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THE DETERMINANTS OF KNOWLEDGE SHARING INTENTION IN PROFESSIONAL VIRTUAL COMMUNITIES: AN INTEGRATIVE MODEL

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Abstract

The growing use of information technology and the Internet has led to the emergence of professional virtual communities (PVCs). Why are PVC members willing to spend time and energy to provide valuable knowledge to others? This study extended Icek Ajzen's(1991) theory of planned behavior (TPB) to analyze what determines PVC members' willingness to share knowledge. Empirical data were collected from three IT-related PVCs in Taiwan, and the structural equation modeling (SEM) was performed to verify the fit of the proposed model. Based on 423 usable samples were obtained, the results showed that knowledge sharing intentions would be significantly affected by, in order of importance, attitude toward knowledge sharing, perceived behavioral control of knowledge sharing, and subjective norm of knowledge sharing. The factors affecting attitude toward knowledge sharing were, in order of importance, perceived ease of use, perceived usefulness, enjoyment in helping others, knowledge self-efficacy, compatibility, and trust. The major factor that affected the subject norm of knowledge sharing was peer influence. Factors that affected perceived behavioral control of knowledge sharing were, in order of importance, knowledge self-efficacy, resource availability, and perceived ease of use.

Keywords: Knowledge sharing, Knowledge contribution, Professional virtual communities, Theory of planned behavior (TPB)

1   INTRODUCTION

The growing use of information technology and the Internet has led to the emergence of professional virtual communities (PVCs). A PVC is defined as a community designed for discussing certain expertise, such as the programming, database maintenance, or biotechnology (Adler and Christopher, 1999). Members of PVCs interact virtually via the Internet to communication, exchange information and share knowledge (Hsu et al., 2007). The most widely recognized benefit of PVCs is that they allow their members to share and disseminate knowledge (Lin et al., 2009). However, PVC members may or may not belong to the same organization, may not have geopolitical relationships, and may not even know one other.   Unlike members of other organizations, PVC members have no external incentive to share knowledge.   Why are PVC members still willing to spend time and energy providing valuable knowledge to others? The objective of this study is to deepen our understanding about the determinants of knowledge sharing intention in PVCs.

Prior researches (e.g., Bock et al., 2005; Lin, 2007) follow the theory of reasoned action (TRA), which implicitly assumes that knowledge sharing behavior is volitional. However, knowledge contributors may face constraints such as limited time or the inability to provide knowledge. These issues call for the inclusion of perceived behavioral control (PBC) adequately in predicting the PVC members' knowledge sharing behavior. The knowledge management literature on knowledge sharing behaviors in PVCs has focused on personal, technological or environmental factors. Such studies argue that knowledge sharing is directly influenced by these factors. However, these factors are always explored independently, without an integrative perspective of their relative importance. This study examines how such factors affect knowledge sharing intentions through their influence on attitude, subjective norm and perceived behavioral control. These factors in the formation of behavioral intentions have not been carefully examined. Thus, this study explores relevant factors discussed in knowledge management literature, and more specifically, how those factors affect PVC members' knowledge sharing intentions. Such determinants included personal motivations, as well as technological and environmental factors. Further, the study combined these factors with the theory of planned behavior (TPB) to develop an integrative model for predicting and understanding PVC members' knowledge sharing intentions.

2   THEORETICAL BACKGROUND

2.1   Knowledge Sharing in Virtual Communities

Numerous studies that explore PVCs members' motivations for contributing knowledge have revealed three broad motivator categories: personal factors (Chiu, 2006; Hsu et al., 2007; Lin et al., 2009; Wasko and Faraj, 2005), system factors (Lin et al., 2009; Ma and Agarwal, 2007; Phang et al., 2009) and environmental factors (Chiu, 2006; Hsu et al., 2007; Lin et al., 2009; Phang et al., 2009; Wasko and Faraj, 2005). For example, in studies about electronic networks of practice, Wasko and Faraj (2005) found that people contribute knowledge when they perceive reputation enhancement, when they have experiences to share, and when they are structurally embedded in the network. In a study integrating social cognitive theory with social capital theory, Chiu et al. (2006) found that social interaction ties, trust, norms of reciprocity, identification, shared vision, shared language, community-related outcome expectations, and personal outcome expectations may be important motivations for community members to contribute knowledge. A study by Ma and Agarwal (2007) reported that perceived identity verification is strongly linked to member satisfaction and knowledge contribution. Another study by Hsu et al. (2007), integrating personal and environmental perspectives, found that self-efficacy, outcome expectations, and multidimensional trusts (include economy-based trust, information-based trust, identification-based trust) tend to influence knowledge sharing behavior in online communities. Phang et al. (2009) adopted a socio-technical perspective of an online community and found that individuals perceived tracking fulfilment as more important for usability.

