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Testing a model of sense of virtual community

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Abstract

A distinguishing feature of virtual communities is their sense of community, i.e., their participants' feelings of membership, identity, influence, and attachment with each other. This study tests a model in which members' perceptions of the group's norms mediate the relationships between supporting each other and identifying each other with the members' sense of virtual community. Two studies were conducted providing partial support for the model. The results show that the perception of norms mediate the relationship between SOVC and (a) observing and publicly exchanging support, (b) perceiving that others know one's identity, and (c) using technical features to learn and create identity. Theoretical and practical implications are discussed.

Keywords: Virtual communities; Sense of virtual community; Social exchange; Social identity; Norms

1. Introduction

Groups of people interacting through computer-mediated communication have become common within organizations and society. These groups can range from the professional (e.g., AoIR, the listserv for association of Internet researchers) to the social (e.g., Honda motorcycle enthusiasts on Yahoo groups). They can form on a variety of interactive communication technologies including listservs, newsgroups and bulletin boards, chatrooms and even blogs. Although the technologies and specific topics vary, what is common to these online groups is the members' public exchange of information and support (Jones, 1997).

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Some researchers and practitioners refer to these online groups as *virtual communities*. Virtual communities, as opposed to other online groups, are believed to be particularly important because they are self-sustaining social systems in which members engage and connect with each other (Rheingold, 1993; Schuler, 1996). But what makes an online group a virtual community?

One feature that distinguishes virtual communities from mere virtual groups is their members' feelings of community. These feelings of community are more formally known as a *sense of virtual community*. Community psychologists have long considered members' sense of community as an important feature of face-to-face (FtF) communities (Chipuer & Pretty, 1999; Fisher, Sonn, & Bishop, 2002; McMillan & Chavis, 1986; Obst & White, 2004) and virtual community researchers are beginning to pay attention to these feelings in virtual groups (Blanchard & Markus, 2004; Koh & Kim, 2003; Obst, Zinkiewicz, & Smith, 2002a; Rheingold, 1993; Roberts, Smith, & Pollock, 2002). The purpose of the current research is to build upon and expand our knowledge of what contributes to members' sense of virtual community. The next section provides the theoretical and empirical background to this model.

2. Sense of community

Sense of community (SOC) has an extended history in the community psychology literature. Sarason (1986) was one of the first researchers to identify that community members' feelings about each other and the community itself are important to the community's successful functioning. SOC is desired in a community because it leads to satisfaction with and commitment to the community (Burroughs & Eby, 1998), and is associated with involvement in community activities and problem-focused coping behavior (McMillan & Chavis, 1986).

McMillan and Chavis (1986) further developed the SOC construct by defining it as an individual's feelings of membership, identity, belonging, and attachment with a group. Their SOC descriptive framework has been widely accepted because of its theoretical base and its qualitative empirical support (Chipuer & Pretty, 1999; Obst & White, 2004).

Research in FtF communities and organizations has examined the correlates of SOC in an effort to determine what leads to SOC. Zaff and Devlin (1998) found that the amount of interaction between community members and components of the physical environment led to SOC. Schuster (1998) examined the processes of exchanging support that led to SOC in a writers' group in an assisted care home for the elderly. In a qualitative study, García and her colleagues (1999) concluded that the community's history was an important factor in creating SOC. Obst and her co-workers (2002) found that among other demographic variables, membership in a local organization, and their view of the neighborhood predicted their global measure of SOC.

In examining SOC at work, Pretty and McCarthy (1991) found both individual (e.g., gender and hierarchical status) and environmental characteristics such as peer cohesion, supervisor support, and job involvement were positively related to SOC. Burroughs and Eby (1998) found that supportive exchanges between employees and the organization made a significant positive contribution to their SOC measure. Clark (2002) found that supportive supervision and the intrinsic value of the work lead to her measure of SOC in an organization. Royal and Rossi (1999) found that organizational variables (perceived

orderliness of students and support for innovation) and time related variables (employee tenure and time spent with interacting with others) led to SOC in a school.

In summary, there is a small but growing body of research on what contributes to FtF SOC. For the most part, researchers of FtF SOC have found that member interactions and, particularly, the exchange of support between members are positively related to SOC. Other consistent correlates of SOC include member involvement with and tenure within the community being examined.

3. Sense of virtual community

Sense of community is also gaining attention in virtual communities. Roberts and her colleagues (2002) examined sense of virtual community (SOVC) in a chatroom in which participants use text to create objects with which they interact. Through a qualitative study, they found that the virtual communities they examined differed from FtF communities, but members still experienced a sense of community similar to that defined by McMillan and Chavis. Likewise, Obst, Zinkiewicz, and Smith (2002b) compared the senses of community between members' online science fiction fan group and the members' neighborhoods. However, Obst and her colleagues found that the participants' feelings of membership and influence were weaker for SOVC compared to SOC.

