Empirical Investigation on Relational Social Capital in a Virtual Community for Website Programming

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Abstract

A virtual community of interest has a specific and narrow topic of discussion. Therefore, these communities attract registered members who are focused on knowledge sharing. The current research examines whether network ties, which are an aspect of structural social capital that can be categorized into strong and weak social ties, can provide a non-trivial explanation for members' trust, reciprocity, and identification in a virtual community for website programming interest. This relationship enables us to examine a context in which members share a common goal of resolving programming problems through knowledge sharing in contrast with other community settings where only general topics are discussed (e.g., societal and emotional issues). Data were collected through a survey of a virtual community for website programming composed of 69 members. Affirming conventional perception, results of the study indicate that weak ties affect the level of generalized trust and facilitate group identification. Remarkably, the number of members' strong ties is not significantly related to the degree of their perceived norms regarding generalized reciprocity. Reciprocity refers to a mutual expectation that a benefit granted at present should be repaid in the future. The results suggest two key points. First, even for a virtual community of interest, weak ties overshadow strong ties in explaining the outcome variables. Second, reciprocity is not guaranteed even in a focused form of discussion with a non-social topic that involves specialized knowledge. Therefore, virtual community members should be cautious even if ties are strong. Overall, results imply that virtual community administrators, particularly those who manage specialized communities, should be attentive to the strong and weak ties that exist among the community members.

Keywords: identification, reciprocity, social ties, trust, virtual community

ACM Categories: J.4

Introduction

In contrast to the three other types of virtual communities (Armstrong and Hagel 1996), namely, communities of transaction, fantasy, and relationship, a *virtual community of interest* provides a focused platform through which people interact with one another about specialized topics of interest (Ali-Hassan et al. 2010; Klemm et al. 2003; Tan et al. 2012). This platform is a learning tool in which the typically exchanged content is not as emotional as

that of other platforms (Wagner and Bolloju 2005). A virtual community of interest is widely used in companies (Montoya-Weiss et al. 2001; Thomas and Bostrom 2008) and educational institutions (Eastman and Swift 2002; Harman and Koohang 2005; Junco and Cole-Avent 2008; Marra et al. 2004), and its existence primarily depends on the extent of knowledge exchange among its members (Wagner and Bolloju 2005). To promote knowledge exchange (i.e., raising questions and responding to them), community members must feel comfortable with the tasks of pre-conditionally seeking and sharing their knowledge as they may not necessarily have met and known other members of the group (Abrams et al. 2003; Constant et al. 1996).

The current research empirically focuses on a virtual community of specific interest, particularly a website programming community, which differs from the general communities where general social topics are discussed (Burrows et al. 2000; Park et al. 2009; Ridings and Gefen 2004). A virtual community of interest provides more specialized, technical, and narrow discussions as registered membership is made specifically for the purpose of discussing website programming only. In such a virtual community of specific interest, a few core individuals who possess strong ties with many others could facilitate the dialogue, thus suggesting that people with a high number of strong social ties tend to dominate the interaction (Williams and Cothrel 2000). An individual who possesses strong ties has a strong bond with the community; conversely, an individual who possesses weak ties has feeble bonding with the community (Granovetter 1983). If such argument is true, then strong ties (compared with weak ties and their joint influences) can cause virtual community members to feel comfortable enough to facilitate communication with one another.

The concept of social ties (strong and weak) is part of the study on social capital, which proposes that social resources, which are embedded in relationships in the form of social ties between an individual and other persons (Tsai and Ghoshal 1998), prompt people to communicate with one another. The virtual community selected in the current study serves its main purpose by enabling people to access new social circles and establish social capital (Kraut and Attewell 1997; Sutanto et al. 2011). Social capital is broadly defined as an asset that is embedded in relationships among individuals, communities, networks, and societies (Burt 1997; Leana and Van Buren 1999). Coleman (1990) asserts that social capital should be described as different entities sharing two common elements; that is, both entities are characterized by social structures and must facilitate the actions of actors within the structure. Social capital has three dimensions, namely, structural, cognitive, and relational (Nahapiet and Ghoshal 1997) dimensions. The first dimension pertains to the overall pattern of connections among actors, including social ties and network configuration. The second dimension refers to resources that provide shared representations, interpretations, and systems of meaning. The third dimension refers to assets that are embedded in interactions, such as trust, norms, and identification. Although several studies have examined all three perspectives of social capital in a single discussion, researchers have become increasingly interested in social ties, particularly in the structural aspect of social capital (e.g., Haythornthwaite 2002; Jack 2005). This growing interest is due to the rising awareness that people function within interactive social systems such as virtual communities, as exemplified in our focal context of a virtual community of interest (Constant et al. 1996).

As with other computer-mediated forms of communication, a “critical mass” or a minimum number of people is required to sustain interactions within a community (Licklider and Taylor 1968). Without lively interactions, members will either stop participating or migrate to larger groups (Hiltz et al. 1986), thus resulting in the loss of valuable benefits in the community that could have attracted new members (Butler 2001). The mere existence of technical infrastructures in a virtual community does not guarantee that individuals would be willing to join and share knowledge (Alavi and Leidner 1999; Butler 2001), especially considering that participation in virtual communities is voluntary by nature. Previous studies have attempted to understand the motivation of users in contributing to virtual communities by sharing knowledge with others whom they have probably never met in real life [i.e., “strangers” according to Constant et al. (1996)]. To do so, scholars have introduced the concept of relational social capital to explain pro-social behaviors (Xu and Jones 2010). Relational social capital provides the necessary conditions in which knowledge exchange can occur (Kankanhalli et al. 2005). Individuals may forego the tendency to free ride in terms of obtaining knowledge because of the influence of relational social capital (Coleman 1990). In this regard, trust (Ridings et al. 2002), reciprocal commitment (i.e., norms of reciprocity) (Bagozzi and Dholakia 2002; Wasko and Faraj 2005), and identification (Kankanhalli et al. 2005) can be considered the elements of relational social capital related to an individual’s motivation to participate in knowledge exchange in virtual communities. However, few studies have discussed how relational social capital is developed in a virtual community (Adler and Kwon 2002; Chiu et al. 2006).