The same study also found social interactivity to be a more important factor regarding sociability when community members contribute knowledge. Lin et al. (2009) investigated the relationship between contextual factors, personal factors, sharing behavior, and community loyalty in PVCs. They reported that trust significantly affects knowledge sharing self-efficacy, perceived relative advantage, and perceived compatibility, all of which in turn positively affect knowledge sharing behavior.

2.2   Theory of Planned Behavior (TPB)

The TPB is one of the most influential and comprehensive psychological theories in applied human behavior research (Pavlou and Fygenson, 2006). The TPB is derived from the TRA, which claims that actual behavior is affected by behavioral intention. Furthermore, it claims that behavioral intention is affected by attitude toward such behavior as well as subjective norm. The TRA assumes that personal behavior is deemed a full volitional control. The TPB extended the TRA to reflect complexities in a world where individuals do not have complete control over their behaviors (Ajzen, 1991). The theory assumes that individual behavior is determined not only by attitude or subjective norm, but also by willpower. Thus, Ajzen (1991) proposed the TPB, a revised model of the TRA that compensates for the limitations of the TPB by predicting and interpreting individual behavior more effectively.

3   RESEARCH MODEL AND HYPOTHESES

Based on TPB, the research model is developed (see Figure 1) and research hypotheses summarizes as follows.
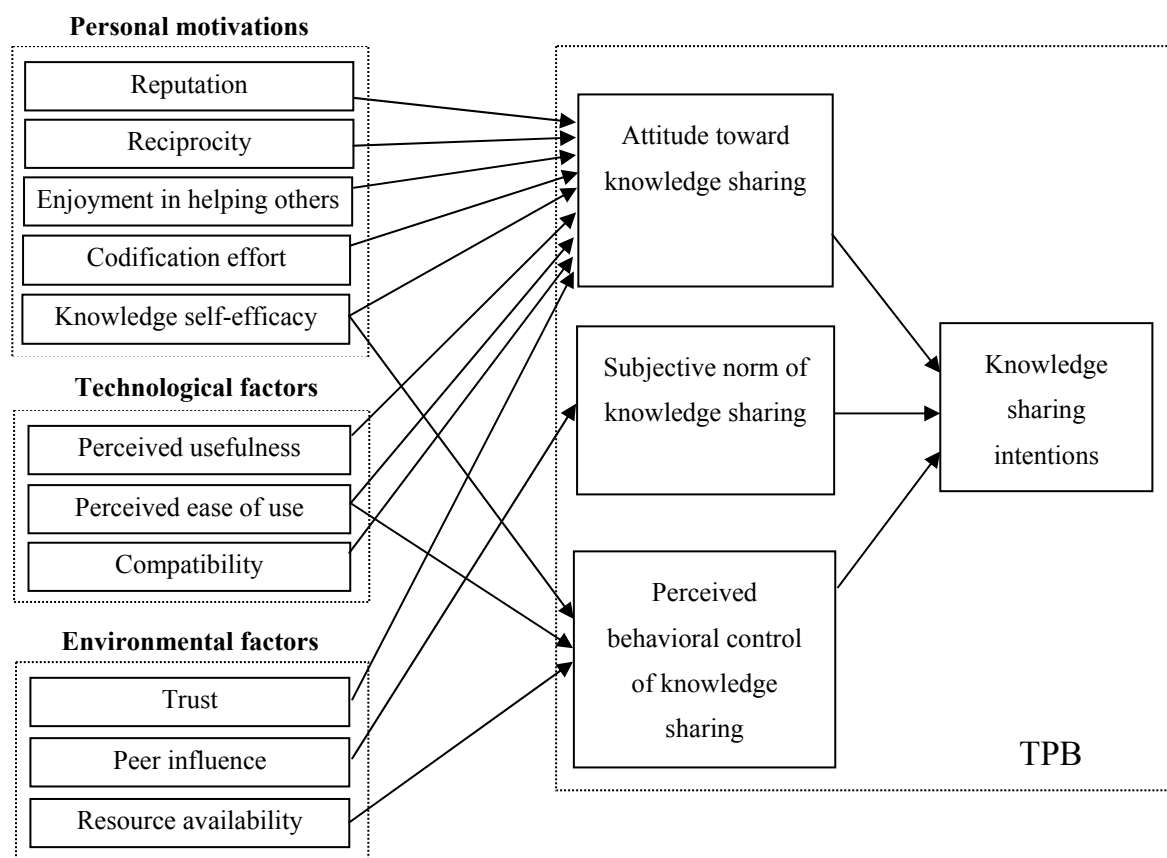

Figure 1.   Research model

3.1 Personal Motivations

Rheingold (1993) pointed out that increased recognition is an important factor for participating communities. One effective method to enhance community members' recognition is to increase their visibility within the community. In PVCs, the best way to establish a reputation is to share knowledge with other members. A certified expert, for example, might generate more confidence and interest from other members in his posted articles by sharing knowledge. Generally, the PVC would provide a reputation system to promote contributors' quantity and quality of knowledge. For instance, many PVCs provide contribution ranking systems and ways members can assess the quality of submitted articles. Prior research has shown that building reputation is a strong motivator for knowledge sharing (Davenport and Prusak, 1998) and could also develop a member's positive attitude toward sharing (Hsu and Lin, 2008). Thus, if a member expects that he or she can establish a reputation by sharing knowledge, he or she is more likely to develop a positive attitude toward knowledge sharing. Hence, we proposed:

H1. Reputation has a positive effect on users' attitudes toward knowledge sharing in PVCs.

