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Kathy N. Shen

Abu Dhabi University, kathy.shen@adu.ac.ae

Mohamed Khalifa

University of Wollongong in Dubai, mkhalifa@uow.edu.au

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Design for Social Presence in Online Communities: A Multidimensional Approach

Kathy Ning Shen
Abu Dhabi University
kathy.shen@adu.ac.ae

Mohamed Khalifa
University of Wollongong in Dubai
mohamedkhalifa@uowdubai.ac.ae

Abstract

The design of online communities that promotes user participation is critical to the community's success in fostering new ideas and innovations, building knowledge competencies, and strengthening customer relations. Social presence has been considered as a major design principle and important concept in explaining the relationship between online community artifacts and online user behavior. While most prior IS research adopts a unidimensional conceptualization of social presence and focuses on its effects on user attitude and/or behavior, this research employs a multidimensional conceptualization and demonstrates its suitability for understanding the effects of online community artifacts on social presence. More specifically, this research examines the effects of three categories of design artifacts (artifacts supporting self-presentation, deep profiling, and virtual co-presence) on three social presence dimensions (awareness, affective social presence and cognitive social presence). To validate the research model, a survey was conducted with four online communities. Different social presence dimensions were found to carry different weights in forming the overall sense of social presence and the effects of perceived usage of various online community artifacts varied for different social presence dimensions.

Keywords: Social Presence, Online Communities, IT Artifacts, Multidimensional Conceptualization

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INTRODUCTION

Online communities, also called virtual communities, are computer-mediated social spaces that allow groups to form and be sustained primarily through ongoing virtual communication processes (Bagozzi and Dholakia, 2002). Given the large varieties in online communities, this article focuses on text-based online communities (e.g., online communities supported by software packages like vBulletin, phpBB, and Invision). Much evidence has shown their potent influence in bringing together far-flung, like-minded individuals (Hagel and Armstrong, 1997) and their commercial and/or social values (Gupta and Kim, 2004). More importantly, online communities represent an important mechanism for knowledge exchange and sharing (Wasko and Faraj, 2000; Wenger, 1998). A growing number of companies are building online communities to facilitate peer-to-peer help (Daugherty et al., 2005), foster new ideas and innovation (Nambisan, 2002; Teigland and Wasko, 2003), and build knowledge competencies (Saint-Onge and Wallace, 2003; Daugherty et al., 2005). Online communities are also used to access customer knowledge. Many firms are hosting online user communities to collect feedback and ideas (Williams and Cothrel, 2000) and to strength their innovation process (Jeppesen and Frederiksen, 2006). As of Feb. 2005 (update this information), 14 out of the top 20 most popular English/Chinese websites are either online communities or include online community functions. Some large online communities have more than 14 million members (<http://www.big-boards.com/>).

For online communities, the technological capacity of communication media plays a critical role in determining individual behaviour, as all psychological experiences of the represented places and groups are computer-mediated communication (Jones et al., 2004). Technologically speaking, online community design includes various IT artifacts that facilitate communication and interaction¹ (Ren et al., 2007). In this regard, social presence emerges as a major design principle and a core construct in studying computer-mediated communication (CMC) (Biocca et al., 1995). Conceptualized as an inherent property of media, social refers to the feeling of “being with another” or the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships (Biocca et al., 2003). Prior research has demonstrated the important role that social presence plays in explaining email usage (Gefen and Straub, 1997), enhancing e-trust (Gefen and Straub, 2004), sharing information over CMC (Miranda and Saunders, 2003), reducing uncertainty in online shopping (Pavlou et al., 2007), increasing motivation for system usage (Venkatesh and Johnson, 2002), and affecting group consensus in CMC (Sia et al., 2002; Yoo and Alavi, 2001). Along the same lines, achieving appropriate social presence has also been considered a main task and objective for online community design (Preece and Maloney-Krichmar, 2003). Of particular interest in this study is how various online community artifacts affect the members’ sense of social presence.

Existing research on the technical antecedents of social presence has the following limitations. First, most prior research adopts a unidimensional conceptualization of social presence and considers it a static media characteristic. Using face-to-face communication as the benchmark, these studies categorized different media to be high or low in social presence without examining the underlying effects of the specific IT artifacts. Such research sheds little insight on IT artifacts relevant to social presence. Second, some studies conceptualize social presence as a “subjective quality” of media and examine the effects of one or two design artifacts on social presence in isolation, e.g., video (Homer et al., 2008), customer review and recommendation (Kumar and Benbasat, 2006), and physically embodied agents (Lee et al., 2006). Although insightful, such results oversimplify the “subjective quality” of those IT artifacts along one dimension of social presence. It is very likely that video would not arouse the same feeling of “being with another” as that customer review and recommendation would. In other words, different IT artifacts may bring the sense of social presence in different ways, which cannot be captured by a unidimensional conceptualization. Furthermore, such studies may not reveal the relative importance of various IT artifacts—online community users are exposed to a wide range of IT artifacts. Understanding the dominant artifacts for the sense of social presence would be very helpful in allocating design resources.

Indeed, it has been suggested that social presence be re-conceptualized as the fluctuating phenomenal nature of the medium indicating one’s state within the medium (Biocca et al., 2003). To account for the rich communication experience aroused by certain media, a multidimensional approach in conceptualizing social presence has been recommended (Biocca et al., 2001; Shen and Khalifa, 2008). The multi-dimensional conceptualization of social presence has the potential to further the discernment of the different weights of an IT artifact on the various aspects of the feeling of “being with the others.” In turn, community design becomes more relevant and effective. However, such a potential is not yet validated due to the fact that extant research on multi-dimensional conceptualizations of social presence lacks rigorous validation, and little research has been done to examine its antecedents.

Therefore, we are interested in the research question about how various online community artifacts affect different social presence dimensions. In this study, we adopt a multidimensional conceptualization of social presence developed by Shen and Khalifa (2008) to examine the simultaneous effects of various online community artifacts on

¹ <http://www.vbulletin.com/features.php>: See the typical user control features provided by vBulletin.

social presence. According to their conceptualization, social presence has three dimensions: awareness, affective social presence, and cognitive social presence. Our contribution to this conceptualization is twofold. First, we strengthen and complete this conceptualization by clarifying and empirically validating the relationship between social presence dimensions and overall social presence. Second, by examining its online community artifact antecedents, we demonstrate the suitability of this multi-dimensional conceptualization in understanding various implications of online community IT artifacts.