Koh and Kim (2003) initially draw from McMillan and Chavis' conceptualization of SOC. However, their final measure was quite different, including a scale of immersion, which is not included in any other conceptualizations of SOC or SOVC. Additionally, they only used two of McMillan and Chavis' components of SOC, membership and influence, the same two components that Obst, Smith, and Zinkiewicz's (2002) study suggested may not transfer well from SOC to SOVC. Therefore, it is not certain that their measure of SOVC overlaps sufficiently with other researchers' conceptualizations of SOC or SOVC to provide useful comparisons to SOVC.

Blanchard and Markus (2004) examined SOVC in a newsgroup. Consistent with previous researchers, they found similarities to McMillan and Chavis (1986) SOC, including feelings of membership, integration of needs, and shared emotional connections. However, Blanchard and Markus found distinct differences in their group's SOVC. The virtual group members did not report feeling that they influenced or were influenced by others which would have been expected by McMillan and Chavis' framework. This matches with Obst and co-workers (2002) research that influence may not be as important in SOVC as in SOC. Also, the virtual group members reported feeling that simply recognizing others and relationships with specific other members were important to their SOVC. Although these could also be components of SOC, they have not been explicitly recognized as part of McMillan and Chavis' framework. Blanchard and Markus' finding agrees with Obst et al.'s (2002) finding that feelings of membership, which include individual's feelings of identity with the community and its members, may not be the same in SOVC as SOC.

Blanchard and Markus (2004) propose that these differences in influence and the importance of recognizing and having relationships with individuals could be due to the specific nature of interacting in the online environment. That is, information and communication technologies (ICT) can be largely anonymous and members may have greater concerns about the truth of others' identities (see Joinson & Dietz Uhler, 2002). Thus, virtual community members may have a heightened need to recognize specific individuals and develop

relationships with them to feel an SOVC and are less likely to be aware of their own influence or the influence of others.

Understanding the similarities and differences of SOVC compared to SOC is interesting and important; however, it is not as important as understanding how members of groups experience a SOVC. The differences between SOC and SOVC, namely the stronger role of individual relationships and the weaker role of individual influences suggest that the processes of learning the identity of others and the development of identity of oneself are important. Additionally, the previous research on SOC suggests that exchanging support may be important. Therefore, this research will draw on the identity and social identity theories as well as social exchange theories to understand how SOVC develops.

In addition, this research will examine how the perception of norms in a virtual community mediates the identity and social exchange processes to increase SOVC. Although not tested in FtF SOC research, McMillan and Chavis (1986) predict that norms would increase SOC. They argue that as the community becomes more cohesive, there is greater pressure on the community members to conform. This pressure creates a consensual validation among the community members, essentially a feeling among the members that "we are alike". This, they argue, is what develops into part of the members' SOC. Indeed, as members more closely adhere to the norms of the community, their bond to the community increases. Thus, development and adherence to norms closely precede SOC in FtF communities. We suggest that they will similarly lead to SOVC in virtual communities.

4. Identity and social identity theories

First, in developing a model of SOVC, we will consider identity processes in online interactions. The issues of personal identity and identifiability have played central roles in understanding behavioral and affective outcomes online. It was been well established that the ICT which supports virtual communities has fewer social cues than FtF communication (e.g., Kiesler, Seigel, & McGuire, 1984). However, the presence of fewer cues does not necessarily mean that identity is less important in ICT than in FtF interactions (see Culnan & Markus, 1987). The social information processing (SIP) model argues that although there are fewer personal cues in ICT as compared to FtF interactions, relationship development is the same between online and FtF interactions (Walther, 1992, 1995). However, it simply takes a good deal more time for an appropriate amount of cues to be accumulated in ICT and for the relationships to become similar in scope and magnitude. Research on group affective outcomes in ICT based on SIP has found that over time, feelings between members are about the same in virtual and FtF groups (Walther, 1992; Wilson, Strauss, & McEvily, 2006).

In contrast, the social identity model of deindividuation effects (SIDE) (Postmes, Spears, & Lea, 1998) proposes that as individuals are more anonymous (i.e., when cues to individual identity are sparse), this leads to greater immersion in the group and increased salience of group identity, resulting in several positive group outcomes, such as greater solidarity and unity. Specifically, SIDE suggests that the presence of individuating information (e.g., a name or picture) in ICT highlights the individual identity of online group members, while making the social identity of the group less salient. In other words, one's cognitive representation of the group switches from an emphasis on "us" to an emphasis on "you and me".

