David against Goliath? Group size and bystander effects in virtual knowledge sharing

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ABSTRACT   Knowledge management has been identified as a key factor for sustaining a competitive advantage in today's corporate world. A fundamental aspect of knowledge management in a global economy is the sharing of information in online groups. Most researchers and practitioners have so far assumed that a large knowledge sharing group increases response rates, velocity of receiving a response and quality. However, psychological research under the umbrella of the so-called bystander effect suggests counter-intuitively that, with an increase in group size, the likelihood of helping decreases. This study provides empirical support for the fact that a) the bystander effect is also present in virtual (knowledge sharing) environments, b) that group size influences response quality and c) that the negative impact of social inhibition might decrease again in very large groups. The practical trade-offs that managers have to take into account when designing knowledge sharing forums are discussed.

KEYWORDS   bystander effect ▪ group size ▪ knowledge management ▪ knowledge sharing ▪ online communities ▪ quality

Introduction

As business has been moving into the knowledge economy, the cultivation, management, and the internal sharing of a firm's knowledge have been

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widely identified as key success factors in creating value and sustaining competitive advantage (McEvily et al., 2000; Miller & Shamsie, 1996; Nonaka, 1991, 1994; Nonaka & Takeuchi, 1995; Nonaka et al., 2006; Ofek & Sarvary, 2001; Von Krogh et al., 2000). Knowledge sharing has therefore been implemented in companies such as Chevron, Ford, Xerox, Raytheon, IBM, DaimlerChrysler, Hewlett Packard, Shell, and Siemens (Davenport & Prusak, 1998; Voelpel, 2003). Parallel to the augmentation within the business community, academic interest in knowledge management has produced a considerable scientific output including various special issues in leading academic journals (Argote et al., 2003; Grandori & Kogut, 2002; Helfat, 2000; Spender & Grant, 1996).

Knowledge sharing can refer to various practices that include relatively trivial issues, such as for instance sharing corporate procedures, or branching out to include more value-adding contents such as the sharing of best practices (Szulanski, 1996) or forums that allow interaction among a firm's employees. Siemens for instance established an 'urgent request' forum, in which members were able to enter urgent questions to be answered by other users. Such questions as, for instance, 'My customer needs a business case to implement this new router technology by next Thursday. Can anyone help?' (Voelpel et al., 2005: 4) were posted online, addressing the group in search of advice. In practice, the efficiency and effectiveness of such knowledge sharing forums may yield a considerable advantage for the organization. At Siemens for instance, a question posted by a South American manager about insurance matters in the Amazon rainforest was answered within a matter of hours by his Senegalese colleague, whose information helped save the company approximately US$1 million. Thus, helping behaviour is of major importance to the practice of knowledge sharing.

However, knowledge sharing initiatives often do not prove to be as beneficial as they promise to be (Ciborra & Patriota, 1998; Davenport et al., 2003; Swan & Scarbrough, 1999; Voelpel & Han, 2005). One question following from such problems with knowledge sharing systems is whether some of the observed decreases in contributions might be related to the size of the knowledge forum.

This exploratory study investigates the question of optimal group size for virtual knowledge sharing forums. As we will show, the literature on knowledge sharing assumes various advantages of larger versus smaller groups. However, the knowledge sharing literature does not seem to explicitly address the question of variations of group size as a determinant of helping behaviour. Would very large groups for instance follow the same pattern?

In this respect, we focus on two aspects of helping. First, we investigate the relationship of group size and helping behaviour, in particular

whether or not users respond to a request and how quickly they do so, and second, we are interested in the influence of group size on the quality of the responses that are a vital element from a knowledge sharing perspective. Thus, it is not only important how group size may affect whether members do help or not and how quickly, but it also plays an important role in how much effort the respondents make in order to deliver quality help or quality knowledge. We aim at adding an important insight of the influence of group size to the knowledge management literature, trying to sketch the boundaries of an appropriate group size for knowledge sharing forums and thus provide managers with hints in how to design knowledge sharing forums that deliver more, faster and better responses to their users. Finally, as a consequence of this study, new questions and further research opportunities regarding the relationship between group size and helping behaviour are indicated.

