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Exploring factors that influence knowledge sharing behavior via weblogs

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ABSTRACT

Knowledge sharing is seen as one of the essential processes for knowledge management. A growing number of professionals have started weblogging, and use this tool to share their ideas. It is important to explore ways to encourage individuals to contribute personal knowledge and to assist community members to share their expertise. Through the lens of sharing culture, we explore the factors that facilitate voluntary knowledge sharing in a virtual community. Specifically, the use of three categories associated with a sharing culture – fairness, identification and openness – is considered as a linear combination, which means that enjoying helping and usefulness/relevancy thereafter promote knowledge sharing behavior. To test the theoretical model, we survey 442 members of three online communities. In addition to the positive effects of fairness and openness on community sharing culture, we also find that enjoying helping, sharing culture and usefulness/relevancy are strongly linked to member knowledge sharing behavior. This paper offers a new perspective on the mechanisms related to the sharing culture construct, which in turn facilitates weblog knowledge sharing behaviors and yields important implications for understanding knowledge sharing behavior in online communities.

1. Introduction

In the contemporary knowledge-intensive economy, knowledge is recognized as a critical strategic resource for the individual, and is considered to be a source of sustainable competitive advantage (Drucker, 2001). According to Alavi and Leidner (2001, p. 109), knowledge is the information processing that takes place in human minds, as well as personalized information related to facts, procedures, concepts, interpretations, ideas, observations, and judgments. Many researchers have argued that knowledge sharing, the process by which an individual imparts his or her expertise, insight, or understanding to another individual so that the recipient may potentially acquire and use the knowledge to perform his or her task(s) better, is an essential part of effective knowledge management (Bock & Kim, 2002; Markus, 2001; Wasko & Faraj, 2005). Knowledge sharing lies at the core of continuous improvement processes and is quintessential in terms of transforming an individual's process improvements into actual learning. Davenport and Prusak (1998) defined knowledge sharing as processes that involve exchanging knowledge between individuals and groups. Further, knowledge creation is directed towards more informal knowledge sharing activities within communities of practice. Moreover, knowledge that is embedded within a community is conceptualized as the "social practice of knowing", which includes the routines and commonly shared languages of a community (Wasko & Faraj, 2005).

Huysman and Wulf (2006) noted that individuals do not share their knowledge under all circumstances, and that they may not be willing to share as much as organizations would like them to. Hansen, Nohria, and Tierney (1999) proposed two knowledge management strategies that are commonly used by successful organizations to share knowledge: codification and personalization. Knowledge sharing that involves two or more employees is a two-way process, which is believed to develop the competency of the employees involved (Nonaka & Takeuchi, 1995). Interactions can be face-to-face with a shared context or mediated via technology, such as by e-mail, text messaging, videoconferencing, or weblogs, among others. While the role of technology in terms of codification strategy is to capture the knowledge representation and to store knowledge (Grover & Davenport, 2001; Kankanhalli, Tan, & Wei, 2005), its role in terms of personalization concerns the knowledge transferred through direct person-to-person contact. In the past, user communities were highly associated with situations in which the transmission and acquisition of knowledge was both difficult and costly. However, weblog tools and technology can facilitate knowledge sharing, thereby allowing interpersonal communication to play a role in terms of knowledge sharing. Furthermore, weblog tools may assist users to gain immediate access to potential knowledge pools within user

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communities, and the use of such tools can significantly reduce the costs associated with searching for solutions to their problems; for innovative ideas, using the tools can lead to a better understanding of how new products can be improved. It is also important to ensure each individual's willingness to share knowledge with other members in virtual communities. Although researchers and practitioners have realized that individuals are not born to share knowledge, some individuals may be more inclined than others to share what they know (Wasko & Faraj, 2005). Identifying the motivation that underlies knowledge sharing behavior in cyberspace can help both academics and practitioners to gain insight into why people do or do not share knowledge.

While many factors are involved in knowledge sharing, the technology mediated environment is particularly important (Carlson & Davis, 1998). In recent years, the weblog phenomenon has undergone continuous expansion, and the weblogger population has become increasingly diverse (Hsu & Lin, 2008). Weblog tools are mainly used to support the acquisition and retrieval of codified knowledge in order to improve individual knowledge bases. Weblogs may be viewed as an evolved form of personal web pages used to publish personal knowledge. They possess the following features: personal editorship, a hyperlinked post structure, frequent updates, and free public access to the contents and archives. Also, weblogs are an appropriate media for knowledge transfer such as information that can be easily understood and recorded, or for know-how, which is more complex and usually involves several types of hypertext documents. A growing number of professionals have started weblogging and use it to present their work, to follow developments in the field, and make ideas known or published. Anderson, McEwan, Bal, and Carletta (2007) and Ma and Agarwal (2007) have pointed out that this technology provides the foundation and mechanisms for communication and interaction within an online community. The technology mediated environment can help knowledge accumulation by processing and presenting information in flexible ways. Further, members in any community become more inclined to use information technology (IT) if they are encouraged, are able, and have the opportunity to share knowledge with others (Ruppel & Harrington, 2001).

To date, little empirical research has been conducted to investigate virtual community environments and mechanisms in terms of their conduciveness to knowledge sharing behavior. The objective of this research paper is to examine the factors that influence the knowledge sharing behaviors of community members. Since knowledge sharing does not happen in a vacuum, but is influenced by psychological factors and factors related to organization culture, this study will examine the effect of these two aspects on knowledge sharing behavior. The remainder of this paper is organized as follows. In Section 2, the research model and study hypotheses are presented based on theoretical and empirical rationales. The research methodology and specific information pertaining to the research procedures and measures are given in Section 3, while Section 4 outlines the data analysis techniques and presents the results. Finally, the implications of the findings are discussed in Section 5, together with theoretical and managerial implications and an overview of the limitations associated with this study as well.