We adapt the online community artifacts characterizing the technical context of online communities from the framework developed by Ma and Agarwal (2007). The reason for choosing this framework is due to the similarity of the research context. This framework proposes four categories of online community artifacts supporting self-presentation, deep profiling, persistent labeling, and virtual co-presence. Ma and Agarwal (2007) showed that actual usage of these artifacts by the member or his/her communicators facilitates identity communication and identity confirmation. Different from identity communication (Ma and Agarwal 2007) that is mainly controlled by the member him/herself, the social interaction context for a focal person and subsequent sense of social presence is shaped more collectively by members using various community artifacts for self-presentation and rich communication. Therefore, we conceptualize that perceived overall usage of online community artifacts will influence the sense of social presence.

We conceptualize the model at the dimensional level in order to obtain insight on the correspondence between online community artifacts and various social presence dimensions, but we test the model at both dimensional and multidimensional levels. Data from four similar online communities and the empirical results provide strong support for the research model. As the first attempt to apply a multidimensional conceptualization of social presence to understand the effects of online community artifacts, this research entails theoretical and practical implications for online community research and design.

This paper is structured as follows. We first review social presence theory and the application of social presence in prior IS research. Then we discuss the multidimensional conceptualization of social presence and justify the research hypotheses. Next, we describe the empirical study and discuss the results. In conclusion, we discuss the theoretical and practical implications of these results and make suggestions for future research.

SOCIAL PRESENCE IN PRIOR IS RESEARCH

The concept of presence has been used in studying telecommunication, teleoperators, and virtual environments. A widely accepted definition of presence is "a perceptual illusion of non-mediation" that occurs "when a person fails to perceive or acknowledge the existence of a medium in his/her communication environment and responds as he/she would if the medium were not there" (Lombard and Ditton, 1997). Two types of presence are identified, i.e., physical presence and social presence. Physical presence, also known as spatial presence or telepresence, describes the illusion of being physically present in the setting simulated by the medium (Lombard and Ditton, 1997; Slater et al., 1994; Venkatesh and Johnson, 2002). Social presence, on the other hand, is conceptualized as the inherent property of media, refers to the feeling of "being with another" or the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships (Biocca et al., 2003). The focus of this study is the social aspect of presence, or social presence, as this type of presence is considered to be the central design principle for social computing technologies, e.g., Multi-User Dungeon (MUDs), Email, Online Chat, and online communities (IJsselsteijn and Riva, 2003).

Considered a design guideline, social presence theory advocates that the design of CMC should be as proximate to face-to-face communication as possible (Pavlou et al., 2007). As indicated in Appendix II, most prior IS research adopts the unidimensional conceptualization of social presence (Short et al., 1976) and measures social presence as the extent to which a person perceives a medium as unsociable/sociable, insensitive/sensitive, cold/warm, and impersonal/personal. Similarly, media richness theory argues that media vary in their ability to enable users to communicate and change understanding – their "richness," which is dependent upon certain characteristics of the medium, such as feedback speed, the number of cues, the degree of personalization, and the language variety (Daft and Lengel, 1986). From a media-dependent perspective, both social presence theory and media richness theory advocate the fit between media and task (Yoo and Alavi, 2001). While media richness argues that rich media are more suitable for equivocal tasks requiring resolutions of different opinions, social presence theory suggests that communication would be effective for certain tasks if the communication medium entails the fit between the level of social presence and the level of interpersonal involvement for certain tasks.

Although considered an important principle for online community design, social presence in prior studies is mostly examined as the antecedent of user behavior/attitude, e.g., motivations (Venkatesh and Johnson, 2002) and information sharing (Miranda and Saunders, 2003). How IT artifacts affect social presence is relatively understudied.

Following the media-dependent perspective, most prior studies consider social presence as a static media characteristic. Using face-to-face communication as the benchmark, such studies categorize different media to be high or low in social presence without examining the relationship between specific design artifacts and social presence. Such research sheds little insight on design factors relevant to social presence. The other studies examine the effects of IT artifacts, e.g., physically embodied agents (Lee et al., 2006), computer-synthesized voice (Lee and Nass, 2005), customer review and recommendation (Kumar and Benbasat, 2006), 3D avatar and Text-To-Speech voice (Qiu and Benbasat, 2005), imaginary interaction elements of textual and graphic information (Hassanein and Head, 2007), and video (Homer et al., 2008). Such studies that examine the effects of IT artifacts on social presence in a controlled fashion are helpful to understand their impact, but may not be able to provide the information regarding their relative importance in a real setting.

Indeed, such a media-dependent perspective on social presence has been challenged and criticized for ignoring the dynamics of social interaction. Walther (1995) demonstrates that, given enough time, users in computer-mediated communication are able to develop the same intimacy as in face-to-face communication, an indication of a strong sense of social presence. Moreover, social presence may also be affected by the social context (Markus, 1994; Yoo and Alavi, 2001). Evidence like this suggests it may not be appropriate to consider social presence as an inherent property of media. Thus, Biocca et al. (2001) re-conceptualize social presence as the fluctuating phenomenal nature of the medium, that is, properties of the communication interaction, specifically, rather than relating to any direct attribution of the medium per se. A successful virtual environment will not only provide indistinguishable sensory experiences (more social cues), but will also need to mimic human perception and reception (Pares and Pares, 2006). Existing evidence has shown that people react to media in much the same way they do in reality (Reeves and Nass, 1996). Moreover, the ability to feel "presence" or an illusion of non-mediation because of an IT artifact basically does not differ from the ability to feel "presence" in the real world (Riva et al., 2004). Because face-to-face interaction is regarded as the golden benchmark for all computer-mediated systems, the feeling of "being with another" should be similar to how people perceive any environment without mediation, which implies the necessity of a multidimensional approach in conceptualizing social presence (Biocca et al., 2001; Lombard and Ditton, 1997; Shen and Khalifa, 2008; Witmer et al., 2005).

Furthermore, by adopting a unidimensional conceptualization of social presence, most prior studies oversimplify the implications of IT artifacts. While various IT artifacts can arouse the sense of social presence, it might be too arbitrary to assume that they influence social presence in the same manner. In other words, the feeling of "being with another" aroused by a computer-synthesized voice may not be as same as the feeling one gets from interacting with a 3D avatar. Some IT artifacts may be affective laden (e.g., 3D avatar) while the others are cognitive laden (e.g., customer evaluation), probably leading to a different sense of social presence. With a multi-dimensional conceptualization of social presence, it is possible to discern such different effects of IT artifacts on different dimensions of social presence and, therefore, help designers choose appropriate IT artifacts for a desired social presence.

Finally, examining the effects of IT artifacts on social presence in isolation fails to reveal the relative importance of various IT artifacts, which are usually integrated in one website. In online communities, users are exposed to various artifacts that may simultaneously affect users' online experience and subsequent behavior in different ways. Technically speaking, decisions regarding online community design are more about how to blend or integrate different artifacts to create the desired online interaction experience than about focusing on specific artifacts (Ren et al., 2007). Therefore, simultaneous examination of various IT artifacts within the same website is necessary to understand the effects of online community design on social presence.