The importance of considering relational social capital is exemplified by Levin and his colleagues (2002). Through a two-part survey of 138 respondents from three organizations, they showed that trust influences the degree to which individuals choose to share knowledge, which is important in establishing an environment that fosters a legitimate community (e.g., website programming community) (Levin et al. 2002). In fact, limited measurements have been used to determine the influence of strong and weak ties (Ruef 2002). Therefore, the current study investigates how members of a virtual community of interest cultivate trust, norms of reciprocity, and identification (as elements of relational social capital) by drawing upon the concepts of network ties (i.e., aspect of structural social capital). In this manner, we aim to demonstrate that relational social capital develops from strong and weak ties in a virtual community. A survey of a virtual website programming community comprising 69 members provides several interesting perspectives on social ties and virtual community. The current study recommends that virtual community administrators, particularly those managing specialized communities, should pay attention to specific aspects when examining both weak and strong social ties among community members.

Relational Social Capital and Ties

In this paper, relational social capital refers to the community's "public goods" as opposed to the "private goods," which are possessed by individual community members. Individuals benefit from relational social capital as private goods (Leana and Van Buren 1999) by gaining remarkable access to information (Burt 1997) or a higher social status than what they had before (Lin 1999; Lin et al. 1981). By contrast, studies on public goods regard relational social capital as an attribute of a social unit rather than an individual actor. Moreover, the outcome of individual actions in enhancing relational social capital directly contributes to the social unit as a whole (Leana and Van Buren 1999; Portes 1998). In most existing studies, the motivational effects of relational social capital are considered public goods (Adler and Kwon 2002). Trust, particularly generalized trust, does not depend on a specific individual but on the entire social unit or community (Kankanhalli et al. 2005; Leana and Van Buren 1999; Levin and Cross 2004). Furthermore, norms or degrees of consensus in a social system (Coleman 1990) are treated as meaningful only in the collective context (Bagozzi and Dholakia 2002; Kankanhalli et al. 2005; Leana and Van Buren 1999; Wasko and Faraj 2005). Identification refers to an individual's association with a group or community (Bagozzi and Dholakia 2002; Wasko and Faraj 2005) rather than with particular individuals.

The three elements of relational social capital, namely, generalized trust, norms, and identification, encourage knowledge sharing within a network (Leana and Van Buren 1999; Wasko and Faraj 2005). Therefore, all the members in a network benefit from knowledge sharing (Song et al. 2007). As suggested by Portes (1998), we established the following assumptions on relational social capital as public goods to better explain the concept: (a) the possessors of relational social capital (i.e., individuals who make claims) make up virtual communities; (b) the sources of relational social capital (i.e., individuals who agree to make the assets available) are the community members; and (c) the relational social capital in the context of this paper refers to trust, norms, and identification. In this study, we investigate the factors that motivate the members to make relational social capital available in a virtual community (Portes 1998). Moreover, we probe into the process that encourages members to possess generalized trust in community members, what convinces them that a norm of reciprocity exists in the community, and what makes them believe that they are part of the community. In this regard, we study the activities of the community members as well as the network ties of each member with the aim of focusing on the source of relational social capital (i.e., the individual members).

The strength of ties is determined through the combination of frequency, emotional intensity, intimacy, and reciprocity between a person and his/her acquaintances (Granovetter 1983). In this study, we focus on the public good aspect of relational social capital to analyze the strong and weak ties that serve as an individual's attachment to a community. Studies conducted in the offline context have found that people who have strong ties engage in frequent interactions, self-disclosure of emotions, and knowledge exchanges; by contrast, members with weak ties participate in fewer knowledge exchanges (Walker et al. 1994; Wellman et al. 1988). As another example in the online context, people with strong ties are more likely to adopt new media and influence others to do the same compared with those who have weak ties (Haythornthwaite 2002). The intricacy of social ties in communication is further illustrated through the relationships between inter-firm networks and performance (Rowley et al. 2000) and inter- and intra-community ties to relational social capital development (Woolcock 1998). These results show that strong ties in a social network bond individuals

(Putnam 2000), [1] whereas weak ties bridge individuals in the network (Gittell and Vidal 1998). Furthermore, people with few weak ties are "deprived of information from distant parts of the social system and will be confined to the provincial news and views of their close friends" (Granovetter 1983, p. 202). This finding suggests that people with weak ties may be more likely to identify with the groups whom they are comfortable with rather than with an entire social system. However, from a broader perspective on the different natures of social ties, weak ties are as important to a social system as strong ties, especially because the absence of the former will result in a fragmented social system (Granovetter 1983). Therefore, bonding ties are likely to be more exclusive in their benefits. Conversely, bridging ties are likely to have strong positive externalities for the entire community (Szreter 2002). The present paper examines these differences in terms of the development of the previously mentioned elements of relational social capital (i.e., generalized trust, norm of reciprocity, and identification).

Research Model

Figure 1 shows the research model used in the study. We posit that the numbers of strong and weak ties jointly affect generalized trust (H1). Individually, the number of strong ties is related to norms of reciprocity (H2), and the number of weak ties can enhance identification (H3).

Generalized trust

Trust is the belief that the "results of somebody's intended action will be appropriate from our point of view" (Misztal 1996, pp. 9–10). Generalized trust is defined as an expectation of goodwill and benign intent (Yamagishi and Yamagishi 1994), and it exists in a community with a strong relational social capital (Putnam 1993; Young 2008). In this study, we argue that both strong and weak ties facilitate the development of generalized trust. Strong ties cultivate trust between two individuals through frequent interactions, during which actors learn about and become more dependent on one another (Larson 1992; Levin and Cross 2004). A study conducted by Levin and Cross (2004) validates the positive relationship between the strength of ties and trust. Nevertheless, the reason why people trust those with whom they have had limited or no history of interaction remains unclear (Constant et al. 1996).

We also argue that trust can be extended from neighbors to strangers through weak ties. With strangers, an individual can adopt a pattern of either "parochial solidarity" (in-group altruism and out-group defection) or "universalistic solidarity" (openness to strangers) (Macy and Skvoretz 1998). The likelihood of adopting universalistic solidarity depends on the probability of meeting a trusted stranger. In addition to creating opportunities to meet other trusting actors in a network, weak ties (compared with strong ties) are more effective at conveying information through the network (Granovetter 1983). Through weak ties, an individual obtains sufficient information to gauge the trustworthiness of others. Therefore, weak ties are just as important in diffusing trust in a community.