2. Literature review and hypotheses

The two stories illustrate possible scenarios of virtual community members sharing their knowledge with their communities.

> John is a programmer who attends a Java program community. John enjoys contributing to the community FAQ documents or discussion archives and does so on a regular basis. When asked why he enjoys using the weblog he replies, "Well, that way I don't have to deal with all those annoying people asking annoying questions. I can just tell them where to go for the answers!"
>
> Ella, a board manager in a software development community, wants to be seen as exemplary in terms of knowledge sharing. She believes very strongly that sharing her knowledge is a part of her duties as a manager, but that it is also important to share knowledge to set an example for others. There is very little that Ella would consider withholding from a colleague, unless it was of a very confidential nature or a need-to-know basis. She also recalls many instances where she had spent a large amount of time and energy helping others solve their problems.

As Nonaka (1994) stated, knowledge is created through cycles of combinations, internalizations, socializations, and externalizations; together, these transform knowledge between the tacit and explicit modes. Knowledge sharing is one of several knowledge management processes; these include knowledge creation/generation and knowledge acquisition, knowledge codification, and knowledge sharing, which is similar to knowledge transfer and knowledge use or application (Alavi & Leidner, 2001; Bock & Kim, 2002; Davenport, De Long, & Beers, 1998; Kankanhalli et al., 2005). Knowledge sharing is defined as the sharing of community related information, ideas, suggestions and expertise among individuals. Based on Davenport and Prusak's (1998) proposal, we operationally define knowledge sharing among community members as a process that includes the attempt to transfer knowledge by a sender, the completion of the transfer, and the successful absorption of this knowledge by a recipient. To be more specific in terms of the current study, knowledge sharing behavior concerns the willingness of individuals in a virtual community to share with others the knowledge they have acquired or created. Unlike traditional knowledge diffusion where individuals passively accept content, knowledge can be created or spread by community members through active participation. The sharing can occur directly via communication, or indirectly via some webpage. In virtual communities, knowledge sharing behavior cannot be forced but can only be encouraged and facilitated. However, additional investigation is required in terms of what factors are likely to affect or induce such knowledge sharing behaviors.

Employing Nonaka's (1994) model and adapting a process oriented perspective, Lee and Choi (2003) developed an integrative research model that interconnects knowledge management enablers and processes with organizational performance. In addition, their study emphasized the significance of a trust-based culture in terms of effective knowledge transfer, but noted that organizations may face some difficulties in building a knowledge sharing environment due to the lack of an adequate culture, even considering their well-developed information technology. Huysman and Wulf (2006) also suggested that the culture of sharing in a virtual community is a critical driver of knowledge sharing: when a community generally encourages knowledge sharing, the members are more likely to seek out external assistance. Another facet of their study concerned the level of espoused value, which includes the set of derived beliefs/norms/values that remain implicit or explicit within an individual. Previously, Denison (1996 p. 624) reported that "culture refers to the deep structure of organizations which is rooted in the values, beliefs and assumptions held by organizational members". Moreover, according to the social perspective, Bock, Zmud, Kim, and Lee (2005) found that three virtual community culture factors for knowledge sharing are related to these institutional structures: i.e., fairness (a trusting climate), identification (a group-specific climate that facilitates team interaction), and innovativeness (a climate that is tolerant of failure). From our interviews and based on the contextual factors identified in the prior literature, we derived three community sharing cultural

factors: fairness (a trusting climate), identification (a climate characterized by pro-social norms), and openness (a climate where information flows freely). With these factors in mind, it seems that community culture is a multi-dimensional construct that may occur at different cognitive levels. In addition, it seems obvious that culture is a formative construct since the three subscales represent significantly different dimensions. The culture latent construct is a linear combination of its indicators; when consequences of the latent construct are included, the formative model can be estimated.

Perceived fairness is the expression used to depict the role of fairness as it directly relates to the community (Hsu, Ju, Yen, & Chang, 2007; Kim & Mauborgne, 1998). In particular, perceived fairness points to the means by which members decide if they are treated fairly within the community, and to the ways in which these decisions affect other related factors. Perceived fairness was shown to play a strong role in members' disposition to share their knowledge. Perceptions regarding the fairness of the community are seen as prerequisites for social exchange between the individual and the community (Hsu et al., 2007). Moreover, reciprocity also plays a beneficial role, as it induces feelings of personal obligation, gratitude and trust. When a person perceives interaction fairness, he/she is predicted to react positively toward the interaction community. As well, individuals who trust each other are more willing to share relevant ideas and comprehensive information, as well as to clarify goals and problems with a problem-solving orientation; therefore, it is an important facilitator associated with sharing via online communication (Bock et al., 2005). According to Podsakoff, MacKenzie, Paine, and Bachrach (2000), perceived fairness has a significant relationship with organizational culture. Kankanhalli et al. (2005) also found that contextual factors (generalized trust, pro-sharing norms, and identification) moderate the impact of extrinsic benefits (reciprocity and organizational reward) on electronic knowledge repositories (EKRs) used by contributors. Additional studies have suggested that individuals engage in knowledge sharing with the expectation that their future knowledge requests will be positively met by others (Bock et al., 2005; Kankanhalli et al., 2005; Raban & Rafaeli, 2007; Wasko & Faraj, 2005).

