan.

Accepted 5 August, 2011

This paper reported a practice on innovations attained through knowledge transfer in knowledge communities of a high-tech enterprise. In this case, leaders in advanced semiconductor packaging and testing technologies drove knowledge communities according to the company's core abilities and organization learning strategies. Their remarkable practical knowing could be a paradigm for other high-tech companies. This paper discovered mechanisms of the intra-organizational knowledge networks, and the results showed that, the transfer of management know-how was facilitated by community competition and interaction. The knowledge transfer behavior intention (KTBI) was associated with four factors and it had a significantly positive impact on community members' innovation. This paper provided a theoretical and practical model to support the transfer of knowledge and presented the value and functions of multifaceted innovation communities and organization learning.

Key words: Knowledge community, knowledge transfer, innovation performance.

INTRODUCTION

Knowledge management has been the subject of many researches in the past decade. Several theories have emerged and offered new insights into the modeling, acceptance, use and application of knowledge at both the individual and organizational levels (Davenport et al., 1998; Gilbert and Cordey-Hayes, 1996; Nonaka and Takeuchi, 1995). Studies showed that knowledge has become the most crucial component in remaining competitive advantage and the main driving force of sustainable capability in the present world economy. Shahgholian and Hajihosseini (2011) also pointed out that, capability relies heavily on knowledge, and it is the application of creative mentality that effectively makes promotion and development possible. The interaction and cooperate sharing among team members has become very important (Reagans and Zuckerman, 2001; Tsai, 2001; Hansen, 2002). Tsai (2001) argued that organizational units can produce more innovations and enjoy better performance if they occupy central network positions that provide access to new knowledge developed by other units. If there are defects or gap in the members' internal learning mechanism or new knowledge flowing mode, new knowledge and new technology from outside (other teams, units or organization) will be difficult to assimilate, diffuse and extend among members. The transferring of tacit knowledge in innovation and research can be especially difficult. For such sharing to take place, interpersonal relationships and group-interaction (Stenmark, 2001) must take place. Studies probing into knowledge transfer had focused mostly in the argumentation of concepts and theory. There is a need to explore which knowledge transfer modes can enhance quality knowledge transfer within the knowledge-driven organization. In other words, it was through the process of

*Corresponding author. E-mail: gohome8515@gmail.com. Tel: +886-8-7799821 ext. 8515, +886-930691451. Fax: +886-8-7784172.

knowledge transfer that community learning and innovation can take place. Hence, this research deals with knowledge transfer in community. Some important issues and essential background are interpreted in the following sections.

Knowledge community

Due to the limits of IT-driven knowledge management for interactive innovation processes, a community-based approach has been alternatively spotlighted. Some researchers noted that knowledge can be embedded in groups or Communities of Practice (CoP) (Wenger, 1998). CoP is an interactive relationship network which consists of dynamic and living communication processes for employees to contact reference people or experts in their domain within the organization. CoP is different from a network which is “about” something and not just a relationship. When knowledge takes the form of collective know-how or tasks executed by experienced groups, it requires reciprocal coordination and the transmission problem is complex. The community-based approach has been considered to be one of the most effective tools for knowledge creation and transfer. The approach emphasizes dialogue through social networks (person-to-person contact) and helps to informally share knowledge (Koh and Kim, 2004). For managers, through better understanding of the informal organization of research and development (R&D) staff, they can more successfully capture and exploit new ideas, and more efficiently disseminate information throughout the function (Allen et al., 2007). For this reason, practice knowledge communities have been studied in a variety of fields which help enterprises contain and manage organizational/individual knowledge to extend their knowledge as a means of creating business value.

Knowledge transfer

Organizations strive to find optimal ways to facilitate the flow and transfer the company’s knowledge from individuals in order to integrate an individual’s unique knowledge into the company’s knowledge bank (Cadiz et al., 2006). Knowledge transfer has been proclaimed as one of the most critical knowledge management activities in the current information age. Knowledge transfer occurs when knowledge is diffused from one entity to others and it can unfold through processes of socialization, education and/or learning (Joshi et al., 2004). Communities of Practice are conceptually positioned as a very important and successful element of corporate knowledge management. By utilizing information technology (IT) platforms, CoPs enable a direct connection to knowledge works and transfer it to reuse tacit expertise to remote business problems (Trier, 2005; Wenger et al., 2002). However, limited attention has been examined empirically. Therefore, it is imperative to understand the knowledge transfer process and role in the knowledge community as well as the space of socialization and communication.

Innovation

The measurement and management of innovation are not easy. Innovation is not as simple as a body of practice but also a body of behaviors, a complex frameset of interactions, learning processes and co-evolution between actors and institutions (Versailles and Merindol, 2006). Usman et al. (2011) showed that the feedback and job role innovation have a significant impact on organizational learning culture. Organizations increasingly realize that their human capital is the source of renewal and innovation. Tsai (2001) showed that the interaction between network position and absorptive capacity significantly affects business units' innovation and performance. Research data also confirmed that innovation was positively associated with firm performance, which was measured by revenue growth (Thornhill, 2006). However, not all firms reaped rewards from innovation and they had to be active in many markets in order to capture the fruits of innovation successfully (Kafouros et al., 2008). Therefore, the management of technological innovation has become one of the most attractive and promising fields within the management area.

