# De-lurking in virtual communities: a social communication network approach to measuring the effects of social and cultural capital

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## Abstract

*The a-symmetry of activity in virtual communities is of great interest. While participation in the activities of virtual communities is crucial for a community's survival and development, many people prefer lurking, that is passive attention over active participation. Often, lurkers are the vast majority. There could be many reasons for lurking. Lurking can be measured and perhaps affected by both dispositional and situational variables. This project investigates social and cultural capital, situational antecedents of lurking and de-lurking. We propose a novel way of measuring such capital, lurking, and de-lurking. We try to figure out what are the triggers to active participation. We try to answer this by mathematically defining a social communication network of activities in authenticated discussion forums. Authenticated discussion forums provide exact log information about every participant's activities and allow us to identify lurkers that become first time posters. The proposed Social Communication Network approach (SCN) is an extension of the traditional social network methodology to include, beyond human actors, discussion topics (e.g. Usenet newsgroups threads) and subjects of discussions (e.g. Usenet groups) as well. In addition the Social Communication Network approach distinguishes between READ and POST link types. These indicate active participation on the part of the human actor. We attempt to validate this model by examining the SCN using data collected in a sample of 82 online forums. By analyzing a graph structure of the network at moments of initial postings we verify several hypotheses about causes of de-lurking and provide some directions towards measuring active participation in virtual communities.*

## 1. Introduction

What makes for active participation online? Virtual communities are among the most intriguing and promising developments of the new connected era [47]. Virtual communities feature prominently in both the public sphere and the workplace [14, 17, 18]. Factors affecting the success and effectiveness of the virtual community setting include the technology supporting it, the design of the setting, the number of participants, and others. However, the most important factor for the success of any community is its people. It is therefore crucial to understand people's behavior in virtual communities. An important task in this context is answering the question: what triggers active participation? How can we gauge activity? Active posters are the most visible element of the virtual community. Active and interactive posting have come under research scrutiny early and are being studied extensively [10, 42, 46, 61]. However, many members of virtual communities never become active posters. They prefer passive participation.

This passive participation – regular visits to the community, but reticence or very seldom posting is often called lurking. Lurkers have received less research attention because of a curious methodological and measurement paradox. Despite the promises of "cyberarcheological" excavations into logs of virtual community behavior [19], lurking is hard to track in many computer-mediated forms. While prevalent, lurking leaves behind few traces. For example, BBS, forums, newsgroups and the like keep less and more opaque records of reading behavior.

Nevertheless, initial studies of the intriguing phenomenon of lurking have begun appearing recently. The data collected was either from email distribution lists where lurkers can be tracked with good approximation [35] or by using proprietary tools that log lurkers' communicative behavior [50].

Is lurking dysfunctional? Not necessarily. In many contexts lurkers serve as a conventional mass media audience. Lurkers are often the justification and target for advertising support. People lurk because that is what they enjoy doing, because they have nothing to say or because they are just learning about the community [33]. An artificially enforced even spread

of active contribution would definitely result in information overload [52]. In sum, heterogeneity in participation is to be expected, and it has its functions.

However, reticence has some drawbacks. Some lurkers do have opinions, ideas and information of value to the community. Some are just waiting for the right moment to contribute, either because of their character or because of the community atmosphere [21]. The opinions of those people are often important and community members lose much by allowing the latter kind of lurkers to remain passive.

The problem of de-lurking has much in common with the problem of active political participation [39]. We argue that people with opinions who do not participate in their community life are similar to those virtual community participants who are reluctant to actively contribute. Indeed, there is recent accelerated attention to the interrelation of social capital and political participation in public spheres [27, 39, 40]. "Social capital" [39] is often invoked as a major player in understanding and triggering political participation. Another important role in community life is played by an individual's cultural capital [7]. We propose to focus on social capital in the context of virtual communities, as did Aviv, Erlich and Ravid [3, 4] and also on cultural capital of virtual community participants.