MULTIDIMENSIONAL CONCEPTUALIZATION OF SOCIAL PRESENCE

Despite the awareness of the necessity for a multidimensional conceptualization of social presence, such research remains in its infancy. Several presence researchers made the initial effort, relying on exploratory factor analysis in an attempt to understand the multidimensional structure of presence in general. For instance, Witmer et al. (2005) analyze the responses of 325 individuals to a 32-item presence questionnaire and reveal four distinct and separable dimensions: involvement, adaptation/immersion, sensory fidelity, and interface quality. Although insightful, such a data-driven approach based primarily on objective criteria lacks theoretical underpinning, and the resulting factors have little meaning or interpretability (Waller and Bachmann, 2006). In parallel, a theory-driven confirmative approach is also advocated. Biocca et al. (2001), based on a comprehensive review of social presence literature, define mediated social presence as "the moment-by-moment awareness of the co-presence of another sentient being accompanied by a sense of engagement with the other...as a global, moment-by-moment sense of the other, social presence is an outcome of cognitive stimulations (i.e., inferences) of the other's cognitive, emotional and behavioral dispositions" (page 2). They identify three dimensions based on a literature review: co-presence, involvement, and behavioral engagement. The authors gather all related items for each dimension and then identify a set of empirically determined sub-dimensions within each dimension: 1) isolation/inclusion, mutual awareness and mutual attention for

co-presence; 2) empathy and mutual understanding for psychological involvement; and 3) behavioral interaction, mutual assistance, and dependent action for behavioral engagement. This conceptualization provides a comprehensive understanding of social presence. However, it is embedded in the prior presence research with a focus on immersive media and small group or human-machine interactions, featured with the dyad interaction. Moreover, the sub-dimensions in Biocca et al. (2001) are empirically determined based on existing items and still lack theoretical underpinning.

Realizing the differences between online communities and immersive media, Shen and Khalifa (2008) examine the appropriateness of the original conceptualization by Biocca et al.(2001) and extend it to the context of online communities. Drawing upon the media psychology literature, they propose a multidimensional conceptualization of social presence, defined as the awareness of the other sentient beings accompanied by affective and cognitive engagement with the others in computer-mediated social spaces. They propose three dimensions, i.e., awareness, affective social presence and cognitive social presence. **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 by keyboard. The sensory extensity and intensity are both low. User status (e.g., online/offline, where he/she is, or what he/she is doing) and self-presentation features (e.g., images and avatars) are used to enhance awareness. In addition, awareness in an online community is also achieved through users' continuous 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. Emotion, at the very least, is a prerequisite to experience being present in a virtual environment. Vastfjall (2003) also found the sense of presence and emotional reactions to 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. Thus, an emotional reaction may be used as evidence of 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 with 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 the meaning of the context offered by a symbolic system in order to be "present" in it (Riva et al., 2002).

The three dimensions discussed above enrich our understanding of social presence. However, as suggested by Law et al. (1998), a multidimensional conceptualization needs to specify 1) the relational level, i.e., whether the multidimensional construct exists at the same level as its dimensions, and 2) the relation form between itself and its dimensions, i.e., whether the dimensions can be algebraically combined to form an overall representation of the construct. According to Shen and Khalifa (2008), dimensions represent different aspects of social presence, which users in online communities are ready to experience simultaneously without necessarily following a developmental continuum. This suggests two possible relational levels. The first one is to consider the multidimensional construct of social presence as the higher order abstraction behind dimensions, fitting with the latent model of multidimensional conceptualization in Law et al. (1998). Given this conceptualization, a strong correlation among dimensions is a must, similar to the requirement for reflective measures. But existing evidence suggests the opposite. For instance, the low awareness of the others' individuality may even strengthen the psychological attachment to the online community (Postmes et al., 1998). Therefore, we opt for another possible conceptualization, considering that the multidimensional construct of social presence exists at the same level as its dimensions, and the three dimensions of social presence, together, form the overall sense of social presence. This fits with the aggregate model in Law et al. (1998).

Shen and others examine the utility of differentiating three dimensions of social presence in terms of its effects on online community participation and its relations with the other two important mechanisms driving online community participation, i.e., motivations (Shen and Khalifa, 2007; Shen and Khalifa, 2008) and social identity (Shen et al., 2007). Such studies demonstrate the relative importance of three dimensions of social presence in influencing motivations, social identification and user participation. The differential importance of social presence dimensions implies that an effective online community design does not simply provide as many features as possible, but targets a specific desired online experience. For online community designers and managers, it is imperative to understand the connotation of specific online community artifacts in terms of online experience.

RESEARCH MODEL AND HYPOTHESES

Despite the wide proliferation of online communities, very few frameworks are available for categorizing and studying online community artifacts. Based on an extensive review of the literature and close observation of a large number of online communities, Ma and Agarwal (2007) identify four categories of community artifacts that can potentially reduce attribution difference and enhance self-presentation, supporting: self-presentation, deep profiling, persistent labeling, and virtual co-presence. For instance, "who is online" and "who is doing what" are designed to support virtual co-

presence. Conceptualized as vehicles for identity communication, these artifacts also constitute the virtual social environment and serve the external stimuli for users to develop “the feeling of being with the others.” Thus, this research adopts the categorization of online community artifacts from Ma and Agarwal (2007) as the antecedents of social presence. Different from Ma and Agarwal (2007), we focus on “perceived usage” of such features by all community members rather than the focal member’s usage, because it is the overall usage of the members in online communities that determines an individual’s exposure to the others’ identities and, consequently, shapes his/her perception of the social context. Moreover, we exclude consistent labeling. In Ma and Agarwal (2007), persistent labeling refers to “the use of a single label to present (identify) oneself” (pp. 49), and artifacts supporting persistent labeling, e.g., user ID, are argued to enhance accountability. However, this definition is more about user behavior rather than design artifacts. Practically speaking, requiring a persistent label for each registered member or email account has more to do with community policy than with voluntary user choice. Artifacts for labeling (e.g., user ID or account name) can better be categorized as self-presentation and are the most straightforward form of expressing one’s identity (e.g., gender, nationality, age, interest, and self-image) (Donath, 1999). Because the primary interest of this research is how the members’ perceived usage of artifacts will affect the different dimensions of social presence, we hypothesize at the dimensional level. The justification for the hypotheses is discussed as follows.