Many studies of technology companies in Taiwan stressed the importance of knowledge diffusion, but few focused upon the practice of knowledge transfer networks, such as CoP. How do creative and innovation knowledge shared and diffused in practice knowledge communities? Can a practical network help professionals to increase their knowledge, creativity ability and performance among team members? With these questions in mind, this research investigates the practical knowledge community by a company case, S-Inc, is considered to be a ‘high-tech’ enterprise, in the Taiwan semiconductor industry.

THEORETICAL MODEL AND HYPOTHESES

Factors affecting knowledge transfer in community

Theory of planned behavior (TPB), a model that Ajzen proposed (Ajzen, 1989; Ajzen, 2002), pointed out that behavior intention was influenced by “Attitude toward the Behavior” (AB), “Subjective Norms Concerning the Behavior” (SN) and “Perceived Behavioral Control” (PBC). As a rule, the more favorable the attitude and subjective norm and the greater the perceived control, the stronger should be the person’s intention to perform the behavior.

TPB has been applied to different contexts to

investigate a wide range of IT and a cumulative tradition has already been developed in this stream of research. Knowledge community is a new method which used IT for enterprise to assemble experts, opinions and ideas in order to improve communication and knowledge creation. TPB is a mature model which has been validated in different contexts. Therefore, this theory was formed the basis on the concept framework in this research in order to investigate the community member's knowledge transfer behavior in the knowledge community.

The knowledge community was based upon TPB as supportive functions of collaboration, cooperation, sharing, creation, stimulating learning motivation and the transfer of tacit knowledge to explicit knowledge. The functions also included trust, commitment, norm, sharing, interaction, cooperation, communication, criticism, reflection and common values. The research also defined the outcomes of the knowledge community as knowledge transfer attitudes toward behavior (KTAB), knowledge transfer subjective norms (KTSN) and knowledge transfer perceived behavioral control (KTPBC). They focused on knowledge transfer which was related to some factors in the knowledge community. Therefore, the first research hypothesis was proposed as follows:

Hypothesis 1: In a knowledge community, the knowledge transfer intention is significantly and positively affected by the factors of the knowledge community
Hypothesis 1a: In a knowledge community, KTAB significantly and positively affected knowledge transfer behavioral intention
Hypothesis 1b: In a knowledge community, KTSN significantly and positively affected knowledge transfer behavioral intention
Hypothesis 1c: In a knowledge community, KTPBC significantly and positively affected knowledge transfer behavioral intention.

Moreland (1999) argued that if know-how is collective, the level of performance is likely to be influenced by group members' stability because knowing what other members know helps individuals to coordinate their actions (Edmondson et al., 2003). Bresman et al. (1999) reported a multi-methods study of knowledge transfer in international acquisitions. They showed the technological know-how transfer was facilitated by communication, visits and meetings by the time of the acquisition. Eraut (2004) deconstructed the key concepts of informal learning from experience, tacit knowledge, learning transfer and intuitive practice to disclose the range of different phenomena which were embraced by these popular terms. He noted that the factors which affected learning in the workplace were confidence (self-efficacy), support, commitment and value.

Chen (2004) found that, trust and adjustment have positive effects while conflict possesses a curvilinear effect on knowledge transfer performance based on a survey of a sample of 137 alliance cases.

In short, the knowledge community has offered different interaction opportunities for learning. Computer networks have opened up virtual communities, strengthened activity assistance and knowledge learning. Thus, the mechanisms of a true knowledge community offer: (1) a creative opportunity for learning; (2) an atmosphere of sharing; (3) synchronous and asynchronous space for interaction; (4) an open introspection, criticism and reflective environment; and (5) guides for cooperation and problem solving. The mechanisms above showed that the group communication patterns, the structural and political environment and member stability influenced the knowledge transfer actions. The researcher expected that:

Hypothesis 1d: In a knowledge community, environment with critique and introspection (ECI) significantly and positively affected knowledge transfer behavioral intention

In addition, based on TPB mentioned above, attitude toward the behavior, subjective norm and perception of behavioral control led to the formation of a behavioral intention. Intention was also assumed to be an immediate antecedent of behavior. Therefore, the researcher proposes:

Hypothesis 2: In a knowledge community, the knowledge transfer behavior was significantly and positively affected by the KTBI

Knowledge transfer and innovation performance

Koh and Kim (2004) developed a virtual community activity framework which integrated community knowledge sharing activity into business activities in the form of an e-business model. They examined that the level of community knowledge sharing activity had led to virtual community outcomes which were related to loyalty toward the virtual community service provider.

Diaz-Diaz et al. (2006) studied the influence of technological knowledge. They assessed different levels of codification on innovation capability from the resource- and knowledge-based view of the firm. To that end, a study reported that tacit assets exert more influence on firm innovation than other technological knowledge assets.