Hollander and Willis (1967) suggested that individuals have a natural need to belong to their work team, and adapt to the norms and values of the team in order to avoid sanctions. The identity beliefs are grounded in cultural assumptions and values, but specifically involve only those characteristics that are seen as self-defining. Identification has been proposed as a precursor to in-group cooperation (Tyler, 1999), organization citizenship behavior (Podsakoff et al., 2000; Van Dick, Grojean, Christ, & Wieseke, 2006; Yu & Chu, 2007), and support for the organization (Jones, Cline, & Ryan, 2006; Ruppel & Harrington, 2001). Consequently, virtual community members are more likely to perceive themselves as group colleagues, and thereby form participation intentions in relation to this plural target. If two actors have direct and frequent interaction with each other, they are more likely to think alike or behave similarly (Szulanski, Cappetta, & Jensen, 2004). The interpersonal affiliation shared by virtual community members has also been shown to increase the willingness to share knowledge and resources with other members, to provide support, and to commit to group-based goals (Barrett, Cappleman, Shoib, & Walsham, 2004; Ma & Agarwal, 2007). Further, stronger identification with the community unit results in greater in-group favoritism, while increased social identity reduces competition between group members. A group of people can become a community-of-practice if individuals contribute in a voluntary manner because they feel that more can be learned through community participation, and because they identify closely with their own perceptions of the community culture. Moreover, Ma and Agarwal (2007) presented empirical evidence that identification with the cyber community unit increases knowledge sharing within the group.

Information technologies can be thought of as artifacts that reflect social values and norms. If the community encourages sharing knowledge, then members are expected to open the flow of knowledge to enact the norm. Therefore, we might expect open and organic cultures to increase the use of technology for knowledge sharing. Curry and Stancich (2000) suggested that an ethical and open culture is key to enabling knowledge sharing. Hult, Ketchen, and Nichols (2002) argued that the knowledge necessary to learn within the group and to create something new is inherently difficult to articulate and communicate. Within the community, the notion of interaction intensity induces members to communicate closely in order to establish cooperation patterns. Further, interactive learning allows members to get close enough to acquire not just the explicit knowledge, but the deeper tacit components of knowledge (Lin, 2007). In addition, the more intensive the interactions among community members are, the more willing they are to build relationships with each other and to share capabilities and knowledge. In turn, if member interaction and knowledge sharing experiences are positive, openness is improved. The above discussion shows that community openness is an important factor in determining the extent to which people within a community share knowledge among themselves. In the current study, we treat the community's openness in the domain of knowledge sharing culture as an individual propensity that is, in general, associated with more positive beliefs in terms of knowledge sharing. Consequently, this study employs the concept of openness as an antecedent of community knowledge sharing culture, which leads to the following hypotheses:

H1: In the online community knowledge sharing context, individual fairness perceptions positively affect knowledge sharing behavior mediated through community sharing culture.

H2: In the online community knowledge sharing context, individual identification perceptions positively affect knowledge sharing behavior mediated through community sharing culture.

H3: In the online community knowledge sharing context, individual openness perceptions positively affect knowledge sharing behavior mediated through community sharing culture.

Wasko and Faraj (2005) defined electronic networks of practice as computer-mediated discussion forums where individuals exchange ideas on problems of practice with others based on common interests. It was also found that individual decisions regarding whether to share knowledge or not can be influenced by the perceived benefits and costs of sharing. Further, reciprocity can facilitate knowledge sharing, and individuals who share their knowledge with others are expected to benefit from their sharing behavior (Wasko & Faraj, 2005). This differs from altruism, which concerns the performance of some behavior intended to benefit others without expecting anything in return (Lin, 2007; Podsakoff et al., 2000; Raban & Rafaeli, 2007). Helping behaviors can enhance value, group cohesiveness, and the sense of belonging to a team, all of which may improve work performance and help the virtual community to attract and retain better members. Knowledge sharing through weblogs can be seen as a form of generalized social exchange where more than two people participate and reciprocal dependence is indirect, with the weblog as the intermediary between knowledge contributors and seekers. Frequent interactions with community members can assist the exchange of both tacit and codified knowledge; moreover, individuals may contribute knowledge to the community because they feel that helping others solve problems is interesting and they derive feelings of intrinsic

enjoyment by doing so (Davenport & Prusak, 1998; Kankanhalli et al., 2005; Wasko & Faraj, 2005). Szulanski et al. (2004) suggested that that the motivational forces are derived from individual belief structures and institutional structures, i.e., the values and norms of the community. As such, many people feel morally obligated to share knowledge in order to contribute positively to the community advancement. By fulfilling their own altruistic or pro-social motives, virtual community members derive intrinsic enjoyment. Therefore, our fourth hypothesis predicts the following:

H4: Enjoyment related to helping others has a positive effect on the virtual community member's knowledge sharing behavior.

Furthermore, there are many additional influences on knowledge sharing, including environment, managerial and technical artifacts, which are all influenced by organizational culture. Hall and Goody (2007) suggested that organizational culture has an effect on people's attitude towards sharing information. Alavi and Leidner (2001) also posited that a sharing culture is manifested in the deep beliefs/values/attitudes within an organization. Moreover, knowledge is embedded in the context of individual value, and culture influences the virtual community members in terms of sharing what they know. For instance, previous researchers (Bock et al., 2005; Davenport & Prusak, 1998; Davenport et al., 1998; Jones et al., 2006) have suggested that the culture of sharing supports the notion that such knowledge sharing can lead to a more effective use of knowledge management tools, and can ultimately visualize the benefits that are attributed to knowledge sharing behavior. Furthermore, a culture that encourages the free flow of knowledge also encourages individuals to share more of their knowledge with each other, thereby increasing the quantity and quality of the knowledge pool in the community (Hult et al., 2002; Raban & Rafaeli, 2007). This study ought to comprehend a specific and perhaps limited view of culture which is the beliefs/norms/values that motivate member's knowledge sharing behaviors. We therefore hypothesize that:

H5: A sharing culture has a positive effect on virtual community members' knowledge sharing.