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., avatars, personal profiles, signatures, etc. Using these features in online communication will help the members to be aware of each others’ existence as social actors. Moreover, features supporting self-presentation enable members to convey rich information about their behavioral contexts, social association, and dispositional traits (Ma and Agarwal 2007). These help users to better construct and confirm meaning about their relationship with the others and the community, leading to a strong sense of cognitive social presence. Moreover, a high level of self-disclosure resulting from features supporting self-presentation also enhances the likelihood of developing intimacy with others (Laurenceau et al., 1998), which is characterized with a strong emotional connection. Thus, we hypothesize that:

- H1a: A member’s perceived usage of online community artifacts supporting self-presentation is positively related to his/her sense of awareness.
- H1b: A member’s perceived usage of online community artifacts supporting self-presentation is positively related to his/her sense of affective social presence.
- H1c: A member’s perceived usage of online 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, and 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 other members may also shorten the psychological distance when the focal member interacts with others in the online community. Thus he/she may be more likely to develop emotional connections or the sense of affective social presence. Finally, the features supporting deep profiling may also contribute to a sense of awareness by presenting the existence and histories of the community members and the community itself. Therefore, we hypothesize that:

- H2a: A member’s perceived usage of online community artifacts supporting deep profiling is positively related to his/her sense of awareness.
- H2b: A member’s perceived usage of online community artifacts supporting deep profiling is positively related to his/her sense of affective social presence.
- H2c: A member’s perceived usage of online 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 actually overlaps with the unidimensional conceptualization of social presence and focuses 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, etc. Based on our observation, the first two are most commonly employed in online communities. Such tools are mainly used to notify members’ about the others’ activity status, which gives rise to a strong awareness of the others’ existence. However, using these features and noticing the others’ availability may not directly guarantee an increased understanding or emotional immediacy among members, which requires rich contextual information and further interaction. Ijsselstein et al. (2003) argue that

in awareness systems, the level of social presence will be very low. This is similar to sitting in a crowded coffee shop but remaining distant from the others. Mere awareness of the others' availability does not always guarantee emotional and cognitive connection. Existing research also finds contradictory effects of IT artifacts supporting virtual co-presence. For instance, Spring and Vathanophas (2003) find that the awareness tool may reduce the users' need to communicate, and this reduction in communications may cause a reduction in the quality of the work effort. Moreover, extensive design efforts that have been invested in far more sophisticated notification systems (e.g., Carroll et al., 2003) for decision support and/or group collaboration also imply that IT artifacts used in online communities may not be able to offer sufficient information for members to develop mutual understanding and/or emotional connection. Therefore, we hypothesize that:

- H3a: A member's perceived usage of online community artifacts supporting virtual co-presence is positively related to his/her sense of awareness.

Figure 1 summarizes the above hypotheses:

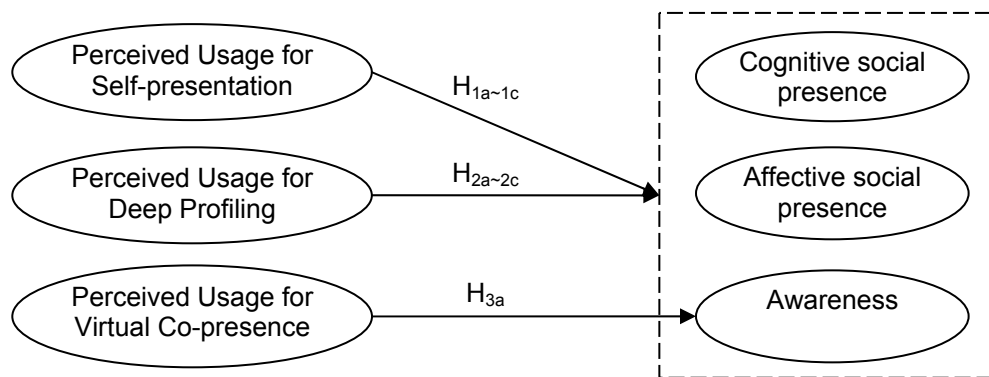


Figure 1: Theoretical Model

CONTROL VARIABLES

Prior research also demonstrates that social presence, conceptualized as unidimensional (Short et al., 1976), is also subject to individual and social influences, in addition to design features. For instance, Walther (1995) shows that users' perceptions of CMC may evolve over time, and even with "lean" media, users can develop strong relationships. In the context of online communities, it is also reasonable to expect that a user with long tenure in an online community will develop a stronger attachment to the community regardless of technological features. Therefore, the tenure of membership is considered a control variable in examining the effects of online community artifacts on social presence dimensions. Second, social context may be another factor affecting the sense of social presence. For instance, people interacting in a cohesive group may develop a stronger sense of social presence than in a non-cohesive one (Yoo and Alavi, 2001). To control for this factor, we choose similar online forums for data collection and also check for group differences before testing the structural model.

METHODOLOGY

Sample and Data Collection

We conducted an online survey study with four online communities of general interest in Hong Kong; participation was voluntary without any incentive. All of them were using the same software package, vBulletin, with similar interface design and functions, e.g., browsing and searching information, asynchronous discussion by posting, multimedia exchange and voting. According to big-boards.com,² vBulletin is the most popular forum software, used by 1,385 online communities. All surveyed online communities also had similar community policies and content structures. Only registered members could contribute and access the content of these online communities. The text-based discussion over these online communities was both utilitarian and hedonic in nature, e.g., information exchange, seeking social support, and/or relaxation. Different from communities of practice, the surveyed online communities were less task-oriented.

² <http://www.big-boards.com/statistics>.

With permission and assistance from the community administrators, we posted the link to the online questionnaire, together with an introduction to the study, on the largest board of each online forum. Participation was voluntary, and each participant needed to indicate his/her ID with the online forum, so that we could track community participation. A total of 430 registered members completed the survey. As indicated in Table 1, the sample was dominated by young (60.9% less than 20 years old) male members (83.3%). Because some demographic information was public for registered members, we randomly sampled another 30 members from each community and conducted a t-test on age and gender. No significant difference was reported, indicating that our sample represented the typical users in those communities. The majority of subjects were familiar with online communities (99.3%). More than half of the subjects were frequent visitors, logging onto the online community at least once a day (77%) or at least once a week (16.7%). 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. Although the majority of the sampled respondents were frequent visitors, as indicated by the frequency of login, their participation levels varied considerably and some lurkers also participated in the survey. We tested the community membership effect (four different communities) by comparing the demographics and the factor scores of all variables across four forums. We found no significant difference.

Table 1: Demographic Information of Participants

Variables	Items	%
Gender	Male	83.3
	Female	16.7
Age	<20	60.9
	20~35	36.3
	>36	2.8
Familiarity with VC	Not at all	0.7
	Moderate	32.6
	Fair	44.7
	Very much	22.1
Education	Primary School	0.7
	High School	36.3
	Certificate	40.5
	Undergraduate	21.4
	Graduate	1.2
Experience with Internet	< 1 year	1.6
	1~2 years	7.0
	2~3 years	17.9
	>4 years	73.5
Frequency of Login	Less than once a month	1.2
	Once a week	5.1
	Several times a week	16.7
	Once a day	23.5
	Several times a day	53.5
Tenure in Weeks	<15 weeks	17.2
	15~30 weeks	17.4
	>30 weeks	65.3

In evaluating the response rate, we compared our sample with each discussion board's active members during the data collection period rather than with the accumulated total registered members. Although the system keeps all members' information, not all members remain active over time and only active members shape the "community." Moreover, given the limits of the permission granted, we only posted the survey on the largest discussion board of each forum. Thus, we took the average of the daily number of online users on respective boards over a week as a proximate for the active membership and calculated the response rate, ranging from 13 to 15 percent. We tested the group difference with an ANOVA by comparing the demographics and the factor scores for all variables and found no significant difference.