According to Davenport and Prusak (1998), people's time, energy and knowledge are limited. Therefore, except when profitable, people are usually unwilling to share these scarce resources with others. Reciprocity is a form of conditional gain; that is, people have a general expectation of some future return (Blau, 1964). People often believe that they could obtain mutual benefits (Hsu and Lin, 2008) or knowledge feedback in the future (Kankanhalli et al., 2005a) through knowledge sharing. In PVCs, except seek for important information, the latest theme and popular themes, it might also provide promising job opportunities. The anticipated reciprocity that users might benefit from while participating in PVCs comprises such job opportunities in favour of quick responses to all questions a member asks. Many empirical studies have also confirmed that reciprocity benefits have continually helped drive PVC members to share knowledge (Bock et al., 2005; Chiu, 2006). Thus, if members believe they can obtain reciprocity benefits from other members by sharing knowledge, they will develop a more positive attitude toward knowledge sharing. This leads to the following hypothesis:

H2. Reciprocity has a positive effect on users' attitudes toward knowledge sharing in PVCs.

People are willing to share knowledge in virtual community, because they felt that it was a very interesting thing to help others in solving their problems and they were also very satisfied with themselves while helping others (Kollock, 1999). Through knowledge sharing, people can often obtain the perception of pleasure from helping others. Previous research has indicated that an individual's attitude toward knowledge sharing is affected by that individual's enjoyment in helping others (He and Wei, 2009; Lin, 2007). Knowledge contributors who derive enjoyment from helping others, they will be more favorably oriented towards the knowledge sharing. Therefore, we hypothesized the following:

H3. Enjoyment in helping others has a positive effect on users' attitudes toward knowledge sharing in PVCs.

Contributing knowledge in the virtual community, it comprises both the contextualization and interpretation of knowledge. This is a cost for the knowledge sharing, because knowledge contributors must take time and effort (Ba et al., 2001; Markus, 2001). It takes time in knowledge coding, and after sharing knowledge, knowledge contributors will take more time to clearly explain or assist the knowledge seekers to have a better understanding of the knowledge provided (Goodman and Darr, 1998). Previous researches have suggested that the codification effort is a significant inhibitor for knowledge contribution (Ba et al., 2001; Goodman and Darr, 1998; Kankanhalli et al., 2005a). Members might feel that sharing knowledge with other PVC members might require a lot of time, plus even more time to respond to additional questions proposed by other PVC members. Hence, we hypothesized:

H4. Codification effort has a negative effect on users' attitudes toward knowledge sharing in PVCs.

Knowledge self-efficacy is the confidence in one's ability to provide knowledge that is valuable to others (Kankanhalli et al., 2005a). Prior researches have also revealed that an individual with strong

knowledge self-efficacy would have the power of self-motivation to promote knowledge sharing (Bock and Kim, 2002; Hsu et al., 2007). Self-efficacy has long been suggested as the key determinant factor for behavioral control (Bandura, 1977; Hsieh et al., 2008). In PVCs, the threshold for participation was higher than in the general virtual community, because of the increased need for professional knowledge. PVC members with higher knowledge self-efficacy would tend to agree with their own knowledge and thus feel more confident in providing valuable knowledge; hence, they would have more positive attitudes about knowledge sharing as well as a perceived behavioral control of sharing. Hence, we hypothesized:

H5. Knowledge self-efficacy has a positive effect on users' attitudes toward knowledge sharing in PVCs.

H6. Knowledge self-efficacy has a positive effect on users' perceived behavioral control of knowledge sharing in PVCs.

3.2   Technological Factors

Taylor and Todd (1995) proposed that there are three technology acceptance factors able to affect an individual's attitudes: perceived usefulness, perceived ease of use and compatibility. The technology acceptance model (TAM) is an adaptation of the TRA, which has mainly been used to explore the factors influencing user acceptance of information technology (Davis, 1989).TAM suggests that the attitude toward using is influenced directly by both perceived ease of use and perceived usefulness. TAM also claims that attitude toward using would further affect user intentions. An important concern for community members is system reliability (Phang et al., 2009) and the availability of task support whenever needed (Shneiderman, 1998). Therefore, the more people perceive the usefulness of a system, the more favorable their attitude toward knowledge sharing will be. We thus proposed the following hypotheses:

H7. Perceived usefulness has a positive effect on users' attitudes toward knowledge sharing in PVCs.