In this paper we use data collected about communication behavior in "authenticated" online forums. We focus on activity, social and cultural capital in these forums. The unit of analysis is the entire forum. We have therefore secured a sample of 82 forums, representing many thousands of users. The data were collected among authenticated forums resident on servers of a large university in Israel.

Authenticated forums were selected as this research population allows an attempt to define a measure for social capital in a virtual community with traceable active and passive participation. We ask about the correlation between social and cultural capital and de-lurking patterns. For this purpose we will define a novel Social Communication Network approach (SCN). SCN is an extended version of traditional social network analysis [58]. The extension to the traditional approach is the inclusion in the mapping, measurement and analysis of not just human participants but also discussion topics (e.g. Usenet newsgroups threads) and subjects of discussions (e.g. Usenet groups). We conclude with some future directions in the field of fostering active participation in virtual communities.

## 2. Related Work

### 2.1. What is lurking?

Lurking has been a concern since the early years of public CMC. Interactivity on the Web was limited from its inception. Most often, users read pages published on the Web. Despite its interactive potential [45] most use of the web is in read-only mode. The glaring exception to passive, non-interactive use of the internet is in computer based communities. These were based on a variety of technologies and "places" such as Usenet newsgroups, bulletin board systems (BBS), and later Web forums. Interactive media attract attention because of their call for active participation. Rheingold [47] reports that one of the first collaborative systems, proposed by Source Telecomputing Corporation was even called Participate.

Even in participatory virtual communities, many people limit their participation to reading and never post themselves. The reported proportion of lurkers varies from around 90% [21, 29] to around 50% [35, 50]. To "lurk" usually means "lying in wait", often with malicious intent. But interestingly enough, the Merriam-Webster dictionary definition of the verb "lurk" has one unexpected meaning – "to persist in staying"[1]. Thus lurkers can be defined as a persistent but silent audience.

Lurkers have been recognized by many researchers as an important and integral part of any community. Rafaeli and Sudweeks [45] point out that though lurkers are an important part of any online group there is little information about their activity. Whittaker et al. [61] also acknowledge lurking as a very popular activity among virtual community participants that leaves no traces.

Several recent studies tried to collect information on lurking either by using mail distribution lists [33, 34, 35, 53] or proprietary tools that collect information about online users' communicative behaviors [50]. These behaviors include connecting (visiting the community), browsing (passively participating in virtual community life), attending time durations, contributing opinions, responding to specific posts and finally interacting (i.e. responding in a reciprocal manner that reflects on history) [43, 44, 45]. It is worth noting though when comparing the results of those studies that as McLuhan [30] puts it the medium is the message. So lurking behavior in different media (such

[1] See http://www.m-w.com/cgi-bin/dictionary?book=Dictionary&va=lurk, meaning (c).

as email distribution lists, chat rooms or newsgroups) may differ.

## 2.2. Why do people lurk?

There are many reasons for lurking. Nonnecke [33] and then Nonnecke & Preece [34] interviewed lurkers and report a variety of reasons, from the personal (such as concerns for privacy) to work related reasons (e.g. I am paid to lurk). Other researchers studied the dynamics of online media [24, 61]. One of the first virtual communities, The Well [55], hosted a discussion back in 1992 where people were proposed to state their reasons for lurking [1].

Nonnecke & Preece [34] and several others point out that lurking is often used for learning about a community. Kraut et al. [24] suggest that lurking can be a way to learn about a new topic. As proposed by Donath [9] people often study characters of other participants through their postings. Whittaker et al. [61] define lurking as peripheral participation, done until a topic of interest is spotted. Jay Cross [1] states in the Well discussion: "In some conferences, I'm 100% lurker. These are generally places like Usenet or Telecommunications where I'm a total novice, just there to try to figure out what's going on". And Nicholas Browne added in the same discussion: "I think a lot of it has to do with how comfortable you feel with the medium, and this is probably something that only comes with time".

