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Knowledge Contribution in Virtual Communities: Accounting for Multiple Dimensions of Social Presence through Social Identity

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Abstract
Virtual communities provide an important venue for knowledge sharing. Prior research has demonstrated that both system design factors, e.g., social presence, and social aspects of VC, e.g., social identity, are critical for encouraging knowledge contribution. However, we still lack a good understanding of how the system design and the social aspects of VC jointly influence members' knowledge contribution. Also the uni-dimensional conceptualization of social presence in most prior research may not be sufficient to capture the complexity in VC interaction. To address these theoretical voids, a research model is developed to explain the effect of social presence on knowledge contribution as mediated through social identity. More particularly, drawing upon environmental psychology literature and prior research on social presence, we propose a three-dimensional conceptualization, consisting of sensory, affective, and cognitive components, and discuss their distinct roles in developing social identification and promoting knowledge contribution. The research model was empirically tested with a survey involving 430 registered members. The results provided a strong support for the validity and usability of the multi-dimensional conceptualization of social presence. We also found the distinct effects of various social presence dimensions on social identity and knowledge contribution. Both theoretical and practical implications are discussed.

Keywords: Social presence, Social identity, Knowledge contribution, Virtual communities

Introduction

Virtual communities (VC), sometimes called online communities, describe social aggregations with common values and interests on the Internet. Drawing together geographically dispersed, like-minded people to form a network for knowledge sharing, VCs change the traditional mode of knowledge sharing that takes place in physical interactions. Similar to their physical counterparts, members' knowledge contribution is the pulse for generating content and building relationships (Lee et al. 2003). A recent study indicates that active on-going contribution is ranked as one of the top factors for a successful virtual community (Leimeister et al. 2004). How to support social interaction and encourage knowledge contribution in VC becomes a major challenge for practitioners and attracts much academic interest as well.

Prior studies have adopted interpretative and positive approaches to investigate the contributor behavior in VC (Constant et al. 1996; Wasko and Faraj 2000, 2005; Bagozzi and

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Dholakia 2002; Kankanhalli et al. 2005). However, they shed little light on the interaction between technologies and social processes in affecting knowledge sharing in the context of virtual communities. The behavior examined in most prior studies is simplified as user-interface interaction, neglecting the social aspect of VC, i.e., the community acts as an important reference group for its individual participants (Bagozzi and Dholakia 2002). Some studies with a focus of "community" on the other hand, directly applies the existing theories developed in the physical context to VC, e.g., social influence theory (Bagozzi and Dholakia 2002), value and gratification paradigm (Dholakia et al. 2004), and social capital theory (Wasko and Faraj 2005), where the impacts of IT have been understudied. For virtual communities, the technological capacity of communication media plays a critical role in determining individual behavior, as all the psychological experience of the represented places and people is computer-mediated (Jones et al. 2004). We therefore lack a good understanding of how the system design and the social aspects of VC jointly influence members' knowledge contribution.

Social presence captures the sense of "being together with another" including primitive responses to social cues, simulations of 'other's minds' and automatically generated models of the intentionality of others (Biocca et al. 2003), It emerges as a major design principle in telecommunication systems as well as a core construct in studying computer-mediated communication (Biocca et al. 1995). From the social aspects, social identity has been demonstrated as a main driver for pro-social behavior in general (Ellemers et al. 2004; Hogg and Reid 2006) and knowledge contribution in communities in particular (Kankanhalli *et al.* 2005; Chiu et al. 2006). However, several limits remain in both fields, which call for further theoretical development. For social presence research, despite its importance, the conceptualization of this construct is in its infancy. Most prior research adopted various uni-dimensional definitions, ranging from binary formulations (existence versus non-existence), to sensory awareness, psychological involvement and behavioral engagement (Biocca et al. 2003). The lack of consistent and comprehensive conceptualization of social presence makes it difficult to compare the results of different studies and hinders the development of design guidelines. Furthermore, the uni-dimensional approaches, originally developed in simple technological contexts, may not be able to capture the complex nature of social presence evoked in virtual environments with diversified technological features and rich interactions among multiple users. On the other side, most prior studies in the IS fields take social identity as given without addressing its antecedents in general and the effects of technological factors in particular. We therefore still have very limited knowledge about interventions to enhance social identity in VCs.