Constant et al. (1996, pp. 119) observed "information providers gave useful advice and solved the problems of information seekers, despite their lack of a personal connection with the seekers." One theory that explains this observation is that "advice from more diverse ties will be more useful than advice from less diverse ties" (Constant et al. 1996, pp. 120). This explanation suggests the inter-function of strong and weak ties in fostering trust. Whereas strong ties establish the trust base, weak ties aid in the transfer of trust, which facilitates the development of generalized trust within a community. Stewart (2003) observed that trust transference, which is the generalization of impressions of one entity to related entities (Hamilton and Sherman 1996), exists in an online context. Therefore, we present the following hypothesis:

> H1: In the presence of a large number of strong ties, a virtual community member's generalized trust in the entire community increases with the number of weak ties that the member has established.

Norm of reciprocity

Representing the degree of consensus in the social system (Nahapiet and Goshal 1998), norms control members' actions through socially defined rights (Coleman 1990; Nahapiet and Goshal 1998). In this study, we aim to investigate generalized norms, particularly the generalized norm of reciprocity. The generalized norm of reciprocity is a continual relationship of exchange that may be unrequited or imbalanced but involves a mutual expectation that a benefit granted at present should be repaid in the future (Putnam 1993). Compared with generalized trust, in which the help or support provided is not misused, future action is expected to return the help or support provided in the generalized norm of reciprocity. This expectation can only be guaranteed when the individual has strong ties with others. The

[1] More recent studies include those of Chiu et al. (2006), which examined knowledge sharing in virtual communities, and Borgatti et al. (2009), which used the social network analysis technique to analyze social phenomena.

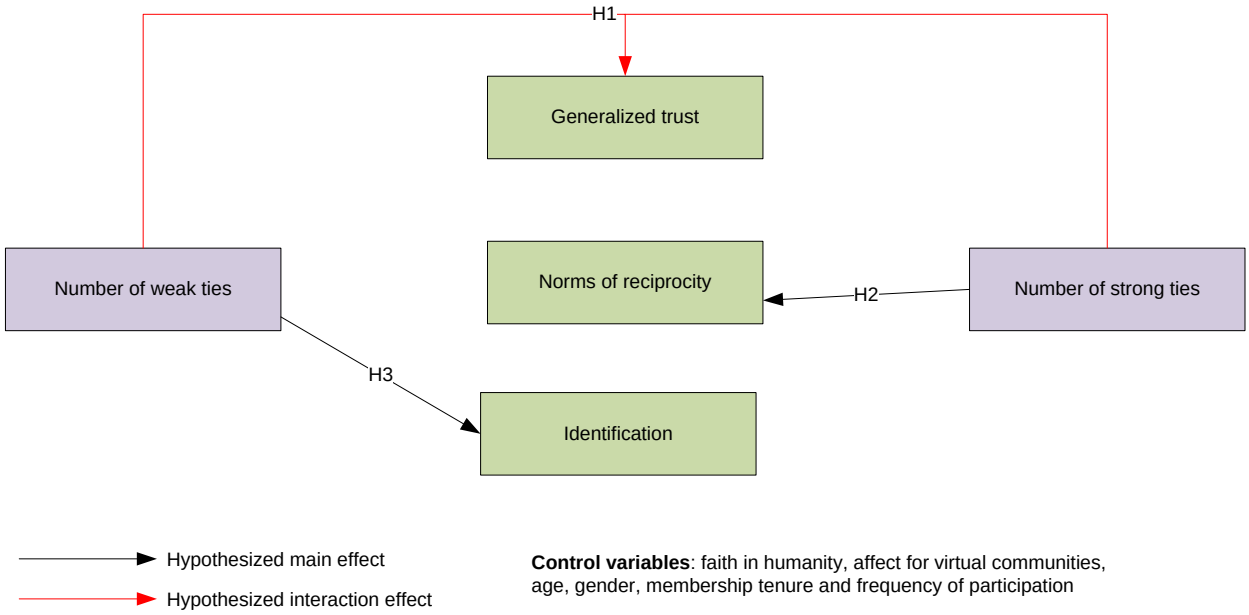

Figure 1. Research model

greater the emotional involvement of two individuals, the more time and effort they are willing to devote for the benefit of the other (Hansen 1999; Reagans and McEvily 2003), and the greater the desire to reciprocate or maintain a balanced relationship between them (Reagans and McEvily 2003). As summarized by Lomnitz (1977, pp. 209), "the basic social economic structure of the shantytown is the reciprocity network… it is a social field defined by an intense flow of reciprocal exchange between neighbors." Accordingly, we present the following hypothesis:

> H2: A virtual community member's perception of a norm of reciprocity in the community is positively related to the number of strong ties that that particular member has established within the community.

Identification

Identification refers to the perception of oneness with or belongingness to a particular human aggregate (Ashforth and Mael 1989). Individuals may identify with a certain aggregate or group based on their similarities with other group members and on the salience or distinctiveness of their group membership (Ashforth and Mael 1989; Lau 1989; Turner 1984). Although strong ties help develop specific attachments and relationships (Taylor et al. 1996), such ties do not necessarily result in an individual's identification with the entire community. Conversely, weak ties may produce a sense of status-group membership, which pertains to the common participation in a horizontally organized cultural community whose members share a specific outlook and a belief in its importance. This phenomenon can be explained by the fact that an individual's level of communication with others (with whom he/she has weak ties) is less personal and involves events and entities at a higher level of abstraction (Hansen 1999). Moreover, establishing weak ties enhances the salience of a person's membership as viewed by other community members. That is, when a member's weak ties in a community increase, the other members' awareness of his/her membership also increases. Therefore, the member's group membership becomes more distinctive (Lau 1989). As communicating with people with whom the individual has weak ties is less personal and involves events and entities at a higher level of abstraction (Hansen 1999), weak ties produce a sense of status-group membership, which is a common participation in a horizontally organized cultural community whose members share a particular outlook and belief in its importance (Granovetter 1983). Although Constant et al. (2004) did not describe the significant correlation between weak ties and the motivation of information providers to provide useful advice for identification, they observed such correlation by collecting organizational data. In our view, using that data set could have established the degree of identification among the members of a knowledge sharing community. An individual's strong ties are likely to encourage identification only within the group, whereas weak ties may create identification with the whole community. Therefore, the following hypothesis is proposed:

H3: A virtual community member's identification with the entire community is positively related to the number of weak ties that such member has established within that community.