Leenders et al. (2003) who studied knowledge transfer and creativity among new product development (NPD) team members found that the frequency of intra-team communication was strongly associated with the team's creative performance. In the study, the researcher argued that the knowledge flows in knowledge communities influenced the outcomes, interaction and innovation. Thus:

Hypothesis 3: In a knowledge community, knowledge transfer, including behavioral intention and behavior, significantly and positively affected members' innovation

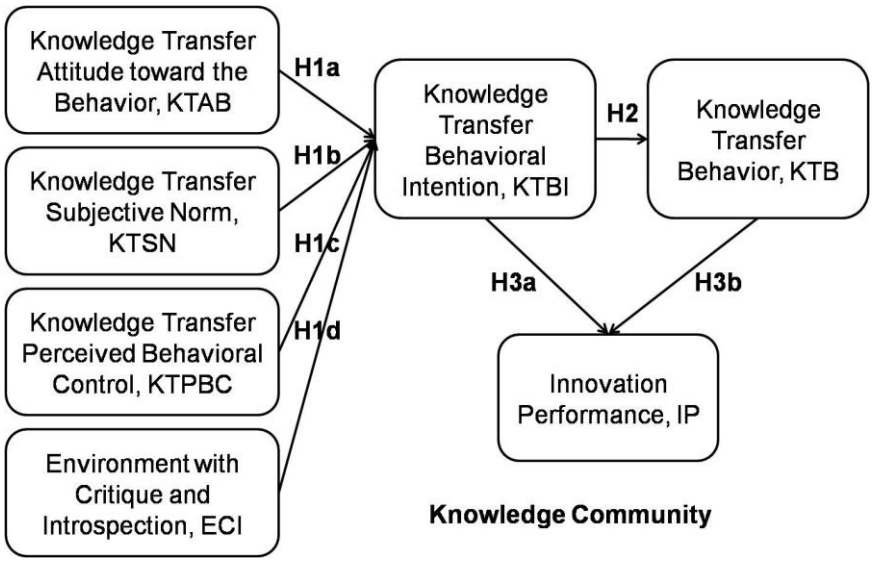

Figure 1. Conceptual framework of the study.

performance

Hypothesis 3a: In a knowledge community, knowledge transfer behavioral intention significantly and positively affected members' innovation performance

Hypothesis 3b: In a knowledge community, knowledge transfer behavior significantly and positively affected members' innovation performance

Knowledge exploration depended on a shared understanding between different cultural and disciplinary backgrounds; knowledge was continuously negotiated through interactive social network processes. Based on a field survey of 77 virtual communities of Korea, Koh and Kim (2004) found that the level of community knowledge sharing activity was related to virtual community outcomes which were significantly associated with loyalty to the service provider. Knudsen (2007) explored the natural and relative importance of different types of inter-firm relationships for new product development success. He found that the interaction with a specific type of partner was expected to influence innovative performance by means of appropriate knowledge transfer. Molina and Llorens-Montes (2006) used empirical data from 179 Spanish firms and indicated that teamwork was an important factor to improve knowledge transfer. In addition, they argued that successful innovation was increasingly dependent on organizational knowledge and knowledge management. Knowledge transfer in community among different actors, contextual factors such as trust, motivation, management support and learning orientation was crucial for fostering innovation. From the literature above, the knowledge community played an important role for knowledge sharing, exploration and transfer. In addition, impression of knowledge transfer in the community influenced interactions and innovations.

To conclude, the overall hypothesized framework of this study about knowledge community and relationships between knowledge transfer and innovation is illustrated on Figure 1.

RESEARCH METHODOLOGY

Respondents

The empirical study selected S-Inc. which was chosen from the companies list in the Electronics and Information Technologies (EIT) category on the Taiwan Stock Exchange (TSE). This high-tech firm was founded in 1984, a world leader in semiconductor-manufacturing services. S-Inc. implemented knowledge management and drove strategic knowledge communities. Its knowledge communities [Best Known Method (BKM)] were operated according to the company's core ability and knowledge strategies. Thirty-one BKMs, which have been operated over three years, were set up at the average of 10 to 25 members per community. The subjects of this research questionnaire survey were its 31 knowledge communities. Questionnaires were distributed to 205 community members at S-Inc. and 169 were returned. From these returned questionnaires, three of them were partially completed, so the valid questionnaires were only 166. Therefore, the effective response rate was 80.96%.

Research instrument

A survey technique was used to collect data. To ensure the validity and reliability of the questionnaire, expert consultation and a pre-test were conducted. First, eight experts (two professors whose domain was in KM and IT research and six consultants/managers with knowledge community experience) previously validated the survey. The feedback from this phase resulted in some restructuring and refinement of the survey to improve its quality and content validity. Second, the pre-test of the questionnaire was administered by 100 knowledge community members and then ten items which were not

Table 1. Summary of measurement scales.

Construct	Factor		Mean	S.D	Cronbach's alpha		Factor loading
					Corrected Item-total correlation	Sub -instrument	
KTAB	Usefulness	FX1	4.10	0.69	0.73	0.87	0.80
	Job consistency	FX2	3.92	0.65	0.82		0.90
	Behavioral beliefs	FX3	3.92	0.66	0.73		0.82
KTSN	Motivation to comply	FX4	3.98	0.57	0.47	0.63	0.65
	Normative beliefs	FX5	3.82	0.74	0.47		0.74
KTPBC	Self-efficacy	FX6A	4.02	0.64	0.55	0.71	0.75
	Self-efficacy	FX6B	3.72	0.59	0.62		0.66
	Facilitating condition	FX7	3.46	0.75	0.44		0.80
ECI	Innovative culture	FX8	3.49	0.84	0.77	0.90	0.84
	Open dialogue	FX9	3.74	0.73	0.82		0.89
	Reflection and challenge	FX10	3.64	0.71	0.82		0.89
KTBI	Aspiration	FY1	3.92	0.74	0.69	0.81	0.66
	Try to	FY2	3.87	0.70	0.69		0.62
KTB	Quantitative	FY3	3.50	0.84	0.87	0.93	0.81
	Qualitative	FY4	3.60	0.83	0.87		0.94
IP	Individual innovation performance	FY5	3.10	0.80	0.67	0.80	0.56
	Team innovation performance	FY6	3.44	0.79	0.67		0.71
Total						0.95	

qualified were deleted. Cronbach's alpha value for the whole questionnaire was 0.95. For all the question factors, Cronbach's alpha values ranged from 0.63 to 0.93 which suggested the adequate reliability of the questionnaire (DeVellis, 1991; Gay, 1992). Few minor changes were added and the final version of the questionnaire is provided in Appendix 1.

