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DESIGN FOR SOCIAL PRESENCE IN ONLINE COMMUNITIES: A MULTI-DIMENSIONAL APPROACH

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DESIGN FOR SOCIAL PRESENCE IN ONLINE COMMUNITIES: A MULTI-DIMENSIONAL APPROACH

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Abstract

In online communities, numerous technical and social design decisions determine the social interaction space and affect the community participation. Social presence has been considered as a major design principle in computer-mediated communication. While most prior IS research adopts a uni-dimensional approach and restricts social presence to be the subjective nature of media, this research adopts a multi-dimensional approach (Shen and Khalifa 2007) to examine the online community design. Compared to uni-dimensional conceptualizations of presence/social presence, multi-dimensional conceptualizations can better capture the sense of social presence induced by both technical and social factors, and therefore entail more valuable implications for community design. The multi-dimensional approach also extends the developers' impacts on online community, from interface design to user experience design. Built upon the work by Shen and Khalifa (2007) and Ma and Agarwal (2007), this study examines the technological antecedents of social presence dimensions. An online survey was conducted with four online forums. The empirical results provide interesting insights regarding the relative importance of three social presence dimensions in driving online community participation as well as the various correspondences between community artifacts and three social presence dimension.

Keywords: Social Presence; Online Community Design; Multi-dimensional Conceptualization.

1 INTRODUCTION

For most online communities, members' voluntary participation is critical to sustain the community and to realize the benefits for members. Online community design plays an important role in affecting community participation (Ren et al. 2007). Technologically speaking, online community design includes various website features that facilitate communication and interaction. In this regards, social presence emerges as a major design principle in telecommunication systems and a core construct in studying computer-mediated communication (Biocca et al. 1995). First proposed by Short et al. (1976), social presence referred to the "subjective qualities" of the medium and was conceptualized as a uni-dimensional construct. This conceptualization has been widely employed in IS research (e.g., Venkatesh and Johnson 2002; Miranda and Saunders 2003; Kumar and Benbasat 2002).

However, recent developments in presence research have provided rich evidence suggesting the multi-dimensional nature of social presence (Lombard and Ditton, 1997). Social presence, the social aspect of presence, is re-conceptualized as the fluctuating phenomenal nature of the medium, that is the properties of the communication interaction specifically rather than direct attributions about medium per se (Biocca et al. 2003). This advancement suggests the significant impact of developers in not only the interface design but also the experience design (Pares and Pares 2006). Although insightful, the multi-dimensional conceptualization of presence has been mainly limited to the investigation of immersive media, e.g., virtual reality. Online communities represent a different media context in terms of design goals, modes of interaction and technological features (Shen & Khalifa 2007). Shen and Khalifa (2007) examined the appropriateness of multi-dimensional conceptualizations of social presence for studying online communities and proposed a multi-conceptualization of social presence for online communities, consisting of three dimensions, i.e., awareness, affective social presence and cognitive social presence. They also empirically investigated the usability of this multi-conceptualization of social presence in enhancing the understanding of community participation. However, their study did not investigate the antecedents of different dimensions of social presence. Given the relative importance of social presence dimensions, designers would like to know the relationship between various community design features and the social presence dimensions.

Therefore, in this research, we try to fill in the theoretical gap by examining the technological antecedents of social presence dimensions in online communities. This paper is structured as follows. We first describe the multi-dimensional conceptualization of social presence. Next, we develop the research model and justify it. This is followed by a description of the empirical study and a discussion of its results. In conclusion, we discuss the theoretical and practical implications of these results and make suggestions for future research.

2 MULTI-DIMENSIONAL CONCEPTUALIZATION OF SOCIAL PRESENCE

Most prior research adopts the uni-dimensional conceptualization of social presence (Short et al. 1976), and considers social presence as stable properties of the medium (see Biocca et al. 2003 and Shen and Khalifa 2007 for reviews). However, this has been challenged by many presence researchers who argue for a multi-dimensional approach in understanding social presence. It is widely acknowledged that presence should be considered as an experience that varies in a moment-to-moment fashion (Heeter 2003). Biocca et al. (2001) even re-conceptualized social presence as the fluctuating phenomenal nature of the medium, that is properties of the communication interaction specifically rather than direct attributions about medium per se. From a design point of view, Pares and Pares (2006) also argue that a successful virtual environment will not only provide the indistinguishable sensory experiences, but also need to mimic the human perception and reception. Instead of focusing on artifact design, they advocate the experience design. A multi-dimensional approach is advocated to

better capture the user experience and accordingly provide more integrated practical implications for designing virtual experience.