This paper is aimed to bridge the gaps in prior research by exploring the multi-dimensional conceptualization of social presence and by examining social identity as a mechanism to translate social presence design into knowledge contribution. By integrating social identity theory and social presence theory, we developed and empirically tested a model explaining the effects of multi-dimensional social presence on social identification process and knowledge contribution. A rigorous mediation test was used to elucidate the relationship between social presence and social identity in affecting knowledge contribution. Theoretically, this paper the empirically validates the multi-dimensional conceptualization of social presence and illustrates their distinct roles on social identity formation and knowledge contribution. Practically, the findings are expected to provide design guidelines for VCs designer and administrators so as to motivate the community members' contribution.

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This paper is structured as follows. We first present the conceptualization of social presence, which is followed by a theoretical development section. Then we describe the empirical study and discuss the results. Finally, we summarize the study, discuss the theoretical and practical implications and make suggestions for future research.

Conceptualization of Social Presence

Described as the feeling associated with being together with others, social presence is usually conceptualized as a uni-dimensional construct (Biocca et al. 2003). A variety of uni-dimensional definitions have been proposed (e.g., sensorimotor, psychological and behavioral engagement) (Biocca et al. 2003) and examined in specific technological and/or task contexts (e.g., face-to-face interaction, email systems or teleconferencing systems). However, in the context of VCs, a wide range of technologies evoking different senses of social presence are integrated within the same system. Some features may only arouse the awareness of other community members' existence, while others may be able to convey emotions of communication. Characterized with many-to-many interactions, VCs may embed various social spaces. These characteristics of VC necessitate a multi-dimensional approach in conceptualizing social presence.

Psychological environment literature suggests that sense of place includes multiple components, e.g., physical settings, activities, and meanings (Relph 1976). Consequently the sense of place comprise the cognitive, affective and conative (i.e., behavioral commitment) domains of human-environment relationships (Jorgensen and Stedman 2006). Social presence shares the common characteristics with sense of place in that both require interaction with the environment and result from the individual's perceptions and/or reflection. Therefore, a similar approach can be applied to construct the multiple dimensions of social presence.

Integrating the environmental psychological perspective and the findings in prior research on social presence (Biocca et al. 2003), we propose a multi-dimensional approach and conceptualize social presence with three components, i.e., sensory, affective and cognitive. The sensor presence refers to the individual's sense of social space, including the spatial co-presence and minimal attributions of others (e.g., basic categorization of others' identities, intentions, and attention). Affective presence refers to the feelings towards the virtual environment, including sense of access to intelligence, salience of the interpersonal relationship, intimacy and immediacy. Cognitive presence refers to the belief about the social actors' mental models in the virtual environment. In the context of VC with various interactions, social presence reflects the degree to which VC allow their members to perceive the presence of other participants and the consequent psychological involvement and mutual understanding, although they are located in dispersed places. Thus, we posit that community members' sense of social presence includes the three components simultaneously.

Theoretical Development

Social influences have been shown critical to prompt individuals' knowledge contribution in VC (Wasko and Fajar 2005). Perceptions of shared social identity provide people with multiple motivations for knowledge sharing and also with a shared cognitive framework that allows the sharing behavior to be mutually beneficial and productive (Postmes 2003). On the technological side, social presence, shaping the extent to which the computer-mediated communication medium allows intimacy and immediacy, is expected to facilitate the formation of social identity and consequent enhance knowledge contribution. Thus, relying

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on the social identity and social presence theories, we develop the research model as shown in Figure 1.

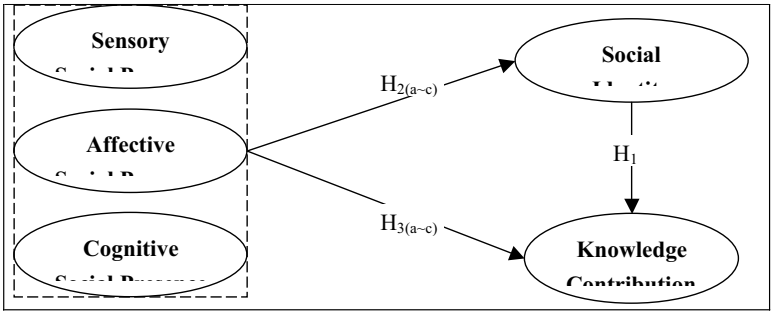

Figure 1: Research Model

Social Identity and Knowledge Contribution

According to social identity theory, social identification leads individuals to perceive themselves in terms of the characteristics they share with other members rather than their distinctive characteristics (Turner 1982). It turns the group, psychologically, into a part of the self, blurring the distinction between the self and the group (Smith and Henry 1996). In this study, the social identity with a VC is defined as the emotional significance that the members attach their membership in that community (Van Der Vegt and Bunderson 2005). Such an emotional social identity, also characterized as affective commitment (Allen and Meyer 1996), has been shown to most clearly "supply the motivational force" leading to action or the "readiness to engage in or disengage from interaction" (Bergami and Bagozzi 2000, p563).