Perceived ease of use is another core construct of TAM, as it has a positive effect on the user's attitude (Davis, 1989). If it take extra time to learn a system, or if that system is more difficult to learn, then there is a natural tendency for people to avoid using it (Malhotra and Galletta, 2004; Venkatesh, 1999). Prior research has also provided evidence that the ease of technology use is associated with behavioral control in home PC adoption (Brown and Venkatesh, 2005), electronic commerce adoption (Pavlou and Fygenson, 2006) as well as information and communication technology usage (Hsieh et al., 2008). If members feel PVCs can be used easily, they will be more likely to view knowledge sharing favorably. Furthermore, when members view PVCs as easy to use, they often perceive knowledge sharing behavior to be under their own full control. Thus, we proposed the following hypotheses:

H8. Perceived ease of use has a positive effect on users' attitudes toward knowledge sharing in PVCs.

H9. Perceived ease of use has a positive effect on users' perceived behavioral control of knowledge sharing in PVCs.

Compatibility is elicited from the innovation diffusion theory (IDT). This theory suggests that compatibility represents the level of information technology complying with the users' existing values, past experience, and current needs (Moore and Benbasat, 1991; Rogers, 1995). Previous research has shown evidence that compatibility is strongly correlated with attitude towards the adoption of information technology (Cho, 2006). When members in PVCs perceive knowledge sharing as compatible with their individual values and needs, they are more likely to share knowledge (Lin et al., 2009). If PVC membership and involvement are similar to users' prior experience, feelings of familiarity might lead users to view PVC membership as consistent with the habits and needs of their contributions. Thus, members would be better able to establish positive attitudes toward knowledge sharing. Hence, we hypothesized:

H10. Compatibility has a positive effect on users' attitudes toward knowledge sharing in PVCs.

3.3   Environmental Factors

In this study, trust is defined as one's belief that the results of others' actions will be appropriate from one's point of view (Misztal, 1996). People believe that the other people will have good intentions, competence and reliability while sharing and repeatedly using the knowledge (Mishra, 1996). Trust is a key factor in effective knowledge exchange (Adler, 2001). Suppose a knowledge seller trusts his knowledge buyers. He would then be willing to contribute his own knowledge, and would not fear that buyers would misuse his knowledge (Davenport et al., 1998). PVCs, however, do not provide a certain norm to compel members to share knowledge like in an organization. Also, PVCs do not give real incentives to members who contribute knowledge. Therefore, trust has become a critical factor in the virtual community (Lin, 2008). Previous research has also pointed out that trust might create an atmosphere of knowledge sharing (Nonaka, 1994). Suppose both parties of a knowledge exchange could establish a good relationship of trust with each other in the process of sharing knowledge. Trust would then facilitate the knowledge exchange between these community members. Therefore, trust is an important factor in influencing members' attitudes toward knowledge sharing. Thus we hypothesized:

H11. Trust has a positive effect on users' attitudes toward knowledge sharing in PVCs.

People are often easily affected by and often imitate their peers. Peer influence refers to the fact that one's peers have the ability to influence one's thinking and/or actions. With the emergence of the Internet, the transmission of information is much quicker and thus the phenomenon of peer influence is even more obvious. Prior studies have also shown evidence that peer influence would have a positive effect on users' subjective norm (Bhattacherjee, 2000; Hsieh et al., 2008; Hung et al., 2003). We thus propose the following hypotheses:

H12. Peer influence has a positive effect on users' subjective norm of knowledge sharing in PVCs.

In TPB, resources availability facilitates decisions regarding technology usage (Taylor and Todd, 1995). For an individual, the cost of sharing knowledge includes the time or effort that is required (King and Marks, 2008). Szulanski (1996) presumed that knowledge contribution behavior is often affected by lack of important factors, such as resources and time. With sufficient time or opportunity, users might even like to contribute more knowledge. Such a situation is, therefore, expected to have a greater influence on perceived behavioral control of knowledge sharing. We thus hypothesized:

H13. Resource availability has a positive effect on users' perceived behavioral control of knowledge sharing in PVCs.

3.4   TPB Beliefs

TPB asserts that behavioral intentions are determined by three general beliefs: attitude, subjective norm and perceived behavioral control. Attitude reflects an individual's feelings of favorableness or unfavorableness towards performing a behavior. Subjective norm indicates whether such behavior is performed under the social pressure or is subject to the influences of other people (e.g. colleague, peer, family). Perceived behavioral control reflects the perceptions of internal and external constraints on such behavior. Attitude toward knowledge sharing has been shown to influence behavioral intention to share knowledge (Bock and Kim, 2002). According to Bock et al. (2005), the more likely the subjective norm is to share knowledge, the greater one's intention to share knowledge will be. Perceived behavioral control is a prerequisite for sharing knowledge because when an individual perceives the ease of sharing knowledge, he will feel that such an act is completely under his control. A positive relationship between perceived behavioral control of knowledge sharing and intentions to share knowledge is thus expected. Thus we hypothesized:

H14. Attitude toward knowledge sharing has a positive effect on knowledge sharing intentions.

