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Adrian Yeow  
*University of Maryland*

Steven Johnson  
*University of Maryland*

Samer Faraj  
*University of Maryland*

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# LURKING: LEGITIMATE OR ILLEGITIMATE PERIPHERAL PARTICIPATION?

*Knowledge Management*

**Adrian Yeow**

R.H. Smith School of Business  
University of Maryland  
[yongkwang\\_yeow@rhsmith.umd.edu](mailto:yongkwang_yeow@rhsmith.umd.edu)

**Steven L. Johnson**

R.H. Smith School of Business  
University of Maryland  
[steven\\_johnson@rhsmith.umd.edu](mailto:steven_johnson@rhsmith.umd.edu)

**Samer Faraj**

R.H. Smith School of Business  
University of Maryland  
[sfaraj@rhsmith.umd.edu](mailto:sfaraj@rhsmith.umd.edu)

## Abstract

*By sponsoring, promoting or simply monitoring virtual communities related to their products, work processes, and other topics of interest, organizations leverage the efforts, insights, and abilities of individuals inside and outside their organization. Lurkers are participants who persistently demure from engaging in the core activities that sustain a virtual community. Because virtual communities are perpetuated through voluntary contributions, the persistent peripheral participation of lurkers is sometimes viewed negatively as social loafing or free-riding. Alternatively, an individual may engage in legitimate peripheral participation when their passive monitoring of group activities educates, socializes, and otherwise prepares them for more effective contribution. We reconcile these conflicting views of lurking with individual- and community-level models of peripheral participation that include a parsimonious typology of virtual communities. Through empirical tests based on over 395,000 observations gathered over five months from 548 online discussion forums, we demonstrate how lurking effects growth in site membership and participation. We conclude that lurking as legitimate or illegitimate peripheral participation is context-dependent and a more complex, nuanced activity than previously theorized and measured.*

**Keywords:** Lurking, virtual communities, social loafing, peripheral participation

## Introduction

As the nature of Knowledge Management Systems (KMS) evolves, different organizational challenges become more pertinent and a variety of research questions grow even more compelling (Vaast et al. 2006). Today, organizations are increasingly using Internet-based technologies as intra-organizational, inter-organizational, and extra-organizational platforms for knowledge creation, dissemination, and storage (Sambamurthy et al. 2005). By sponsoring, promoting, or even just monitoring virtual communities related to organizational products, processes, or other topics of interest, organizations can leverage the efforts, insights, and abilities of others inside and outside of their own organization.

Virtual communities built on online discussion forums have emerged as one of the more popular class of Web sites that provide support for open communication among their participants (e.g. Horrigan et al. 2001; Petersen 1999). Online discussion forums began as bulletin boards, newsgroups, and listserv technologies that “migrated” over to the World Wide Web (Rothaermel et al. 2001). These early forums were mainly built around social support groups, hobbyists, or just gaming clubs (Armstrong et al. 1996). The trend over the last few years has been the growth of

online discussion forums within sponsored Web sites, especially in business Web sites (Jeppesen et al. 2006; Kenny et al. 2000; Muniz et al. 2001).

Academic research concerning virtual communities has focused primarily on understanding the nature of participation and the motivations of participants (Lee et al. 2003; Ridings et al. 2004; Wasko et al. 2000). While the majority of studies have focused on the most visibly active members, some empirical study has shown that online communities tend to be supported by a small nucleus of core contributors, and that the remaining majority of “members” are silent partners. For example, during a four-month period Butler (1999) found that 50 per cent of the communities he studied had no new messages. In other studies, researchers found that 40 to 90 percent of online communities are comprised of members who do not contribute content themselves, but only browse the postings on these forums (Mason 1999; Nonnecke et al. 2000)

Whereas the sustainability of virtual communities requires a critical mass of contributors (Marwell et al. 1993), persistent peripheral participation can be seen as a threat to the survival of a group. A group’s collective efforts are undermined when “knowledge contributors have no assurances that those they are helping will ever return the favor, and lurkers may draw on the knowledge of others without contributing anything in return” (Wasko et al. 2005 pg. 37). Indeed, the negative connotation of the term “lurker” no doubt reflects the conventional perspective on “lurking.” Just as lurking in the shadows connotes being up to “no good”, a member of a group who does not contribute to the group may be viewed suspiciously as having something to hide, or as a free-loader who free-rides on the efforts of others (Kollock et al. 1999; Morris et al. 1996).

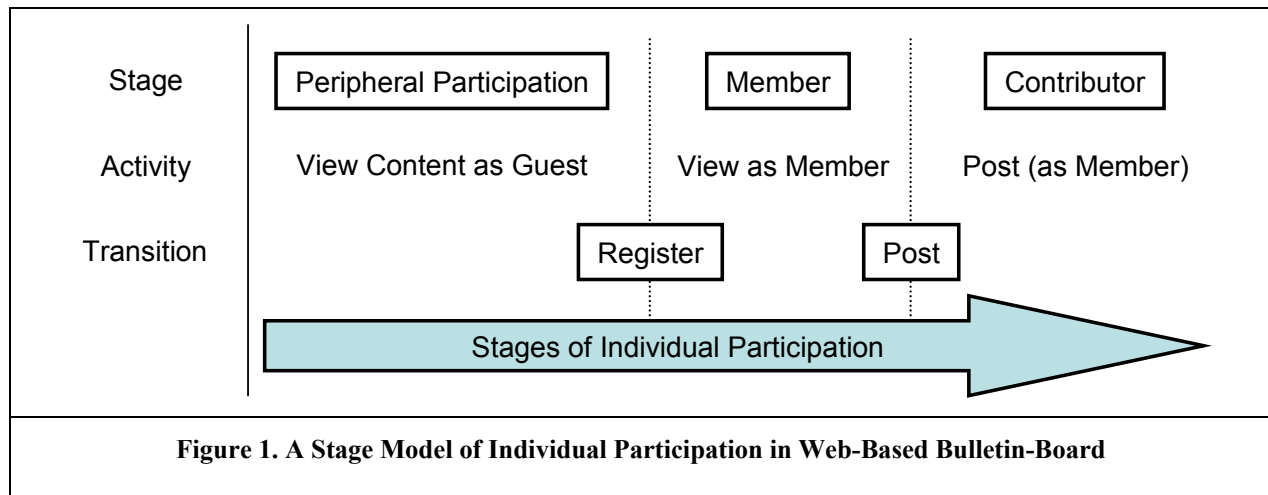
An alternative narrative has also evolved regarding the potential benefits of lurking (c.f. Rafaeli et al. 2004). Just as virtual communities may be considered to be online networks of practice (Wasko et al. 2000; Wasko et al. 2005), lurking may be considered as legitimate peripheral participation (Lave et al. 1991) that provides inexperienced group members with an extended period of observation in order to prepare for more intensive participation.

The objective of this study is to reconcile these two conflicting perspectives. It makes the following contributions. First the paper contributes to the literature on online communities by explicating the impact of lurking behavior on online forums. Specifically, the paper provides two key theoretical explanations for how lurking might influence the growth and participation patterns in virtual communities. We find lurking to be primarily driven by social loafing, albeit this is complemented by the socialization perspective. Second, the paper contributes to a more nuanced perspective of how the types of communities moderate user and participant behaviors. Finally the findings contribute to the literature by empirically testing our model on a large sample of online communities observed over a period of time. This extends most of the empirical research within online communities that have focused on older technologies like listservs (Butler 2001).

The rest of the paper is organized as follows. First, we consider the individual and organizational motivations that discourage or promote persistent peripheral participation (“lurking”). Next, we build a model of the effects of lurking on the growth of virtual communities. After describing the test of this model, we conclude the paper with a discussion of findings and implications.