Methodology

Operationalization of constructs

Researchers have identified two key indicators of strength of ties, namely, frequency of communication and closeness (Hansen 1999; Marsden and Campbell 1984). Both indicators were taken into consideration in this survey. First, we identified the members with whom the respondent corresponded[2], and then asked the respondent to indicate whether each name on the list was their friend or an acquaintance. Next, we asked the respondents to list down other members whom they considered their friends but were not included in the list. The members they considered as friends represented the strong ties, whereas those they considered acquaintances represented the weak ties. This procedure served as a closeness indicator. Subsequently, we asked the respondents to indicate the frequency of communication (i.e., about daily, weekly, monthly, or rarely) between them and the members with whom they corresponded. We reviewed the communication logs to correct any memory errors that the subjects might have made as the response for this item may be subjective. In case of discrepancies between the reported and the observed frequencies, we considered the higher score because we could not observe private communications through private or instant messaging. We recorded a strong tie between members A and B if the frequency of their communication with each other was daily or weekly, and recorded it as a weak tie if the communication occurred monthly or rarely (i.e., less frequent than monthly).

The definitions of the key dependent and control variables are presented in Table 1.

Wherever possible, we used instruments from previous studies in the current study. Previous studies suggest that the disposition to trust, of which faith in humanity is a component, may influence trusting beliefs (McKnight et al. 2002). Faith in humanity refers to the belief that others are upright and well-meaning, and it may naturally lead to the belief that others will return the favor the individual has received. In our analysis, we controlled these variables because they could affect the individual's formation of relational social capital in a virtual community. Aside from the two control variables, the other variables considered in the study were age, gender, membership tenure, frequency of participation in virtual communities, and history of offline interactions (including communication through private messages and prior history) (Appendix A).

Table 1. Definitions of dependent and control variables

Variable Name	Definition
Dependent variables	
Generalized trust	A virtual community member's belief that other members would behave appropriately
Identification	Perception of oneness with or belongingness to a virtual community (adopted from Ashforth and Mael 1989)
Norms of reciprocity	Mutual expectations of virtual community members that a benefit granted at present would be repaid in the future (adopted from Putnam 1993)
Control variables	
Faith in humanity	A person's faith in the benevolence of others (McKnight et al. 2002)
Affect for virtual communities	Extent to which the subject enjoys participating in activities transpiring in online communities (adapted from Stewart 2003)

Conceptual validation

All survey items were subjected to a two-stage conceptual validation process in accordance with the procedures listed by Moore and Benbasat (1991). Four graduate students participated in the unstructured sorting that produced good results, with 81% of the questions classified based on the intended constructs[3]. We modified IDEN1 (originally phrased as "I speak of this community to my friends as a great community to participate in") because we thought this item was inappropriate in a virtual setting (i.e., in daily life, an individual may not talk about his/her online experiences with friends). The items measuring generalized trust among community members (TRUS) and a person's faith in humanity (FATH) were not adequately differentiated. One likely reason is that faith in humanity can be

[2] We consider a correspondence to have been transpired if the respondent replied to the person's message on an online forum or if the person replied to the respondent's message in the past three months.

[3] The hit rates for each construct are as follows: TRUS (87.50%), IDEN (85%), NORM (100%), FATH (54.17%), and AFFE (100%).

defined as a component of the disposition to trust (Xu et al. 2012). In addition, faith in humanity is sometimes referred to as benevolence, which is one of the three components of trust (Xu et al. 2012). To address this concern, we included the name of the virtual community in the items for generalized trust. In this manner, we were able to place generalized trust within the particular context of the community and at the same time differentiate it from a macro perspective of faith in humanity. Thus, we adapted a general measure of trust proposed by Pavlou and Gefen (2004) and contextualized it within a community setting. We also applied the work of Pavlou and Gefen (2004), which referred "trust in the community of sellers" as trust in a virtual community. After modifying these items, we conducted structured sorting with four other graduate students. Approximately 90% of the questions were correctly placed[4].

Survey administration

An online survey was conducted in a virtual community where the members share a common interest in website programming. Specifically, members visit the community forum to exchange ideas and share their experiences in website development and programming. The community members come from several countries in North America, Europe, and Asia. After a member provided a favorable reply to the survey request we sent, we checked that member's posts on the forums to identify the member IDs of the posts to which he/she had explicitly replied or those who replied to his/her posts. After encoding these names into our database, we emailed the link of the actual survey site to the members. Prior to the survey, the respondents were asked to input their member IDs, which were matched to the IDs listed in the database. This step generated a list of members with whom each respondent had previously corresponded. Thereafter, the respondents were asked to indicate the degree of closeness and frequency of communication with every member included on their lists. Afterwards, the respondents were asked to answer other survey questions. At the end of the survey, free post counts or bandwidths were given to the respondents as a token of appreciation.

Among the 237 members initially identified as eligible for the survey, 68 responded to the survey request, thus producing a response rate of 29%. Table 2 shows the representative descriptive statistics of the respondents.

[4] The hit rates for each construct are as follows: TRUS (100%), IDEN (90%), NORM (100%), FATH (75%), and AFFE (100%).

Table 2. Descriptive statistics of the respondents

Categories	Respondents' demographics
Gender	Male (90%) Female (10%)
Age	Less than 16 years (16%) 16–20 years (47%) 21–25 years (19%) 26–30 years (9%) More than 30 years (9%)
Membership tenure [5] (in months)	Mean = 8.4; std. deviation = 5.13
Frequency of visiting the community	About once a day (34%) About once a week (40%) About once a month (16%) About once every two months (6%) About once every three months (4%)

The majority of the respondents were male, and most of them were in their late teens or early 20s. The mean and standard deviation of the membership tenure indicate that we obtained a good combination of new and experienced members.