Studies on KTAB, KTSN, KTPBC, KTBI and KTB have been well researched especially in the context of the TPB application (Ajzen, 1989; Ajzen, 2002; Chau and Hu, 2002). They have also been developed, validated and adopted in IT adoption and diffusion research.

RESULTS

Respondent's profile

The 166 respondents mentioned in this study were all over 30 with an age range from 31 to 35. Only 12% of respondents were the leader of a knowledge community, while the others were members. The distribution of gender was quite unbalanced in terms of gender with only 16% of the respondents being females. Over 90% of the respondents agreed that their communities were operated well/persistently; whereas only 9.2% revealed that their knowledge community was impeded or interacted infrequently. In knowledge communities, 85% of the leader style was liberated and 15% were restrained.

Measurement model analysis

A confirmatory factor analysis (CFA) conducts the measurement model. Constructed reliability was initially evaluated by using Cronbach's alpha reliability test. Table 1 indicated that the total Cronbach's alpha exceeded 0.90 which was significantly above 0.7 for exploratory research justifying the reliability of the measurements for model testing. Additionally, a discriminate validity test was performed using factor analysis. A varimax-rotated principal component factor analysis was conducted and the results were given in Table 1. As shown, seven factors were extracted; these matched the number of constructs in our research model. A review of the loading coefficients indicated that items intended to measure the same construct converged as originally envisaged and suggested the adequacy of the discriminate validity of the measurement model.

Model testing

AMOS 5.0 was used to test the research model with the sample covariance matrix as input. The overall model fit was assessed by using eight goodness-of-fit indices: X^2/degree of freedom, standard root mean square residual (SRMR), root mean square error of approximation (RMSEA), comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normalized fit index (NFI), incremental fit index (IFI) and non-normalized fit index (NNFI) or Tucker Lewis index (TLI) (Hair et al., 1998). The X^2 statistic was not used because of its sensitivity about sample quantity

Table 2. Fit indices for SEM model of this study.

Fit index	Recommended value	Overall structural model	Model without KTSN
Chi square/degree of freedom	<3.00	2.26 (230.75/102)	2.363 (184.267/78)
SRMR	<0.05	0.0498	0.0500
RMSEA	<0.10	0.09	0.027
CFI	>0.90	0.94	0.94
GFI	>0.90	0.86	0.88
AGFI	>0.80	0.79	0.81
NFI	>0.90	0.90	0.91
IFI	>0.90	0.94	0.95
NNFI or TLI	>0.90	0.92	0.92

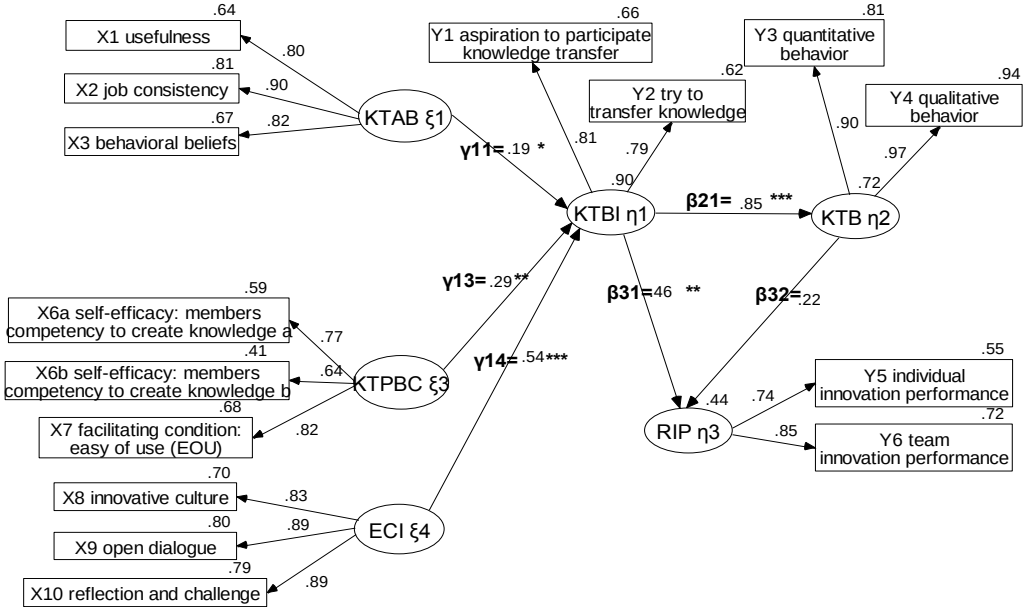

Figure 2. Results of overall structural model.
Standardized estimates: Chi-square = 230.754 (df =102), chi square/df = 2.262, RMR = 0.27; SRMR = 0.0522, GFI = 0.863, AGFI = 0.794, N= 166, CFI = 0.939, NFI = 0.897, IFI = 0.940.