## **Lurking as a Stage of Individual Participation**

For this paper we adopt a definition of lurking as persistent peripheral participation. Lurkers are participants who persistently demure from engaging in the core activities that sustain a virtual community. Arguably, as the perception of both periphery and participation are context-specific, the identification of behavior as lurking is dependent upon technology constraints and group-specific norms. For example, if a mailing list technology requires an explicit subscription (e.g. joining the group) prior to viewing any content, then a group-specific norm for “de-lurking” might reasonably include posting at least one message. Yet, for a Web-based bulletin board technology where viewing of content is open to guests, the act of registering as a virtual community member may be sufficient. Figure 1 shows the stages of increasing participation that a virtual community member may go through in the latter case.



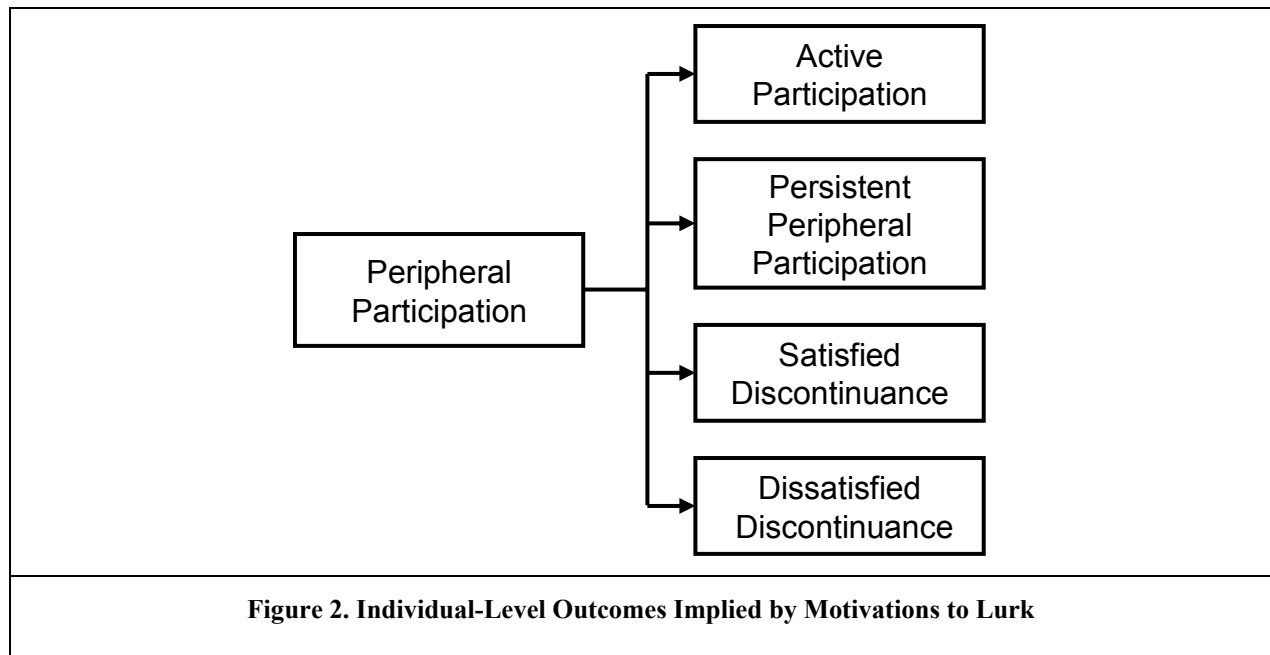
Despite the prevalence of lurkers as an acknowledged phenomenon, they have attracted relatively little attention from Information Systems researchers. The difficulty of capturing evidence of passive participation (especially in traditional types of technologies such as mailing list-based virtual communities) creates a significant barrier for empirical research. This creates the potential bias for the over-representation of studies focused on the most active members (Rafaeli et al. 2004). Indeed, there are only a handful of descriptive research works within Information Systems literature that are specifically focused on lurking (e.g. Nonnecke et al. 2000; Nonnecke et al. 2004a; Rafaeli et al. 2004).

Another notable exception is a survey of virtual community members by Preece et al. (2004) that identified specific reasons for persistent peripheral participation (defined in the context of MSN online discussion boards as readers who never posted a message). Before discussing those responses, it is useful to revisit Figure 1 and consider the potential outcomes of peripheral participation. In Figure 2 we have identified four potential outcomes after a potential virtual community member engages in their first peripheral participation with a group.

The first, and presumably the most successful, outcome from both the individual and virtual community perspective is the conversion of a peripheral participant into an active one. Second, we have the uncertain outcome of persistent peripheral participation. The charge of free-riding is based on this being a positive outcome for an individual but a negative outcome for the virtual community. From the perspective of legitimate peripheral participation, a community member should remain in the periphery until they are ready to “de-lurk”. On the other hand, from this perspective a member who remains in the periphery for too long may be unnecessarily hesitant to engage in active participation that is desirable to other virtual community members.

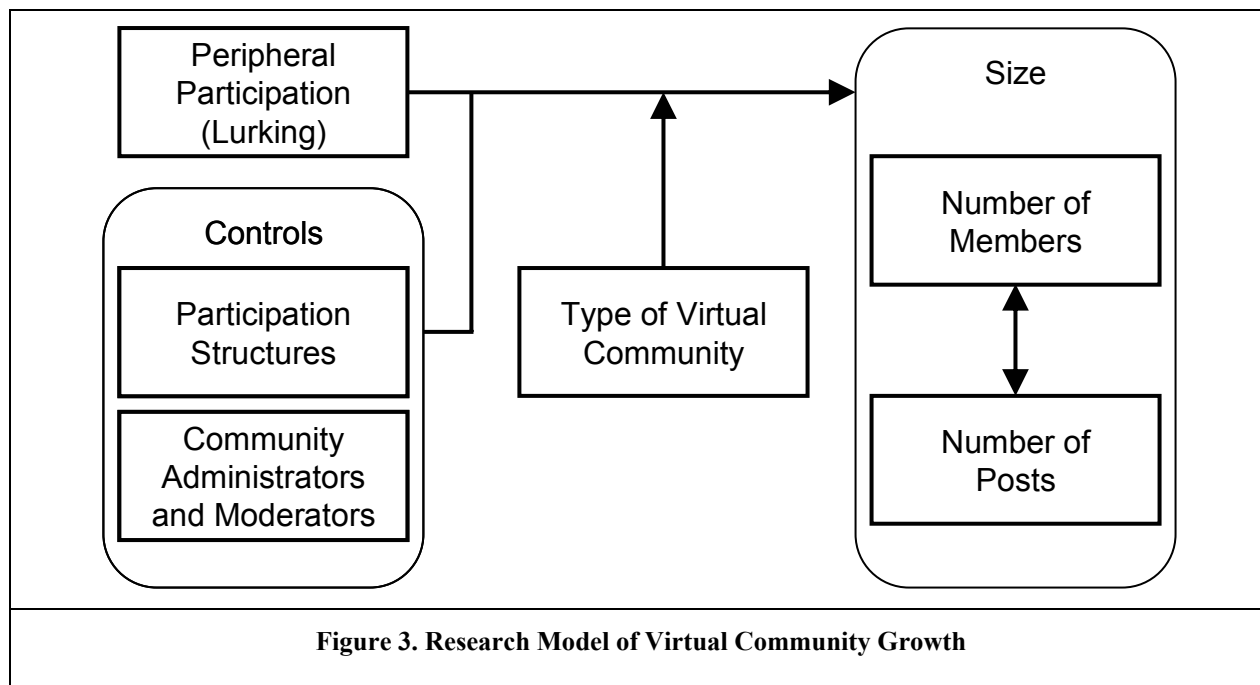
Third, there is the case of satisfied discontinuance. This is where a peripheral participant determines that they are not interested in a virtual community and ceases interaction. To the extent that this is a rational judgment based on accurate indications, it is presumably another positive outcome for both the individual and the extant virtual community. Finally, there is the case of dissatisfied discontinuance, where the individual attempts to continue their participation (either peripherally or at another stage) but is unable to due to technical or social difficulties.