H15. Subjective norm of knowledge sharing has a positive effect on knowledge sharing intentions.

H16. Perceived behavioral control of knowledge sharing has a positive effect on knowledge sharing intentions.

4   RESEARCH METHODOLOGY

4.1   Measurement

To ensure the content validity, items which were used to measure each construct had been developed, based on the previous researches, to make sure wherever it was possible and could be slightly modified so as to suit the context of PVCs. Both a pre-test and a pilot test were undertaken in order to validate the instruments. The following 51 items were assessed on a seven-point Likert scale (ranging from 1=strongly disagree to 7=strongly agree): three items regarding reputation (derived from Wasko and Faraj (2005)), defined as the perceived enhancement of reputation and image due to knowledge contributed to the PVC (Kankanhalli et al., 2005a); four items regarding reciprocity (derived from Kankanhalli et al. (2005a)), defined as the belief that current knowledge contribution behavior would lead to future requests for knowledge to be easily satisfied by others (Davenport et al., 1998) ; four items regarding enjoyment in helping others (derived from Kankanhalli et al. (2005a)), defined as the perception of pleasure from helping others through knowledge contributed to a PVC (Wasko and Faraj, 2000); five items regarding the codification effort (adapted from Kankanhalli et al. (2005a)), defined as the perceived time and effort required to compile, input and explain knowledge in a PVC (Markus, 2001); four items pertaining to knowledge self-efficacy (adapted from Kankanhalli et al. (2005a)), defined as confidence in the ability to share valuable knowledge in a PVC (Spreitzer, 1995); four items to measure perceived usefulness (adopted from Taylor and Todd (1995)), defined as the degree to which a person believes that the PVC can enhance work and learning performance (Davis et al., 1989); three items to measure perceived ease of use (adopted from Taylor and Todd (1995)), defined as the degree to which a person believes that using the PVC is free of effort (Davis et al., 1989); three items regarding compatibility (adopted from Taylor and Todd (1995)), defined as the degree to which a person believes that knowledge sharing via the PVC fit/match his existing values, previous experiences, and current needs (Taylor and Todd, 1995); four items pertaining to trust (adopted from Kankanhalli et al. (2005a)), defined as the degree to which a person believes that others have good intentions, and exhibit competence and reliability while sharing and repeatedly using knowledge (Mishra, 1996); two items regarding peer influence (adopted from Taylor and Todd (1995)), defined as the degree to which a person perceives that peers/colleagues expect his/her knowledge sharing in the PVC (Taylor and Todd, 1995); three items regarding resource availability (adopted from Kankanhalli et al. (2005b)), defined as the degree to which a person evaluates the resource factors, such as time and opportunities, required in knowledge sharing (Taylor and Todd, 1995); four items pertaining to attitude (adopted from Taylor and Todd (1995)), defined as the degree to which a person has a feelings of favorableness or unfavourableness towards the knowledge sharing behavior (Ajzen, 1991); two items for subjective norm (adopted from Taylor and Todd (1995)), defined as the degree to which a person perceives whether social pressure will affect the performance of knowledge sharing behavior(Ajzen, 1991); three items pertaining to perceived behavioral control (adopted from Taylor and Todd (1995)), defined as the degree to which a person perceives the ease or the difficulty of performing knowledge sharing behavior (Ajzen, 1991); and three items regarding knowledge sharing intention (adopted from Venkatesh (2003)), defined as the degree to which a person believes that he/she will engage in a knowledge sharing act (Ajzen, 1991).

4.2   Data Collection

The subjects in this study were members who had shared professional knowledge in PVCs. Empirical data was collected by conducting a survey in Taiwan, over a period of two months, from April 15 to June 15, 2009. Two of the largest programming PVCs in Taiwan are JavaWorld and BlueShop. One of the multimedia design PVCs in Taiwan is Flash forum. These three PVCs all provide knowledge sharing, knowledge seeking, technical discussion, employment searches, file uploading, etc. Members

with sharing experience were invited to complete the questionnaire. Out of all members who completed the entire questionnaire, 27 members would have a chance to be rewarded. The on-line survey collected 423 usable responses after eliminating 48 invalid responses. The sample consisted of 338 males (80 percent) and 85 females (20 percent), exhibited the majority of sample is male. Seventy percent of participants were between the ages of 21 and 30. Participants with more than two years' experience with PVC membership accounted for 58.2 percent, indicating that most of them are familiar with this PVC.