Nahapiet and Ghoshal (1998) argue that social identity nurtures one's motivation to share knowledge, in contrast, distinct and contradictory identities within communities set up barriers to knowledge sharing. Given the human natural tendency of hoarding knowledge, people would not contribute knowledge unless they recognize as themselves as part of the social fabric of the VC and the contribution is conducive to their welfare. Social identity, implying an emotional involvement with VCs, fosters loyalty and citizenship behaviors (Ellemers et al. 1999; Bergamin and Bagozzi 2000; Bagozzi and Dholakia 2002). Such an identification renders individuals to maintain a positive self-defining relationship with other members, and elevate their activeness to contribute knowledge motivate (Hogg and Abrams 1988). Bagozzi and Dholakia (2002) further confirm that social identity motivates the participation in online interaction by enhancing "we-intention", i.e., individual commitment to participate in an joint action, and involves an implicit or explicit agreement between the participants to engage in that joint action. Chiu et al's (2006) empirical study also demonstrates that the social identity is able to increase the volume of knowledge sharing in VC. Consistent with the prior research, we hypothesize that:

H_1: Social identity will positively influence community members' knowledge contribution.

Social Presence and Social Identity

According to the social identity theory, identification with a social group is mainly derived from the group's ability to fulfill its members' needs (Hogg and Abrams 1988).

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Communication research shows that digital environments may be perceived as socially rich environments allowing the development of social identity for individual members (Postmes et al. 1998). Social presence, describing levels of social affordance of computer-mediated communication channels, enables the social identification process.

In details, sensory social presence, the awareness of other members' identity and the social situation of a virtual community, has been regarded as the prerequisite for conducting social activities and maintaining the VC (Prasolova-Forland 2002). Second, the perception of affective social presence reflects the salience of other members and the salience of interpersonal relationships, which imply a better chance to have high quality social interactions among community participants (Biocca 2003). The VCs designed high in social presence could evoke members' psychological involvement, intimacy and immediacy, consequently facilitate members' social identification. Finally, the cognitive social presence suggests an appropriate match between the medium and the communication tasks, predicting more effective, efficient, or satisfying communication, thereby leading to a higher level of social identification (Venkatesh and Johnson 2002). Accordingly, we hypothesize that:

H_{2a}: Sensory social presence will be positively related to the social identity of VC members.
H_{2b}: Affective social presence will be positively related to the social identity of VC members.
H_{2c}: Cognitive social presence will be positively related to the social identity of VC members.

Social Presence and Knowledge Contribution

In addition to indirect effects of social presence on knowledge contribution, we also propose a direct effect of social presence on members' contribution. Social identity theory interprets knowledge contribution as an intentional behavior resulting from the identification process (Bagozzi and Dholakia 2002), which may not capture impulsive or automatic aspects of individual behavior. As demonstrated in social psychological research, social stimuli can trigger the automatic, non-conscious perceptual interpretation that serves as the basis for further responses to the situation (e.g., Baumeister 2002; Strack and Deutsch 2004). Bargh (1997) finds that "there is insufficient evidence to support the position that conscious mediation of situational effects is the rule rather than the exception". Social presence serves as an interface between participants and VC and reflects the physiological and psychological perception of the represented social environment. The stronger sense of social presence, the more approximate is the virtual community to a real one. The salient social stimuli may activate the direct access processing of existing goals or trigger an automatic perceptual interpretation, both of which do not necessarily involve a well-developed intention. The existing research also supports the direct linkage between social presence and individual behavior. In particular, Viegas and Donath (1999) argue the mutual awareness (i.e., sensory social presence) forces the constant knowledge contribution; Miranda and Sounder (2003) demonstrate that the affective and cognitive social presence encourages frank communication and increases knowledge sharing. Consequently, we hypothesize that:

H_{3a}: Sensory social presence will be positively related to VC members' knowledge contribution.
H_{3b}: Affective social presence will be positively related to VC members' knowledge contribution.
H_{3c}: Cognitive social presence will be positively related to VC members' knowledge contribution.