The major reasons for lurking reported by Preece et al. (2004) span all four of these outcomes. Some lurkers reported that they felt that serving as an audience was enough to be an active participant in the group. That is, they considered themselves to be active participants. Another set felt that they needed to learn more about the group before they felt comfortable posting messages (presumably through continued peripheral participation). Others had made up their mind that they either had no intention to contribute (and felt no requirement to do so) or had already achieved the objective from the group and had happily discontinued participation altogether. The last two sets of responses reported by Preece et al. (2004) were those with negative experiences. Some participants did not like the group dynamics and therefore preferred to remain anonymous, while the final set faced technical difficulties that precluded them from posting.



### The Effects of Lurking

The most prevalent success measure in online community research is community size. Consistent with prior studies, we adopt the number of members and the number of posts as measures of virtual community size that reflect the success of a virtual community. From a resource-based view of online communities, the membership size of the community and the number of posts represent the amount of the community’s resources (Butler 2001). The larger the virtual community's membership, the bigger is the pool of resources available to the entire group (Butler 2001). Furthermore, virtual communities are platforms of interaction and, therefore, the other aspect of membership as resource is the idea of “audience resource” (Butler 2001 pg. 348). This aspect corresponds directly to the individual motivation of reputation building in that participants would rather join a virtual community with potentially larger “audiences” (Wasko et al. 2005). Finally, given that a virtual community caters not only to information and knowledge but also to social-emotional content, a greater diversity of members provides a more diverse set of posts, leading to a higher probability of meeting relational needs (Johnson et al. 2005).



On another level, membership size is also a reflection of a virtual community's success in the sense that those communities that cater to economic exchanges among its members would be more successful in fostering exchanges with a larger community (Rothaermel et al. 2001). As shown in Figure 3, we note that there is a tight relationship between both measures of size in that as membership size grows, so does the number of postings, and vice versa. As the number of members increases, we would expect to see an increase in the number of posts in a virtual community, leading to a further increase in members. Rothaermel et al. (2001), Johnson and Faraj (2005), and Butler (2001) all point to this mutually reinforcing impact of virtual communities' postings on its size. In this sense, membership size and number of postings are endogenous variables in the model.

$$\text{MEMBER} = f(\text{POST}, \text{LURK}, \text{TYPE}, \text{CONTROLS}) \quad (1)$$

$$\text{POST} = g(\text{MEMBER}, \text{LURK}, \text{TYPE}, \text{CONTROLS}) \quad (2)$$

where Member is the total number of members of a virtual community to date, Post is the total number of posts to a virtual community to date, Lurk is the number of guests in a virtual community relative to the community size (as measured by number of members), Type is the virtual community category, and the controls (discussed below) are a set of variables that have influence on both endogenous variables.

Lurkers are defined by Rafaeli et al. (2004) as a "persistent but silent audience". Hence, lurking behavior is defined as passive browsing and typically refers to guests or even registered users who frequently visit virtual communities but do not or seldom post to these forums. Academic perspective on the effects of lurking has been mixed. Early researchers placed a negative connotation on lurking by labeling it as a type of "free-rider" behavior (Kollock et al. 1999; Morris et al. 1996). This was a reflection of the participatory and giving nature that characterized early online communities. Early anecdotal evidence is from The WELL, one of the earliest online communities, which had an intense discussion on the issue of lurking and its negative impact on its forum (Well 1992). This is reinforced by the fact that the top reason for lurking as provided by lurkers was "just reading is enough" (Nonnecke et al. 2004b). Some observers compared this to the "tragedy of the commons" where free-riding on the community's public good will lead to a decline of the community (Kollock et al. 1999).

Recently some researchers have argued that "lurking" is a vital and integral part of online community and forum behavior. Research into motivations behind lurking in online discussion board shows that lurking is a way for newcomers to learn about the group (Nonnecke et al. 2004b). Lurkers' postings to The WELL discussion thread on lurking echo this idea too (Well 1992). Rafaeli et al. (2004) points to the "sense-making" that takes place within lurkers and this aids in the building of a belonging in lurkers to the community. They claim that this is an important

step in building the community's "virtual social capital". A similar understanding of lurking is found in Burnett's (2000) discussion on online human information behavior where he posits that "people may simply situate themselves within a promising 'information neighborhood,' because it is a likely place within which to stumble across information of interest ... (which) may or may not be of immediate utility" (Burnett 2000 pg. 4). This conceptualization of lurking reflects both ideas in that there are two underlying mechanisms: an undirected activity (wandering and browsing) that allows for "participants" to absorb information about the environment, and the directed activity of seeking out information of interest and concern. Furthermore, others have argued that by providing this "unseen" presence, lurkers constitute an "unseen" audience that ensures that discussions remain viable (Burnett 2000).

Using the social psychology stream of literature as our main perspective, we categorize the above two camps into the following concepts: social loafing and socialization. Social loafing is a "group phenomenon where individuals contribute or exert less effort to achieve a goal when they perceive that they are working jointly with others than when they are working alone" (Karau et al. 1993). Research on social loafing has found that it has a detrimental effect on overall group performance (Karau et al. 1993). From Nonnecke et al.'s (2004) survey of lurkers, we note that 22.8 percent of respondents feel that they have nothing to offer and that 18.7 percent feel that others would respond the way they would. These responses show that many of the lurkers do not think that their contributions will affect the group's outcome and, furthermore, that their contribution to the group is non-identifiable. These are key signals of social loafing within virtual communities. In this situation, we posit that lurking will have an overall negative effect on the virtual communities' level of resources and size. The effect of social loafing and the blatant non-committal mercenary views, i.e., free-riding of resources, will result in a vicious cycle where eventually the group might even cease to exist (Wasko et al. 2005).

The second view of lurking that uses the ideas of "sense-making" or orienteering information seeking is grounded in the idea of socialization. Socialization refers to the adjustment and adaptation of group members to new communication environments and points to the "process of learning the behaviors and attitudes necessary for assuming a role in an organization (Morrison 1993 pg. 173)". Morrison's research in newcomer behaviors in real world organizations shows that socialization involves not only role and task clarifications but more importantly the need to gain understanding of the culture (behaviors and attitudes) via the norms and values of the organization. This process also allows newcomers to become socially integrated where their actions and behaviors are adjusted to the norms and expectations (Morrison 1993 pg. 174). We apply this to the online setting, as per Ahuja and Galvin (2003), and note that in the same lurker survey (Nonnecke et al. 2000), 29.7 percent claimed that they were "still learning about the group" and this was the second most common reason for lurking in the list. Another survey showed that lurkers tend to feel a lesser sense of membership when compared to posters (Nonnecke et al. 2004a). In such cases, lurking would be manifestation of the socialization process.

This is especially salient and relevant in an online setting as socialization involves learning of behaviors and attitudes of the group and this type of social information tends to be informal, nuanced, tacit, and ambiguous. Previous studies have shown that a significant amount of time and experience with electronic media is required to convey this type of information (Finolt et al. 1991; Yoo et al. 1999). In a study of virtual groups, Ahuja and Galvin (2003) found that newcomers did not actively use electronic media to inquire about norms, which are more sensitive and tacit in nature. Instead, they found that newcomers adopted the direct observation behaviors found in traditional groups to gain such information i.e., they silently watch the group email related to such information which is similar to the lurking behavior in virtual communities.