We examined for the possibility of non-response bias and selection bias by comparing our sample with a random sample of the total population in terms of tenure of membership, gender, and age. Such information was public for all registered members. We found no significant differences between our respondents and the random sample, indicating the representativeness of our sample. Moreover, no floor or ceiling effect was reported for the measurement of social presence dimensions, which implied that other influences--such as positive affectivity, extroversion, personal benevolence--may not be a serious concern affecting the results.

Measures

We measured three dimensions of social presence with reflective items from Shen and Khalifa (2008) (See Appendix I). We used formative items to measure the perceived usage of online community features supporting these three categories (see Table 3 for measures). As a base list, we used the online community IT artifacts supporting deep profiling, self-presentation, and virtual co-presence identified in Ma and Agarwal (2007). Then we consulted two online community administrators for assistance in identifying relevant artifacts used in the surveyed online communities and placing them into three categories. In this way, we guaranteed the content validity (Petter et al., 2007). In addition, we adapted the scale to measure the perceived usage of certain online community IT artifacts, rather than actual usage by the focal member as used in Ma and Agarwal (2007). A sample question was "To what extent do people in this forum use peer evaluation? (1 = not at all; 7 = to a very great extent)."

DATA ANALYSIS AND RESULTS

Although our sample came from very similar online forums, and we found no significant difference in the demographics across the four forums, we also conducted the following tests for group homogeneity. We conducted factor analysis for each forum and generated similar factor structures. Then we calculated the factor scores of all variables for each forum; and an ANOVA test did not report significant difference in factor scores across the four forums. These results indicated the homogeneity in the measurement structure. We then ran Partial Least Squares (PLS) separately for two online forums that offered sufficient sample size for PLS analysis and found similar results in the magnitude and significance of path coefficients. After pooling the data from these two tested forums, we added the data from the other two forums and ran PLS again. No significant difference was reported. These results suggested that group variance may not be a serious problem in this research and allowed us to pool the data from the different online forums for the following data analysis.

Before testing the measurement and structural models, we checked for possible common method variance with Harman's single-factor test (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. We found no dominant factor emerging from the factor analysis, implying that common method variance was not a serious problem. We also checked the correlation matrix of the reflective constructs and formative measures, and none of the correlations exceed 0.90, which is strong evidence that common methods bias does not exist (Pavlou et al., 2007).

We conducted data analysis in a holistic manner using PLS, since it is capable of handling both reflective and formative measures. In addition to hypothesis testing at the dimensional level, we also examined the validity of the multidimensionality of social presence. As discussed in the prior section, we propose that the multidimensional construct of social presence exists at the same level as its dimensions. The three dimensions of social presence, together, then, form the overall sense of social presence, fitting with the aggregate model in Law et al. (1998). Empirically, this suggests, at the multidimensional level, the factor scores of three social presence dimensions should be modeled to be the formative measures of social presence.

Measurement Validation

We employed different validation for reflective and formative measures. 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 2, 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 percent level with high loadings (all above 0.70), providing additional evidence for convergent validity (Barclay et al., 1995). As for the formative measures, all item weights were significant, as indicated in Table 2. Moreover, we examined the collinearity diagnostics for each formative variable, and resulting VIFs were all less than 2, indicating a good reliability (Petter et al., 2007).

Table 3 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 distinct constructs, implying distinct aspects of social presence experienced by the community participants. The low correlations among social presence dimensions also validated the conceptualization of the multi-dimensional social presence as the aggregate model.

Table 2: Measurement Model

Variables	Measures	Loadings	Weight	Std.	T-Stat.	
Awareness ρ=0.668; AVE=0.803	Item1	0.829		0.038	21.70	
	Item2	0.888		0.026	34.47	
Affective Social Presence ρ=0.906; AVE=0.660	Item1	0.774		0.023	33.88	
	Item2	0.793		0.019	41.72	
	Item3	0.864		0.013	68.82	
	Item4	0.835		0.021	39.51	
	Item5	0.792		0.021	37.24	
Cognitive Social Presence ρ=0.922; AVE=0.664	Item1	0.862		0.014	61.80	
	Item2	0.755		0.031	24.76	
	Item3	0.821		0.017	48.95	
	Item4	0.829		0.020	41.16	
	Item5	0.819		0.021	39.66	
	Item6	0.797		0.022	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 co-presence	Who is online		.638	.124	5.13	
	Who is doing what		.570	.134	4.25	

Table 3: Correlations between Latent Constructs (Diagonal Elements are Square Roots of the AVE)

	A	ASP	CSP
Awareness (A)	0.844		
Affective Social Presence (ASP)	0.085	0.812	
Cognitive Social Presence (CSP)	-0.113	0.381	0.814

Structural Model Results

Figure 2 presents the results of the PLS analysis of the structural model with social presence dimensions. Overall, the empirical results provided strong support for the research model. Including the control variable of tenure, the research model explained 15.3 percent of the variance of awareness, 18.9 percent of affective social presence, and 12.2 percent of cognitive social presence.

Perceived usage of online community artifacts supporting self-presentation had consistent significant effects on the three social presence dimensions, i.e., awareness (.158; p<.05), affective social presence (.277; p<.01), and cognitive social presence (.189; p<.01), validating H_{1a-1c}. As an important means of identity communication, online community artifacts supporting self-presentation also contribute to the development of social presence. Perceived usage of online community artifacts supporting deep profiling was found to be a significant factor for awareness (.165; p<.01), validating H_{2c}. Its effects on affective social presence (.122; p<.05) and cognitive social presence (.153; p<.01) were also significant, confirming H_{2a-2b}. Finally, perceived usage of online community artifacts supporting virtual co-presence was reported to have a significant effect on awareness (.142; p<.05), confirming H_{3a} and a marginal small effect on affective social presence (.095; p<.05), which was not hypothesized in the research model. As hypothesized, there is no significant relationship between online community artifacts supporting virtual co-presence and cognitive

social presence. Comparatively speaking, awareness could be achieved with a wide range of design features, while cognitive social presence was influenced only by selected design features. We also calculated the effect size and found perceived usage of online community artifacts supporting self-presentation were more important than the other two antecedents in inducing awareness, affective social presence, and cognitive social presence. However, the effect size for perceived usage of online community artifacts supporting self-presentation was small (.18-.27).