Although SIDE would suggest that cues to identity negatively influence group-based outcomes, such as group affiliation and SOVC, recent research suggests that this may not always be the case. First, Walther (1996) developed a hyperpersonal model of relationship development that partially builds on the SIDE and SIP models. The hyperpersonal model argues that when members' group identity is salient, members over-interpret the minimal cues that are present and idealize their partners. Thus, minimal cues increase affect between partners in groups particularly when members identify with the group. Additionally, recent work by Postmes, Spears, Lee, and Novak (2005) suggests that group and individual identity may coexist, and that expressions of individuality through communication among group members may actually strengthen group identity and solidarity.

Thus, although SIDE originally suggested that cues to others' identity would decrease group-based outcomes, more recent theoretical and empirical evidence from SIP, the hyperpersonal model and even SIDE suggests that learning cues of other people's identities can accentuate certain intra-group outcomes, in this case, SOVC. However, this is only true to a point. The SIDE model and the hyperpersonal model both argue that as cues to the personal identity increase, deindividuation is likely to decrease and the social influence is likely to decrease (Postmes et al., 1998; Walther, 1996). It is not clear at what level of learning others' identity this occurs. That is, cues to others' identity should increase SOVC, but at some point, too much individuality will begin to decrease the members' feelings of social unity and will decrease members' SOVC. At this point in the model development, we can acknowledge this, but hypothesize that generally, cues to others' identity increase SOVC.

Although previous research has focused primarily on learning others' identity, creating one's own identity in the group and believing that others understand it also plays an important role in ICT outcomes (Ma & Agarwal, 2007). Ma and Agarwal focus on how developing one's own identity affects participation in and satisfaction with the virtual community. However, their attention to creating one's own identity highlights a neglected area of the personal and social identities approach. As members learn of others' identities, for example, through the use of technological features (e.g., signature files), they also present information about themselves using these same features. As they learn other's identities, they perceive that others are learning theirs. Thus, as members perceive others' individual characteristics as providing important cues as to the group's characteristics of solidarity (Postmes, Spears, & Lea, 2000; Tanis & Postmes, 2005), they may perceive that their own identity cues could do the same. Therefore, we hypothesize that both learning others' and creating one's own identity are potentially related to SOVC.

5. Social exchange theory

Although learning the identity of other members is an important by product of interacting in virtual communities, it is not the main function of member participation. Indeed, the exchange of support is a very important reason for the existence of many virtual communities (Baym, 1997; Rothaermel & Sugiyama, 2001; Wellman & Guilia, 1999). This research adds to understanding SOVC by examining the support exchange behavior by group members through social exchange theories.

There are a variety of ways in which members exchange support in virtual communities. Support may be exchanged publicly in posts for the entire group to read or may occur privately through emails exchanged behind the scenes. Wellman and Guilia (1999) have

argued that the public exchange of support may increase members' perceptions of being a supportive group when in fact, few people are actually involved in the supportive exchange. Thus, there is a perception that the group is very supportive, even if only a few of the members actually help each other. However, because everyone can read the message, all group members benefit from the support exchange even if they were not active in creating it.

Social exchange theory is one of the fundamental theories for understanding behavior between individuals and within groups. It explains why people help each other, why they exchange information, support, and love among other commodities (Cropanzano & Mitchell, 2005). Social exchange theory is based on the near universal norm of reciprocity (Goulder, 1960). This reciprocity can either be direct as in the help exchanged between two people or indirect when help is exchanged with an entire group (Flynn, 2005).

Additionally, social exchange theory argues that people's affective attachment is governed by the entity with which they are exchanging support (Flynn, 2005). That is, if the exchange is dyadic, the attachment remains between the two social exchange partners. But if the exchange occurs indirectly within a group or organization, the attachment is to the group or the organization. Therefore, in this model, we hypothesize that exchanging support in a virtual community is positively related to SOVC.

6. Development and adherence to group norms

Thus far, the model proposes that both identity processes and social exchange processes contribute to the development of SOVC. However, what is the mechanism by which these processes lead to SOVC? The development and adherence to group norms may serve as one important mediator of this relationship. In support of this proposal, past research suggests that identity and social identity processes, as well as social exchange processes, lead to the formation of group norms. Members of groups, such as those in naturally forming virtual communities, have been shown to create and then observe norms of behavior (Postmes et al., 2005). In particular, through learning others members' identity, they inductively create a social identity, and subsequently develop norms about what this group does and what its particular characteristics are (Postmes et al., 2005).