In this case, the effect of socialization will provide a positive effect of lurking on online community groups. When sufficient socialization has occurred through lurking, we propose that this will result in an increase in the amount of contribution and size of the online communities.

From these two contrasting perspectives on lurking, we propose the following set of competing hypotheses:

H1a: In virtual communities, a higher level of lurking in the previous time frame (t-1) will be associated with a decrease in the number of members in the current time frame (t). (Social Loafing perspective)

H1b: In virtual communities, a higher level of lurking in the previous time frame (t-1) will be associated with an increase in the number of members in the current time frame (t). (Socialization perspective)

H2a: In virtual communities, a higher level of lurking in the previous time frame (t-1) will be associated with a decrease in the number of postings in the current time frame (t). (Social Loafing perspective)

H2b: In virtual communities, a higher level of lurking in the previous time frame (t-1) will be associated with an increase in the number of posts in the current time frame (t). (Socialization perspective)

### *Types of Virtual Communities*

Virtual communities are highly varied in terms of their purposes and domains. Various scholars have discussed how these domain differences might impact activities (Jeppesen et al. 2006; Wasko et al. 2005) characteristics (Preece 2001) and user beliefs (van der Heijden 2004) in virtual communities. Nonnecke and Preece (2000) found that the level of lurking differed significantly in different types of discussion lists. According to their study, lurking in health-support communities was around 46 per cent while software-support communities had up to 82 per cent lurkers. This difference in lurking occurred even after taking into account the size of the community. This finding points to the need to take into account the purpose and type of particular virtual communities when discussing the effects of lurking behavior. However, as there is such a wide range of virtual communities, there has been little consensus among researchers regarding the typology of virtual communities (Lee et al. 2003; Porter 2004). Several typologies have been proposed and each has their strengths and weaknesses (see Burnett 2000; Hagel et al. 1997; Porter 2004; Stanoevoka-Slaveba et al. 2001). After reviewing each of these typologies, we found that the most parsimonious and conceptually grounded typology is that based on the idea of information exchange (Burnett 2000; Ridings et al. 2004) and establishment (Porter 2004).

Virtual communities (and communities in general) provide a platform for two main types of exchanges: directed information exchange and social interactions (Burnett 2000; Ridings et al. 2004). Directed information exchange involves information seeking, information provision, and information sharing behavior. Clear examples of this type of exchange include queries for information, directed projects and announcements. Social interaction, on the other hand, involves relationship building behavior, e.g. exchanging gossip and pleasantries, providing emotional support, and engaging in language games and play (Burnett 2000). Although it is true that all communities engage in both types of exchanges to a certain extent (Blanchard 2004), we argue that the degree to which either type of exchange occurs in each type of community would differ (Burnett 2000). In other words, we propose that different types of virtual communities would have a different ratio of either of these exchanges.

Establishment refers to the organizations involved in the management and maintenance of the virtual communities. Specifically, there are two main types: business-sponsored virtual communities and community-based virtual communities. An example of the former includes product-support forums, while examples of the latter include health support groups and gaming groups. [We do not include auction sites such as eBay as part of this scope as they are geared mainly to economic transactions.]

Putting these two categories together, we propose two main types of virtual communities: Relational-Interest and Transactional-Commercial. The Relational-Interest category includes community-based virtual communities that are either stand-alone sites or embedded in an overall community-oriented site with other types of content. These virtual communities tend to be organized around topics of interest (hobbies, life experiences) or professional interests (e.g. legal professions) and meet personal interest or relationship needs. As such, we propose that these online forums tend to be dominated by social interaction type of exchanges rather than directed information exchange.

For the Transactional-Commercial category, we include virtual communities that are organized as a supplemental feature to a commercial firm sites and are organized around products or services of these firms (Porter 2004). Unlike the Relational-Interest type that is more conducive to developing strong personal relationships, Transactional-Commercial forums are more goal or transaction-oriented and provide less incentives and opportunities for participants to develop stronger personal relationships (Stanoevoka-Slaveba et al. 2001). As a result, we expect that the dominant type of exchange found in these virtual communities is directed information exchange (rather than more social interactions).

Evidence for the latter type of forum is seen in Jeppesen and Frederiksen's (2006) study of a firm-sponsored virtual community. It was driven by a core business and used to promote innovation among its end users. As seen from the study, the information exchanges in this virtual community dealt with information seeking and information sharing with little emotional exchanges. Other types of similar virtual communities might include software support



communities, online deals communities, and association-sponsored communities. These communities are a stark contrast from Cummings et al.'s (2002) study of online support groups for the hearing-impaired.

These social support groups were typically un-sponsored and run by nonprofessionals. They were also built specifically to engender empathy and for posters to present their ideas, thoughts, and feelings to others like themselves. Other social support communities that have been studied are online patient communities, hobbyists, and fantasy-related communities. There are, however, exceptions to either category where certain Transactional-Commercial communities may be dominated by social interaction (e.g. toy hobbyists who congregate on a toy manufacturer's virtual community) or certain Relational-Interest forums are dominated by directed exchanges (e.g. slickdeals.net where participants exchange information of the latest online/offline deals). However, we propose that on average most of the sites based on the establishment profile will contain the proposed dominant type of exchange.

As such, we argue that Transactional-Commercial communities, with their emphasis on directed information exchanges, will amplify the negative effects of social loafing. In fact, there is anecdotal evidence from communities like these where contributors of information have restricted access to their "resource" to only those members who have a history of prior contributions. Conversely, socialization's positive effects will be attenuated within this type of virtual community.

With regards to Relational-Interest virtual communities, we propose that this community type will amplify the positive lurking effects driven from the socialization perspective. In such cases, where trust, emotional, and other non-transactional needs are more salient, we propose that newcomers and guests will indeed benefit from the passive observation of the sites. Once they are sufficiently "socialized" into the process, the probability of their contribution at a later date may increase. Similarly, the negative impact of social loafing on virtual communities is attenuated within these forums. Formally, as before, we propose the following competing hypotheses:

H3a: The negative association between lurking in the current time frame and the number of members and postings in the next time frame due to social loafing is amplified for Transactional-Commercial virtual communities and attenuated for Relational-Interest virtual communities.

H3b: The positive association between lurking in the current time frame and the number of members and postings in the next time frame due to socialization is attenuated for Transactional-Commercial virtual communities and amplified for Relational-Interest virtual communities.

### ***Control Variables***

Based on review of relevant papers (Butler 2001; Johnson et al. 2005; Ma et al. 2005), we propose that the model has to take into account the following characteristics of virtual communities. First, participation structures of virtual communities can facilitate or constrain how participants interact (Johnson et al. 2005; Ma et al. 2005). Participation structures include the forums that are formed on these virtual communities and the individual threads that are posted within these forums. These structures are coping mechanisms that are enacted when virtual communities grow very large, in order to prevent them from becoming unstable and breaking down (Rothaermel et al. 2001). The participation structures variable therefore contributes significantly to the online growth with respect to the number of posts and hence is an important control. The participation structures that are taken account in this model are the number of forums (NF), presence of a moderator post feature (Modpost) and thread depth (Depth).

Another important control variable is moderation intensity as measured by the level of site management (Rothaermel et al. 2001, Johnson et al. 2005). This may include content moderation, user monitoring and censoring, setting up of formal and informal rules of engagement, etc., and includes all activities that provide guidance for the online discussion forum's interactions. Similar to participation structures, moderation intensity provides stability, assurance, and a voice of authority that serves as the foundation for community building and therefore points to its significance as a control variable. The moderation variables are the number of site administrators (Admins) and the number of moderators for the forums (Mods); they are posited to specifically influence the membership size.