(Bentler and Bonett, 1980; Marsh and Hocevar, 1985). Since the standardized regression weight from KTSN to KTBI was negative and insignificant, the model without factor KTSN was tested too. The results of these indices came along with their recommended values for the common model fit and are shown in Table 2. Although the GFI index failed to meet the recommended minimum values, other fit indices have clearly suggested a good model fit which led the researchers to believe that the model fit was reasonably adequate to assess the result for the structural model. The results showed that the modified TPB (add factor ECI and remove factor KTSN) was an appropriate model for studying knowledge transfer behavior in a knowledge community.

DISCUSSION

The discussion obtained from findings in this study is presented in accordance with the research hypothesis.

1. In a knowledge community, the knowledge transfer intention was positively affected by the factors of the knowledge community.

Based on the structural equation modeling (SEM) test, the first hypothesis (H1) was partially established (Figures 2 and 3). The research confirmed that in the knowledge community, the factors of KTAB, KTPBC and ECI significantly and positively affected knowledge transfer behavioral intention (γ11=0.19*, γ13=0.29**, γ14=0.54***). Relatively, KTSN did not affect KTBI in this case and indicated that H1 could not be fully established.

This showed that the information needed a space to be read, understood, given with meaning and then transferred to knowledge. The knowledge community provided a space, such as real space and virtual space, in order to encourage interaction and trust and then

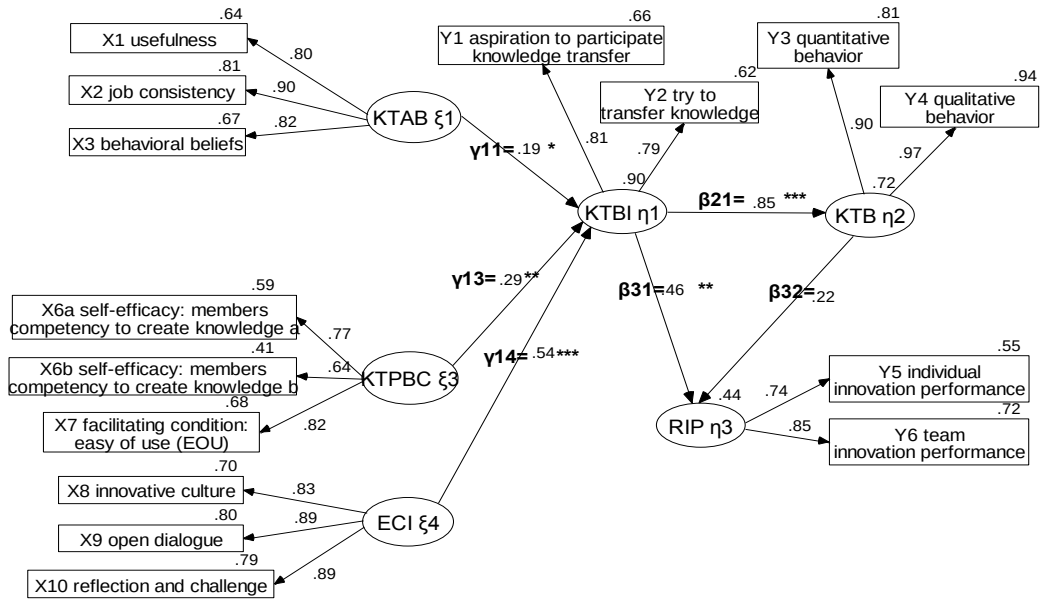

Figure 3. Modified model without KTSN.
Standardized estimates: Chi-square = 184.27 (df =78), chi-square/df = 2.363, RMR = 0.027; SRMR = 0.050. GFI = 0.879; AGFI = 0.813; CFI = 0.944; NFI = 0.908; IFI = 0.945; N = 166.

promoted the intention of knowledge transfer.

The result showed that, KTAB had a positive and significant effect on KTBI (H_{1a}). This is consistent with the contention that behavioral attitudes would affect behavioral intention in TPB (Ajzen, 1989; Lai and Li, 2005). It also reflected the viewpoint from Argyis and Schon (1991) that receivers' behavior intentions were related to their learning attention. As one respondent said, "I felt that I could get problems solved through other experts' help when I joined communities. Therefore I thought it was worthy to spend time to join." Consequently, if members thought that knowledge transfer would help them with their work and they would have more positive attitudes toward knowledge transfer, they had a greater intention to participate in knowledge transfer.

Also, the ECI had significantly positive effect on KTBI (H1d), and this reflected the views that factors, such as inner-team communication frequency (Leenders et al., 2003), collaboration (Pan and Scarbrough, 1998), one-to-one social network for information sharing, consolidation of members' relationship (Wenger, 1998) and relational context (Kostova, 1999; Szulanski, 1996) strongly related to team innovation. This was similar to what one respondent said: "I was surprised to find that the problem about machine's setting-up parameter which had been perplexed me for a long time would be solved by the other unit. If this knowledge had been transferred to other units, there must have no more redundancies." The best communities welcomed the people who were willing to provide ideas and encouraged different opinions and debates. A war of words was the source of community vitality, animation and effectiveness.