5   RESULTS

5.1   Analysis of the Measurement Model

The constructs were assessed for reliability using Cronbach's alpha and composite reliability. Nunnally (1978) suggested that the acceptable value for Cronbach's alpha was above 0.7. In order to improve the reliabilities of the corresponding constructs, PU1 had been omitted from the perceived usefulness construct. The coefficients used for all constructs ranged from 0.77 to 0.94, in which, all measures surpassed 0.70 criteria. The composite reliability had also led to very similar results ranged from 0.80 to 0.94, all measures higher than the recommended level of 0.7 would be deemed to be the reliable constructs (Nunnally, 1978).

A confirmatory factor analysis was conducted with related data in order to acquire evidences of convergent and discriminant validity. *Convergent validity* is demonstrated when items loading exceeded the acceptable value of 0.5 recommended by Hair et al. (2006) on their corresponding constructs, and AVE of the construct is larger than 0.5 exceeded the threshold value suggested by Fornell and Larcker (1981). We used a principal components analysis with a varimax rotation. One question regarding codification effort and one question pertaining to perceived ease of use tapped onto other constructs and then were omitted. After omitting these questions, all of the factors had loading over 0.5 for their corresponding constructs, and the AVE for all constructs exceeded the threshold value of 0.5, thus convergent validity is demonstrated. *Discriminant validity* is demonstrated when the square root of the AVE from the construct is greater than the inter-construct correlations, as suggested by Fornell and Larcker (1981). Table 1 shows the square root of AVE values are greater than inter-correlations and thus exhibit acceptance discriminant validity.

Construct	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Reputation	**0.79**														
2. Reciprocity	0.48	**0.79**													
3. Enjoyment in helping	0.50	0.67	**0.87**												
4. Codification effort	0.12	0.01	-.010	**0.71**											
5. Knowledge self-efficacy	0.44	0.38	0.44	-0.11	**0.92**										
6. Perceived usefulness	0.43	0.61	0.57	-0.03	0.39	**0.79**									
7. Perceived ease of use	-0.07	0.25	0.30	-0.47	0.17	0.26	**0.87**								
8. Compatibility	0.34	0.59	0.66	-0.11	0.44	0.67	0.28	**0.91**							
9. Trust	0.38	0.50	0.45	-0.04	0.30	0.42	0.04	0.45	**0.76**						
10.Peer influence	0.28	0.29	0.32	-0.09	0.39	0.35	0.15	0.38	0.30	**0.86**					
11.Resource availability	0.34	0.46	0.63	-0.23	0.56	0.54	0.40	0.55	0.26	0.37	**0.81**				
12.Attitude	0.38	0.63	0.63	-0.17	0.52	0.60	0.44	0.64	0.39	0.46	0.67	**0.84**			

13.Subjective norm	0.42	0.30	0.37	-0.06	0.47	0.39	0.10	0.43	0.37	0.58	0.45	0.55	**0.93**		
14.behavioral control	0.37	0.30	0.40	-0.10	0.59	0.33	0.29	0.43	0.24	0.38	0.52	0.52	0.51	**0.82**	
15.Intention	0.34	0.41	0.58	-0.18	0.47	0.47	0.38	0.53	0.31	0.40	0.72	0.70	0.59	0.62	**0.85**

Table 1.   Convergent validity and discriminant validity.

5.2   Analysis of the Structural Model

The structural model is used to investigate model-fit indices and the strength and direction of the relationship between the constructs. The fit statistics indicate that the research model provides a good fit to the data (x^2 = 1731.36, df = 985, x^2 / df = 1.758, GFI = 0.860, AGFI=0.826, RMSEA= 0.042, NFI = 0.901, CFI= 0.954), as shown in Table 2. The data supports the proposed model and 13 of the 16 hypotheses. Figure 2 illustrates the path coefficients and their significance in the structural model.

Fit indicators	Results	Recommended value	Suggested by authors
Chi-Square/D.F.	*1.758*	＜3	Hair et al., 2006
GFI	*0.860*	＞0.8	Browne and Cudeck, 1993
AGFI	*0.826*	＞0.8	Browne and Cudeck, 1993
RMSEA	*0.042*	＜0.08	Hair et al., 2006
NFI	*0.901*	＞0.9	Hair et al., 2006
CFI	*0.954*	＞0.9	Hair et al., 2006

Table 2.   Goodness of fit of the structural model.