## **Data and Measures**

### ***Data***

To test our model, we are specifically interested only in virtual communities that are formed around online discussion forums. This is an important scope parameter for this study as the label "virtual community" has been

widely applied to all forms of online communications (Porter 2004) and as a such, there has been some confusion concerning what virtual communities are. We chose online discussion forums because they are the more predominant form of virtual community as discussed earlier. They also provide the most comprehensive repertoire of communication tools, as compared to other community software, and hence make online participation much richer. Furthermore, most of the site statistics for the members and nonmembers are made very accessible, which makes research into the phenomenon at hand tractable.

We collected data from online discussion forums that used the same type of engine i.e., the vBulletin engine developed by Jelsoft Enterprises Limited, a U.K. based company. An initial list of online forums was created from public sources, e.g. bigboards.com, search engines such as Yahoo! search engine, and from the customer support Web site run by Jelsoft for vBulletin users. We identified a total of 1,643 unique URLs that were vBulletin-powered message boards. However not all sites made all data elements publicly available; therefore, our automated agent visited each of the 1,643 sites to ascertain if the data elements were available. This was supplemented by a manual visit to determine if a different URL would point to the site's "main page". We also limited our sample to sites with at least three members. Our final sample included 555 online forums of which 548 were used in the analyses, given that there were 7 sites with missing data. Of the final set, we coded the online discussion forums into the three categories that mapped to the two conceptual types of online forums. Based on our coding, we had 43 Support online forums, 127 Content online forums and 378 Community-based online forums. The last two categories map to the Relational-Interest type (n=505) while the first category maps to the Transactional-Commercial type of forums (n=43).

Site statistics and membership information of these online forums were collected in a daily, randomized fashion using an automated agent from November 2005 to March 2006. We aggregated the day/week data into a cross-sectional set of data for each site-month. The aggregation was based on maximum value found as the data collection may not have been able to gather some data at different times of the day due to various technical reasons (e.g. heavy user traffic) and we aimed to understand the structure of the sites under peak conditions.

For this particular study, we chose to use cross-sectional data collected at the end of our observation period i.e., March 2006 for all our variables. We then chose November 2005 data, the start of our observation period, for our lagged variables so as to allow for a certain time to lapse prior to observing any impact of these variables on online forums. We did however run models using lurk ratio from the intervening months (December, January, etc.) as part of our sensitivity analysis which we shall discuss further below.

### ***Variable Operationalization***

The endogenous variables of Membership Size and Number of posts were measured directly from the site statistics. Membership Size was measured by the total number of registered members (both active and inactive) for the online discussion forum at the end of data collection period (from founding to date), and the number of posts was measured by the total number of posts to the online discussion forum at the end of data collection period.

Lurking is a relatively unmeasured construct (Rafeli et al. (2004) is an exception). The vBulletin engine provides us with the number of guests that are online in the online forums. We use that as a proxy for the level of lurking that is present in that forum. This is a credible proxy as most online forums only grant read-only rights to guests and prohibit them from posting messages. For our analysis, we normalized the number of guests by the total member size of the online forum (Lurk).

As discussed above, we included the participation structures and moderation intensity as controls. Participation structures are measured by number of forums (NF), presence of a moderator post feature (Modpost), and thread depth (Depth). The former two are directly extracted from site statistics, whilst the latter is measured as the ratio of total number of posts to total number of threads. The moderator post feature is coded 1 if it is present and 0 if it is absent. Moderation intensity is measured in turn by the number of administrators and the number of moderators on the site, again available directly from the site statistics.

### ***Methodology***

Given the close interrelationship between the number of members and number of posts, we used a two stage least squares (2SLS) model where the number of members and number of posts are endogenous variables and the other variables as instrumental variables give us the full model estimation equations below. In order to confirm the endogeneity of posts and membership, we conducted the Hausman test for the full model (model 4) below using

STATA for our equations. The results for both the equations were significant (equation 1 chi-sq test statistic = 133.85,  $p = 0.0000$  and equation 2 chi-sq test statistic = 16.73,  $p = 0.0000$ ) and the results confirm our suspicion of endogeneity.

$$Y_1 = \delta_{12}\hat{Y}_2 + \beta_{11}X_1 + \beta_{12}X_2 + \beta_{13}X_3 + \beta_{14}X_4 + \beta_{16}X_6 + \beta_{17}X_7 + \beta_{19}X_9 - (1)$$

$$Y_2 = \delta_{21}\hat{Y}_1 + \beta_{21}X_1 + \beta_{22}X_2 + \beta_{23}X_3 + \beta_{25}X_5 + \beta_{26}X_6 + \beta_{28}X_8 + \beta_{29}X_9 - (2)$$

where endogenous variables are:

- $Y_1$ : The natural log of Total Members (MTot)
- $Y_2$ : The natural log of Total Posts (PTot)

Instrumental variables are:

- $X_2$ : The natural log of lagged Lurk ratio (Lurk)
- $X_3$ : Type (Type) is a dummy variable coded as 0, 1 where 0 is for Transactional-Commercial, 1 is for Relational-Interest virtual communities
- $X_4$ : The natural log of lagged Number of Forums (NF; control variable)
- $X_5$ : The natural log of lagged Depth (Depth; control variable)
- $X_6$ : The natural log of lagged Number of administrators (NAdmins; control variable)
- $X_7$ : The natural log of lagged Number of moderators (NMods; control variable)
- $X_8$ : Lagged Moderator Post feature (ModPost, control variable) is a binary variable
- $X_9$ : Interaction term of natural log of lagged Lurk ratio and Type (Type\*Lurk)

Most of the variables (except for binary variables e.g. Version, Type) are log-transformed given their highly skewed distribution which is consistent with most online group research ( e.g. Butler 2001; Johnson et al. 2005; Ravid et al. 2004). All transformed variables had a constant value of 1 added prior to transformation given that there was zero data in these variables. Table 1 below presents the descriptive statistics and correlations for all key study variables (transformed). Finally, we also tested the full model (model 4) in terms of overidentification using Bassman's test and found no significant problems with both equations.

**Table 1. Descriptive Statistics and Correlation of Key Variables**

Variables	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9
1 Total Members (LN)	8.23	2.33	0.69	13.239	1.00								
2 Total Posts (LN)	11.55	3.18	0	16.999	0.77*	1.00							
3 Lurk (LN)	0.03	0.06	0	0.5596	-0.30*	-0.31*	1.00						
4 No. of forums (LN)	3.27	1.02	0	7.4793	0.45*	0.37*	-0.04	1.00					
5 Depth (LN)	2.38	0.67	0	4.4136	0.35*	0.68*	-0.19*	0.10*	1.00				
6 No. of admins (LN)	1.55	1.42	0	7.8770	0.06	0.10*	-0.10	0.06	0.03	1.00			
7 No. of moderators (LN)	1.78	1.60	0	7.7528	0.37*	0.41*	-0.04	0.30*	0.23*	0.37*	1.00		
8 Type	0.92	0.27	0	1	0.07	0.17*	-0.04	0.06	0.20*	-0.02	0.08	1.00	
9 Moderator Post	0.16	0.36	0	1	-0.14*	-0.16*	0.03	-0.09*	-0.20*	0.16*	-0.17*	-0.04	1.00

\* significant at 0.05

## Results

Table 2 below presents the results of the 2SLS regressions used to test the hypotheses for Membership Size while Table 3 presents the results for Total number of posts. Model 1 of each table is the base model that includes only the control variables. The results show that the anticipated membership size of online forums and the total number of posts in these forums has positive and significant impacts on each other. Furthermore, the number of moderators and depth of forums are positively associated with membership size and total number of posts respectively.