In addition, the researcher found that KTSN had no significant effect upon KTBI (H1b). This result did not fit in the opinion of TPB (Ajzen, 1989) and neither did the empirical results (Chau and Hu, 2002; Leonard et al., 2004; Riemenschneider et al., 2003; Saade and Bahli, 2005). From Liao (2008), the manager's expertise has a direct effect on knowledge-sharing behavior. To reason out, it might be that the research engineers were more independent and had their own stance so they were not easily affected by their surroundings. The other reason might be because research engineers had better cognitive levels of technology control, better knowledge creation capability and they did not fail when using the platform.

2. In a knowledge community, the knowledge transfer behavior intention significantly positively affected the knowledge transfer behavior.

The second hypothesis (H_2) was established (β21=0.85***). This single path had a high coefficient of determination R^2 72% to KTB. This indicated that KTBI was an important factor that affected KTB. Once the community members had high knowledge transfer intention, the behavior happened spontaneously.

The results showed that knowledge transfer behavior positively and significantly affected innovation performance, that is, the stronger the knowledge transfer behavior in community, the higher the innovation performance. This result did fit with the opinion of TPB (Ajzen, 1989); due to the closed relationship between behavior intention and real behavior, the measurement of behavior intention in TPB substituted for behavior. The

result also corresponds to the views which were addressed by many researchers that the knowledge transfer outcome caused enterprises innovation (Huang et al., 2003; Nonaka and Takeuchi, 1995; Swap et al., 2001). Once the knowledge was transferred, the next step of 'innovation behavior' would be stimulated. Similarly, only when knowledge was shared, discussed and debated among members, did they apply this knowledge to practical thought which would in turn, be aroused into innovative ideas.

3. In a knowledge community, knowledge transfer behavioral intention significantly and positively affected members' innovation.

The third hypothesis (H3) was partial established. Knowledge transfer behavioral intention significantly influenced members' innovation positively (β31=0.46**). However, the knowledge transfer behavior did not significantly affect innovation performance.

The research result found that the higher the members' behavioral intention, the better the innovation performance. This was homologous to many researchers' findings that concluded that knowledge transfer caused the effects of business innovations (Armistead, 1999; Cohen and Levinthal, 1990; Nonaka and Takeuchi, 1995; Swap et al., 2001). The effect of KTBI to innovation performance (IP) was higher than KTB (β31=0.46** >β32=0.22) and this showed that if members have an intention to transfer knowledge, they were more willing to share, listen and discuss during community activities. Even if there was no knowledge transfer documents brought out, they could still stimulate inspiration of knowledge transference through the interactive process. Finally, innovation performance would be improved.

4. In a knowledge community, knowledge transfer is important for members' innovation.

Based on results, it was argued that, in terms of encouraging interactive innovations, the knowledge community model was superior. From the whole structure model, the researchers found that, only through knowledge transfer would innovation be affected in the knowledge community. The research results indicated that an integrated model that presented the basic categories of cognitions from TPB provided a good explanation of the knowledge transfer and innovation process in a knowledge community. As expected, the relationship between KTBI and IP were positively and highly significant. In this model, it appeared that knowledge transfer was facilitated by the knowledge community which was the driving force behind innovation. The findings demonstrated the value of knowledge transfer and the managers should take this seriously when driving knowledge community.

In addition, from the case S-Inc., the researcher found that leaders or managers should make the members understand the advantages and the importance of knowledge transfer. They also needed to establish the members' mutual recognition of knowledge transfer and provide enough freedom and dialectical interactive space or activity for the communities. These strategies would stimulate knowledge sharing and knowledge transfer activities effectively.

In this knowledge transfer framework, the trajectory and effective path of knowledge transfer and innovation performance has been presented clearly. In addition, ECI, the revised factor to TPB model, has been verified to be a significant and important factor to knowledge transfer intention. The ECI which includes innovative culture, open dialogue and reflection and challenge improved the open atmosphere in community and provides an easy space for members to bring their ideas/innovations into full play. In our case, ideas and practices competition encourage and nurture the knowledge communities. Only if a community has clear and definite goals and topics did community knowledge and discussions effectively transfer to innovation through the knowledge transfer process. In this way, communities could help the company in actual routines and operations. Otherwise, the knowledge community had the possibility to turn into a discussion area or "ballroom chatting" without any actual performance.

Conclusion

The reliability and invariance analyses supported the validity of the TPB instrument for evaluating knowledge transfer behavior. The results on path coefficients also indicated the significance of the model and the correlations of almost all the research variables. As expected, the relationships between KTPBC, ECI, KTB and KTBI were positive and highly significant which was consistent with prior TPB research. These findings supported prior research and showed that modified TPB was a good model to evaluate intention and the actual use of knowledge community. The only unexpected findings were the path of KTSN to KTBI and KTB to IP which were not supported in the research. This research confirmed the important factors of a knowledge community. This may be a recommendation for high-tech industries that they should view the performance of each factor of knowledge transfer in their community frequently in order to pursue research innovations. Knowledge communities played an important role for S-Inc. which has formed an informal and topic-oriented organizational structure. Knowledge transfer intention also created capital innovations during the interactive communication process. On the other hand, Chen and Chen (2010) investigates effect of organizational innovation and learning in information and electronics industry on knowledge management, as to organizational innovation, managerial and technological innovation offers significant help to acquisition, creation, diffusion and accumulation of knowledge in a company. Thus, further research should focus on the practical application of these results to other industries and the

social network analysis of existing virtual networks or other innovative community forms within organizations.