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Method

Sample and Data Collection

The research model was tested with an online survey involving 430 respondents from four different virtual communities of interest. The selected communities had been operational for two to three years as online forums with a registered membership ranging from 21,000 to 310,000. For each forum, the membership is heterogeneous in demographics and interests, distributed among 40 to 80 interest boards. The knowledge in communities is mainly contributed and only accessed by registered members. The basic functions are similar across these four communities, e.g., browsing, searching, synchronous and asynchronous discussion, multi-media exchanging and voting. Members can attach animated icons (e.g., facial expressions) to better express their feelings, as well as audio and video to enrich their exchanges. We obtained the permission of the management of the virtual communities to post a link to our online questionnaire for three days, promising to share the results of the survey with them. The demographic statistics of the respondents and their activity information are shown in Table 1&2. For each of the respondents, we retrieved from the database his/her knowledge contribution data for two weeks starting from the date that he/she submitted the survey.

The possibility of non-response bias was examined by comparing our sample with a random sample of the total population in terms of tenure of membership, gender and age, and with the total members whose tenure was two weeks or above in terms of the number of postings. There was no significant difference, indicating the representativeness of our sample. The gender and community membership (four different communities) effects were tested by comparing the demographic and activity information. No significant differences were found, which allowed us to pool together the data from different communities.

Table 1: Demographic Information

Variables	Items	%	Variables	Items	%
Gender	Male	83.3	Age	<20	60.9
	Female	16.7		20~35	36.3
Level	Member	96.0		>36	2.8
	Manager	4.0	Frequency of Login	Less than once a month	1.2
Familiarity with VC	Not at all	0.7		Once a week	5.1
	Moderate	32.6		Several times a week	16.7
	Fair	44.7		Once a day	23.5
	Very much	22.1		Several times a day	53.5

Table 2: Information of Membership Activities

	Min	Max	Mean	Std.
Number of postings	0	1126	53.54	138.708
Number of threads initiated	0	205	2.86	13.042
Number of threads participated	0	687	36.44	86.927
Tenure of the membership (Day)	.449	1168.648	360.483	257.594

Measures

With a similar approach in extant studies (Miranda and Saunders 2003; Wasko and Faraj 2005; Chiu et al. 2006), we objectively examined the knowledge contribution in VC based on the message postings: 1) the total number of postings, 2) the number of different threads where the postings were made, and 3) the number of new threads created. We measured sensory, affective, and cognitive social presence with a 7-point scale adapted from the Networked Minds Questionnaire (Biocca et al. 2001). The items for sensory social presence

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capture how frequently the participant is aware of the others as well as being aware of by the others in VC. Items for affective social presence focus on the psychological involvement with others. Items for cognitive social presence indicate the extent to which the contributors' mental models are salient for each other. As for social identity, the measures were adapted from the instrument developed by Mael and Ashforth (1992) and validated by van Knippenberg (2000).

Data Analysis

The analysis of moment structures (AMOS 5.0) was used for data analysis. The present analysis followed a two-step procedure based in part on the approach recommended by Anderson and Gerbing (1988). We first tested the measurement model. With this held, a structural model was examined. As all independent variables were measured with valid scales, only confirmatory factor analysis (CFA) was used to assess the validity of the measurement model.

Results and Discussion

Before checking the measurement and structural models, we relied on Harman's single-factor, a widely used method, to check for common method variance that may threaten the internal validity (Podsakoff 1986). According to this approach, common method variance is present if a single factor accounts for the majority of the covariance in the dependent and independent variables. In this study, there was no dominant factor emerging from the factor analysis, implying that common method variance was not a serious problem.

Measurement Model

We conducted CFA to assess the construct reliability and validity. The constructs' reliability was assessed with Cronbach's Alpha and composite reliability (Fornell and Larcker 1981). The Cronbach's Alpha values ranged from 0.726 to 0.880, and composite reliability from 0.600 to 0.915, indicating an adequate reliability (Hatcher 1994). Convergent validity was assessed by checking the loadings. As shown in Table 3, the estimated standard loadings ranged from 0.591 to 0.927, above the commonly used cut-off value of 0.50 (Teo and King 1996). All loadings were significant at p<=0.001 level, indicating good convergent validity.