Based on a comprehensive review of social presence literature and the related studies, Shen and Khalifa (2007) proposed a three-dimensional conceptualization of social presence for online communities. They define social presence as the moment-by-moment awareness of the co-presence of the other sentient beings and the social context accompanied by affective and cognitive engagement with the others. Three dimensions, i.e., awareness, affective social presence and cognitive social presence, are identified. ***Awareness*** refers to the extent to which other social actors appear to exist and react to the users (Heeter 1992). In online communities, users communicate with keyboard. The sensory extensity and intensity are both low. Showing the user status (e.g., online/offline, where is he/she, or what is he/she doing) and using self-presentation features (e.g., images and avatars) are used to enhance the awareness. In addition, awareness in online community is also achieved through users' continuously participation in online discussion in the form of posting. ***Affective social presence*** refers to the emotional responses aroused by virtual social interaction. Huang and Alessi (1999) argue that people do not think about being present in the real world --- they feel that they are. Emotions, at the very lest, is a prerequisite to experience being present in a virtual environment. Vastfjall (2003) also found the sense of presence and emotional reactions to the music are highly interrelated and speculate that the subjective sense of presence is not a separate construct from emotional reaction, but a feeling of presence is actually an emotion. An emotional reaction may be used as evidence to a participant's social presence in an environment and as information input for further evaluation and behavioral response. ***Cognitive social presence*** refers to the belief about the users' relationship the others and the social context. Presence theorists have employed theories of cognition and memory to understand the nature of the cognitive processes that lead to the sense of presence. In general, the user has to be aware of its meaning in order to be "present" in the context offered by a symbolic system (Riva et al. 2002).

3 THEORETICAL MODEL

Nowadays, an online community website usually integrates various technological features to create a virtual social space for communication and interaction. A member's sense of social presence is largely shaped by those design features or community artifacts. Ma and Agarwal (2007) identify a set of online community artifacts that supporting deep profiling, self-presentation and virtual co-presence respectively. For instance, "who is online" and "who is doing what" are designed to support virtual co-presence. Different from Ma and Agarwal (2007) we focus on "perceived usage" of all community members rather than the focal member's usage of such features because it is the overall usage of the members in online communities that determines an individual's exposure to the others' identities and consequently shape his/her perception of social context. In this research, we hypothesize that the members' perceived usage of artifacts supporting deep profiling, self-presentation and virtual copresence will affect the members' experience with the online community, which in turn will influence the members' community participation (see Figure 1). The justification for the hypotheses will be discussed as follows.

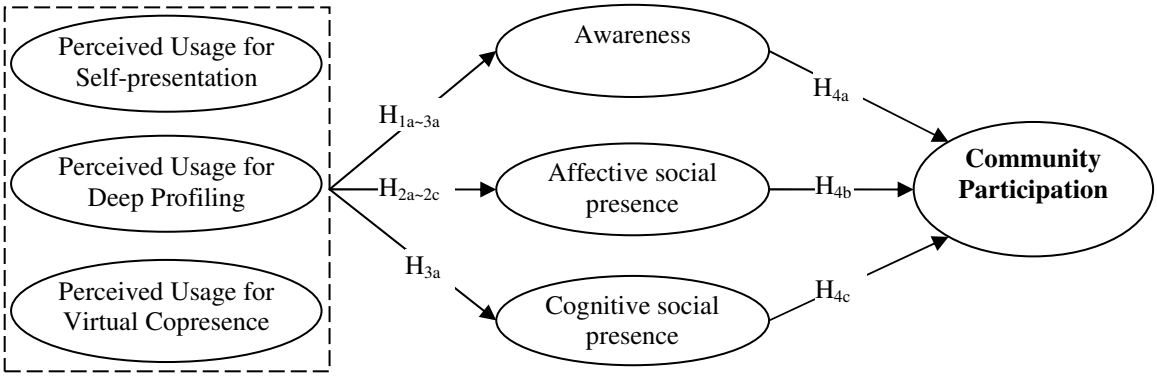


Figure 1. Theoretical Model.