Similarly, Cropanzano and Mitchell (2005) argue that one of the basic tenets of social exchange theory is that people develop and then are constrained by certain rules of exchange, norms that serve as guidelines for people's interactions. These norms of behavior can develop as people participate in the exchange (Cropanzano & Mitchell, 2005) or by merely watching other people interact (Postmes et al., 2005). As discussed previously, virtual community members can observe others exchanging support and can also participate in it privately through email or publicly through posting messages to the group. Thus as members observe and also participate in the exchange of support, they are developing norms of behavior. However, this is likely to happen only with publicly exchanging support and not with privately exchanging support through email. Email connotes a dyadic relationship and therefore should not have an effect on group norms.

Finally, norms are believed to be an antecedent to FtF SOC (McMillan & Chavis, 1986). As members perceive norms of behavior and adhere to these norms, their bonds to the group increase. It is likely that the same processes in virtual groups and SOVC, too. Therefore, this model proposes that norms mediate the relationships between identity and social exchange with SOVC.

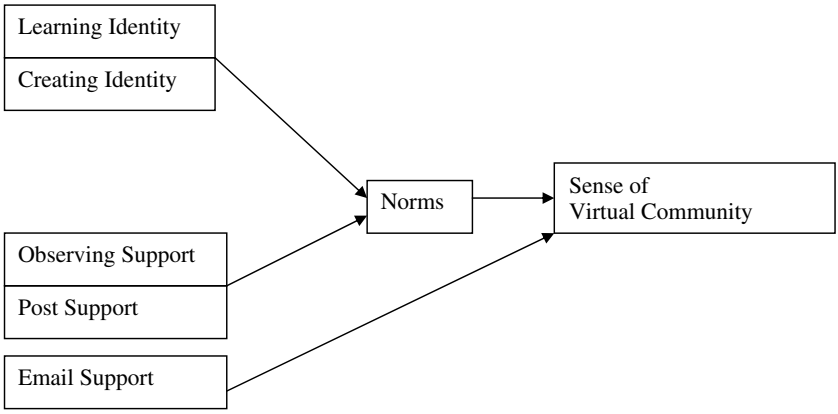

Fig. 1. Proposed model of SOVC for Study 1.

Fig. 1 represents the model to be tested in this research.

7. Study 1

7.1. Methods

7.1.1. Participants

Participants were 216 members of five online groups. The groups were non-randomly picked from a list of listservs and usenet newsgroups. To be considered for this study, the groups had to be active with messages posted daily. Additionally, the topic around which the group had formed had to be similar on both the newsgroup and the listserv, with one exception to be discussed later.

Two of the groups were listservs and three were newsgroups. All of the online groups had social purposes (i.e., two food lover groups, two pet lover groups, and one age related group). The groups were chosen to match each other in terms of topic and type of group. For example, there was one pet lover listserv and one pet lover newsgroup. The only group that did not match was the age related newsgroup in which members chatted about a variety of topics. This group was included even though a comparable listserv group could not be located because it was highly active. The mean age of the participants was 48 (SD = 11.9). Sixty-two percentage of the participants were female. Fifty-five percentage of the participants were from the newsgroups.

7.1.2. Measures

Sense of virtual community. Eighteen items were used to assess sense of community (Blanchard, 2007). Sample items include "I think this is a good group for me to be a member", "I anticipate how some members will react to certain questions or issues in this group", and "I feel obligated to help members of this group". Responses ranged from 1 = strongly disagree to 4 = strongly agree.

Learning and creating identity. To assess creating and learning identities, one item was used for each measure. "I learn about people by reading their posts" was used to assess learning about others. "People learn about me by reading my posts" was used

to assess creating identity. Responses ranged from 1 = strongly disagree to 4 = strongly agree.

Observing and exchanging support. To assess exchanging support, three measures were created: one to assess members' observation of support and two measures to assess their participation in exchanging support through email and posting to the group. Two items were used to assess how much people observed support: "Members of this group support each other" and "Members of this group help each other". Responses ranged from 1 = strongly disagree to 4 = strongly agree.

Emailing support was assessed from four items about the participant's email behavior. Participants were asked how often they emailed a question to other members, emailed an answer to other members, emailed a comment to other members or emailed a response. Responses ranged from 1 = never to 4 = quite a lot.

Posting support was assessed from four items about the participant's behavior on the group. Participants were asked how often they posted a question to other members, posted an answer to other members, posted a comment to other members or posted a response. Responses ranged from 1 = never to 4 = quite a lot.