An individual decision regarding whether or not to share knowledge can be influenced by the perceived benefits and costs associated with each option. For instance, perceived usefulness in the context of knowledge sharing behavior is "the sharer's belief of the likelihood with which the knowledge sharing behavior can improve work efficiency and economic benefits of the individual" (Kankanhalli et al., 2005). In general, perceived usefulness – the beliefs concerning instrumental outcomes associated with knowledge sharing – has recurred as a highly salient predictor of key knowledge sharing behavior in prior empirical examination of knowledge sharing (Bock et al., 2005; Hult et al., 2002; Kankanhalli et al., 2005; Wasko & Faraj, 2005). Indeed, from a potential knowledge sharer perspective, the perceived usefulness of knowledge sharing should increase to the extent that the various contacts have shared the knowledge and communicated their reasoning (Brockman & Morgan, 2003; Kankanhalli et al., 2005). Thus, our final hypothesis:

H6: Perceived usefulness/relevancy has a positive effect on virtual community members' knowledge sharing behavior (see Fig. 1).

3. Methods

The current study is an attempt to construct a theoretical model to predict and explain virtual community knowledge sharing behaviors via weblogs, as well as test the model empirically. The subjects for this research were recruited from the numerous internet users who have used or have the potential for knowledge sharing. A pilot test was conducted before the final questionnaire was distributed to the subjects. To ensure the appropriateness of the research design, the validity and reliability of the items were tested as well.

3.1. Measure development and validation

Knowledge sharing behavior is difficult to observe from an external perspective due to the nature of knowledge in relation to information (Davenport & Prusak, 1998). Furthermore, informers are the best judges as to whether or not knowledge gets shared. In other words, self-reporting is a fair way of measuring actual knowledge sharing. To minimize the possibility of the participants reconstructing history to present a consistent and logical picture, the measurement of intentions was separated from the measurement of actual knowledge sharing as we tested the proposed research model.

Our scale development followed the recommendations of Straub, Boudreau, and Gefen (2004) and the standard psychometric scale development procedures of Devellis (2003). Scales pertaining to the enjoyment of helping were adapted from Alavi and Leidner (2001), Kankanhalli et al. (2005), and Wasko and Faraj (2005); the cultural constructs (fairness, identification, openness) were adopted from Bock et al. (2005), Barrett et al. (2004), Hult et al. (2002), Ma and Agarwal (2007), Kankanhalli et al. (2005), and Podsakoff et al. (2000); the perceived usefulness from the Technology Acceptance model scale (Bock et al., 2005; Davis, 1989; Venkatesh & Davis, 2000; Wasko & Faraj, 2005); and knowledge sharing behavior from Bock et al. (2005) and Davenport et al. (1998).

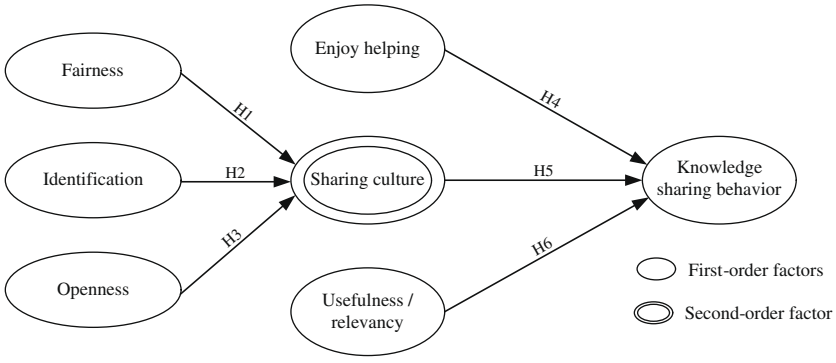

Fig. 1. Knowledge sharing behavior theoretical model.

The initial instrument was reviewed by three researchers, who are experts or have great interest in knowledge management. The instrument was revised based on their comments. Also, the face and content validity of the instrument was verified based on the in-depth interviews with these professionals, the generation of constructs based on an extensive study of prior literature in related fields such as knowledge creation, knowledge transfer, knowledge sharing and knowledge building, and the adaptation of measurement items validated in previous empirical studies.

All items were measured using a 7-point Likert-type scale ranging from "strongly agree" to "strongly disagree". To ensure the desired balance and randomness of the items in the questionnaire, three items were negated and all items were randomly arranged to reduce the potential ceiling (or floor) effect that induces monotonous responses in response to items designed to measure the same construct. Considerable effort was made to ensure that each statement in the final instrument captured the intended meaning of the construct under investigation. A pilot study was conducted prior to the actual test. The initial questionnaire was given to 50 subjects who reported that they had shared knowledge within a community and were familiar with weblogs. The reliability scores, based on the report of Cronbach's alphas ranging from 0.605 for knowledge sharing behavior to 0.879 for openness, imply that the scales used in this study were satisfactory in terms of measuring the constructs of interest. On the basis of the pilot study results, the questionnaire was revised twice more.