Self-presentation is a process to communicate one's identity, helping others form a more sophisticated and accurate understanding of "who am I" (Ma and Agarwal 2007). Various means are used for identity communication in online communities, e.g., avatar, personal profile, signature and etc. Using these features in online communication will help the members to be aware of each other's existence as social actors. Moreover, features supporting self-presentation enable members to convey rich information about their behavioral contexts, social association, dispositional traits (Ma and Agarwal 2007), all of which help members to understand each other and to increase the psychological attachment. Thus, we hypothesized that:

H_{1a}: A member's perceived usage of community artifacts supporting self-presentation is positively related to his/her sense of awareness

H_{1b}: A member's perceived usage of community artifacts supporting self-presentation is positively related to his/her sense of affective social presence.

H_{1c}: A member's perceived usage of community artifacts supporting self-presentation is positively related to his/her sense of cognitive social presence.

Features supporting deep profiling include "who did what", community archives, reputation and/or ranking systems. All such features offer venues for the members' previous interactions and the community history and serve as an extended memory of social information (Ma and Agarwal 2007). They can facilitate the development of mutual understanding (Biocca et al., 2003) or cognitive social presence. Furthermore, the availability of rich contextual information about the others may also shorten the psychological distance when the focal member interacts in the online community. Thus he/she may be more likely to be aroused emotionally and develop a strong sense of affective social presence. Finally, the features supporting deep profiling may also contribute to the sense of awareness by presenting the existence and histories of the community members and the community itself. Therefore, we hypothesize that:

H_{2a}: A member's perceived usage of community artifacts supporting deep profiling is positively related to his/her sense of awareness

H_{2b}: A member's perceived usage of community artifacts supporting deep profiling is positively related to his/her sense of affective social presence.

H_{2c}: A member's perceived usage of community artifacts supporting deep profiling is positively related to his/her sense of cognitive social presence.

Virtual co-presence is defined as a subjective feeling of being together with others in a virtual environment (Biocca et al. 2003). This definition is actually overlapped with the uni-dimensional conceptualization of social presence and focused on the media characteristics. Ma and Agarwal (2007) identify several features in online communities supporting virtual co-presence, including "who is online", "who is doing what", chat room, and etc. The first two are most popular in online communities. The usage of these features may give rise to a strong awareness of the others' existence. However, using these features may not directly guarantee the increased understanding or emotional immediacy among members, which requires rich contextual information. Therefore, we hypothesize that:

H_{3a}: A member's perceived usage of community artifacts supporting virtual co-presence is positively related to his/her sense of awareness

Consistent with prior studies, we also hypothesize the positive effects of social presence dimensions on online community participation as follows:

H_{4a}: A member's sense of awareness is positively related to his/her online community participation.

H_{4b}: A member's sense of affective social presence is positively related to his/her online community participation.

H_{4c}: A member's sense of cognitive social presence is positively related to his/her online community participation.

4 METHOD

The research model was tested with a survey study with four online forums. All of them were using the same software package of vBulletin with similar interface design and functions, e.g., browsing and searching information, asynchronous discussion by posting, multi-media exchange and voting. They also shared the similar community design in terms of policies and organization structures. The content of these online communities was contributed and accessed by registered members only. We also obtained the permission of the administrators to access the community databases for participation data. A total of 430 registered members completed the survey. The sample was dominant with male members (83.3%) and over half of the total subjects were less than 20 years old (60.9%). Only 2.8% of the total subjects were more than 35 years old. The majority of subjects are familiar with online communities (99.3%). 77% of subjects logged in the online community at least once a day, frequent visitors; 16.7%, once a week. Although the majority of the sampled respondents were frequent visitors as indicated by the frequency of login, their participation levels varied considerably. Even some lurckers also participated in the survey. For each of the respondents, we retrieved from the database his/her participation data for two weeks starting from the date that he/she answered the survey. The community membership effect (four different communities) was tested by comparing the demographics and the factor scores for all variables. No significant difference was reported.