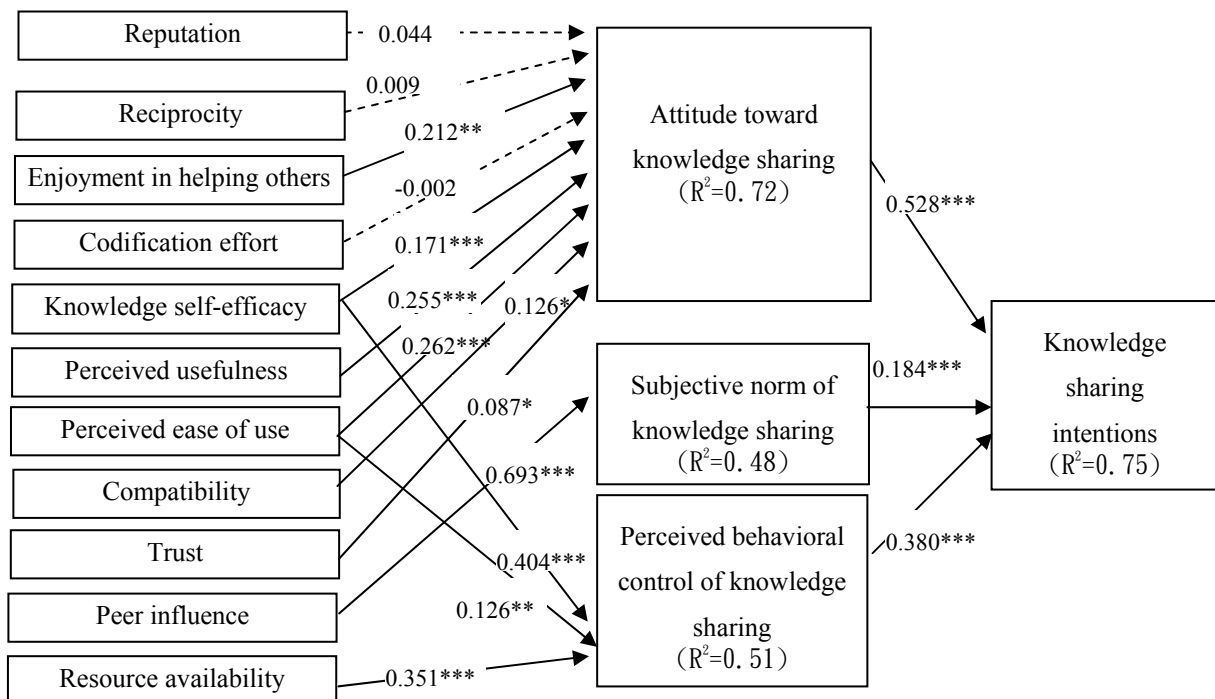*Figure 2.   Result of research model.*

Note: Dotted line means not significant.
*: p<0.05; **: p<0.01; ***: p<0.001*

6   DISCUSSION

6.1   Influence of Personal Motivations

Reputation shows to be an insignificant factor in forming positive attitudes toward knowledge sharing in PVCs. A possible reason is that, although a virtual community has the so-called integration system or member stratifying system, members can enhance their reputation by solving problems for other people. To a user, these titles only represent an honor in the virtual world. Once a user name is changed, the user is no longer recognized. Therefore, one's reputation in a virtual community is only a vanity, and provides no practical benefit. Thus, emphasizing reputation is unnecessary.

An interesting finding from this study shows that reciprocity has an insignificant effect on attitudes toward knowledge sharing in PVCs. The findings of this study are consistent with prior research claiming that reciprocity benefits are not a significant factor in knowledge sharing behavior in electronic networks of practice (Wasko and Faraj, 2005). One possible reason is that most (95.7 percent) subjects in this research had a bachelor's degree or other more advanced degree, and PVC members must have adequate knowledge to discuss professional topics. This shows that people share their knowledge because of their professional experience and/or status, and do not typically care as much about receiving reciprocity benefits. Also, PVC members may not consider reciprocity benefits when they share knowledge because they have a high cooperation norm (Chiu, 2006).

Significant results regarding enjoyment in helping others reconfirms conclusions found in prior studies of knowledge sharing (He and Wei, 2009; Hsu and Lin, 2008; Kankanhalli et al., 2005a). Altruistic people are willing to share knowledge to help others (Wasko and Faraj, 2005). Once the user has used the information system for a while, intrinsic motivation such as the enjoyment of helping others becomes the determining factor. More than 72 percent of the sample in this study had been members for more than one year and were therefore willing to share their knowledge.

Contrary to the commonly held notion, codification effort is irrelevant to PVC members' attitudes toward knowledge sharing. This is evident in that most subjects shared their knowledge a few times a week or even daily. Therefore, it appeared that codification did not hinder knowledge sharing attitudes. A reason for this may be that PVCs are not like normal organizations in which members may not know each other. Thus they may not feel pressured to answer follow-up questions after contributing. This may help explain why members do not consider codification a cost factor.

Knowledge self-efficacy revealed a significant effect on member attitudes and perceived behavioral control of knowledge sharing, which is consistent with reports that knowledge self-efficacy is a significant determinant of knowledge contribution behavior (Bock et al., 2005; Kankanhalli et al., 2005a). A possible reason is that sharing knowledge is a supply-driven act, so individuals share knowledge according to their capability. Knowledge self-efficacy can help establish positive attitudes, as well as increase confidence, and the ability to control oneself.

6.2   Influence of Technological Factors

Perceived usefulness revealed a significant effect on member attitudes toward knowledge sharing. Community members find PVCs improve work and learning efficiency, and helps to build positive attitudes toward knowledge sharing. The PVCs in this research were all mature, IT-related communities in Taiwan. They not only discuss professional topics, they also provide other services thus increasing members' willingness to use it for sharing knowledge with others.