Norms. Members' perceptions of the group's norms were measured by asking participants one item "People in this group know what the proper behavior is". Responses ranged from 1 = strongly disagree to 4 = strongly agree.

7.2. Results

7.2.1. Validating measures

The first step in analyzing the data is to determine that the measures used in this study are valid and that there is not a serious problem with mono-method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This was achieved by conducting an exploratory factor analysis using principal axis factoring and a promax rotation (Fabrigar, Wegener, MacCallum, & Straham, 1999). Promax rotation was used as an oblique rotation because it is expected that the factors are likely to correlate with each other.

Four factors were extracted to assess each of the multi-item scales in the study (i.e., SOVC, observing support, emailing support, and posting support). The initial solution indicated that four SOVC items loaded inappropriately on other factors, an issue noted in other research (Blanchard, 2007). These items were therefore eliminated from the scale. A final exploratory factor analysis resulted in all items loading onto their appropriate scales and with commonalities in the appropriate range (Fabrigar et al., 1999).

7.2.2. Hypothesis testing

Descriptive analyses are in Table 1. The study's hypotheses were tested using structural equation modeling and path analyses on AMOS 6 (Kline, 2005) followed by calculating Sobel tests and confidence intervals to determine the reliability of the mediation effect (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002).

The original model was a poor fit to the data with χ^2 (14) = 69.35, $p < .001$, RMSEA = .16, CFI = .83 and RMR = .04 (Kline, 2005). Modification indices suggest that including direct relationships from observing and posting support to SOVC could improve the model. These relationships are theoretically valid indicating partial instead of complete mediation by the norms variable. An additional analysis was, therefore, run including these paths.

Table 1
Descriptive analyses of Study 1 variables

Variable	Mean	SD	1	2	3	4	5	6
1. SOVC	3.19	.41	(*.93*)					
2. Identify others	3.29	.53	.24**	(–)				
3. Identity of self	3.18	.53	.31***	.73***	(–)			
4. Observe support	3.63	.51	.40***	.34***	.28***	(*.85*)		
5. Email support	2.41	.66	.45***	.06	.12	.19*	(*.88*)	
6. Post support	2.91	.52	.43***	.15	.22**	.16*	.46***	(*.85*)
7 Norms	3.25	.57	.40***	.22**	.29***	.42***	.07	.12

Note: $N = 216$. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Reliabilities are in the diagonal.

The resulting modified model is much improved with χ^2 $(9) = 16.184$, $p = .06$, RMSEA = .07, CFI = .96 and RMR = .03. Even though the RMSEA is greater than.05, it is less than.08 and therefore represents reasonable error of approximation (Kline, 2005). Therefore, this modified model represents a reasonable approximation of the data.

As expected, creating identity ($\beta = .26$, $p < .001$) and observing support ($\beta = .38$, $p < .001$) were related to norms. However, learning identity ($\beta = -.11$, $p = .32$) and posting support ($\beta = .02$, $p = .81$) were not. Also, as expected, norms ($\beta = .28$, $p < .001$) were related to SOVC. Additionally, observing support ($\beta = .20$, $p < .01$) posting support ($\beta = .25$, $p < .001$) and emailing support ($\beta = .29$, $p < .001$) were also directly related to SOVC.

Two Sobel tests were calculated to determine if norms partially mediated the relationship between observing support, creating identity and SOVC. The other Sobel tests were not calculated because these variables (posting support and learning identity) failed the initial test of being related to norms (Baron & Kenny, 1986). The perception of norms mediates the relationship between creating identity and SOVC ($z = 2.13$, $p < .05$, confidence interval from.03 to.08) and also mediates the relationship between observing support and SOVC ($z = 3.12$, $p < .001$, confidence interval .06–.11). Thus, although there is a direct relationship between creating one's own identity and observing support to SOVC, additional variance can be explained by examining how creating one's own identity and observing support affects norms.

7.3. Discussion

The results of Study 1 partially support the research model. Norms mediates the relationship between creating identity, observing support, and SOVC. However, learning identity was not related to norms. SOVC was directly related to observing the exchange of support as well as privately emailing and publicly posting support.

Thus, in Study 1, believing that others know who one is through reading posts (i.e., creating identity) is related to perceptions of norms of behavior, but knowing others' identity is not. The latter finding supports the original SIDE model (Postmes et al., 1998) that argues that as people are perceived as individuals online, unifying group processes (e.g., norms, SOVC) break down. The former finding is more supportive of the SIP model (Walther, 1995) and the more recent SIDE formulations (Postmes et al., 2000, 2005) even suggesting that as people perceive they are "known" in the group, they are likely to perceive group norms of behavior and feel a SOVC. Perhaps they are feel they are accountable for their behavior and feel more accepted in the group.