The possibility of non-response bias and selection bias was examined by comparing our sample with a random sample of the total population in terms of tenure of membership, gender and age. Such information is public for any registered member. We found no significant differences between our respondents and the random sample, indicating the representativeness of our sample.

4.1 Measures

Similar to prior studies (Miranda and Saunders 2003), participation was objectively measured by contributions over two weeks, i.e., 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. The individual participation was then scaled by the average participation of the associated community. As compared to perceived measures of participation, actual contribution can better distinguish an active participant from a lurker (Blanchard 2004). Methodologically, it helps alleviate the potential problem of common method variance. The subsequent test indicated high correlations among these three indicators. In addition, both convergent and discriminant analyses supported the reflective measures for participation. Three dimensions of social presence were measured by reflective items from Shen and Khalifa (2007). The artifacts supporting deep profiling, self-presentation and virtual co-presence were adapted from Ma and Agarwal (2007) with some adjustment to the surveyed online communities. Formative items were used to measure the perceived usage of online community features supporting deep profiling, self-presentation and virtual co-presence (see Table 1 for items).

4.2 Data Analysis

The analysis of the data was done in a holistic manner using Partial Least Squares (PLS). We conducted tests of significance for all paths using the bootstrap re-sampling procedure and the standard approach for evaluation that requires path loadings from construct to measures to exceed 0.70. For checking internal consistency, we relied on composite reliability measures (ρ) and on the average variance extracted (AVE) as suggested by Fornell and Larcker (1987). we tested the

discriminant validity by comparing the square root of the AVE for a particular construct to its correlations with the other constructs (Fornell and Larcker 1987).

5 RESULTS AND DISCUSSION

5.1 Measurement Model

The measurement model for reflective constructs was assessed by examining internal consistency as well as convergent and discriminant validities (Hulland 1999). As illustrated in Table 1, the composite reliability scores of the reflective constructs (ρ) exceed the threshold of 0.70, indicating internal consistency (Nunnally and Bernstein 1994). The AVE scores for the three constructs with reflective measures are much higher than the generally recognized cutoff value of 0.5, demonstrating convergent validity. In addition, all reflective items are significant at the 99% level with high loadings (all above 0.70), providing additional evidence for convergent validity (Barclay et al. 1995).

Variables	Measures	Loadings	Weight	Std.	T-Stat.
Participation ρ=0.889; AVE=0.727	Item1	0.829		0.08	10.28
	Item2	0.839		0.03	21.39
	Item3	0.888		0.03	24.50
Awareness ρ=0.668; AVE=0.803	Item1	0.829		0.03	21.70
	Item2	0.888		0.02	34.47
Affective Social Presence ρ=0.906; AVE=0.660	Item1	0.774		0.02	33.88
	Item2	0.793		0.01	41.72
	Item3	0.864		0.01	68.82
	Item4	0.835		0.02	39.51
	Item5	0.792		0.02	37.24
Cognitive Social Presence ρ=0.922; AVE=0.664	Item1	0.862		0.01	61.80
	Item2	0.755		0.03	24.76
	Item3	0.821		0.01	48.95
	Item4	0.829		0.02	41.16
	Item5	0.819		0.02	39.66
	Item6	0.797		0.02	35.73
Perceived usage for deep profiling	Peer evaluation		.452	.111	4.06
	System ranking		.311	.119	2.62
	Interaction archives		.572	.093	6.15
Perceived usage for self-presentation	Unique user ID		.283	.117	2.42
	Personal profile		.287	.127	2.26
	Avatar or nickname		.332	.117	2.85
	Signature		.456	.118	3.88
Perceived usage for virtual copresence	Who is online		.638	.124	5.13
	Who is doing what		.570	.134	4.25

Table 1. Measurement Model

Table 2 presents the discriminant validity statistics. The square roots of the AVE scores (diagonal elements) are all higher than the correlations among the constructs, demonstrating discriminant validity. Furthermore, all items loaded higher on their respective constructs than on others, providing additional support for discriminant validity. The discriminate analysis results also provide empirical

evidence for our argument that different aspects of social presence should be considered as distinct constructs, implying distinct aspects of social presence experienced by the community participants.