The research results indicated that perceived ease of use directly affected attitude toward knowledge sharing and perceived behavioral control of knowledge sharing. If an interface is not easy to operate, is illogical, or causes trouble when, users will not be willing to use that system. Under this condition, user friendliness can determine rate of PVC use and whether PVC members feel in control of PVC functions.

The results indicated that compatibility positively and significantly affects user attitudes toward knowledge sharing. The Internet allows users to share knowledge with people they do not know. And there is not only one kind of virtual community on the Internet. Users can gather a variety of information through these communities. This phenomenon is especially prevalent where the Internet is so prosperous. Thus people are well accustomed to this way of sharing knowledge. Because such communities are in compliance with current user trends and values, compatibility thus significantly influences members' knowledge sharing attitudes.

6.3   Influence of Environmental Factors

The results showed that trust affects member attitudes toward knowledge sharing. Internet community members usually gather because they share an interest or vision (Chiu, 2006). They generate identification and trust among each other by and by (Chiu, 2006). Trust can help build up relationships and maintain information exchanging relationships among members (Blau, 1964). When these relationships are built on high confidence in one other, members will be more willing to participate in social exchange and cooperation (Nahapiet and Ghoshal, 1998). Previous research indicates that trust is the key factor in fostering knowledge sharing in virtual communities (Chiu, 2006; Hsu et al., 2007) and positively affects attitudes toward knowledge sharing.

The results indicated that peer influence significantly impacts the subjective norm of knowledge sharing, which is consistent with Taylor and Todd (1995). That is, friends, colleagues or classmates of the virtual community member positively influence whether the user shares knowledge in the PVC.

This study found that resource availability significantly affects perceived behavioral control. That is, cognitive and situational resources are needed to perform a behavior; they cause members to perceive that they have full control. Szulanski (1996) pointed that insufficient resources and time affect knowledge contribution. Davenport and Prusak (1998) also noted that, in the knowledge market, insufficient time can cause inefficiencies in the knowledge market. This study highlights the importance of resource availability in knowledge-sharing scenarios.

6.4   Influence of TPB Constructs

The results were consistent with the propositions of TPB. As expected, attitude, subjective norm and perceived behavioral control significantly affected knowledge sharing intentions. We suggest future researches to also note the influence of the mediator (attitude, subjective norm and perceived behavioral control) on the knowledge sharing intentions.

7   IMPLICATIONS

This study makes several important contributions to research literature. First, this study applied TPB to develop a comprehensive model that explains and predicts knowledge sharing intentions. To provide a better explanation of the knowledge sharing behavior in PVCs, a model was developed and empirically tested to analyze and predict the knowledge sharing intentions of PVC members. The TPB integrated personal motivations, technological factors, and environmental factors as external beliefs. Second, the finding indicated that attitude, subjective norm and perceived behavioral control are mediators of knowledge sharing intentions in PVCs and have key roles in the knowledge sharing intentions of PVC members. Finally, an important contribution is the identification of environmental factors that predict knowledge sharing intentions. Previous studies of user participation in virtual communities can be discussed from the system perspective (e.g., Teo et al., 2003). However, knowledge sharing involves interpersonal interaction Future research must consider environmental factors that predict knowledge sharing behavior.

This study also makes several important contributions to practice. First, the results suggest that community developers should endeavor to generate intrinsic motivation rather than extrinsic motivation; i.e., the pleasure and self-efficacy of performing knowledge sharing behavior should be

emphasized rather than behavior to achieve reputation or reciprocity. Second, community managers should consider environmental factors. For example, peer influence affects subjective norm of knowledge sharing. Members may be asked to introduce colleagues and friends to the PVC. Third, technological factors have a stronger influence on member attitudes toward knowledge sharing compared to other predictors (e.g., personal motivations). To encourage knowledge sharing, community developers must ensure the interface is useful and easy to use in order to generate positive attitudes. Finally, because knowledge self-efficacy has a strong positive effect on how PVC members perceive the behavioral control of knowledge sharing, community developers should provide useful feedback to improve individual self-efficacy.

8   CONCLUSION AND LIMITATIONS

To elucidate knowledge sharing intentions in PVCs, this study integrated personal motivations, and technological and environmental factors with the TPB. However, this study has a few inherent limitations. First, the data was collected via three PVCs in Taiwan. Future research can replicate this study in different countries to generalize the results. Second, this research hypothesized that knowledge sharing is a planned act, and the subjects were limited to those who with experience sharing knowledge on PVCs. The sample excluded subjects without knowledge sharing intention. Future researchers can compare data between members who have and have not shared knowledge. Finally, other community-related factors (e.g., community size and community identification) may also affect the formation of knowledge sharing intentions. Future research can extend this model to account for other unexplored but important factors in the PVC context.

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