Abbreviations: KTBI, Knowledge transfer behavior intention; **R&D,** research and development; **TPB,** theory of planned behavior; **AB,** attitude toward the behavior; **SN,** subjective norms concerning the behavior; **PBC,** perceived behavioral control; **KTAB,** knowledge transfer attitudes toward behavior; **KTSN,** knowledge transfer subjective norms; **KTPBC,** knowledge transfer perceived behavioral control; **ECI,** environment with critique and introspection; **NPD,** new product development; **EIT,** electronics and information technologies; **TSE,** Taiwan Stock Exchange; **CFA,** confirmatory factor analysis; **SRMR,** standard root mean square residual; **RMSEA,** root mean square error of approximation; **CFI,** comparative fit index; **GFI,** goodness of fit index; **TLI,** Tucker Lewis index; **NNFI,** non-normalized fit index; **SEM,** structural equation modeling; **EOU,** ease of use; **IP,** innovation performance.

REFERENCES

Ajzen I (1989). Attitude structure and behavior. IN AR Pratkanis SJB, AG Greenwald (Ed.) Attitude structure and function. Hillsdale, NJ, Lawrence Erlbaum Associates.

Ajzen I (2002). Constructing a TpB questionnaire: Conceptual and methodological considerations. Retrieved January 5, 2004 from http://socgeo.ruhosting.nl/html/files/spatbeh/tpb.measurement.pdf.

Allen J, James AD, Gamlen P (2007). Formal versus informal knowledge networks in RD: A case study using social network analysis. RD Manage., 37(3): 179-196.

Argyris C, Schon DA (1991). Organizational learning: Theory, method, and practice. Addison-Wesley.

Armistead C (1999). Knowledge management and process performance. J. Knowl. Manage., 3(2): 143-157.

Bentler PM, Bonett DG (1980). Significance tests and goodness of fit in the analysis of covariance structures. Psychol. Bull., 88(3): 588-606.

Bresman H, Birkinshaw J, Nobel R (1999). Knowledge transfer in international acquisitions. J. Int. Bus. Stud., 30(3): 439-462.

Cadiz D, Griffith TL, Sawyer JE (2006). Experienced community of practice and knowledge transfer in a science/ technology company. Proceedings of the 39th Hawaii International Conference on System Sciences (HICSS-39). Hawaii.

Chau PYK, Hu PJH (2002). Investigating healthcare professionals' decisions to accept telemedicine technology: An empirical T test of competing theories. Inf. Manage., 39: 297-311.

Chen CJ (2004). The effects of knowledge attribute, alliance characteristics, and absorptive capacity on knowledge transfer performance. RD Manage., 34(3): 311-321.

Chen ML, Chen KJ (2010). Relationships among organizational innovation, learning and knowledge management in the information technology industry. Afr. J. Bus. Manage., 4(14): 3191-3200.

Cohen W, Levinthal D (1990). Absorptive capacity: A new perspective on learning and innovation. Adm. Sci. Q., 35(1): 128-152.

Davenport TH, De Long DW, Beers MC (1998). Building successful knowledge management projects. Sloan Manage. Rev., 43-57.

Devellis RF (1991). Scale development theory and applications. London, SAGE.

Diaz-Diaz NL, Aguiar-Diaz I, Saa-Perez PD (2006). Technological knowledge assets and innovation. Int. J. Technol. Manage., 35(1-4): 29-51.

Edmondson AC, Winslow AB, Bohmer RMJ, Pisano GP (2003). Learning how and learning what: Effects of tacit and codified knowledge on performance improvement following technology adoption. Decis. Sci., 34(2): 197-224.

Eraut M (2004). Informal learning in the workplace. Stud. Continuing Educ., 26(2): 247-273.

Gay LR (1992). Educational research competencies for analysis and application, NY, Macmillan.

Gilbert M, Cordey-Hayes M (1996). Understanding the process of knowledge transfer to achieve successful technological innovation. Technovation, 16(6): 301-312.

Hair JF, Anderson RE, Tatham RL, Black W (1998). Multivariate data analysis (5th Ed). NJ, Prentice Hall Inc.

Hansen MT (2002). Knowledge Networks: Explaining effective knowledge sharing in multiunit companies. Organ. Sci., 13(3): 232-248.

Huang CT, Liu TC, Warden CA (2003). The tacit knowledge flow of R&D personnel and its impact on R&D performance. Proceedings of 9th of Asian Pacific Management Annual Conference. Osaka, Japan.

Joshi KD, Sarker S, Sarker S (2004 Jan.). Knowledge transfer among face-to-face information systems development team members: examining the role of knowledge, source, and relational context. Proceedings of the 37th Hawaii International Conference on System Sciences (HICSS-37), Hawaii.

Kafouros MI, Buckley PJ, Sharp JA, Wang C (2008). The role of internationalization in explaining innovation performance. Technovation, 28(1-2): 63-74.

Knudsen MP (2007). The relative importance of interfirm relationships and knowledge transfer for new product development success. J. Prod. Innov. Manage., 24(2): 117-138.

Koh J, Kim YG (2004). Knowledge sharing in virtual communities: An e-business perspective. Expert Syst. Appl., 26: 155-166.