Table3: Reliability Measures and Goodness of Fit Statistics

Constructs	Standard Loading	Reliability	Constructs	Standard Loading	Reliability
Knowledge contribution		0.915[b]	Cognitive social presence		0.859[b]
KC1	0.923[**]	0.852	CSP1	0.884[**]	0.781
KC2	0.800[**]	0.640	CSP2	0.824[**]	0.679
KC3	0.927[**]	0.859	CSP3	0.743[**]	0.552
Social Identity		0.619[b]	Affective social presence		0.833[b]
SI1	0.744[**]	0.554	ASP1	0.812[**]	0.659
SI2	0.591[**]	0.349	ASP2	0.877[**]	0.769
Sensory social presence		0.600[b]			
SSP1	0.684[**]	0.468	[**] P<=0.001		
SSP2	0.615[**]	0.378	[b] Composite reliability		

Discriminant validity was assessed by comparing the square root of average variance extracted (AVE) for a particular construct to its correlations with the other constructs (Fornell and Larcker 1981). The square roots of the AVE scores were all higher than the correlations among the constructs (see Table 4), demonstrating discriminant validity.

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Table 4: Correlations between Latent Constructs

	KC	SI	CSP	ASP	SSP
Knowledge contribution (KC)	0.885				
Social Identity (SI)	.611**	0.672			
Cognitive social presence (CSP)	.419**	.367**	0.819		
Affective social presence(ASP)	.441**	.504**	.356**	0.845	
Sensory social presence (SSP)	.198**	.051	0	0	0.650
The diagonal numbers are the square root of AVE (Fornell and Larcker 1981).					

Noticing the high correlation between social identity and knowledge contribution, we conducted 10 chi-square difference tests for each pair of constructs. The chi-square difference between the unconstrained and constrained model was all significant at 99.9% level, demonstrating that each pair of constructs was much better to be treated as distinct (Anderson and Gerbing 1988). Furthermore, all items loaded higher on their respective constructs than others, providing additional support for discriminant validity. The discriminate analysis results empirically verified our multi-dimensional conceptualization of social presence, implying distinct aspects of social presence experienced by VC members.

Structural Model

Table 5 presents the results of structural models. The initial full model fits well overall as indicated by the goodness of fit indices, e.g., goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and comparative-fit index (CFI), above the threshold values (Hair et al. 1998) and the root mean square error of approximation (RMSEA) less than 0.05 (Browne and Cudeck 1993).

Table 5: Goodness of Fit Indices for the Structural Model

Goodness of fit indices	Initial model	Revised model	Desired levels
χ^2 (df)	40.795	41.257	Smaller
df	45	46	-
χ^2/df	0.907	0.897	<3
p	0.650	0.671	-
GFI	0.985	0.984	>.90
AGFI	0.973	0.974	>.80
CFI	1	0.984	>.90
RMSEA	0	0	<.05

To obtain further support for the validity of the model, rather than using a saturated model where "everything is related to everything" as the baseline, we performed formal tests of mediation for social identity. Specifically we used the Aroian version of the Sobel test suggested by Baron and Kenney (1986). The test results confirmed that social identity mediated the effects of affective social presence ($t=6.157$; $p<0.001$) and cognitive social presence ($t=5.743$; $p<0.001$) on community members' knowledge contribution. However, the mediating effects of social identity on the relationship between sensory social presence and knowledge contribution was insignificant ($t=-0.242$; $p=0.809$). We then revised the model (see Figure 2) by removing the link between sensory social presence and social identity. The revised model performed as good as the initial one but more parsimonious (see table 5). The results discussion will be based on the revised model.

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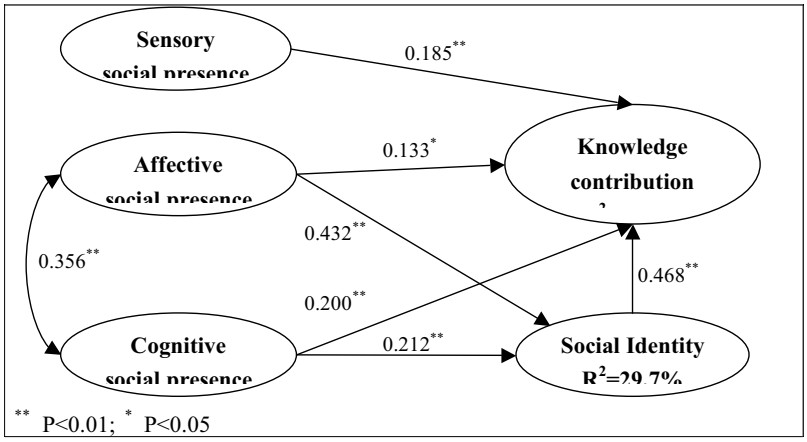

Figure 2: Revised Model

The revised model explained 46.2% of the variance of knowledge contribution, and 29.7% of the variance of social identity, providing a strong support for our research model. Consistent with prior research, social identity was found to be a strong driving force for members' knowledge contribution (H_1: 0.468, $p<0.01$). The significant mediating effect of social identity was validated for affective and cognitive dimensions, but not for sensory social presence.