3.2. Sample and descriptive statistics

The purpose of this study was to determine the specific factors that influence knowledge sharing behavior within weblogs. To fulfill our objectives, this study used online and interview surveys. The research model was tested with data from members of three professional virtual communities called Chip123 (Taiwan RD Innovation Forum), TESEC (Taiwan Elementary and Secondary Educator Community) and Blueshop. Invitation e-mails to answer a series of questions on an attached URL linked to a web-based survey form were sent to potential participants; each e-mail contained an introduction regarding the purpose of the study and the website URL for the actual survey. Only offline responses submitted within 60 days of the survey request were included in the analysis. Participation in the study was completely voluntary, but was limited to those subjects who were eighteen or older and who had knowledge sharing experience via weblogs. In total, 442 (318 via offline data collection, 124 via online data collection) usable responses were obtained.

The data from the two sources were combined into a chi-square analysis that showed that there were no significant differences between the two groups. Non-response bias was also examined using a split-sample analysis of online and offline responses. A chi-square analysis was used to investigate the differences between the data collected from offline and online sources. Further, we also investigated whether there were any significant differences in terms of demographic variables, and the chi-square results for those variables, including gender, age group, educational level, knowledge sharing experience and community member history, show that there were no significant relations between the online and the offline data sources: the chi-square values ranged from 0.498 to 5.111, while p values ranged from 0.402 to 0.638. The results of these analyses suggest that non-response bias was not a threat to this study. Based on the above, we combined the two data sets and analyzed them as one data set (see Table 1).

4. Results

Structural equations modeling (SEM) was used in a comprehensive, combined analysis of both measurement and structural models. The use of SEM has become increasingly accepted in both the Information Systems and the Behavioral Science literature (Chin, 1998). Advantages of SEM include explicit modeling of measurement error, estimation of both direct and indirect relationships among the latent variables and the provision of various indices of global model fit. The LISREL software package was used to perform all SEM statistical procedures, and all research hypotheses were tested using LISREL 8.72 and SPSS 10.0 with the measurement items. Using LISREL 8.72 with the maximum-likelihood estimation,

Table 1
Profiles of respondents.

Demographics	Level	Online dataset	Offline dataset	Chi-square value	p value
Gender	Male	37	106	0.498	0.499
	Female	87	212		
Age	19 or younger	14	56	2.820	0.588
	20–29	19	45		
	30–39	63	149		
	40–49	17	43		
	50 or older	11	24		
Educational background	Secondary high school	11	32	2.539	0.638
	Associate degree	49	124		
	Undergraduate degree	60	147		
	Graduate degree	1	10		
	Doctoral degree	3	5		
Knowledge sharing experience	Less than 6 months	79	199	4.037	0.544
	6 months–1 year	33	74		
	1 year–2 years	8	32		
	2 years–3 years	3	5		
	Over 3 years	1	3		
	Missing value	0	5		
Member history	Less than 6 months	28	83	5.111	0.402
	6 months–1 year	31	82		
	1 years–2 years	29	90		
	2 years–3 years	27	44		
	Over 3 years	8	16		
	Missing value	1	3		

we tested the hypothesized models and paths in the models. The virtual community culture construct included a second-order factor with three first-order factors as formative indicators, and first-order factors with reflective indicators. Also, the data analysis was divided into two sections, including an analysis of the measurement and of the structural model.

4.1. Measurement model evaluation

The measurement model specifies the relationships between the observed variables (manifest variables, or indicators) and the latent variables (constructs being measured). Using LISREL estimations and traditional alphas, the assessment of the measurement model includes an investigation of reliability coefficients (Cronbach's alpha), composite reliability coefficients (LISREL internal consistency coefficients) and Average Variance Extracted (AVE).

Bollen (1989) suggested that lambda, or standard loading, and the squared multiple correlations between items and constructs should receive attention during the measurement model testing. In the analysis of the measurement model, each item on seven hypothesized constructs was significant, and $p < 0.01$ in all cases. Aside from the significant loading of all items to their constructs, the analysis of the squared multiple correlations (SMC) demonstrated that the majority of the items in this study met the recommended criteria of 0.40 (Taylor & Todd, 1995), as depicted in Table 2. Further, internal consistency was assessed by means of Cronbach's alpha coefficient: values were calculated for each of the multi-item factors included in the model. The Cronbach's alpha coefficient ranged from 0.770 to 0.884, and the results presented in Table 3 attest to the high internal consistency of the instrument in which all values were above the suggested level of 0.70 for scale robustness (Nunnally & Berstein, 1994). The internal consistency of the measurement model was assessed by computing the composite reliability; the coefficients ranged from 0.801 to 0.891, and are displayed for each of the variables under study in Table 3. In addition, all constructs displayed a higher composite reliability than the benchmark of 0.60 recommended by Fornell and Larcker (1981). These indictors suggest that the data exhibited high internal reliability.

The average variance extracted indicates what percentage of the variance of the construct is explained by an individual item. In this study, all constructs demonstrated average variance extracted values of between 0.578 and 0.681 (see Table 3), which are higher than the benchmark of 0.5 recommended by Fornell and Larcker (1981). Overall, the average variance extracted from the constructs demonstrated a satisfactory reliability and validity. In sum, the internal consistency and validity results enabled us to proceed to an estimation of the structural model.

Table 3
Construct reliability results.

Construct	Cronbach's alpha	Composite reliability	Average variance extracted
Fairness	0.860	0.865	0.681
Identification	0.884	0.891	0.671
Openness	0.863	0.870	0.626
Enjoy helping	0.808	0.808	0.584
Usefulness/relevancy	0.770	0.801	0.578
Knowledge sharing behavior	0.859	0.867	0.620

4.2. Structural model estimation

A structural model is analyzed to investigate and depict the link among variables in a proposed model (Byrne, 1998). In the current study, the constructs and their hypothesized relationships were tested simultaneously. Results of structural equation modeling obtained for the theoretical model revealed a chi-square of 602.09 (df 174; $p \leqslant 0.001$), chi-square/df of 3.460, GFI of 0.884, adjusted GFI of 0.846, RMSEA of 0.076, NFI of 0.966, NNFI of 0.971, and CFI of 0.976. The indices for measuring the fitness of the structural model are provided in Table 4.