All three ways of exchanging support were related to SOVC, thus suggesting, as with FtF SOC, that support is important in SOVC. Only observing support was related to norms, which additionally partially mediated its relationship to SOC. This suggests that observing others exchanging support increases perceptions of norms of behavior and increases members attachment to the group as proposed by Flynn (2005).

7.4. Limitations

Although Study 1 partially supports the model, there are several limitations that suggest a second study. First, several of the measures used in Study 1 were 1-item measures (e.g., norms) and involved perceptions of behavior instead of actual behavior. For example, learning and creating identity focused on perceptions that members have that they know others' identity and that others know theirs. Although this approach agrees with Blanchard and Markus (2004) study, participants in Blanchard and Markus' study additionally reported using the technical features of the communication medium (e.g., signature files) to get to know other people as well as create their own identities.

Additionally, the exchanging support items do not cover the full range of online behaviors that can occur in observing as well as exchanging support. In particular, in this study, measures of observing others' exchanging support is more of a *perception* that others exchange behavior than a report of others' behavior. Study 2 will address the limitations by adding behavioral items to the measures of exchanging support, perceptions of norms, creating and learning identities.

8. Study 2

8.1. Methods

8.1.1. Participants

Participants were 277 members of 11 bulletin boards from Babycenter.com, a very active online information, support and commercial center for parents. The groups were non-randomly chosen to reflect stage of life-stage of parenting (pregnancy versus early parenthood). All the bulletin boards met the same minimal level of activity during the observation period as Study 1. Members were recruited through a message posted to each group. In exceptionally active boards, a message was added to the survey recruitment thread to bump the post to the first page of the group's messages. Average age of the participants was 29 (SD = 4.29) and 99% of the respondents were women, which is typical for Babycenter.com.

8.2. Measures

Sense of virtual community. The same 18 items from Study 1 were used to assess sense of community. However, the response scale was changed from 1 = strongly disagree to 7 = strongly agree to allow for more scale sensitivity.

Learning and creating identity. Six items were developed to assess people's perceptions of learning others' identity. These items include "I know the screen names of other people in this group" and "I know the real names of other people in this group". Three items were developed for perceptions creating one's identity "Other people in this group know my

screen name", "Other people in this group know my real name", and "Other people know my personality in this group". Participants were asked how much they agree with these items and responses ranged from 1 = strongly disagree to 7 = strongly agree.

To assess how participants used the technology features to learn and create identity, participants were asked how often they engaged in four items including "do people in this group put personal information about themselves or their families at the end of their message?" and "do you put personal information about you or your family at the end of your messages (like names & ages)?" Responses ranged from 1 = never to 6 = all the time.

Observing and exchanging support. Study 2 expanded on the measures developed in Study 1 to assess observing and exchanging support. These additional items related to the online behaviors that could be observed or enacted (e.g., asked a question, asked for help, asked for support, provided information, shared experiences). Sixteen items were developed for observing support and posting support; 14 items were developed for emailing support because two of the public support items (e.g., posting a short comment and posting a message not related to the topic) were not appropriate in email. Participants were asked how often they engaged in the behaviors and responses ranged from 1 = never to 6 = all the time.

Norms. Four items were used to assess perceptions of the group's norms including "I understand what appropriate behaviors are for this group" and "People generally behave appropriately on this group". Responses ranged from 1 = strongly disagree to 7 = strongly agree.

8.3. Results

Again, the first step of the Study 2's analysis was measurement validation. Although the number of participants in the study represents an acceptable level of power in testing the model once items have been collapsed into their respective scales, the 81 items present a problem in validating our measures through a factor analysis. Estimates are for five times as many observations as there are variables (Stevens, 2001) which would call for over 405 observations.

To address this issue, two factor analyses were tested for the measurement model,[1] opting to assess the measures as rigorously as possible with the behavior measures evaluated in one analysis (53 items, requiring 265 observations) and the affective and perception measures evaluated in the second (28 items, requiring 140 observations). This strategy is rigorous because mono-method bias is more likely within measures of similar type (behavior, affect) than between different types of measures (Podsakoff et al., 2003). Thus, if we can determine appropriate loading of measures in these analyses, we can be less concerned about mono-method biases in the analysis of our model. In all of the analyses, we used principal axis factoring with a promax rotation (Costello & Osborne, 2005; Fabrigar et al., 1999).