The affective social presence contributed more to social identity with much higher magnitude of effect (H_{2b}: 0.432, $p<0.01$) than that of cognitive social presence (H_{2c}: 0.212, $p<0.01$). Social identity implies members' emotional attachment to the communities, thus its formation is more likely to be triggered by the affective social presence of VC design that emphasizes on the individual feelings towards the virtual environment. Meanwhile, the cognitive social presence of VC design is aimed to form members' shared mental models, thereby drives the social identification process. As for the insignificant relationship between sensory social presence and social identity (H_{2a} rejected), a plausible explanation is that sensory social presence, shaping the community members' positive sense to VCs, directly activates the participants' non-consciousness to enjoy their knowledge contribution in VCs. Such a sensory perception to particular VCs however is not sufficient to enlighten the members' social identification process, which confirms Bargh's (1997) finding that conscious mediation of situational effects is not a rule.

The direct impacts of social presence on knowledge contribution varied for different dimensions. The sensory and cognitive social presence had a higher magnitude of effect on members' contribution (H_{3a}: 0.185, $p<0.01$; H_{3c}: 0.200, $p<0.01$ respectively) than that of affective social presence (H_{3b}: 0.133, $p<0.05$). In the context of VC, the sense of virtual environment and the shared understanding among community members may make them believe the ability of VC to fulfill their social needs, therefore are more likely to elevate the knowledge contribution. In contrast, the effect of affective social presence on knowledge contribution is more mediated through social identity.

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To sum up, our results illustrate the distinct effects of three components of social presence on social identity and knowledge contribution, and provide empirical support for the multi-dimensional conceptualization of social presence.

Conclusion and Implications

VC research needs to bring system design factors and social aspects together, so as to understand the mechanisms for making system design effective and to shed lights on technological determinants for VC interventions, e.g., social identification. In this study, we integrate social presence theory and social identity theory to explain their joint effects on knowledge contribution in VC. Our study advances the research on social presence by proposing and empirically testing a three-dimensional conceptualization, i.e., sensory, affective and cognitive. Our results also demonstrate the effects of social presence on social identity and knowledge contribution vary for different dimensions.

This study entails both theoretical and practical implications. First of all, our results demonstrate appropriateness of a contingency approach in VC research. With the fast updating in technological development, most prior studies oversimplify the effect of system design by assuming a direct link between technological factors and individual behavior. We still lack theoretical underpinnings for system design. Even in VCs, individual behaviors are most likely driven by psychological or social factors, which serve as contingencies for effectiveness of system design. Future research should keep exploring the other contingencies. Secondly, we demonstrate the role of social presence in developing social identification with VC. Social identity has been cited as one of most important factors for pro-social behavior. However most prior research on VC takes social identity as given without examining its antecedents in general and system design impacts in particular. Therefore, the understanding of how to enhance social identity in VC is still limited. In this study, social presence was demonstrated as one powerful driving force for social identity. Finally, our study provides both theoretical and empirical supports for the multi-dimensional conceptualization of social presence. In general, the conceptualization of IT artifacts needs to be updated with new technological contexts. The three dimensions of social presence better capture the complexity in VC. Moreover, such conceptualization, as demonstrated with the empirical results, provides more insight on the impacts of system design on both social identity and knowledge contribution. The validity and usability of this conceptualization need more future research. In terms of practical implications, the multi-dimensional conceptualization of social presence extends the design objectives for VC. Designers should strive to achieve multiple levels of social presence by designing various self-presentation and interaction tools. The distinct role of social presence dimensions provides insights for VC designers and administrators to prioritize resources.

Although the current findings are encouraging and supportive, the context of our study, i.e., communities of interest, may limit the generalizability of results. We controlled the characteristics of VC such as nature (community of practice vs. community of interest), origin (network vs. small-group-based communities), size, and life-cycle stage (forming, norming, storming, performing, adjourning), which potentially affect the results. Future research could test the model in a variety of contexts.