Data Analysis and Results

Tie strength indicators

Although both closeness and frequency indicators are commonly used to measure the strength of ties, these indicators rendered different results in this study (Table 3). The frequency indicator was mainly used as we could adopt the communication logs as an objective measurement to address any possible bias made by the respondents. The choice of tie strength indicator is explained in the section discussing the implications.

Reliability and validity

The constructs were subjected to reliability and validity tests before being used to test the hypotheses. Cronbach's alpha was used to assess reliability. All constructs had alpha values equal to or above the criterion of 0.80 (Nunally 1978), except for the construct on affect for virtual communities. To improve the reliability of AFFE, we excluded AFFE3, considering that it was a reverse coded item. This removal increased the Cronbach's alpha for this construct to 0.82. Subsequently, we tested the items for validity using the principal components factor analysis with varimax rotation.

We also deleted one item under the norms of reciprocity (NORM3) and two items under faith in

[5] The community has been in existence for two years.

humanity (FATH4 and FATH6) because these items loaded unintended factors. Nevertheless, deleting them did not significantly affect the Cronbach's alphas of these two constructs. The final results of the reliability coefficients and factor analysis are shown in Tables 4 and 5, respectively. Table 6 lists the correlations among the constructs. Related tests for the common method bias were also conducted. The results show that the variance explained by one factor is 42.410%, which is below 50%, thus indicating no obvious common method bias.

Table 3. Comparison of closeness and frequency indicators

Indicator	Total number of strong ties (in aggregate)	Total number of weak ties (in aggregate)	Percentage of respondents whose numbers of strong/weak ties differ in the two indicators
Closeness	139	1125	56%
Frequency	67	1167	

Table 4. Reliability coefficients of constructs

Construct	Number of Items	Cronbach's alpha
TRUS	2	0.80
IDEN	5	0.93
NORM	3	0.84
FATH	4	0.81
AFFE	2	0.82

Table 5. Principal factor analysis results

	Factors				
	1	2	3	4	5
TRUS1	0.459	0.314	0.189	0.157	**0.644**
TRUS2	0.197	0.240	0.223	0.145	**0.815**
IDEN1	**0.781**	0.254	0.228	0.114	0.200
IDEN2	**0.799**	0.084	0.123	0.337	0.094
IDEN3	**0.786**	0.221	0.205	0.223	0.027
IDEN4	**0.832**	0.221	0.260	0.123	0.202
IDEN5	**0.818**	0.241	0.182	-0.021	0.190
NORM1	0.436	0.099	**0.712**	0.225	0.135
NORM2	0.166	0.051	**0.777**	0.031	0.380
NORM4	0.330	0.256	**0.769**	0.181	-0.010
FATH1	0.194	**0.792**	0.059	0.207	0.209
FATH2	0.294	**0.722**	0.291	0.094	0.020
FATH3	0.006	**0.566**	0.445	0.018	0.371
FATH5	0.287	**0.790**	-0.006	0.016	0.162
AFFE1	0.186	0.034	0.054	**0.892**	0.123
AFFE2	0.197	0.200	0.219	**0.843**	0.077
AVE	0.780	0.642	0.750	0.844	0.831
Composite reliability	0.946	0.877	0.900	0.915	0.907

Table 6. Construct correlations

	Trust	Strong	Weak	Iden	Norm	Affe	Ben	Age	Gender	Tenure	Freq
Trust	**(0.912)**										
Strong	0.151	**(1.000)**									
Weak	0.003	0.303	**(1.000)**								
Iden	0.590	0.155	0.109	**(0.883)**							
Norm	0.565	0.149	0.094	0.617	**(0.866)**						
Affe	0.378	0.067	-0.037	0.445	0.412	**(0.919)**					
Ben	0.608	0.091	-0.128	0.552	0.503	0.338	**(0.801)**				
Age	-0.165	-0.303	-0.106	-0.132	-0.112	-0.006	-0.077	**(1.000)**			
Gender	-0.121	-0.062	-0.138	-0.060	-0.076	-0.073	-0.076	0.159	**(1.000)**		
Tenure	0.009	-0.020	0.116	0.008	-0.110	0.011	-0.173	-0.042	-0.093	**(1.000)**	
Freq	0.080	-0.265	-0.416	-0.084	-0.082	-0.127	-0.012	0.081	0.296	0.182	**(1.000)**

Diagonal elements are square roots of AVEs. All non-diagonal elements denote the constructs' correlations.

Structural model

Considering that the partial least squares (PLS) analysis can model latent constructs with small to medium sample sizes in non-normal conditions (Chin et al. 2003), we used this method to evaluate the explanatory power of the independent variables (Figure 2). We then tested the explanatory power of interaction using the traditional approach of including the product term of the weak and strong ties (Chin et al. 2003). In the PLS analysis, we included all the main and interactive relationships between the ties and the dependent variables.

With regard to the relationship between structural social capital and generalized trust, we hypothesize that the interaction term of the strong and weak ties is positively related to generalized trust (H1). However, we did not include the relationships between individual social ties and generalized trust because of our theoretical argument, which states that strong ties form a trust base that is diffused to the entire community through weak ties (Chin et al. 2003). The results reveal that the combination of strong and weak ties significantly increases generalized trust (coefficient=0.148, t=2.253, Figure 2). However, a non-significant relationship exists between weak ties and generalized trust (coefficient=0.118, t=1.510) as well as between strong ties and generalized trust (coefficient=0.075, t=1.596). Therefore, the results support H1. Overall, structural social capital accounts for 0.471 of the variance in generalized trust.