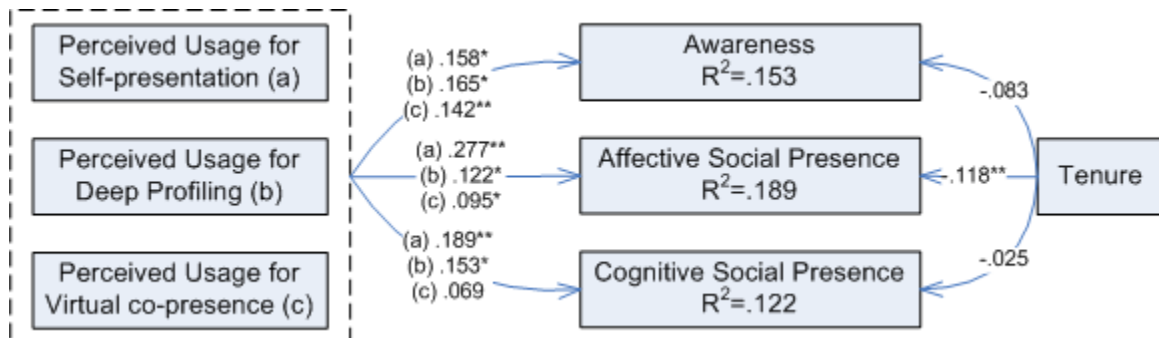


Figure 2. Structural Model Results with Social Presence Dimensions

Tenure was found to have a significant effect on affective social presence only (.118; $p < .01$). With time, members are more likely to develop a strong emotional connection with the community. The insignificant effect of tenure on awareness may be attributed to the members taking the others' presence for granted after they have adapted to the community; while a possible explanation for the insignificant effect of tenure on cognitive social presence might be the lack of emphasis or demand for cognitive connection among community members. We also tested the moderating effects of tenure. The significant positive moderating effect of tenure was reported for the linkages between self-presentation and affective and cognitive social presence, as well as between co-presence and affective social presence.

The examination of the weight of formative measures provides insights on the relative importance of specific online community artifacts. Within 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 artifact affords for expressing identities. Using signature or avatar/nickname, members enjoy more freedom and active control in presenting their identities. Meanwhile, these two features also offer many options for an individual to be differentiated from the others. Finally, information presented through these two features is embedded in on-going interaction, leading to widespread communication of identity. In contrast, a personal profile is usually a structured document, which may not be checked by others, and user ID provides only very limited identity information. Within the category of deep profiling, members heavily used interactive archives (weight=.572, $p < .01$) to gain better understanding of others as well of 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 other members' content assessment (e.g., to what extent they feel the post is helpful); while system ranking mainly recorded each member's participation activities (e.g., the total number of posts, the number of excellent posts, etc.). We found both schemes to be significant, but the members seemed to rely more on peer evaluation (weight=.452, $p < .01$) than system ranking (.311, $p < .05$). Finally, both features supporting virtual co-presence were significant. The feature indicating who is online (weight=.638; $p < .01$) seemed more important in creating the sense of awareness than the feature indicating who is doing what (weight=.570; $p < .01$).

We tested another competing model at the multidimensional level in which we modeled the factor scores of three social presence dimensions to be the formative measures of social presence (Figure 3). Together with the control variable, this model explained 23.9 percent of the variance of social presence, which was conceptualized as an aggregated multidimensional model. We found the weights of all dimensions to be significant: awareness (.340; $p < .01$), affective social presence (.671; $p < .01$), and cognitive social presence (.202; $p < .01$). Consistent with the model at the dimensional level, we found affective social presence to be the most influential dimension and cognitive social presence the least. As for the antecedents of multidimensional social presence, we found all three design variables to be significant, explaining 23.9 percent of the variance of social presence. Consistently, we found perceived usage of online community artifacts supporting self-presentation to be the most effective for developing social presence (.293; $p < .01$). The second effect variable was perceived usage of online community artifacts supporting deep profiling (.160; $p < .01$). Perceived usage of online community artifacts supporting virtual co-presence was only marginally significant (.112; $p < .05$), suggesting social presence requires relatively more sophisticated artifacts beyond simply indicating the others' presence.

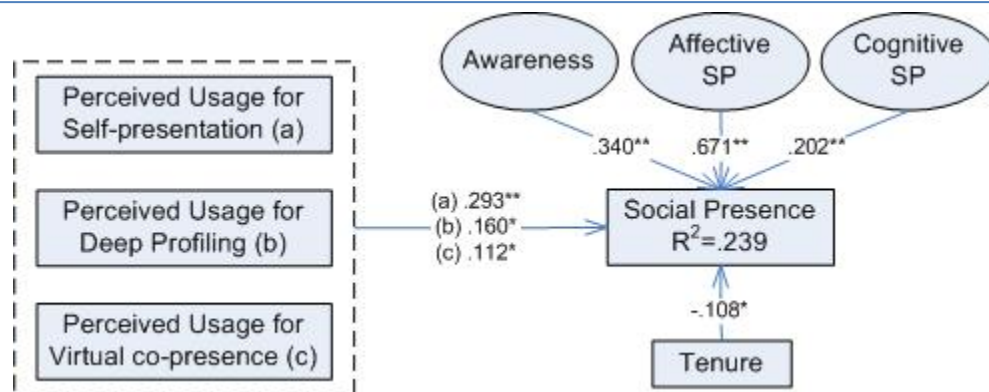


Figure 3. Structural Model Results with the Multidimensional Social Presence

THEORETICAL AND PRACTICAL IMPLICATIONS

In online communities, numerous technical and social design decisions determine the social interaction space and affect community participation. Social presence has been considered a major design principle in computer-mediated communication. While most prior IS research adopts a unidimensional approach—restricting social presence to be the subjective nature of media—and examines the effects of design artifacts in isolation, this research, built upon the work by Shen and Khalifa (2007) and Ma and Agarwal (2007), adopts a multidimensional conceptualization of social presence and an integrative approach to investigate the effects of design artifacts on various social presence dimensions.

We tested the research model with an online survey of four online forums. The empirical results provide strong support for the research model and validate several hypotheses. We further clarify the multidimensional conceptualization of social presence as an aggregate model according to Law et al. (1998). Awareness, affective social presence, and cognitive social presence represent unique aspects of social presence, and the overall social presence can be represented through the linear aggregation of these three components. Furthermore, built upon the existing categorization of online community artifacts (Ma and Agarwal, 2007), this study sheds light on the antecedents of multidimensional social presence by identifying and validating three groups of online community artifacts supporting self-presentation, deep profiling, and virtual co-presence. The results showed the different relative contributions of online community artifacts to three dimensions of social presence.