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References

Allen, N.J. and Meyer, J.P. "Affective, Continuance, and Normative Commitment to the Organization: An Examination of Construct Validity," *Journal of Vocational Behavior* (49:3), 1996, pp. 252-276.

Anderson, J.C., and Gerbing, D.W. "Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach," *Psychological Bulletin* (103:3), 1988, pp 41-423.

Bagozzi, R.B., and Dholakia, U.M. "Intentional Social Action in Virtual Communities," *Journal of Interactive Marketing* (16:2), 2002, pp 2-79.

Bargh, J.A. "The Automaticity of Everyday Life," in: *Advances in Social Cognition,* J. Rober S. Wyer (ed.), Lawrence Erlbaum Associates, Mahwah, New Jersey, 1997, pp. 1-62.

Baron, R.M., and Kenny, D.A. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Consideration," J*ournal of Personality and Social Psychology* (51:6), 1986, pp. 113-1182.

Baumeister, R.F. "Yielding to Temptation: Self-control Failure, Impulsive Purchasing, and Consumer Behavior," *Journal of Consumer Research* (28:4) 2002, pp 670-676.

Bergami, M., and Bagozzi, R.P. "Self-Categorization, Affective Commitment and Group Self-Esteem as Distinct Aspects of Social Identity in the Organization," *British Journal of Social Psychology* (39:4), 2000, pp 555-577.

Biocca, F., Harms, C., and Burgoon, J.K. "Toward a More Robust Theory and Measure of Social Presence: Review and Suggested Criteria," P*resence* (12:5), 2003, pp 456-480.

Biocca, F., Harms, C., and Gregg, J. "The Networked Minds Measure of Social Presence: Pilot Test of the Factor Structure and Concurrent Validity," Presence 2001, Philadelphia, 2001.

Biocca, F., Kim, T., and Levy, M.R. "The Vision of Virtual Reality," in: C*ommunication in the Age of Virtual Reality,* M.R. Levy (ed.), Lawrence Erlbaum Associates Inc., Hillsdale, 1995, pp. 3-14.

Browne, M.W., and Cudeck, R. "Alternative Ways of Assessing Model Fit," in: *Testing Structural Equation Models,* J.S. Long (ed.), Sage, Newbury Part, CA, 1993, pp. 445-455.

Chiu, C.M., Hsu, M.H., Wang, E.T.G. "Understanding Knowledge Sharing in Virtual Communities: An Integration of Social Capital and Social Cognitive Theories," *Decision Support Systems* (42:3), 2006, pp. 1872-1888.

Constant, D., Sproull, L., and Kiesler, S. "The Kindness of Strangers: The Usefulness of Electronic Weak Ties for Technical Advice," *Organization Science* (7:2), 1996, pp. 119-135.

Dholakia, U.M., Bagozzi, R.P., and Pearo, L.K. "A Social Influence Model of Consumer Participation in Network- and Small-Group-Based Virtual Communities," *International Journal of Research in Marketing* (21:3), 2004, pp. 241-263.

Ellemers, N., De Gilder, D., and Haslam, S.A. "Motivating individuals and groups at work: A social identity perspective on leadership and group performance," *Academy of Management Review* (29: 3), 2004, pp. 459-478.

Ellemers, N., Kortekaas, P., and Ouwerkerk, J.W. "Self-Categorisation, Commitment to the Group and Group Self-Esteem as Related but Distinct Aspects of Social Identity," *European Journal of Social Psychology* (29:2-3), 1999, pp 371-389.

Fornell, C., and Larcker, D. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18) 1981, pp 39-50.

Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C. *Multivariate Data Analysis,* (5th ed.) Prentice Hall, Upper Saddle River, N.J., 1998.

Hatcher, L. A *Step-by-Step Approach to using the SAS System for Factor Analysis and Structural Equation Modeling* SAS Institute Inc., Cary, NC, 1994.

Customer 5/19/07 11:51 PM
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JT 11/15/06 12:58 AM
Inserted: 6

Hogg, M.A. and Reid, S.A. "Social Identity, Self-categorization, and the Communication of Group Norms," *Communication Theory* (16:1), 2006, pp. 7-30.

Hogg, M.A., and Abrams, D. *Social Identifications: A Social Psychology of Intergroup Relations and Group Processes* Routledge, London, 1988.