To test H1a – H2b i.e., whether social loafing or socialization is the main motivator behind lurking behavior, we added the lagged lurk variable in model 2 for both tables. As model 2 shows, lurking has a significant and negative impact on online forums' membership size. It has a positive impact on online forums' total posts, but this result is not significant. The results support H1a and disprove H1b, thus pointing to the apparent importance of social loafing as a key motivation for lurking on online forums. However, the impact of lurking on online posting, despite its lack of significance, indicates that socialization may make a small contribution to motivation for lurking in online forums (H2b).

To analyze the moderating effect of type and lurking on online forum growth and test hypotheses H3a and H3b, we introduced the type of forum to model 2 as the base model for moderation (model 3) and then added the interaction of type of forum with the lurking variable in model 4. First, the main effects of lurking and type on membership (see Table 2 model 3) are significant (for lurking) and negative (for both). In other words, Relational-Interest online communities (coded 1) tend to be smaller while lurking continues to have the negative impact discussed above. On the other hand, lurking continues to have a positive but non-significant relationship with the total number of postings while Relational-Interest communities tend to have more postings (see Table 3 model 3). The interaction of type of forum with lurking is especially interesting for the membership model (Table 2 model 4), where we find that the main effects of lurking and type remain significantly negative while the interaction term is positive and moderately significant ( $p = 0.035$ ). The interpretation of this result is clearer as we consider the graph in Figure 4 below. Here we find that there is an overall negative impact of lurking on membership. However, this negative impact of lurking on membership is attenuated in Relational-Interest online communities (green line) while amplified in Transactional-Commercial online communities (blue line). In other words, the results with respect to the membership growth of online communities provide preliminary support for H3a while providing no evidence for H3b. The interaction model for posting was not significant and did not provide additional insight into the moderation effect.

In order to explore the interaction of type and lurking on membership in more detail and for illustrative purposes, we split the sample into the two types of forum. We ran separate models (of lurking effect on membership) on these sub

samples. The sample for model 5 was used on Transactional-Commercial forums (n=43), model 6 was for Relational-Interest forums (n=505) (see Table 2). Comparing the coefficients for lurking in models 5 and 6 shows that lurking has a stronger negative relationship in Transactional-Commercial online forums than in Relational-Interest online forums. Furthermore, comparing that to the average impact of lurking (model 3), we find that lurking's negative impact is slightly amplified in Transactional-Commercial online forums but slightly attenuated in Relational-Interest online forums. This set of results confirms our H3a.

In conclusion, we proposed that there are two plausible psychological motivations underlying the social lurking phenomenon i.e., social loafing and socialization. We empirically studied the lagged effect of lurking on membership sizes and volume of posts and statistically showed that the results supported the social loafing perspective (H1a and H3a were based on social loafing perspective and they were supported). Although these results support the social loafing perspective, they represent the “average” lurking’s impact on the average online forum. Our interaction results points to the possibility that the two “competing” motivations may co-exist and operate simultaneously within each community. Specifically, in Relational-Interest virtual communities we note that the overall negative effects of lurking is attenuated possibly due to higher level of socialization motivation present.

**Table 2. 2SLS Estimates of Variables Coefficients (Membership Size Models)**

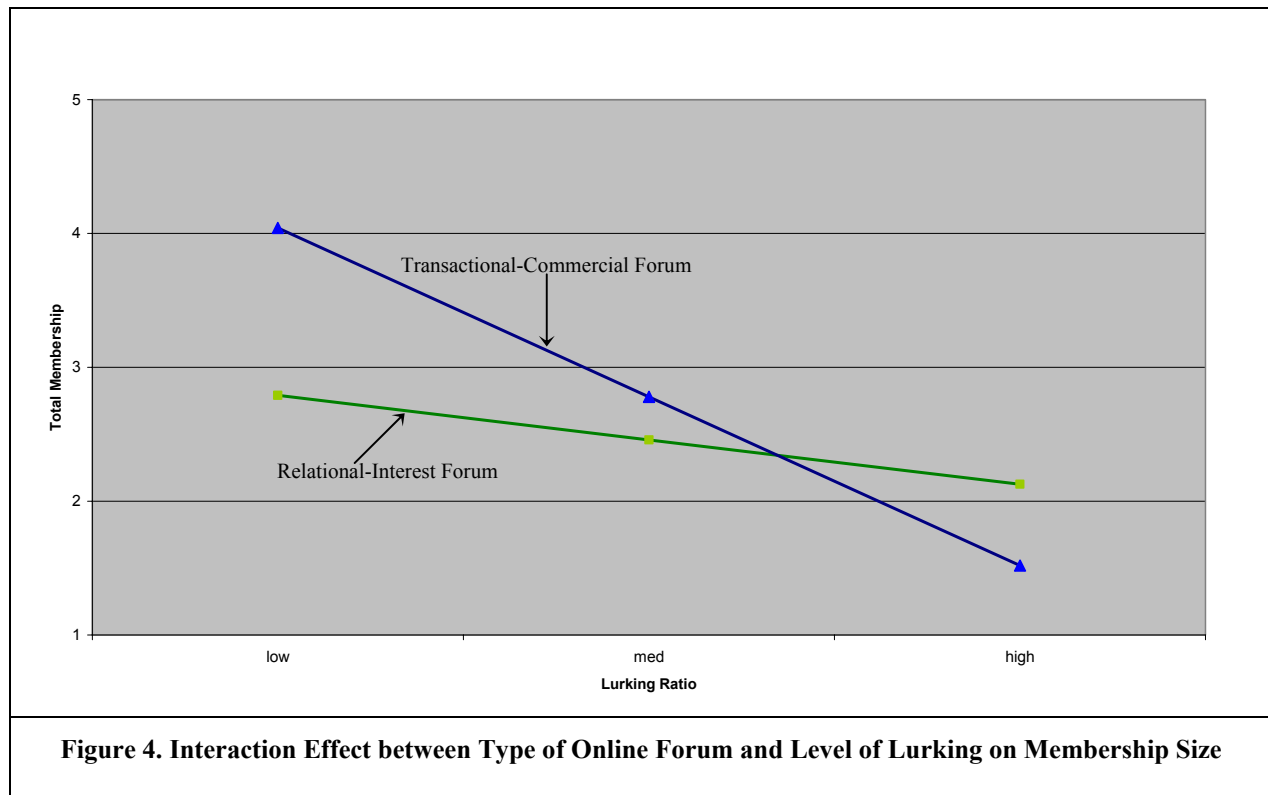
Variables	Model 1	Model 2	Model 3	Model 4	Model 5 (Type 0)	Model 6 (Type 1)
Total Posts (LN)	0.34***	0.30***	0.31***	0.31***	0.47***	0.29***
Lurk (LN)		-6.58***	-6.40***	-22.63**	-20.28**	-6.28***
Type			-0.35	-0.64*		
No. of admins. (LN)	-0.05	-0.06	-0.06	-0.06	0.09	-0.08
No. of moderators (LN)	0.19***	0.21***	0.21***	0.21***	0.31	0.22***
No. of forums (LN)	0.53***	0.56***	0.56***	0.55***	0.20	0.58***
Type*Lurk				16.66*		
R <sup>2</sup> (adj)	0.594	0.593	0.600	0.604	0.799	0.5802
N	548	548	548	548	43	505