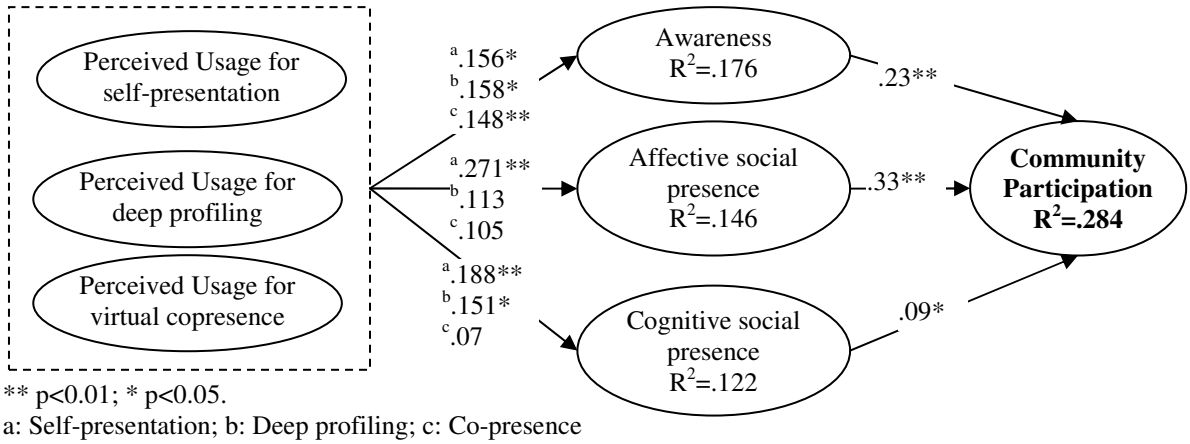
	P	A	ASP	CSP
Participation (P)	0.852			
Awareness (A)	0.174	0.844		
Affective Social Presence (ASP)	0.463	0.085	0.812	
Cognitive Social Presence (CSP	0.362	-0.113	0.381	0.814

Table 2. Correlations between Latent Constructs (The diagonal elements are the square roots of the AVE scores)

5.2 Structural Model

Figure 2 presents the results of the PLS analysis of the structural model. All social presence dimensions have significant effects on participation, verifying $H_{4a\text{-}4c}$. In addition, affective social presence (.33; p<.01) exerts the strongest influence among three dimensions while cognitive social presence's contribution is the least (.09; p<.05). The difference in the relative importance may be explained by the nature of the surveyed online communities. Social interaction in the surveyed online communities is for general purposes of information exchange and/or entertainment. Thus, the participation is less driven by cognitive social presence. Moreover, the mere awareness is also a main factor driving online community participation. A strong sense of awareness implies a lively on-going discussion in the online community, attracting members to join the crowd.

As for the antecedents of social presence dimensions, we found the perceived usage of community artifacts supporting self-presentation have consistent significant effects on three social presence dimensions. Features supporting self-presentation seem to be the most effective way to create a strong sense of social presence in general and to arouse emotional responses (affective social presence: .271, p<01) in particular. The perceived usage of community features for deep profiling, on the other hand, was found to be significant for awareness (.158, p<.05) and cognitive social presence (.151; p<.05), but not for affective social presence. One possible explanation is that emotional response is more likely associated with ongoing communication rather than historical information. Finally, as hypothesized, the usage of features supporting virtual copresence was only reported to be significant for the sense of awareness (.148; p<.01). Particularly, it had no significant effect on affective social presence which was the main driving force for community participation. This result suggests that such features may be simply necessity for sustaining an online community, but not sufficient to make it flourish.