Theoretical Implications

As the first attempt to use multidimensional social presence to understand the effects of online community artifacts, this research entails rich theoretical implications. First, by testing models at both dimensional and conceptual levels, this research strengthens the original multidimensional conceptualization and empirically validates the relationship between social presence dimensions and overall social presence. As indicated in this study, overall social presence can be conceptualized as a linear aggregate of three dimensions. Three dimensions capture the richness in user perceptions and experiences aroused by online community artifacts, while the weights may imply the dynamic nature of communication. Conceptualized this way, social presence shows great potential in explaining online community complexity. In our sampled online communities, affective social presence accounted for a large portion of the overall sense of social presence. It is also possible that with different online communities, the main component of social presence might be cognitive social presence (e.g., communities of practice) or awareness (e.g., social networking). This conceptualization can also be used in longitudinal design to understand online community dynamics. Varied weights of social presence dimensions over time would be a good indication for online community involvement. Second, while most prior studies, although acknowledging the guidance role of social presence, only examine its consequences, providing little insight on specific design guidelines, this research investigates the design antecedents of social presence. More importantly, by examining the model at the dimensional level, this study offers more integrative and specific guidance for enhancing social presence.

Practical Implications

In addition to the above theoretical implications, this study also provides valuable guidelines for online community practitioners. First of all, the three-dimensional conceptualization of social presence enriches the understanding of online communities and helps lay out more specific design objectives. Our results showed that not all dimensions of

social presence carry the same weight in every online community. In the sampled online communities, affective dimension was weighted more in the sense of social presence, while in other online communities, the sense of social presence might be more cognitive laden than affective laden (e.g., communities of practice). Realizing such differences in online communities, designers will have specific design objectives (awareness, affective or cognitive social presence), instead of an objective to enhance social presence as a whole. For instance, for the online communities in this study, online community design could target how to enhance emotional connections among users.

Furthermore, by examining the association between community artifacts and different social presence dimensions, we demonstrate that not all community artifacts affect social presence in the same manner. Some artifacts are more related to affective social presence, others, to cognitive social presence, and others merely contribute to the sense of awareness. Discerning such differences will help designers choose appropriate online community artifacts.

Finally, while the specific online community artifacts in this paper are widely available in most online communities, the findings provide a general guideline based on multidimensional conceptualization of social presence for developing new IT artifacts for online communities. For instance, given the importance of affective and cognitive social presence, visualization of emotional involvement/connection as well as common ground among members might be interesting add-ons for existing online communities.

In sum, the multidimensional conceptualization of social presence has a great potential to increase understanding of online community dynamics and complexity and offers an alternative approach to guide online community design. It opens the door for more insightful and interesting research opportunities.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This paper has a number of limitations that create some interesting opportunities for future research. First this research only surveyed one type of text-based online communities. The difference in the weights of social presence dimensions may vary for different types of online communities. For instance, open-source communities may heavily rely on the mutual understanding or cognitive social presence among members to sustain on-going contribution. Thus, future research needs to investigate various online communities to find out which dimension(s) carries (carry) more weight in the sense of social presence and is (are) the driving forces behind community participation. Moreover, as many companies use online communities within their organizations for employee use, it is also necessary to examine the model in the business context with additional organizational influences. Finally, social networking websites have become another major social venue for many people. We believe that the multi-dimensional conceptualization of social presence can be readily extended to various online social venues, but its technical antecedents might be quite different from those used in text-based online communities. Accumulation of such studies may result in a richer understanding of user experience requirements for online communities as well as technical antecedents.

Second, the sample mainly consisted of young male community members. Although this reflects the real demographic composition in the surveyed online communities, samples with different gender compositions should be investigated in 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 be dissimilar from the male-dominant environment. Furthermore, given the popularity of online communities, it will be important to examine other demographics.

Third, in this study, the members' tenure was the only control variable we considered. Although we demonstrated that certain individual psychosocial characteristics may not pose a serious concern for this study, tenure by itself may not be able to fully capture members' community status, which may affect their perception of and interaction with online community IT artifacts. Hence, future research may incorporate the members' community status (e.g., Arrigara and Natalia, 2008; Preece and Shneiderman, 2009) in examining the effects of IT artifacts on social presence.

Fourth, although we found the effects of perceived usage of online community IT artifacts to be significant in inducing social presence, the effect size remains small. This suggests that future research needs to explore the other social, psychological, and individual factors that may play a more important role in shaping people's sense of social presence. In addition, the interaction between technical factors and non-technical factors would be another promising direction to enrich our understanding of social presence in online communities.

Finally, because this study focused on perceived usage of online community artifacts, one cannot infer that increasing the inclusion or usage of community artifacts in a certain category (i.e., self-presentation, deep profiling, and virtual co-presence) will increase awareness, affective social presence, or cognitive social presence, simply due to the discrepancy among the inclusion of community artifacts, actual usage of those artifacts, and user perception of usage.

Therefore, it will be necessary to further examine the other relevant conceptualizations about community artifacts in relation to different social presence dimensions.

CONCLUSION

Online communities have become an integral venue in our social life. Social presence, or “the feeling of being with others,” emerges as a major design principle and important concept in explaining the relationship between design artifacts and online user behavior. Different from most prior IS research featuring a unidimensional conceptualization of social presence, this research employs a multidimensional conceptualization and demonstrates its suitability for understanding the various effects of online community artifacts. Based on a survey study with four online communities of interest, we found that different social presence dimensions carry different weights in forming the overall sense of social presence and the effect of perceived usage of various online community artifacts varies for different social presence dimensions. Our results shed light on the valuable implications of a multidimensional conceptualization of social presence in understanding online communities and informing online community design.

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APPENDIX I: OPERATIONALIZATION OF SOCIAL PRESENCE

Please specify the frequency of occurrences of the following situations within this online forum. (In the following statements, “the others” refers to the users whom you interacted with.) (1= never happened; 7 = very often)

Awareness (Shen and Khalifa, 2008):

1. I hardly notice the other individual.
2. I feel that the others are aware of my presence.

Affective Social Presence (Shen and Khalifa, 2008):

1. The other individuals are influenced by my moods.
2. I am influenced by the others moods.
3. The others’ mood does NOT affect my mood/emotional-state.
4. My mood does NOT affect the others' mood/emotional-state.
5. I think people in this forum affect each other’s mood/emotional-state.

Cognitive Social Presence (Shen and Khalifa, 2008):

1. I know the purpose of this forum.
2. People in this forum understand each other.
3. I understand the others’ opinions.
4. The others understand what I mean.
5. My thoughts are clear to the others.
6. The other individuals' thoughts are clear to me.