With regard to the relationship between relational social capital and norms of reciprocity, we propose that the number of strong ties is positively related to the norms of reciprocity (H2). The results reveal a positive non-significant relationship between

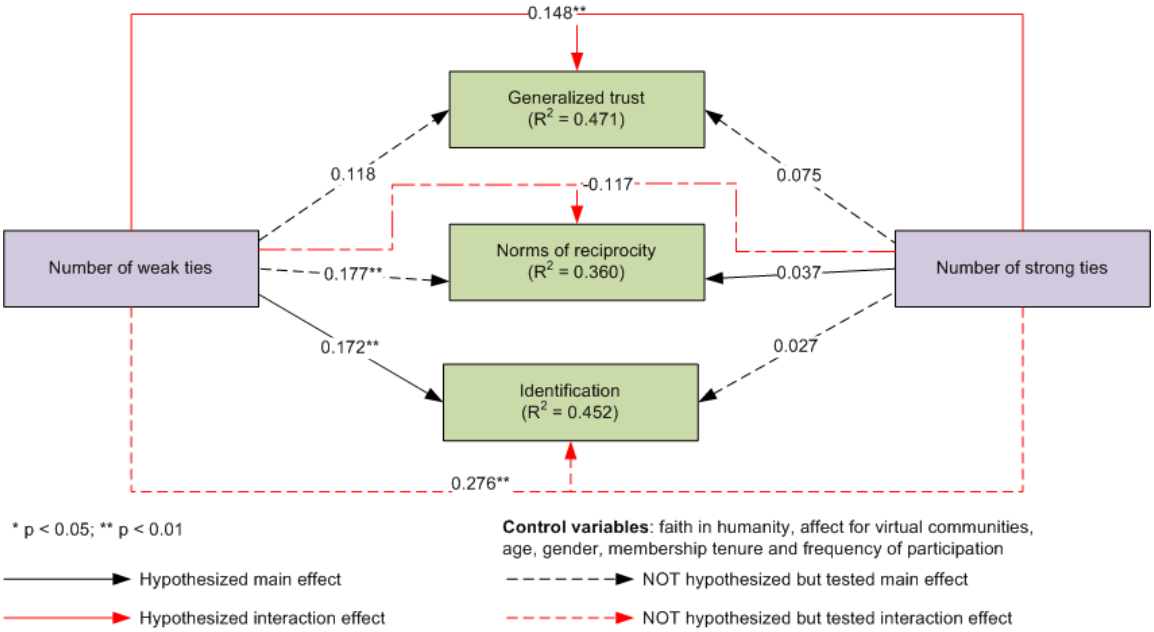

Figure 2. PLS model result

relational social capital and norms of reciprocity (coefficient=0.037, t=0.848). Therefore, H2 is not supported. Contrary to the theoretical conjecture that the effect of norms of reciprocity is contingent only on the number of strong ties, a significant positive relationship was found between the number of weak ties and norms of reciprocity (coefficient=0.177, t=2.484). One plausible reason is that the providers of advice are motivated by reputation and fame rather than by strong ties. In general, the relational social capital accounts for 0.360 of the variance in norms of reciprocity.

With regard to the relationship between relational social capital and identification, we propose that the number of weak ties is positively related to identification (H3). The results provide significant evidence supporting this hypothesis (coefficient=0.172, t=2.880). Therefore, H3 is supported. We also note that the interaction term of strong and weak ties is positively related to identification (coefficient=0.276, t=4.361). However, the number of strong ties is not significantly related to a member's identification with the community as a whole. These results are consistent with our argument that, although strong ties create specific attachments and relationships, these do not necessarily result in identification with the community as a whole. Conversely, an individual's communication with people with whom he/she has weak ties is not personal and involves events and entities at a higher level of abstraction. Therefore, the greater the number of weak ties an individual has, the higher his/her sense of status-group membership. The relational social capital accounts for 0.452 of the variance in identification.

Aside from the relationships shown in Figure 2, we find that two control variables (i.e., faith in humanity and affect for virtual communities) have significantly positive relationships with the three other dependent variables. All other control variables are not significant indicators in the model. We also tested the model separately with only the control variables. The control variables only yielded R-squares of 0.424, 0.320, and 0.400 for generalized trust, norms of reciprocity, and identification, respectively.

Discussion

The number of a particular member's strong ties is not significantly related to that member's degree of perceived norms of generalized reciprocity. We argue that strong ties can lead to perceived reciprocity norms because of social or psychological considerations (e.g., the desire to reciprocate or maintain balanced relationships) (Reagans and McEvily 2003). Therefore, when two individuals have a considerable degree of emotional involvement with each other, they would be willing to provide more time and effort in behalf of each other (Hansen 1999; Reagans and McEvily 2003). Such relationships were not observed in our study; this finding may be attributed to the fact that we focused on the norms of generalized reciprocity. Generalized reciprocity refers to the mutual expectation that a benefit granted at present should be repaid in the future (Putnam 1993), although not necessarily by the same beneficiary. Therefore, strong ties may lead to a more specific form of reciprocity, which involves the exact parties linked through these strong ties. For this reason, such reciprocity is not generalized through the influence of strong ties.

The control variables (i.e., faith in humanity and affect for virtual communities) demonstrate significant relationships with all the dependent variables. Studies have suggested that the direct effect of faith in humanity on trust is the strongest when the one who trusts (i.e., the individual from whom the act of trust originates) is not familiar with both the institutional context and the specific individual on the receiving end of this trust (Bigley and Pierce 1998; Rotter 1971). In this study, the virtual community setup may be regarded as an unfamiliar environment for the respondents as they are not aware of the real identities of the other community members and have had no opportunities to meet one another in person. On the one hand, such anonymity within virtual communities may generally result in a more considerable influence on the disposition to believe in a member's generalized trust. On the other hand, faith in humanity involves the belief that others are upright and well-meaning, which may naturally lead to a belief that individuals are bound to return the favor they previously received. This definition may explain the positive relationship between faith in humanity and norms of reciprocity.

The number of virtual communities that an individual engages in is limited. Therefore, an individual's attitude toward a particular community, which is characterized by generalized trust, perceived norm reciprocity, and identification, may subsequently influence his/her affect for virtual communities in general. Although Stewart (2003) did not observe a positive relationship between website effect and trust in a website, the context of the current study is different because the members have limited experience in other virtual communities. In our study, the general attitude may either affect individuals' attitudes toward the virtual community being examined or be influenced by it.

Implications

Theoretical implications

Closeness and frequency are the primary indicators of social tie strength (Hansen 1999; Marsden and Campbell 1984). Although both closeness and frequency indicators are commonly used to measure the strength of social ties, we decided to use the frequency indicator so that we could use the communication logs as an objective measurement to prevent any possible bias in the part of the respondents. In contrast, closeness is a subjective measurement that is subject to several definitions of "friends" on the Internet and that varies across individuals. On the one hand, several members consider people whom they have met on the Internet only as "Internet peers" and not friends. On the other hand, some members consider all people they have corresponded with online as their friends. Therefore, the measurement of tie strength that depends on closeness can be problematic and unreliable, considering the vague definition of the word "friend" within a virtual context. Alternately, measuring the frequency through the communication logs in a virtual community could yield more reliable and objective results.