Although the p value of the chi-square result did not meet the recommended value as depicted in Table 4, this significant p value of 0.000 can be explained by the relatively large sample size employed in this study (442 respondents). Unfortunately, the statistical analysis of chi-square is sensitive to large sample sizes and will reject even a closely fitting model (Bagozzi & Yi, 1988). Therefore, additional indices were utilized to evaluate the fitness of the structural model. The relative chi-square is calculated by dividing the chi-square statistic by its degrees of freedom. Carmines and McIver (1981) indicated that a ratio of a chi-square to degrees of freedom

Table 2
Results of the measurement model.

Constructs	Item	Loading	SMC
Fairness	Overall, I feel fairness within this community	0.85	0.72
	The manager does not show favoritism to any one	0.85	0.72
	I believe the manager evaluation to be good	0.78	0.61
Identification	I am proud to be a member of this community	0.84	0.71
	When someone criticizes this community, it feels like a personal insult	0.82	0.67
	I feel that my community does not care about me	0.80	0.64
	When I talk about this community, I usually say "we" rather than "they"	0.82	0.67
Openness	Open communication is a characteristic of my community as a whole	0.80	0.64
	We are continuously encouraged to bring new knowledge into this community	0.80	0.64
	Sharing knowledge is encouraged by my community in action and not only in words	0.79	0.62
	Generally, I cannot get enough resources that I need in terms of my knowledge sharing	0.78	0.61
Enjoy helping	My knowledge sharing with other members is an enjoyable experience.	0.71	0.50
	I often help other people in this community who need help/information from other members	0.78	0.61
	It feels good to help other members by sharing my knowledge	0.80	0.64
Usefulness/relevancy	I feel that the knowledge sharing with other members is reliable	0.81	0.66
	I feel that the knowledge sharing with other members is beneficial	0.85	0.72
	I feel that the knowledge sharing with other members is valueless	0.60	0.36
Knowledge sharing behavior	I have contributed knowledge to this community	0.77	0.59
	I usually actively share my knowledge with others	0.82	0.67
	I have contributed knowledge to other members that resulted in the development of new insights	0.78	0.61
	I have tried to share my educational and training expertise with other members in more effective ways	0.78	0.61

Table 4
Measures of model fit and reported values for structural model.

Fit index	Recommended values	Model values	Model fit
Chi-square	$p \geqslant 0.05$	602.09 ($p = 0.000$)	Poor fit
Chi-square/degree of freedom	$\leqslant 5$	3.460 ($df = 174$)	Good fit
GFI (goodness of fit index)	$\geqslant 0.9$	0.884	Moderate fit
AGFI (adjusted goodness of fit index)	$\geqslant 0.9$	0.846	Moderate fit
RMSEA (root mean square error of approximation)	$\leqslant 0.08$	0.075	Good fit
NFI (normed fit index)	$\geqslant 0.9$	0.966	Good fit
NNFI (Non-normed fit index)	$\geqslant 0.9$	0.971	Good fit
CFI (Comparative fit index)	$\geqslant 0.9$	0.976	Good fit

smaller than 5:1 is considered an acceptable fit, and that the chi-square value should be as small as possible. Although GFI and AGFI values exceeding 0.90 are preferable, the more liberal cutoff of 0.80 has been used for a good model fit (Hair, Black, Babin, Anderson, & Tatham, 2006). Table 4 shows that most indices indicated a reasonably high level of fitness for the structural model in this study.

4.3. Interpretation of structural model testing

The standardized solution estimated by the LISREL 8.72 program was used for interpreting the structural relation results. Path coefficients for each value from the models are shown in Fig. 2, which also confirms that the model explains a substantial portion of the variance in all the endogenous variables: 80.6 percent for sharing culture and 78 percent for knowledge sharing behavior. All of the six causal paths are specified in the proposed model; five were found to be statistically significant for knowledge sharing behavior. These paths reflect the impact of fairness (H1) and openness (H3) on community sharing culture (0.56 and 0.35), and enjoying helping (H4), sharing culture (H5), and usefulness on knowledge sharing behavior (0.43, 0.46, and 0.14, respectively).

Next, the direct effects of antecedents on the sharing culture of community (i.e., fairness, identification, and openness) were examined. Fairness and openness on sharing culture paths were positively significant, and the results were consistent with those of previous studies (Bock et al., 2005; Curry & Stancich, 2000; Hult et al., 2002; Kankanhalli et al., 2005; Wasko & Faraj, 2005). Although the link between identification and sharing culture was identified in previous studies (Barrett et al., 2004; Ma & Agarwal, 2007; Van Dick et al., 2006), the current study shows that the effect of community identification on members' sharing culture was not statistically significant. Therefore, H1 and H3 are supported. These results suggest that participants are more likely to contribute to the online team, and that there is more individual commitment toward a sharing culture when fairness and openness are apparent.