Kostova T (1999). Transnational transfer of strategic organizational practices: a contextual perspective. Acad. Manage. Rev., 24(2): 308-324.

Lai VS, Li H (2005). Technology acceptance model for internet banking: An invariance analysis. Inf. Manage., 42(2): 373-386.

Leenders R, Engelen J, Kratzer J (2003). Virtuality, communication, and new product team creativity: A social network perspective. J. Eng. Technol. Manage., 20(1): 69-92.

Leonard L, Cronan TP, Kreie J (2004). What influences it ethical behavior intentions - planned behavior, reasoned action, perceived importance, individual characteristics? Inf. Manage., 42(1): 143-158.

Liao LF (2008). Impact of manager's social power on R&D employees' knowledge-sharing behaviour. Int. J. Technol. Manage., 41(1/2): 169-182.

Marsh HW and Hocevar D (1985). Application of confirmatory factor analysis to the study of self-concept: first and higher order factor models and their invariance across groups. Psychol. Bull., 97(3): 562-582.

Molina LM, Llorens-Montes FJ (2006). Autonomy and teamwork effect on knowledge transfer: Knowledge transferability as a moderator variable. Int. J. Technol. Transfer Commercialisation, 5(3): 263-280.

Moreland RL (1999). Learning who knows what in work groups and organizations. In Thompson LL, Levine J M, Messick DM (Ed.). Shared cognition in organizations: The management of knowledge. Mahwah, NJ, Lawrence Erlbaum Associates.

Nonaka I, Takeuchi H (1995). The knowledge-creating company: How Japanese companies create the dynamic of innovation? London, Oxford University Press.

Pan SL, Scarbrough H (1998). A socio-technical view of knowledge sharing at buckman laboratories. J. Knowl. Manage., 2(1): 55-66.

Reagans R and Zuckerman EW (2001). Networks, diversity, and productivity: The social capital of corporate R &D teams. Organ. Sci., 12(4): 502-517.

Riemenschneider CK, Harrison DA, Mykytyn Jr PP (2003). Understanding it adoption decisions in small business: Integrating current theories. Inf. Manage., 40(4): 269-285.

Ryu S, Ho SH, Han I (2003). Knowledge sharing behavior of physicians in hospitals. Expert Syst. Appl., 25(1): 113-122.

Saadé R, Bahli B (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning: an extension of the technology acceptance model. Inf. Manage., 42: 317-327.

Shahgholian K, Hajihosseini H (2011). Designing a model for evaluation of knowledge management level in industrial organizations of Iran (Auto industry). Afr. J. Bus. Manage., 5(2): 332-339.

Stenmark D (2001). Leveraging tacit organizational knowledge. J. Manage. Inf. Syst., 17(3): 9-24.

Swap W, Leonard D, Shields M, Abrams L (2001). Using mentoring and storytelling to transfer knowledge in the workplace. J. Manage. Inf. Syst., 18(1): 95-114.
Szulanski G (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. Strat. Manage. J., 17: 27-43.
Thornhill S (2006). Knowledge, innovation and firm performance in high- and low-technology regimes. J. Bus. Vent., 21(5): 687-703.
Trier M (2005). IT-supported visualization of knowledge community structure. Proceeding of 38th Hawaii International Conference on System Sciences, HICSS'05. Hawaii, IEEE.
Tsai W (2001). Knowledge transfer in intra-organizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. Acad. Manage. J., 44(5): 996-1004.
Usman A, Danish RQ, Waheed N, Tayyeb U (2011). Moderating effect of employees' education on relationship between feedback, job role innovation and organizational learning culture. Afr. J. Bus. Manage., 5(5): 1684-1690.
Versailles D, Mérindol V (2006). Knowledge transfers and R&Dmanagement: An inquiry into the problem of transatlantic complementarities. Def. Peace Econ., 17(3): 239-256.
Wenger E (1998). Communities of practice: Learning, meaning and identity. Cambridge, Cambridge University Press.
Wenger E, Mcdermott RA, Snyder W (2002). Cultivating communities of practice: A guide to managing knowledge. Harvard Business School Press.

Appendix 1: Questionnaire.

Sub-instrument	Factor	Item
KTAB	Usefulness	Information providing for employees' jobs, problem solving, Improvement of employees' capability
	Job consistency	Job related, increase of inter-units' interaction
	Behavioral beliefs	Valuable, cheerful
KTSN	Motivation to comply	Level of complying with important others, effect from community leaders, effect from fellows
	Normative beliefs	Support from my director, support from organizational policy, community norms
KTPBC	Self-efficacy: members' competency to create knowledge	Members' competency of knowledge creating, including externalization, combination, internalization and socialization
	Facilitating condition: EOU	Easy to get resources, easy to use technology, members' capability for the usage of platform
ECI	Innovative culture	Organizational R&D culture, innovative thoughts of community members
	Open dialogue	Space for open dialogue, communication channels
	Reflection and challenge	Critical dialogue, introspective thinking of work
KTBI	Intention and commitment	Intention of participating in knowledge transfer, commitment to transfer knowledge
KTB	Quantitative and qualitative	Quantitative behavior of knowledge transfer, qualitative behavior of knowledge transfer
IP	Individual innovation performance	Profundity of knowledge innovation, connection, ontribution, Satisfaction
	Team innovation performance	Fitting in with goals, innovation level, satisfaction