Another reason which is of special interest to us is a sense of belonging to a group. Nonnecke [33] describes a large group of users who stated that "…a sense of community was possible while lurking". This means that while watching other people talk and getting familiar with the content and style of the community people feel that they belong to the community. The sense of belonging to online community has also been reported by Beadouin and Velkovska [6]. It included, for example, telling jokes that newcomers don't understand or posting a "Happy Birthday" announcements which become 40-message-long threads. While this study refers to active behavior, it is clear that long time lurkers can definitely get into this kind of belonging to the community. In The Well discussion there is also some evidence for this sense of belonging. While talking about personal disagreements online, Gail Williams says: "… oh, I'll name no names: each of us can fill in the blanks on this one!)".

Another frequent explanation of lurking is free-riding. Free-riding is defined as a use of common good without contributing to it [54]. Kollock and Smith [22] clearly defined lurkers as free riders. Wellman and Gulia [60] and Morris and Ogan [31] also talk about free riders, defining non active virtual community participants. This explanation presents lurking in a negative light. Some of The Well discussion participants even propose that lurkers pay more for connection to The Well than active posters [1].

This brings us to the important point. On one hand lurking is a way of getting to know the community and becoming an integral part of it – in other words gaining virtual social and cultural capital[2]. On the other hand, lurking is seen as a negative behavior that can jeopardize communities' existence. Free-riding can cause a "tragedy of the commons", when the lack of contribution to the public good brings about a collapse of this good. This argument is analogous to the arguments about lack of political participation that endangers the free world democracy [38]. This analogy and a connection that has been widely studied recently between social capital and political participation suggest studying the connection between social capital and participation in cyberspace.

## 2.3. Active Political Participation and Social and Cultural Capital

There are many definitions of social capital (see Tamaschke [56] for the complete overview). It can be roughly defined as a value that connection between the people in the community brings both to an individual and a community as a whole[3]. Putnam [39] gives an example of Rotary club where the members contribute to the community and also get important benefits for themselves. Social capital can help getting a job [13] or fight for human rights. It can also help people like Timothy McVeigh blow up other people.

Cultural capital was defined by Bourdieu [7] as knowledge that enables an individual to interpret various cultural codes. Bourdieu stated that cultural capital is unevenly distributed among different society classes. Is cultural capital a subset of social capital?

Active political participation has been a very popular subject of study [2, 57]. Active political participation includes voting, activity in political institutions, agitation and more. There are many reasons for active political participation. There have been works describing micro-level reasons – wealth, status and other individual factors [57]; macro-level reasons, like state institutions influence on levels of

[2] We use the term virtual social capital in a sense of social capital acquired from virtual community activity. By 'virtual' we do not mean "not real" social capital.

[3] See Putnam (2000), pp.19-28 for a discussion of various aspects of social capital.

participation [28], and meso-level reasons operating around social networks and communities [38].

Starting from Robert Putnam's influential book "Bowling Alone" [39], researchers dedicated much attention to the role of social capital in the political involvement of citizens in democratic countries. Putnam has noticed that active political participation has been steadily decreasing in the United States. He connects this decrease to the erosion of social capital.

Following Putnam, many researchers studied the correlation between social capital and active political participation [23, 27]. In those meso-view studies two basic assumptions are presented – either social capital is a glue for political participation (meaning that it connects people together, but there is a need for an active agency, such as a political party or a local council, to provide a gear for the active political participation) or social capital provides both the glue and a gear for the active political participation.

Many scholars [15, 23, 27, 28] acknowledge that there is a clear correlation between social capital and political participation. For example, Krishna [27] determines that social capital provides both glue and gear for active political participation, while agency (such as new leaders in Indian villages) catalyzes the participation trends even more. In addition, Bourdieu says that a person's cultural capital can influence the way an individual is positioned inside their society [7].

We take these conclusions as a starting point in defining virtual social and cultural capital, e.g. those acquired using online forums and its impact on the patterns of de-lurking, that is transfer from passive participation (only visiting the forum to read) to active participation (actively posting opinions and thoughts on the forum).

## 2.4. Defining virtual social capital and cultural capital

In his interview with the Journal of Democracy [38] Putnam defines social capital as follows: "By analogy with notions of physical capital and human capital - tools and training that enhance individual productivity - "social capital" refers to features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit". This definition is broad enough to allow people who silently participate in the community life acquiring social capital.