APPENDIX II: UNIDIMENSIONAL CONCEPTUALIZATION OF SOCIAL PRESENCE IN PRIOR IS RESEARCH AND RELATED IT ARTIFACTS

Source	Definition of SP	Measures	IT Artifacts
(Zack, 1993)	Social presence represents the degree to which the mode of communication allows participants to experience each other as being psychologically close or present. "A particular communication mode comprises characteristics of the medium such as richness and social presence, and characteristics of the channel, such as speed, capacity, reliability, or interactivity." (pp. 210)	NA	Electronic messaging
(Straub, 1994)	"The degree to which a medium permits users to experience others as being psychologically present" (Fulk et al., 1987)	(Short et al., 1976)	Email and Fax
(Gefen and Straub, 1997)	Perceived social presence (SP) refers to the sense of human contact embodied in a medium.	(Short et al., 1976) with one additional item.	Email
(McLeod et al., 1997)	Social presence refers to the degree of tangibility and proximity of other people that one perceives in a communication situation.	Manipulated: face-to-face; identified GDSS and anonymous GDSS	GDSS
(Burke and Chidambaram, 1999)	Social presence is the extent to which one feels the presence of a person with whom one is interacting.	(Short et al., 1976).	Distributed-Synchronous and Distributed-Asynchronous situations
(Yoo and Alavi, 2001)	Social presence refers to the degree of salience of the other person in the communication interactions and the consequent salience of the interpersonal relationship (Short et al., 1976).	(Short et al., 1976)	Audio conferencing vs. desktop videoconferencing
(Sia et al., 2002)	The degree to which people establish warm and personal connections with each other in a communication setting.	Manipulated: Face-to-face vs. CMC	CMC
(Venkatesh and Johnson, 2002)	Social richness: refers to three key attributes, i.e., ability to transmit Social cues, change understanding, and resolve equivocality.	(Short et al., 1976)	Telecommuting technology vs. desktop
(Miranda and Saunders, 2003)	Degree to which the medium facilitate the awareness of the other person and interpersonal relationships during the interaction (Fulk et al., 1990)	Manipulated: Face-to-face vs. Electronic medium	Multi-media
(Nowak and Biocca, 2003)	The perceived ability of the medium to connect people	(Short et al., 1976)	Anthropomorphism
(Gefen and Straub, 2004)	The perception that there is personal, sociable, and sensitive human contact in the medium (Short et al., 1976).	(Gefen and Straub, 1997)	NA
(Lee and Nass, 2005)	(Short et al., 1976)		Computer-synthesized voice
(Qiu and Benbasat, 2005)	The extent to which users sense the existence of other people or intelligent minds in distant locations.	(Short et al., 1976)	3D avatar and Text-To-Speech voice
(Roger and Lea, 2005)	The conceptualization is based on (Short et al., 1976).	The sense of belongingness to, or identification with, the salient social identity.	NA
(Kumar and Benbasat, 2006)	Social presence refers to the degree to which a medium allows an individual to establish a personal connection with others (Short et al., 1976).	(Gefen and Straub, 2004)	Customer review and recommendation

Source	Definition of SP	Measures	IT Artifacts
(Lee et al., 2006)	A psychological state in which virtual (para-authentic or artificial) actors are experienced as actual social actors in either sensory or non-sensory ways.	(Short et al., 1976)	Physically embodied agents
(Pavlou et al., 2007)	Social presence: the extent to which a consumer feels that the online environment closely resembles a physical interaction with a seller.	(Gefen and Straub, 2004)	NA
(Delfino and Manca, 2007)	In the context of online learning, social presence was recently redefined as "the ability of learners to project themselves socially and emotionally as 'real' people into a community of learners"	Expressions of self-disclosure, emotions and conceptualization of the online learning environment as important indicators of social presence.	NA
(Hassanein and Head, 2007)	Medium gives the user a sense of human warmth and sociability.	(Gefen and Straub, 2004)	Imaginary interaction elements of textual and graphic information
(Zhang et al., 2007)	Social presence can be defined as "the degree to which a medium facilitates awareness of the other person and interpersonal relationships during the interaction"	Manipulated: Face-to-face vs. CMC	CMC
(Hatta and Ken-ichi, 2008)	The conceptualization is based on (Short et al., 1976).	Manipulated: virtual anonymity/ non-anonymity One item for manipulation check: "Did you feel that the other negotiator was as dry as a machine?"	Anonymity
(Homer et al., 2008)	NA	Adapted from (Kim and Biocca, 1997) (scale for telepresence)	Video
(Johnson et al., 2008)	A learner perception of the extent to which the technology enables them to create an environment in which they feel is warm, personal, sociable, and active and allows them to be connected in a shared learning space (Short et al., 1976).	(Short et al., 1976).	NA

APPENDIX III: FACTOR ANALYSIS WITH SOCIAL PRESENCE DIMENSIONS

	Component		
	1	2	3
ASP1	.265	.738	.113
ASP2	.156	.765	.071
ASP3	.149	.844	.024
ASP4	.144	.810	-.018
ASP5	.167	.753	.020
CSP1	.828	.163	-.017
CSP2	.719	.135	-.106
CSP3	.809	.172	-.053
CSP4	.798	.151	-.151
CSP5	.799	.115	-.008
CSP6	.750	.121	-.171
Aware1	-.074	.087	.728
Aware2	.002	.012	.812

ABOUT THE AUTHORS



Kathy Ning Shen received the degrees of MS in Information Management from Peking University, and MPhil and PhD in Information Systems from Information Systems Department, City University of Hong Kong. She is currently an Assistant Professor and Chairperson of Management Information Systems (MIS) Department at Abu Dhabi University. She also serves as the Director of Center for Middle East Business Cases. Her research interests include human-computer interaction; virtual communities, IT-enabled learning and knowledge management, e-commerce and online consumer behavior, IT investment and enterprise applications. Her work has been published in journals such as *Communications of the ACM*, *Journal of Computer Information Systems*, *Behaviour & Information Technology*, *International Journal of Human-Computer Interaction*, *Journal of Enterprise Information Management*, and *Journal of Knowledge Management*. She also authored a number of articles and presented in conferences, including *ICIS*, *HICSS*, *PACIS*, and *AMCIS*.



Mohamed Khalifa was educated at the Wharton Business School of the University of Pennsylvania and received the degrees of M.A. in Decision sciences and PhD in Information Systems. At present, he is Professor of Information Systems and the Vice President Academic at the University of Wollongong in Dubai. Dr. Khalifa's research interests include IT adoption and usage, online consumer behavior and knowledge management. His articles appeared in journals such as *Communications of the ACM*, *Journal of the Association of Information Systems*, *IEEE Transactions on Engineering Management*, *IEEE Transactions on Systems Man and Cybernetics*, *Decision Support Systems*, *Data Base* and *Information and Management*.

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