Several studies on social ties have focused on the usefulness of strong and weak ties in "private" relational social capital (e.g., Burt 1997; Levin and Cross 2004). For example, previous studies have shown how the ties between two people can create generalized trust that facilitates knowledge transfer (Levin and Cross 2004) and how weak ties can grant an individual better access to information (Burt 1997). Although the influence of network ties on a community's "public" social capital has been discussed in the works of Putnam (1993; 2000) and Woolcock (1998), these studies lack empirical support. Tsai and Ghoshal (1998) investigated the position (centrality) of a firm in a network with respect to the level of its perceived trustworthiness (i.e., whether an entity is perceived to be trustworthy). Moreover, Levin and Cross (2004) and Berg et al. (1995) examined dyadic trust. In our study, we examined the effects of weak and strong ties on generalized trust to complement the existing literature. In particular, our results show that the number of strong and weak ties established by the community members serves different but important functions in the growth of the members' relational social capital.

Both the strong and weak ties of the members of a virtual community contribute to the degree of the members' generalized trust. Specifically, we find that the number of strong or weak ties is related to the level of generalized trust of an individual, and that when these ties are combined, they are significantly related to the level of generalized trust. Figure 3 illustrates the correlations through a chart. The results support our claim that strong ties can elicit a type of trust among members that can be expanded to the community level through the same members' weak ties. Although weak ties have been previously considered unimportant to the development of dyadic trust between two individuals (Levin and Cross 2004), the number of weak ties of an individual in a virtual community is crucial in transferring his/her trust to the community. Therefore, the number of an individual's weak ties (but not his/her strong ties) affects the development of his/her identification with a virtual community. Moreover, as strong ties "bond" the members who are linked through these ties, weak ties "bridge" members within a particular community.

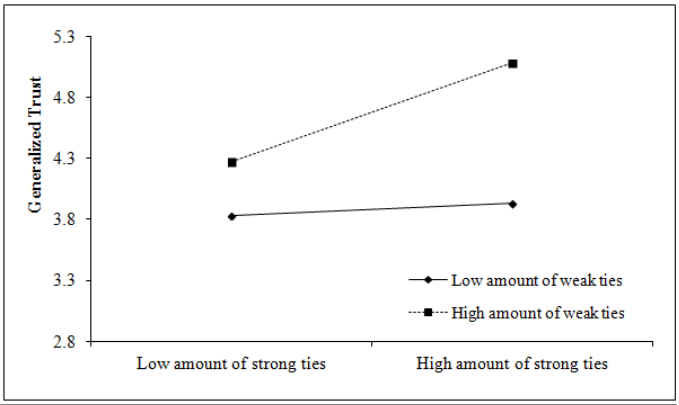

Figure 3. Interaction effects of strong and weak ties

In this study, we emphasize the function of weak ties in a community. Previous studies that validated the strength of strong ties have doubted whether a virtual community could cultivate relational social capital where weak ties dominate the social network (Wellman et al. 1996). However, we find that weak ties contribute to the development of the generalized trust of the community members and demonstrate a positive relationship with the level of group identification. Moreover, weak ties are indirectly related to the perception of reciprocity norms through group identification; that is, a significant positive relationship exists between group identification and the perception of generalized reciprocity norms.

Our theoretical prediction of a significant relationship between the number of strong ties and the norms of reciprocity is not supported. This conclusion is counterintuitive as the norm of reciprocity is defined as a mutual expectation that a benefit granted at present should be repaid in the future. Apparently, having a substantial number of strong ties (i.e.,

having individuals that are more "bonded") may not necessarily lead to reciprocal propensity. This observation suggests that reciprocity is not guaranteed even in a focused (i.e., non-social topic) form of discussion involving specialized knowledge. Therefore, virtual community members should be mindful of this observation regardless of the strength of their ties within the community.

Practical implications

The results of the current study demonstrate that the development of relational social capital is a product of the members' structural social capital (i.e., their strong and weak ties in a virtual community) and their general attitudes within a given community (i.e., faith in humanity and affect for virtual communities). Although virtual community administrators can hardly choose their members based on their faith in humanity and affect for virtual communities, these administrators can create platforms through which they can facilitate interaction and establish weak ties among members. For example, virtual community administrators in a community forum can initiate topics of common interest (e.g., in the website development community, members may have the chance to discuss the features of various types of development software). Most virtual community members can participate in such discussions because the topics do not refer to any specific individual. Therefore, weak ties are established among community members. These weak ties can help transfer an individual member's trusting attitude, which was previously exclusive to members connected by strong ties, to the community as a whole. Generalized trust in a community also enables members to overcome uncertainties they may have as part of the network, thus encouraging openness and further knowledge sharing in a network. Moreover, weak ties can provide a sense of common membership to create group identification that enhances the individuals' concern for the group as a collective entity. Individuals who identify themselves as part of the community are more motivated to share their knowledge within the group. This tendency is especially true as knowledge contribution through a public channel (e.g., a community forum) can benefit the entire community. This observation can be attributed to the individual members' decision to align themselves more closely with the collective outcome instead of focusing on their self-interest. In this regard, although the context of the current study is the virtual community, formal organizations (Montoya-Weiss et al. 2001; Thomas and Bostrom 2008) can build on the findings to derive ways to promote knowledge sharing among employees who have different and diverse relational ties.

Limitations and Future Research

As this research is by no means complete, our study limitations could lead to other opportunities for future research. First, this research focuses on relational social capital in a virtual community of interest, that is, a community focused on sharing knowledge on website programming. Such a virtual community is characterized by the lack of emphasis on emotional support and sharing and is dominated by specialized knowledge sharing and discussion (Wagner and Bolloju 2005). Therefore, the findings of the current research should be further validated in the context of the three other forms of virtual communities, namely, the communities of transaction, fantasy, and relationship (Armstrong and Hagel 1996).