** p<0.01; * p<0.05.
a: Self-presentation; b: Deep profiling; c: Co-presence

Figure 2. Structural Results

The examination of the weight of formative measures also sheds light on the relative importance of specific features. With the category of self-presentation, user signature (weight=.456; p<.01) and avatar/nickname (weight=.332, p<.01) were relatively more important for self-presentation than personal profile (weight=.287, p<.05) and unique user ID (weight=.283, p<.05). One possible explanation might be the space that each feature affords for expressing identities. Using signature or avatar/nickname, members enjoy more freedom and active control in self-presentation. Meanwhile these two features also provide a larger space for an individual to be differentiated from the others. Finally these two features are associated with online interaction, leading to a wide exposure for identity communication. On contrast, personal profile is usually a structured document, which may not be checked by the others; while user ID is very limited in providing the identity information. Within the category of deep profiling, interactive archives (weight=.572, p<.01) were heavily used by the members to gain better understanding of the others as well as the history of the community. In addition, the surveyed online communities provided two evaluation schemes, i.e., peer evaluation and system ranking. Peer evaluation was the content assessment from the other members (e.g., to what extend that you feel the post is helpful); while system ranking was mainly to record each members' participation activities (e.g., the total number of posts, the number of excellent posts and etc.). Both schemes were found to be significantly but the members seem more rely on peer evaluation (weight=.452, p<.01) than system ranking (.311, p<.05). Finally both features supporting virtual copresence were significant. The feature of who is online (weight=.638; p<.01) seemed more important to create the sense of awareness than the feature of who is doing what (weight=.570; p<.01).

6 CONCLUSION AND IMPLICATIONS

In online communities, numerous technical and social design decisions determine the social interaction space and affect the community participation. Social presence has been considered as a major design principle in computer-mediated communication. While most prior IS research adopts a uni-dimensional approach and restricts social presence to be the subjective nature of media, this research adopts a multi-dimensional approach (Shen and Khalifa 2007) to examine the online community design. Compared to uni-dimensional conceptualizations of presence/social presence, multi-dimensional conceptualizations can better capture the sense of social presence induced by both technical and social factors, and therefore entail more valuable implications for community design. The multi-dimensional approach also extends the developers' impacts on online community, from interface design to user experience design.

Built upon the work by Shen and Khalifa (2007) and Ma and Agarwal (2007), this study examines the technological antecedents of social presence dimension. An online survey was conducted with four online forums. The empirical results provide interesting insights regarding the relative importance of three social presence dimensions in driving online community participation as well as the various correspondences between community artifacts and three social presence dimension.

This study entails both theoretical and practical implications. Theoretically speaking, our research extends Shen and Khalifa's (2007) work on the multi-dimensional conceptualization of social presence by examining its important role in informing the online community design. Community artifacts should not be simply considered as either preferred or non-preferred. Rather we need to understand in what way various community artifacts affect the user perception and behavior. Conceptualized as a fluctuating nature of communication, social presence advances the impacts of designers from simple interface design to experience design. The three-dimensional conceptualization of social presence captures all aspects of user experience with online communities and lays out more specific design requirements. Our study empirically demonstrated that effects of community artifacts on social presence vary for different dimensions. The different relationships between community artifacts and social presence dimensions will be very helpful in guiding developers in artifact selection for desired online experiences.

Several cautions need to be made in generalizing our results to the other online communities. First this research only surveyed one type of online communities. The difference in the magnitude of social presence dimensions' effects on online community participation may vary for different types of online communities. For instance, the open-source communities may heavily rely on the mutual understanding or cognitive social presence among members to sustain the on-going contribution. Thus, the future research needs to investigate with various online communities to find out which dimension(s) is (are) the driving forces of community participation. Accumulation of such studies may result in a richer understanding of user experience requirement with online communities. Second, the sample mainly consisted of young male members. Although this reflects the real demographic composition in the surveyed online communities, samples with different gender compositions should be investigated in the future research. In a female-dominant environment, members' participation may be driven by different social presence dimensions and the usage/implications of community artifacts may also dissimilar from that in a male-dominant environment.

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