Jones, Q., Ravid, G., and Rafaeli, S. "Information Overload and the Message Dynamics of Online Interaction Spaces: A Theoretical Model and Empirical Exploration," *Information Systems Research* (15:2), 2004, pp. 194-210.

Jorgensen, B.S. and Stedman, R.C. "A Comparative Analysis of Predictors of Sense of Place Dimensions: Attachment to, Dependence on, and Identification with Lakeshore Properties," *Journal of Environmental Management* (79:3), 2006, pp. 316-327.

Kankanhalli A., Tan B.C.Y., Wei K.K. "Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation," *MIS Quarterly* (29:1), pp. 113-143.

Lee, F.S.L., Vogel, D., and Limayem, M. "Virtual Community Informatics: A Review and Research Agenda," *Journal of Information Technology and Application* (5:1), 2003, pp. 47-61.

Leimeister, J.M., Sidiras, P., and Kremar, H.C. "Success Factors of Virtual Communities from the Perspective of Members and Operators: An Empirical Study," *The 37th Hawaii International Conference on System Sciences*, Hawaii, 2004.

Mael, F., and Ashforth, B.E. "Alumni and Their Alma Mater: A Partial Test of the Reformulated Model of Organizational Identification," *Journal of Organizational Behavior* (13:2), 1992, pp 103-123.

Miranda, S.M., and Saunders, C.S. "The Social Construction of Meaning: An Alternative Perspective on Information Sharing," *Information Systems Research* (14:1) 2003, pp. 87-106.

Nahapiet, J. and Ghoshal, S. "Social Capital, Intellectual Capital, and the Organizational Advantage," *Academy of Management Review* (23:2), 1998, pp. 242-266.

Podsakoff, P.M. "Self-Reports in Organizational Research: Problems and Prospects," *Journal of Management* (12:4) 1986, pp. 531-544.

Postmes, T. "A Social Identity Approach to Communication in Organizations," in: S*ocial Identity at Work: Developing Theory for Organizational Practice,* M.J. Platow (ed.), Psychology Press, Philadelphia, PA, 2003, pp. 81-97.

Postmes, T., Spears, R., and Lea, M. "Breaching or building social boundaries? SIDE-effects of computer-mediated communication," C*ommunication Research* (25:6) 1998, pp. 689-715.

Prasolova-Forland, E. "Supporting Social Awareness in Education in Collaborative Virtual Environments," *CSCW'02*, 2002, pp. 16-20.

Relph, E. *Place and Placelessness,* Pion Books, London, 1976.

Smith, E.R., and Henry, S. "An In-group Becomes Part of the Self: Response Time Evidence," *Personality and Social Psychology Bulletin* (22:6), 1996, pp. 635-642.

Strack, F., and Deutsch, R. "Reflective and Impulsive Determinants of Social Behavior," *Personality and Social Psychology Review* (8:3), 2004, pp. 220-247.

Teo, T.S.H., and King, W.R. "Key Dimensions of Facilitators and Inhibitors for the Strategic Use of Information Technology," *Journal of Management Information Systems* (12:4), 1996, pp. 35-53.

Turner, J.C. "Towards a Cognitive Redefinition of the Social Group," in: S*ocial Identity and Intergroup Relations,* H. Tajfel (ed.), Cambridge University Press, Cambridge, 1982, pp. 15-40.

Van Der Vegt, G.S., and Bunderson, J.S. "Learning and Performance in Multidisciplinary Teams: The Performance of Collective Team Identification," *Academy of Management Journal* (48:3), 2005, pp. 532-547.

Customer 5/19/07 11:51 PM
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JT 11/15/06 12:58 AM
Inserted: 6

van Knippenberg, D. "Work Motivation and Performance: A Social Identity Perspective," *Applied Psychology: An International Review* (49:3), 2000, pp 357-371.

Venkatesh, V., and Johnson, P. "Telecommuting Technology Implementations: A Within- and Between- Subjects Longitudinal Field Study," *Personnel Psychology* (55:3), 2002, pp. 661-687.

Viegas, F., and Donath, J. "Chat Circles," *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM Press*, 1999, pp. 9-16.

Wasko, M. M., and Faraj, S. "'It Is What One Does': Why People Participate and Help Others in Electronic Communities of Practice," *Journal of Strategic Information Systems* (9:2/3), 2000, pp. 155-173.

Wasko, M.M., and Faraj, S. "Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice," *MIS Quarterly* (29:1), 2005, pp. 35-57.

Customer 5/19/07 11:51 PM
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JT 11/15/06 12:58 AM
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