While there is some evidence that heavy Internet users have lower social involvement [25, 32] or some hopes that the Internet will increase social capital [47], Quan-Hasse and Wellman [41] conclude that the Internet supplements traditional social capital rather than transforms or diminishes it (see also [26]). The Internet is used to complement face to face conventional social activity like its technological predecessors did [51]. But what we want to try and measure in our study is an online version of social capital, one that supplements "real" social capital, because when engaging with virtual community, even in a passive way a person is involved in very social activity [22, 37, 47].

We propose to focus on the social network part of social capital definitions. We claim that reading and posting in a forum creates a social network where all participants, both active and passive, acquire social capital by getting access to valuable information [1], learning the social norms of the relevant virtual community [33] and getting to know active participants [9]. Thus our definition of community virtual social capital is "a collection of features of the social network created as a result of virtual community activities that lead to development of common social norms and rules that assist cooperation for mutual benefit". In addition we would like to define personal virtual cultural capital as the level to which a person is involved within the virtual community.

## 2.5. Hypotheses

While research has shown no strong linear correlation between political activity and Internet use [32, 36], we believe that active participation in online communities is stronger than simple use of the Internet and thus is parallel to active political participation. Based on the discussion above we thus propose that:

**H1: Community Virtual Social Capital will positively correlate with the levels of users' activity in the community.**

Will social capital always correlate with the levels of participation? As in a "real" community information overload definitely plays an important role in the forming of virtual community. Jones, Ravid and Rafaeli [20] observed that as the number of interactive posters in USENET forums increases, the number of interactive messages decreases. This observation is related to the cognitive abilities of people to digest huge amount of information. It will definitely result in a decrease in virtual social capital, while activity levels remain high. Thus it is would be a probable that:

**H2: As number of postings increases, activity levels will no longer correlate with virtual social capital.**

We further claim that not only will virtual social capital will affect users' level of activity, but it will also stimulate passive participants to de-lurk, e.g. start active participation. Thus,

**H3: Community Virtual Social Capital will positively correlate with the levels of de-lurking in the community.**

## 3. Methodology

### 3.1. Social Communication Network Approach (SCNA)

Our definition of social capital is based on mapping social networks created by virtual community activities. We need to define a social network based structure that will capture those activities in a reliable manner. Just as cables connecting computers create a computer network, connections and relationships between people create a social network [49]. These connections and relationships can be based on online activity, thus allowing social network analysis to be applied to the study of online communities [11].

Wellman [59] proposes to map the virtual community activities onto social networks, taking into consideration among others such social network features as density (how people in the network are connected to each other), boundedness (how closed the community is), range (how wide is the range of relationships), or strength of ties (how wide and strong are connections between people). We agree with that notion and offer a slight extension of this model.

The usual notion of connection between people in the virtual community is related to direct social interaction [11, 59]. Examples could be a one-on-on chat or a newsgroups discussion. However, many limit their participation to reading content posted by others. These do not engage in direct communication, thus seemingly "fall off" the social network, and do not get counted in traditional measures.

Why not include lurkers in the picture? Such an accounting can be done providing lurkers' activities can be traced. Additional actors in the virtual social network can and should be introduced by building a slightly more complex network, the Social Communication Network. SCN is an adaptation of affiliation networks, as discussed by Wasserman and Faust [58]. We focus on the poster and the posting, following, among others, Schoberth, Preece and Heinzl [48] and Gordon et al. [12]. For the purposes of this new network we include the posting (an individual posting to the community), the topic (a collection of posting, such as newsgroups thread) and even the subject (a collection of topics under the same subject, like a subject-oriented forum). While active participants publish a posting and thus participate in topic and subject, lurkers read postings and participate with topics and subjects in their own way.

In the approach described here, links are not direct associations between human actors. Instead, people have connections to specific postings, topics or subjects. It is the overlapping of these connections that we wish to map as meaningful links. Different levels of participation are manifested through extent of reading, not just posting. Human actors can both READ and POST. This new definition for a network allows it to depict more fully the actual communication activity of people in the forum and not only direct connections between people. We term the result a Social Communication Network (SCN).