Further, all of the independent variables had a significant effect on the knowledge sharing behavior within the online community. In fact, sharing culture was the most important factor associated with knowledge sharing behavior, which indicates that members in better sharing relationships are more likely to expend effort on knowledge sharing behaviors that benefit the whole community. Previous research has suggested that the culture of sharing in an online community is associated with the attitude toward sharing knowledge in general (Bock et al., 2005; Davenport et al., 1998; Jones et al., 2006). In the current study, sharing culture was found to be an antecedent of members' positive knowledge sharing behavior as a member of an online community. In addition, enjoyment related to helping others and usefulness/relevancy in terms of knowledge sharing behavior paths were positively significant, which is also consistent with previous results (Bock et al., 2005; Davenport & Prusak, 1998; Kankanhalli et al., 2005; Podsakoff et al., 2000; Wasko & Faraj, 2005).

4.4. Addressing common method variance

Common method variance is a potential threat to internal validity, particularly when using surveys that collect responses in a single setting. This threat was addressed in a variety of ways. First, the threat of common method bias is high if a single factor can account for majority of covariance between the independent and dependent variables (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Using Harman's one-factor test, we did not detect any single factor that could explain the majority of the covariance. In addition, the number of posts made on the websites employed in this study during the one month period before the questionnaires were collected and the correlation with self-reported knowledge sharing behavior was assessed. There was a significant correlation (0.33, $p < 0.01$) between self-reported knowledge sharing behavior and the number of posts, further underscoring the interval of the knowledge sharing behavior measure.

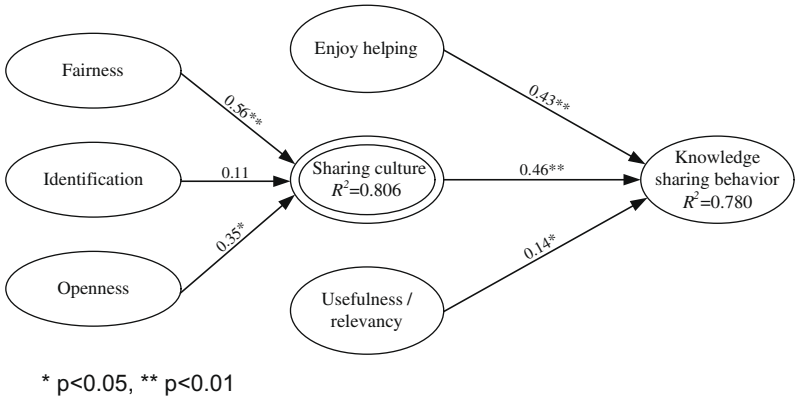

Fig. 2. Path coefficients for the knowledge sharing behavior model.

5. Conclusions

5.1. Discussion and implications for management

It is not uncommon for virtual communities to employ the use of "team virtuality" in regards to interest teams, commerce teams, relationship teams, and transaction teams. When such groups employ weblogs or the web 2.0 platform for discussions, there is a tendency for members to exchange information and knowledge that is common to all, at the expense of unshared knowledge that might pertain to members' areas of expertise. The weblogs help to improve the diversity of the information and encourage members who to contribute individual knowledge. The literature review section of this paper includes two stories related to individuals and their knowledge sharing behaviors: John with his love of sharing through repositories and dislike for sharing with individuals, and Ella with her pride in sharing as much as possible either directly or through the use of knowledge repositories. Each of these individuals had different reasons for sharing or not sharing their knowledge. The reasons why people share or horde their knowledge are unique to each situation and context – the most popular answers are "I enjoy it!" or "I like it!" However, the results of the current study show that there are some aspects that are common and that can predict individuals' knowledge sharing behaviors within virtual communities. Specifically, this paper increases our theoretical and empirical understanding of the knowledge sharing beliefs and behaviors common within an online community domain.

Since the internet has lowered the barriers to entry, online sharing behavior has become more common: networks of practice are now able to extend their reach using technological advances such as websites, electronic bulletin boards, e-mail listservs, and Wikipedia. The aim of this study is to test a behavior model in terms of why people share knowledge with others within online communities. Surveys conducted in three online communities provide empirical support for the structural model. Our results provide support for the theoretical model and qualified support for most of our hypothesized relationships. The results show that the consistency of the behavioral model and the latent variables have great convergent and discriminant validity, and suggest that the proposed behavioral model can effectively predict members' knowledge sharing behaviors within online communities. Also, the model is able to explain 78% of the variance pertaining to intentions toward knowledge sharing behaviors.

Furthermore, the results indicate that fairness and openness significantly affect the sharing culture. Previous research (Bock et al., 2005; Kankanhalli et al., 2005; Wasko & Faraj, 2005) has suggested that the perceived fairness of the community is associated with their attitude toward knowledge sharing. In the current study, fairness was found to be an antecedent of colleagues' perceived sharing culture while using weblog sharing knowledge. Some online community members' willingness to help others seemed to stem from the belief that it is only fair to help others if they, themselves, have received help from the community. To ensure the fairness of the community, online community managers should take an active role as experts within the online community to offer appropriate rewards and lead the ongoing member discussions. The perceived openness in terms of community knowledge sharing to the effectiveness of colleagues' knowledge sharing behaviors depends on the nature of the sharing culture. This finding shows that high openness members are more eager to participate within their communities since they view such interactive environments as ideal places to exchange opinions and request advice about problems. Thus, in addition to open communication, an environment of equality in which members actively participate in knowledge construction should help to encourage individuals to share what they know with others.