In the first factor analysis assessing exchanging support (emailing support, observing support, posting support) and the adherence to norms factors, four factors were extracted with the factor structure generally corresponding to our intended variables; however, three items from the observing others exchange support scale loaded inappropriately on the

[1] Variations on the analyses presented here yield very similar results.

norms factor and were thus deleted. In the last steps, the communalities of the remaining items were examined and were adequate to reflect the items' reliability within the factor structure.

The second factor analysis assessed the SOVC and identity measures (creating identity, learning identity and using the identity technologies). Four factors were extracted that were consistent with the proposed structure of our variables. However, the same four SOVC items from Study 1 again loaded onto inappropriate factors and were thus eliminated from the SOVC measure. In the last step, the communalities were examined and determined adequate. A final analysis was run using only the top loading variables from the exchanging support items and all the remaining items from the other scales and confirmed that the items loaded onto their respective constructs.

8.4. Hypothesis testing

Table 2 contains the descriptive analyses of this study. The analysis strategy for testing mediation in this study is the same as Study 1, a SEM path analysis. As with Study 1, the model was first run testing for full mediation, which was a poor fit to the data $\chi^2(15) = 86.11$, $p < .001$, RMSEA = .13, CFI = .92 and RMR = .14. Modification indices again support a direct link to SOVC from posting and observing support as well as creating identity. Because partial mediation still falls within the study's theoretical argument, these paths were included.

This resulted in a much better fit, $\chi^2(8) = 15.80$, $p < .05$, RMSEA = .06, CFI = .99 and RMR = .08. As predicted, observing support ($\beta = .13$, $p < .05$) and posting support oneself ($\beta = .15$, $p = .06$) were related to norms. In addition, creating one's own identity ($\beta = .24$, $p < .05$) and using the technologies that support identity ($\beta = .14$, $p < .05$) were also related to norms. Unlike predicted, knowing others' identity ($\beta = -.15$, $p = .07$) was negatively and marginally related to norms.

Also as predicted, the perception of norms ($\beta = .46$, $p < .001$) is strongly related to SOVC. However, emailing support ($\beta = -.04$, $p = .29$) was not related to SOVC. The added direct relationships of observing support ($\beta = .09$, $p < .05$), participating in support ($\beta = .19$, $p < .001$), and creating identity ($\beta = .28$, $p < .001$) were related to SOVC.

The variables which showed a direct relationship to norms were then tested for a mediation effect on SOVC. The relationships of SOVC to observing support ($z = 2.15$, $p < .05$, CI from .05 to .13), participating in support ($z = 1.84$, $p < .06$, CI from .03 to .10), creating

Table 2
Descriptive analyses of Study 2 variables

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. SOVC	5.22	1.08	(*.91*)							
2. Identify others	4.92	1.65	.40***	(*.97*)						
3. Identity of self	4.21	1.98	.55***	.71***	(*.99*)					
4. ID technology	3.97	.94	.27***	.26***	.28***	(*.65*)				
5. Observe support	5.39	.69	.21***	.17***	.05	.27***	(.99)			
6. Email support	1.76	1.51	.04	.13*	.10	−.09	.02	(*.95*)		
7. Post support	3.03	1.14	.54***	.48***	.72***	.30***	.17**	.16**	(*.97*)	
8. Norms	5.99	.82	.61***	.15*	.29***	.24***	.17**	−.01	.32***	(*.81*)

Note: $N = 272$. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Reliabilities are in the diagonal.

identity ($z = 2.31$, $p < .05$, CI from .03 to .09) and using the identity technologies ($z = 2.19$, $p < .05$, CI from .04 to .11) are partially mediated by norms. Therefore, the model is partially supported.

9. Discussion

Study 2 further supports the research model (see Fig. 2). Like previous research, the exchange of support positively affects SOVC. In Study 2, both observing support and publicly participating in exchanging support had strong direct relationships to SOVC. However, unlike Study 1 and other previous research (cf., Blanchard & Markus, 2004), the private exchange of support through email was not related to SOVC. One explanation for this is the low level of using email to exchange support as reported by the participants in Study 2. Study 1's participants reported exchanging support through email at only a slightly lower rate than through posts. But Study 2's participants reported a substantially lower level of exchanging support through email. This suggests than when email is used, it positively affects SOVC. However, emailing support is not necessary for a SOVC. Future research should pursue how exchanging support through email affects virtual community functioning. For instance, do members of the group have individual relationships with each other or not? Do new members use email was a way to ease into the group or not?

Participants' perceptions that others know their identity positively affects SOVC. These findings agree with previous research that developing one's identity leads to more virtual community involvement and SOVC (Blanchard & Markus, 2004; McKenna, Green, & Gleason, 2002).