It is worth noting that several social network structure representations can be created from this new network mapping. The most trivial of these will create a link between two people if they posted to the same discussion. Other types of link could be READ-POSTED or READ-READ. A more sophisticated approach allows creating a special link if a message posted by one person was related directly to a message posted by another person (the reactive link, as in [45]). We argue though that the Social Communication Network approach can provide additional information and insight about the nature of CMC.

### 3.2. Measuring Social and Cultural Capital

Generally, social capital measures vary from study to study. Putnam et al. [40] used membership in formal organizations to measure social capital. Krishna [27] used many more variables to define social capital including measures of trust, solidarity and reciprocity, thus returning to a more exhaustive application of Putnam's definition [38]. Of course, social capital is of great interest in online contexts. Daniel and Zapata-Rivera, for example, propose a Bayesian model for measuring social capital in online communities [8].

Based on our definition we propose to measure virtual social capital at the community level of analysis by identifying the density of ties between users in the community. The SCN makes it possible to identify not only the links between users but also the volume of each link. The SCN records users overlapping in consumption (i.e. reading the same message). Even if two users only read the same posting (written by a third person) they acquire common information that contributes to the social capital of the community. Thus our measure for virtual social capital would be the density of the connected SCN.

We operationalize this measure as follows: user A has a link to user B if both A and B have a link to the same posting. Thus each pair of users may have up to P links, where P is the total number of postings in a given community. Density, or community (aggregate) level virtual social capital is calculated as follows:

Given N as number of users in the community, and L as actual number of dyadic links (two persons having read the same message), then

$$Density = \frac{2 * L}{N * (N - 1) * P}$$

Bourdieu states that Embodied Social Capital is directly incorporated within the individual and represents knowledge and ability [7]. Thus the measure of the personal virtual cultural capital, similarly to the above social capital definition, is the proportion of links the user has out of maximum (N-1)*P possible links to other users (LU is the number of actual user links):

$$Density\ (personal) = \frac{LU}{(N - 1) * P}$$

### 3.3. Procedure

We selected the 82 most active online forums from the population of forums that accompany asynchronous, e-learning undergraduate courses in a large university. These courses used printed texts that are distributed by mail, and some face to face meetings. Each course also has the option of using such an online forum to instantiate a learning community. Not all courses take advantage of this option. Students, too, may choose to participate or stay away.

We analyzed the logs of these communities for a period of 8 months (September 2002 to April 2003). Table 1 summarizes the distribution of users and postings for courses and forums. Course sizes varied from 15 to 3000 students. The average size of a course is 370 and standard deviation of 512. Participation and activity on the forums is optional and is not reflected in any way in calculation of final grades. Generally, the course lecturer participates and moderates the course forum.

| | Minimum | Maximum | Mean | Std. Dev. |
|---|---|---|---|---|
| Course participants | 15 | 3000 | 370 | 512 |
| Forums users | 7 | 2816 | 486 | 517 |
| **Messages posted to a course forum** | 82 | 9810 | 857 | 1271 |

**Table 1. Descriptive statistics for forums and courses**

On average, over 50% of the students in each course choose to enter the forum at least once. Forums studied here there varied in size from 7 to 2816 users. The mean number of visitors to a forum was 486 (SD = 517). Message activity per forum varied from 82 to more than 9000 postings.

While the forum interface allowed users to view individual postings very few users actually used this option. The major reading activity was performed by reading the contents of the forum, with batches of messages aggregated on the same page. Thus, visits allowed an opportunity to read every posting published on the forum page. This interface precludes exact information about which individual postings any user really read.