Second, despite our best efforts, the response rate of the survey is only approximately 29%. Although we observed no differences between the respondents and the non-respondents in terms of membership tenure, and none of the other demographic statistics significantly influenced the dependent variables, a small sample size could still cause other problems such as measurement errors and insufficient effectiveness of the study. Therefore, future studies may attempt to conduct a similar survey in a larger community.

Third, this study focused on the relational dimension of social capital. Our study of network ties is actually a facet of the structural dimension based on the definition earlier proposed by Nahapiet and Ghoshal (1998). We did not cover the cognitive dimension of social capital (e.g., shared codes and narratives), which encourages community members to be further involved in shared contexts (Nahapiet and Ghoshal 1998). In a virtual community of interest, members share a common interest and language to a certain extent. Members also share a similar level of expertise and background. We only considered the direct ties in the virtual community investigated. However, indirect ties (e.g., two individuals who are connected to another individual in a virtual community) comprise yet another important part of the members' structural social capital that can also influence their relational social capital. Therefore, future researchers may want to examine the effects of indirect ties at the community level.

Fourth, as noted in Section 4.2 (conceptual validation), the name of the community was added to the items for generalized trust with the aim of better contextualizing generalized trust within the community setting while differentiating it from the macro perspective of faith in humanity. Although the discrimination validity between the two constructs has already been achieved in the collected survey dataset, we performed an additional robustness test

by eliminating faith in humanity from the model. The results of the additional analyses remain consistent with the findings. Nevertheless, the readers should be wary of the potential drawbacks of using the constructs of generalized trust and faith in humanity.

Fifth, with regard to the scale development of generalized trust, Pavlou and Gefen (2004, pp. 47) provide four items for trust; these items measure "beliefs about honesty, dependability, reliability, and trustworthiness of the community." However, in the subsequent analysis, we only used three of the four items. Therefore, the four items are non-dimensional. In applying the previous study to the context of the current study, we selected two of the four items (i.e., measures of reliability and dependability) to reflect generalized trust. These two items were selected after consulting with several researchers who are cognizant of the focal domain of virtual communities. Moreover, we believe that the two items sufficiently represent the construct being studied. We adopted this minimization approach in developing the construct items because we tried to reduce the length of the survey to enable the respondents to be more focused in answering every question. Our subsequent internal and discriminant validity tests of the two adopted items all produced sound results. Nevertheless, readers should be wary when integrating the findings of this study with the existing literature on generalized trust.

Sixth, our study suggests that individuals who have strong and weak ties could have high-generalized trust, but we did not examine the underlying mechanisms that could establish such relation. In other words, further studies are needed to gain a more refined understanding of causality and the actions of such individuals in the community.

Conclusion

We investigated how relational social capital, namely, trust, norms of reciprocity, and identification, is developed in a virtual community. Although individual community members engender this type of public social capital, relational social capital usually results in desirable social consequences for the entire community. Such benefits include knowledge transfer among community members and development of pro-group behaviors. We found that the degree of the members' relational social capital is influenced by the amount of strong and weak ties that the members have in a virtual community. Specifically, weak ties have a versatile function in this study: they influence the level of generalized trust and facilitate the emergence of group identification. Therefore, community administrators should engage in specific measures to facilitate the creation of network ties, particularly weak ties, among their community members. Establishing such network ties among community members can result in the further development of virtual communities.

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Appendix A - Survey Items

Dependent Variables

Variable	Definition	Items	Source
Generalized trust	Belief of a virtual community member that other members would behave appropriately in the community	**TRU1** Most people in this **XYZ** community are generally reliable. **TRU2** Most people in this **XYZ** community are generally dependable.	Adapted from Pavlou and Gefen (2004)
Identification	Perception of oneness with or belongingness to a virtual community (adopted from Ashforth and Mael 1989)	**IDEN1** I feel great to be a member in this **XYZ** community **IDEN2** I find it easy to identify with the **XYZ** community **IDEN3** I feel a sense of belonging towards this **XYZ** community **IDEN4** I am proud to be a member of this **XYZ** community **IDEN5** I would feel good if I were described as a member of this **XYZ** community.	IDEN1-3 is adapted from Cheney (1980); IDEN4 is adapted from both Cheney (1980) and Karasawa (1991); IDEN5 is adapted from Karasawa (1991)
Norm of Reciprocity	Mutual expectations by the virtual community members that a benefit granted at present should be repaid in the future (adopted from Putnam 1993)	**NORM1** If I help other members in this **XYZ** community, I would also get help in the future. **NORM2** Members in this **XYZ** community would return the favor they received from others in the community. **NORM3** Members in this **XYZ** community would reciprocate the support that others have given them. **NORM4** If I support other members in this **XYZ** community, I would also receive support in the future.	NORM 1 and 4 are developed based on the definition given by Putnam (1993)

Control Variables

Variable	Definition	Items	Source
Faith in humanity	A person's faith in the general benevolence of others (McKnight et al. 2002)	**BEN1** In general, people really do care about the well-being of others. **BEN2** The typical person is sincerely concerned about the problems of others. **BEN3** Most of the time, people care enough to try to be helpful, rather than just looking out for themselves. **BEN4** In general, most people keep their promises. **BEN5** People generally try to back up their words with their actions. **BEN6** Most people are honest in their interactions with others.	Adapted from McKnight et al. (2002)
Affect for virtual communities	Extent to which a subject enjoys participating in online communities (adapted from Stewart 2003)	**AFEC1** I like participating in online communities. **AFEC2** My experiences in online communities have generally been positive. **AFEC3** I do not enjoy participating in online communities. (reverse item)	Adapted from Stewart (2003)
Age		Please indicate your age: < 15 years old 16 – 20 years old 21 – 25 years old 26 – 30 years old > 30 years old	
Gender		Female / Male	
Membership tenure		Number of days since the member registered in the community (obtained from the community forum)	
Frequency of participation		How often do you participate in the community forum? about once a day; about once a week; about once a month; about once every 2 months; about once every 3 months	Hansen (1999)
History of offline interactions		*Private messages*: Which members of this community do you talk to through private messages or emails? *Prior History*: Which members have you known before joining the community? For how long?	

Scale of independent variables

	Number of Strong Ties	Number of Weak Ties
Maximum	15	79
Minimum	0	0
Mean	1	17
Std. Deviation	3.05	17.38