\*\*\*p<0.001, \*\* p<0.01, \* p<0.05

**Table 3. 2SLS Estimates of Variables Coefficients (Number of Posts models)**

Variables	Model 1	Model 2	Model 3	Model 4	Model 5 (Type 0)	Model 6 (Type 1)
Total Members (LN)	1.02***	1.02***	1.01***	1.01***	1.11***	1.01***
Lurk (LN)		0.49	0.30	12.16	14.66	-0.02
Type			0.59**	0.81**		
No. of admins (LN)	0.03	0.03	0.03	0.03	-0.04	0.04
Depth (LN)	1.79***	1.80***	1.76***	1.75***	1.58***	1.76***
Moderator Post	0.07	0.07	0.06	0.07	0.06	0.09
Type*Lurk				-12.14		
R <sup>2</sup> (adj)	0.792	0.792	0.796	0.796	0.871	0.748
N	548	548	548	548	43	505

\*\*\*p<0.001, \*\* p<0.01, \* p<0.05



## Discussion

The key finding in this paper is that we found strong support for lurking driven from the social loafing perspective. This resonates clearly with the descriptive surveys that have been conducted earlier (Nonnecke et al. 2004a; Nonnecke et al. 2004b). However, this finding has to be tempered with the fact that it was only obvious for the virtual communities' membership but not for the number of posting. In the case of posting, we found that lurking has a positive but not significant effect. On the one hand, we can propose that the socialization motivation is perhaps present but on a lower level as compared to social loafing. On the other hand, some have proposed that current members might choose to post more given the higher number of lurkers. This alternative is based on the idea discussed earlier, i.e., a larger pool of lurkers serves as a larger "audience resource" (Butler 2001) and also corresponds directly to the individual motivation of reputation building (Wasko et al. 2005). This set of mixed results of lurking on membership and number of posts may be also specific to our operationalization of peripheral and active participation. Nonetheless, this finding does present an interesting area for further theorization and research with regards to lurking's impact on membership and posting within online communities.

The other key finding is that we showed that this relationship between lurking and virtual communities has to be contextualized and that the type of virtual communities has a significant moderating effect on this relationship. Specifically, as hypothesized, Transactional-Commercial communities are more "conductive" for social loafing given that they are mainly based on information gathering and seeking. This is shown in the amplified level of lurking in these communities. However, Relational-Interest virtual communities have a more muted negative lurking effect, as we have proposed. This finding provides a deeper insight into the nature of lurking and complements our main finding in that lurking may indeed be driven by more than just simple selfish use of common resources and that in communities that are driven by social norms, lurking may well be a way in which guests learn and understand these norms prior to their entry as participants. Of course, as discussed earlier, different degrees of social loafing and socialization motivation can co-exist, hence we note that social loafing motivation seems to be more dominant on average but the dampened effect within Relational-Interest virtual communities point to the presence of the socialization motivation as well.

The key research implication of this set of findings is that lurking as an online social phenomenon is more complicated and nuanced than previously discussed in the literature. The main contribution in this paper is to explicate two possible theoretical perspectives of the underlying motivations behind online lurking and to empirically show that we need to combine both theoretical perspectives to fully understand this phenomenon. This is unlike earlier studies that proposed either a negative or positive effect of lurking (Rafaeli et al. 2004). Furthermore we show that research of virtual communities needs to take into account the specific context or type of community in their studies. We argue that despite earlier attempts to provide various taxonomies of virtual communities (Burnett 2000; Hagel et al. 1997; Porter 2004), none of the recent studies has explicitly modeled the impact of the context on various virtual community issues (Butler 2001; Wasko et al. 2005). In our study, we applied a parsimonious and theoretically grounded taxonomy and showed that by doing so, a more complete and nuanced view of lurking can emerge. As such, we believe that the impact of community types might be equally salient when we consider other group processes within virtual communities, for example, how the different types of virtual communities affect the process of membership retention (Butler 2001) or how communication patterns or knowledge sharing differ across different types of communities (Wasko et al. 2005).

Raising sensitivity to the type of virtual community also has practical implications for administrators and owners of virtual community. Management of these communities has usually taken for granted the issue of structures and quality in the sense that most communities “uniformly” adopt these features, such as moderators or community design, without considering the cost and impacts of these features. Specifically, with respect to the issue of lurking, one practical implication is for administrators and managers of Transactional-Commercial virtual communities to create more restrictive rules for lurkers. On the other hand, Relational-Interest virtual communities should consider relaxing their guest rules and provide a more conducive “atmosphere” for lurkers to feel more comfortable in their communities.

Finally, we also found various salient factors affecting the resources of virtual communities. With regard to membership growth, we found that there is a strongly significant positive impact of moderators, which is intuitive and obvious as the more moderators there are to conduct content moderation, e.g. locking threads with flame content or sanctioning users who behave in a hostile manner, the more the members will perceive that the online forum is well managed. With regard to posting, we found that the depth of forums (number of messages per thread) has a strong and positive effect which is in line with previous research in this area (Jones et al. 2001).

Like all research, however, there are specific limitations to our findings. First, data from the online discussion forums are all based on a similar system (Johnson et al. 2005), and there may be systematic biases among these sites. We have attempted to mitigate this by sampling a large and diverse group of online discussion forums. Second, we have attempted to show how lurking affects subsequent membership size over time. This was done by collecting longitudinal data from each virtual community. The current data is based on a five-month (November to March) span with the lurking data based on the first month’s (November) observations and the dependent variables based on the last month’s (March) observations. In order to ensure that there was no bias in choosing November’s data, we conducted sensitivity tests using lurking data from December, January, and February. We found that there was no change in the direction of the impacts, but the significance of the relationship became gradually lower as we used months closer to March. This perhaps point to the amount of intervening time period required for lurking to have an impact on the online forums. Future research should therefore consider a longer time frame of observations.

An alternative method is to use a panel data method to test the data. However, there is a clear endogeneity relationship between the two key variables (membership size and posting volume) and time series methods chosen must be able to take this into account. On our part, we have chosen to use a lagged 2SLS model instead. Third, the current construction of lurking behavior is narrowly constrained to unregistered users and is normalized using the total membership size of virtual communities. The issue with this narrow count of lurking is that it misses out on the registered users who also engage in substantial lurking. However, one of the main considerations in this paper is to consider how lurking impacts on membership and a measure based purely on guests allows us to capture any “delurking” effect that might be present, i.e., lurkers who convert and join the community (Rafaeli et al. 2004). On the other hand, the postings measure and the conceptual underpinning of socialization might require us to take into account inactive registered members. This expanded conceptualization of lurking may add further insights but will require further exploration into how data might be captured and analyzed. One possible research avenue might be to focus on a specific subset of communities and capture detailed user-specific data and activities in these communities, such that inactive membership might be included in our lurking measure.

Lastly, the salience of the type of virtual communities points also to the possibility of multilevel interactions among lurking and other virtual community group processes. In addition to examining antecedents of lurking as a future research, researchers should also adopt a multilevel model that integrates community type concepts and predictors.

## Conclusions

We have attempted in this paper to provide a theoretically grounded model for the phenomenon of lurking and its attendant effects on virtual community growth. Specifically, we have used concepts from social psychology and integrated them with a pragmatic yet parsimonious typology of virtual communities to demonstrate how they interact and impact virtual communities in opposing manners. Although these opposing effects have been proposed in the literature by descriptive studies, the novelty in our model is to direct attention to the context of the virtual community.

Virtual communities and online discussion forums are a growing topic of interest for academics and practitioners alike. Despite strong interest in understanding how virtual communities grow, research has often overlooked the impact of lurking and how peripheral participation interacts with the inherent differences among virtual communities. We propose that it is inappropriate to just use the type of virtual community as a control variable and that research on virtual communities needs to explicitly theorize how the different types of communities can impact behaviors and interactions. We propose that this model opens new potential areas and lines of enquiry into the impact of the context of virtual communities on other factors as well.