To overcome this problem we defined a model for measuring the actual reading activity. Any posting appended to the forum was recorded, starting from an initial, empty state. Each time a user visited the forum's page we calculated her probable reading activity using the following algorithm:

The postings were divided into 3 groups – old postings, regular postings and recent postings. Old postings contained the oldest 20% of messages, regular postings contained the next 50% of messages and finally recent postings contained the remaining 30%. We assigned a probability of 0.2 that a user, while visiting a forum, will read an old posting, 50% probability that she will read a regular posting and 80% probability that a recent posting will be read. For every visit we calculated the probability of reading all currently present postings, so the more often the user visited the forum page the more postings he was likely to read. We construct a Social Communication Network from these scores. A probabilistic model of the actual reading activity then feeds into a description of users who read messages. Using this network we then measured the following variables:

1. Network density – see the discussion above.

2. Activity – we measured the level of activity by identifying the percentage of posters among all participants.

3. Number of de-lurkers – we identified de-lurkers as users who posted for the first time after being inactive, but did persistently read for at least some period of time. We varied this minimal threshold period of time calculation across a range between 10% of users' actual visits to the community to 50%. The reason for this definition is as follows. The frequency of users' visits defines their communication behavior. Someone who tends to visit the community very often has different communication patterns than one who visits only a few times. For someone who visits frequently the amount of time that we consider sufficient to define him as a lurker before the first post is greater than for someone who pays only occasional visits.

4. Level of De-lurking – we measured the level of de-lurking in a forum by identifying the percentage of de-lurkers among all participants.

In addition, we measured the demographic features of each forum – number of links, number of users and number of postings.

## 4. Results

Figure 1 graphs the relation between the social capital measure and activity levels in the community. There is no overall correlation between the two variables. However, it is clear that the number of postings should be introduced to the calculation.

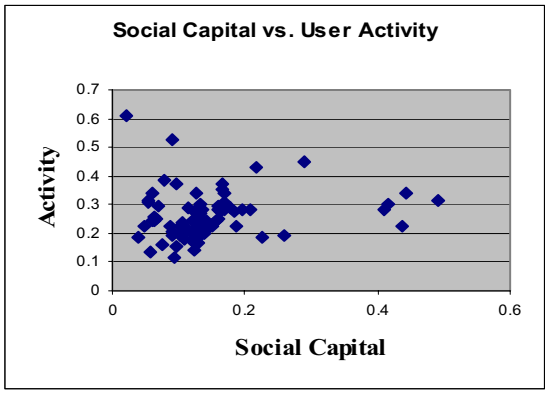


**Figure 1. Social Capital and Activity Relation.**

Tables 2, 3 and 4 show the results of a two-variable multiple regression, taking the Activity variable as a dependent variable and Number of Postings and Social Capital as independent variables, while also counting for interaction between Number of Postings and Social Capital. The model suggests that there is a correlation between social capital and active participation when controlling the Number of Postings variable.

| R | R square | Adjusted R square |
|---|---|---|
| .553 | .306 | .279 |

**Table 2. Regression Model Summary**

| | Sum of Squares | df | Mean Sq. | F | p |
|---|---|---|---|---|---|
| **Regression** | .162 | 3 | .054 | 11.457 | .000 |
| **Residual** | .367 | 78 | .005 | | |
| **Total** | .529 | 81 | | | |

**Table 3. Anova summary for the regression model**

| | Unstand. Coeffs. | | Stand. Coeffs. | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| **Const.** | .198 | .017 | | 11.863 | .000 |
| **Social Capit.** | .297 | .095 | .328 | 3.144 | .002 |
| **N. Postgs.** | .000 | .000 | .711 | 5.372 | .000 |
| **Inter action** | .000 | .000 | -.295 | -2.260 | .027 |

**Table 4. Regression Coefficients**

Excluding communities with exceptionally large message volumes allows new light to be shed on the investigated relation. Table 5 shows the Pearson correlation test for the resulting sample. The correlation between social capital and activity for the truncated sample where the largest forums are removed is significantly positive. This provides support for hypotheses H1 and H2.

| | Activity | Number |
|---|---|---|
| **Social Capital** | 0.228(*) | 76 |

(* = p<0.05)

**Table 5. Bivariate correlation between social capital and activity after excluding the six most active communities.**

Table 6 shows the Pearson correlation between Social Capital and the Level of De-lurking in the community. The table provides different analyses for varying de-lurking thresholds.