Another interesting result pertains to the fact that identification for a sharing culture was not statistically significant. This finding contradicts most of the research findings and theoretical discussion within the existing knowledge sharing behavior literature, where identification is often extolled as a necessary foundation for knowledge sharing behavior (Barrett et al., 2004; Ma & Agarwal, 2007; Van Dick et al., 2006). Members in this study primarily viewed their community as an informational and social universe, rather than as a commercial dynamic. In an online community, colleagues often do not use their real names – nicknames or usernames are more common, as are alterable online personalities and social roles. In other words, identification is a weak subjective norm within the community sharing culture: if members' feelings of affiliation and belonging are based on a shared culture and interests, members are more apt to develop a sense of membership in the online community, even though they meet in cyberspace. These results suggest that a community design supporting effective identity expression and communication will lead to voluntary knowledge contributions. Highly identified members were also more likely to contribute to the organization with several desirable cooperative behaviors related to helping other members and spreading good references. Specifically, members associated with high identification were more likely to purchase proposed services or products based on other members' information and suggestions.

Further, enjoyment related to helping others significantly impacted the knowledge sharing behavior of community members. As hypothesized, when people feel good about sharing knowledge in an effort to help others, they tend to be more motivated to carry out the sharing behavior, highlighting altruism as a motivator for knowledge sharing behavior. The results of this study also provide positive evidence that individuals who enjoy helping others provide more helpful knowledge, as suggested by prior research examining knowledge sharing on the internet (Davenport & Prusak, 1998; Kankanhalli et al., 2005). The fostering of individual enjoyment affects other intrinsic benefits and may be sufficient to motivate members to contribute knowledge. The Blueshop community is an example of an initiative that raises altruism in this way: using a software program, people who have provided useful technical assistance to other software technology users are identified and informed that they have helped others.

Additionally, blog channels implicitly create loosely joined interest groups, which may eventually lead to the creation of an open shared-knowledge repository if sufficient cohesion exists among channel contributors. Our findings confirm that the significance of the sharing culture makes voluntary participants in the virtual context contribute to the community. This finding also implies that a knowledge sharing "culture" does play a role as a motivator of formalized knowledge sharing. This situation arises as a consequence of the development of an increasingly specialized community culture with a common interest, which in turn results in more efficient communication amongst members in terms of the value of introducing a learning phase where newcomers can assimilate the concepts and the culture of the group. Our results show that individuals in communities with strong positive perceptions of the community's knowledge sharing culture have a higher propensity to build shared networks. Members may secure exchange relationships by building a sharing culture as relationships develop. Also, the types of technology chosen should match the existing virtual community's culture. In practice, managers should play an active role in the selection of user-friendly information technology to ensure that it builds upon or at least matches the existing knowledge sharing culture, and enhances existing social networks within the virtual community.

The role of the perceived value of knowledge (usefulness/relevancy) for knowledge sharing behaviors was also examined. Previous research has found that the more valuable the knowledge is, the more likely an individual will be to share it (Brockman & Morgan, 2003; Kankanhalli et al., 2005). Our results indicate that the perceived value of knowledge had a positive relationship with sharing behaviors with colleagues. Respondents in the current study explained that they shared high value knowledge with close colleagues because the recipients had a need for it and because of their interpersonal relationships and history with those close colleagues. If the knowledge was of low value to the individual but of high value to the recipient, then full knowledge sharing occurred, while knowledge sharing did not occur when the knowledge was thought to be of low value for both the owner and the potential recipient. Because members can enjoy various benefits based on their participation in online communities, the major benefit likely consists of the opportunity to share information or knowledge and to communicate with like-minded people.

Finally, community members have the ability to contribute to the development of interactive environments that value and promote knowledge sharing. In short, there is great value created when groups of individuals share knowledge in a public forum; managers of virtual communities should create an environment within which voluntary contributions are promoted effectively. This knowledge sharing behavior is linked in important ways to members' desire to receive feedback from a virtual community that creates, maintains, and enhances an effective knowledge sharing platform. This study has broad research implications in terms of its fresh perspective on computer-mediated coordination and collaboration, and can serve as the foundation for future research. For example, mass collaborative authoring, as occurs in wiki repositories and other sites like Wikipedia, is a relatively new activity with no close corollary in our daily lives; it provides many new opportunities for peer groups to create resources of immense value. Empowering these peer communities through collaborative authoring and other collaborative endeavors will have an enormous impact on the virtual communities in which we live.

5.2. Limitations

Although this study provides insights into the factors affecting colleagues' knowledge sharing behavior in virtual communities, the results must be interpreted with caution. First, although our sample size is more than adequate for testing the theoretical model, members from only three communities were surveyed; thus, external validity limitations exist. Furthermore, the interview survey respondents all live in Taiwan, which may introduce a selection bias to the findings. Related to this is the issue that the online survey sample was drawn from the member list of only three online communities: these users may possess specific characteristics that limit the generalizability of the research findings to other populations. Additional investigations with other types of online communities are necessary to generate findings that are more robust and generalizable.

Secondly, although the model results generally support most of the hypotheses, the use of self-reported scales raises the possibility that common method variance may account for some of the results obtained. On the one hand, self-report measures represent the most appropriate method in this study because all the model variables referred to subjective states. However, as with any self-reported behavior, this runs the risk of a response bias. One strength of the methodology employed is that we employed two methods to measure knowledge sharing behavior – a questionnaire and a check of users' posting history – and then computed the correlation coefficient to ensure that the relationship between knowledge sharing behavior and the number of posts did not change due to attrition. While the results of the validity and reliability tests provided sufficient confidence in the statistical findings, similar studies that employ multi-method, multi-trait measurements should yield more powerful results.

The third limitation relates to the formative scale validation. A formative measurement model is identifiable only when the consequences of the latent construct are included, which can be viewed as a sharing culture model that includes both a measurement model and structural models. Classical test theories such as structural equation modeling assume that the underlying latent construct causes the observed indicators or items in the measure traditional reflective indicators. For formative indicators, the direction of causality is the opposite, so we do not compute the internal reliability of the construct.

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