## References

- Ahuja, M.K., and Galvin, J.E. "Socialization in virtual groups," *Journal of Management* (29:2) 2003, pp 161-185.
- Armstrong, A., and Hagel, J. "The real value of on-line communities," *Harvard Business Review* (74:3) 1996, pp 134-141.
- Blanchard, A. "Virtual behavior setting: An application of behavior setting theories to virtual communities," *Journal of Computer-Mediated Communication* (9:2) 2004.
- Burnett, G. "Information exchange in virtual communities: A typology," *Information Research* (5:4) 2000.
- Butler, B.S. "When is a group not a group: An empirical examination of metaphors for online social structure," in: *Katz Graduate School of Business Working Paper Series*, Pittsburgh, 1999.
- Butler, B.S. "Membership size, communication activity, and sustainability: A resource-based model of online social structures," *Information Systems Research* (12:4) 2001, pp 346-362.
- Cummings, J.N., Sproull, L., and Kiesler, S. "Beyond hearing: where real-world and online support meet," *Group dynamics: Theory, Research and Practice* (6:1) 2002, pp 78-88.
- Finolt, T., Sproull, L., and Kiesler, S. "Communication and performance in ad hoc task groups," in: *Intellectual teamwork: Social and technological foundations of cooperative work*, J. Galegher and R.E. Kraut (eds.), Lawrence Erlbaum, Hillsdale, N.J., 1991, pp. 291-325.
- Hagel, J., and Armstrong, A. *Net gain: Expanding markets through virtual communities* Harvard Business School Press, Mass., 1997.
- Horrigan, J.B., Rainie, L., and Fox, S. "Online communities: Networks that nurture long-distance relationships and local ties.,") 2001.
- Jeppesen, L.B., and Frederiksen, L. "Why do users contribute to Firm-hosted user communities?," *Organization Science* (17:1) 2006, pp 45-63.
- Johnson, S., and Faraj, S. "Joining the Crowd: Determinants of Electronic Knowledge Network Membership Size," *Robert H. Smith School working paper*) 2005.
- Jones, Q., Ravid, G., and Rafaeli, S. "Empirical Evidence for Information Overload in Mass Interaction," *ACM digital library and CHI '01*) 2001.
- Karau, S., and Williams, K. "Social loafing: A meta-analytic review and theoretical integration," *Journal of Personality and Social Psychology* (65:4) 1993, pp 681-706.
- Kenny, D., and Marshall, J.F. "Contextual marketing: The real business of the internet," *Harvard Business Review* (78:6) 2000, pp 119-125.
- Kollock, P., and Smith, M. "Communities in Cyberspace," in: *Communities in Cyberspace*, P. Kollock (ed.), Routledge, London, 1999, pp. 3-25.
- Lave, J., and Wenger, E. *Situated Learning: Legitimate Peripheral Participation* Cambridge University Press, Cambridge, UK, 1991.



- Lee, F.S.L., Vogel, D., and Limayem, M. "Virtual community informatics: A review and research agenda," *JITTA : Journal of Information Technology Theory and Application* (5:1) 2003, p 47.
- Ma, M., and Agarwal, R. "Through a glass darkly: Information technology design and identity communication for sustaining virtual communities," *Information Systems Research* (under review) 2005.
- Marwell, G., and Oliver, P. *The Critical Mass in Collective Action* Cambridge University Press, Cambridge, 1993.
- Mason, B. "Issues in virtual ethnography," Proc. Ethnographic Studies in Real and Virtual Environments: Inhabited Information Spaces and Connected Communities Conf., Edinburgh, 1999.
- Morris, M., and Ogan, C. "The internet as mass medium," *Journal of Computer-Mediated Communication* (1:4) 1996.
- Morrison, E.W. "Longitudinal study of the effects of information seeking on newcomer socialization," *Journal of Applied Psychology* (78:2) 1993, pp 173-183.
- Muniz, A.M., and O'Guinn, T. "Brand community," *Journal of Consumer Research* (27:4) 2001, pp 412-432.
- Nonnecke, B., and Preece, J. "Lurker demographics: Counting the silent," ACM CHI 2000 Conference on Human Factors, The Hague, 2000.
- Nonnecke, B., Preece, J., and Andrews, D. "What lurkers and posters think of each other," Proc. of the 37th Hawaii International Conference on System Sciences, IEEE, 2004a.
- Nonnecke, B., Preece, J., Andrews, D., and Voutour, R. "Online lurkers tell why," Proceedings of the Tenth Americas Conference on Information Systems, ICIS, New York, New York, 2004b.
- Petersen, A. "Some places to go when you want to feel right at home: Communities focus on people who need people," in: *The Wall Street Journal*, 1999, p. B6.
- Porter, C.E. "A Typology of Virtual Communities: A Multi-Disciplinary Foundation for Future Research," *Journal of Computer-Mediated Communication* (10:1) 2004, p article 3.
- Preece, J. "Sociability and usability in online communities: determining and measuring success," *Behavior and Information Technology* (20:5) 2001, pp 347-356.
- Preece, J., Nonnecke, B., and Andrews, D. "The top five reasons for lurking: Improving community experiences for everyone," *Computers in Human Behavior* (20:2) 2004, pp 201-223.
- Rafaeli, S., Ravid, G., and Soroka, V. "De-lurking in virtual communities: A social communication network approach to measuring the effects of social and cultural capital," Proceedings of the 37th Hawaii International Conference on System Sciences, IEEE, Hawaii, 2004.
- Ravid, G., and Rafaeli, S. "Asynchronous discussion groups as Small World and Scale Free Networks," *First Monday* (9:9), September 2004.
- Ridings, C.M., and Gefen, D. "Virtual Community Attraction: Why People Hang Out Online," *Journal of Computer-Mediated Communication* (10:1) 2004, p Article 4.
- Rothaermel, F.T., and Sugiyama, S. "Virtual internet communities and commercial success: Individual and community-level theory grounded in the atypical case of TimeZone.com," *Journal of Management* (27) 2001, pp 297-312.
- Sambamurthy, V., and Subramani, M. "Special Issue on Information Technologies and Knowledge Management," *MIS Quarterly* (29:1), March 2005, pp 1-7.
- Stanoevoka-Slaveba, K., and Schmid, B.F. "A Typology of Online Communities and Community Supporting Platforms," Proceedings of the 34th Hawaii International Conference on System Sciences, IEEE, Hawaii, 2001.
- Vaast, E., Boland, R., Davidson, E., Pawlowski, S.D., and Schultze, U. "Investigating the "Knowledge" in Knowledge Management: A Social Representations Perspective," *CAIS* (17:15), February 2006.
- van der Heijden, H. "User acceptance of hedonic information systems," *MIS Quarterly* (28:4) 2004, pp 695-704.
- Wasko, M.M., and Faraj, S. "It is what one does: Why people participate and help others in electronic communities of practice.," *Journal of Strategic Information Systems* (9:2-3) 2000, pp 155-173.
- Wasko, M.M., and Faraj, S. "Why should I share: Examining social capital and knowledge contribution in electronic networks of practice," *MIS Quarterly* (29:1) 2005, pp 35-57.
- Well, T. "Are you a lurker?," in: *Discussion from the WELL on February to September*, 1992.
- Yoo, Y., and Alavi, M. "Media and group cohesion: Relative influences on social presence, task participation, and group consensus," *MIS Quarterly* (25:3) 1999, pp 371-390.