| | De-lurking (10%) | De-lurking (30%) | De-lurking (50%) |
|---|---|---|---|
| **Social Capital** | **0.502**** | **0.502**** | **0.389**** |

(** = p<0.001)

**Table 6. Correlation between social capital index and de-lurking**

Table 6 shows a stable and significant correlation between the two variables, almost regardless of the arbitrarily chosen de-lurking threshold. In other words, whether we chose 10%, 30% or 50% as the threshold of total time spent reading others' messages before the user chooses to "jump in", the relation between social capital and the de-lurking level within forums remains fairly strong and significant. These correlations provide evidence in support of the last hypothesis.

## 5. Conclusion and Future Work

The current study launches a new research trajectory into lurking, de-lurking and their relation to social capital. In the study of online communities, we try to understand the social dynamics involving not only active and visible participants, but also persistent but invisible participants. The findings presented in this paper suggest that familiarity with the community and persistent involvement, which is often stated as a reason for lurking [33], contributes to eventual active participation in the virtual community life.

Additionally, information overload [20] that impacts active participation, definitely affects passive participation as well. The effects of group information overload cause users to read less and thus acquire less social capital, through having less in common with other users. The reduction in social capital, in turn, leads to erosion in the community involvement.

All three hypotheses received empirical support, based on quantitative analysis of the Social Communication Network measures in the sample of forums studied here. The Community Virtual Social Capital, measured as the density of the affiliation network of reading acts positively correlated with the levels of users' activity in the community, for all but the most highly loaded communities. Of course, these most highly loaded outliers do not have the expected social capital. And this provides indirect evidence for the information overload hypothesis [18, 19]. Our second hypothesis, that as the number of postings increases, activity levels will no longer correlate with virtual social capital also received support in the data. We claimed that virtual social capital as measured here, in other words the overlap in reading among participants, will affect both activity and de-lurking. As expected, Community Virtual Social Capital positively correlated with the levels of de-lurking in the community.

But isn't it a tautology? Doesn't our definition of social capital resemble too closely our definition of activity in the virtual community? Is it trivial that if the community has a high percentage of posters, it will automatically have high social capital? Close examination proves that this is not the case. Our definition takes into consideration not only active posting, but also reading. It is clear though that it is possible that community will have a very high social capital but relatively low number of posters and vice versa – there might be a community with very high percentage of posters who do not really read contributions by others. Thus our model appears to be correct.

The contribution here is twofold, both in measurement and in lessons for forum construction. On the measurement front, we propose several network based techniques to operationalize and instantiate social and cultural capital through density, lurking and de-lurking through measuring emergent participation. The findings reported in Table 6 indicate a promising robustness for the de-lurking measure. From a system design perspective we received further support for an understanding of the ceiling for productive use of online forums. Most importantly, these findings provide reinforcement for the payoff in de-lurking. System designers and forum implementers can conclude that fostering receptive participation may be as important and constructive as encouraging active contributions in online communities.

There are many directions for future work. One of them is continuing the study of effects of virtual social capital on communities. As Krishna [27] points out there is also a role of agency in active political participation. In our case various agents can affect user's decision to participate, including the actual content of postings. James and Rykert [16] indicate the role of facilitators in the discussion. Some of the roles of the online facilitator are maintaining social dynamics of the discussion and moderating the context of the discussion. So it can be assumed that social events during a discussion or controversial content can be a real catalyst for de-lurking. The role of different forms of capital in these dynamics is interesting and worth studying. Another direction would be concentrating on individual members of the community and measuring their virtual cultural capital. In this work we operationalized and measured community level social capital. It is possible and intriguing to calculate personal cultural capital as well. What is its influence on users' behavior?

Finally, the Social Communication Network approach (SCN) proposed here opens an opportunity to study the various aspects of networked structure of virtual community participation activities. Using the techniques of the new science of networks, well described by Barabasi [5], we hope that SCN will help understanding the patterns of users' behavior in virtual communities better.

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