A significant contribution of this research is that it goes beyond the direct relationships of antecedents and SOVC to understand the process by which these antecedents work. This study demonstrates that norms, the perception by group members that there are rules that govern behavior in the group, mediate the relationship between the antecedents and SOVC.

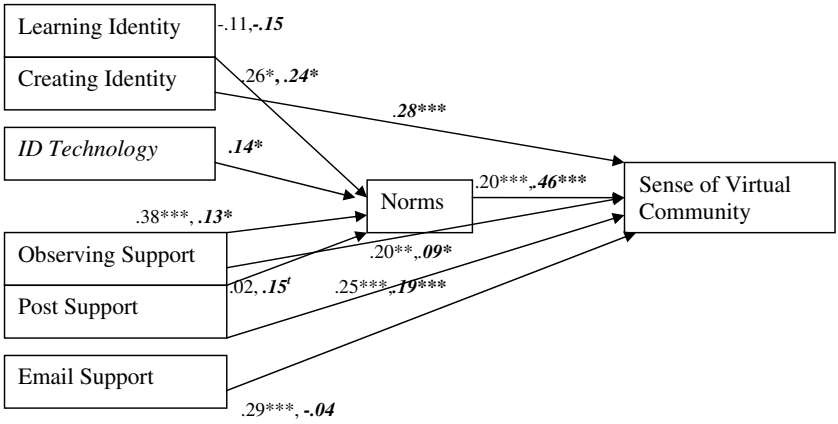

Fig. 2. Results from Studies 1 and 2. Note: results from Study 2 are in ***bold and italicized***. Numbers are standardized β coefficients. $^{'}p = .06$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Social identity theory predicted that members' learning the identity of others and developing an identity for themselves would lead to an increased SOVC through the development of norms. Both Study 1 and Study 2 support that members' perceptions that others understand them leads to norms and then to SOVC. However, neither study found that perceiving the identities of others was related to group norms. Study 2 additionally added in a behavioral measure, the use of technical features to create and learn identity, for which norms also mediated the relationship to SOVC. These results suggest that perceptions of that "others know you" is the more important perception in developing norms. Perhaps it indicates a feeling of acceptance into or accountability in the group.

The behavioral component of Study 2's measure of identity, using the identity technical features, is related to norms and reliably and indirectly affect SOVC. This behavioral measure supports social identity theory's inductive development of norms. This finding is particularly interesting because at the time of the study, participants had to type in their identity creating features (e.g., signature files) every time they posted a message. Clearly, using these features was important to the participants. In general, the use of technical features in online social processes tends to be a neglected area of study (Markus, 2005). Future research should compare groups with different forms of technical features that create identity to determine how they are used and which are more effective.

Social exchange theory predicts that norms should mediate the relationships between the public exchange of support and SOVC. The results from both studies suggest that observing others exchange support is important in this mediation process. Wellman and Guilia (1999) have argued that observing others exchange support is important, but that it may promote slacking from other participants because these lurkers never have to contribute to the community. However, these results indicate that observing others exchange support helps create norms of behavior which lead to SOVC.

Participating in the public exchange of support oneself had a weaker mediated relationship as indicated by the lower confidence interval in Study 2, even though it had a stronger direct relationship to SOVC. Along with Study 1's lack of a mediated relationship, this suggests that active involvement in publicly exchanging support has less of a relationship in developing group norms than would have been expected (e.g., Flynn, 2005).

9.1. Limitations

Like Study 1, Study 2 has limitations. Babycenter.com is composed primarily of women. Therefore, the results of this study may be limited. However, Study 1's findings are generally similar. Therefore, generalizability may not be compromised. However, two studies increase the external validity of this model by demonstrating that it holds in different populations.

Of more concern for the generalizability of this model is that these are social groups and not professional groups. Virtual community research needs to establish and examine SOVC in professional virtual communities. As with social online groups, some professional groups may be more or less likely to have a SOVC. For example, professional listservs that are more informational distributing (e.g., ISWORLD) may be less likely to have a SOVC because help and information may be less likely to be exchanged. However, other professional groups may engage in more interactive exchanges and, thus, this model may be appropriate.

9.2. Conclusion

Members of virtual communities experience a sense of virtual community which comes from the exchange of support within the community, the identity of other members and themselves, and interacting with others outside of the virtual community. Additionally, exchanging support and creating identity help create norms of behavior in the group which in turn increase SOVC.

Virtual communities can provide a pro-social environment in which individuals and groups benefit from their interactions. Virtual communities and other online social systems are likely to become integral parts of people's lives. Our understanding of what makes them experienced as communities can help us develop and manage them.

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