Growing knowledge sharing effectiveness with increasing group size

Most literature on knowledge management implicitly approves the assumption that large knowledge sharing groups are advantageous in their effectiveness and efficiency as compared to small groups, by either pointing towards possible economies of scale and scope (Besanko et al., 1996; Hansen et al., 1999; Mahnke, 1998) or by assuming that a critical mass is necessary for successful implementation of knowledge sharing tools (Von Krogh, 2002). Economies of scale and scope suggest that the efficiency of a knowledge forum grows with each user, who re-uses the knowledge available. Accordingly, knowledge is considered to be a unique organizational resource that gains in value through use (Davenport & Prusak, 1998; Probst et al., 2000). Thus, in order to reap the benefits of the initial investment in knowledge sharing forums, organizations aim at involving a large number of employees in such a forum, thereby reducing average cost per use (Mahnke, 1998).

From an input perspective, the critical mass argument proposes that employees contribute if they perceive that a minimum level or a critical mass of contributions within the knowledge sharing system will be reached (Markus, 1990; Marwell & Oliver, 1993; Oliver et al., 1985; Preece, 2000; Sharratt & Usoro, 2003). Accordingly, Cabrera and Cabrera state that 'an employee [. . .] will choose not to participate in knowledge-sharing because he or she does not feel there is a big enough group to create a useful database of information' (Cabrera & Cabrera, 2002: 699). Therefore, users expect small knowledge sharing forums to be less useful when seeking information. In addition, Kulkarni et al. (2007) present a comprehensive model in which the perceived usefulness of a knowledge sharing system is of high importance.

Among other factors, the amount of members in such a knowledge group is crucial for reaching a certain base level and thus convey the usefulness of the knowledge sharing system to its users. The possible disadvantages of large groups are thought to be relevant because they might lead to information redundancies or because they might make it more difficult to find the sought-after information (Cabrera & Cabrera, 2002; Von Krogh, 2002). However, the authors stay with the assumption that in general, large knowledge-repositories have higher potential for attracting users or reaching the critical mass and thus are more successful. The economies of scale argument therefore aims at the positive effect of large size on the usage, and the critical mass argument tries to explain how users will participate.

Furthermore, Metcalfe's Law states that 'the usefulness, or utility, of a network equals the square of the number of users' (see, for instance, Buckman, 2004: 99). From a knowledge perspective this appears to be a reasonable assumption. With growing size of a particular knowledge sharing community, the likelihood of finding someone who has and is willing to share the information needed should rise as well. Thus, the more users participate in the sharing of knowledge, the higher the returns on knowledge and the higher the perceived probability for participants to answer a given request.

In other words, large membership figures are assumed to be positive for the organization that maintains a knowledge sharing forum, because together with the amount of individuals, the amount of knowledge available grows as well, leading to a larger pool of knowledge accessible to the group, sustaining the competitive advantage of the organization that is therefore interested in tapping the knowledge resources of many rather than few. As in the case of Siemens (Voelpel et al., 2005: 12), a larger knowledge pool is also assumed to lead to better quality responses. Moreover, a critical mass is needed to keep the forum alive and motivate employees to contribute to and check the content of it.

Even though large group size seems to have important advantages, in order to harvest this increasing utility, existing obstacles to sharing knowledge via a virtual group must be understood and possibly removed (see, for instance, Ardichvili et al., 2003; Huysman & De Wit, 2002; Tiwana, 2002). To achieve this is one of the major challenges of knowledge sharing.

Despite these findings indicating that larger groups might be beneficial, none of the knowledge sharing literature known to the authors so far includes group size as a major determinant of helping behaviour. Notably, sharing knowledge is an investment that can be understood as a pro-social behaviour in the sense that the immediate personal gain for the person providing information is not always clear. Social psychological research with its decades' long interest in determining the factors that facilitate or impede

helping behaviour can help to understand the underlying motivations and barriers to sharing knowledge in virtual groups. Laboratory and field experiments for instance found that 'the presence of other people serves to inhibit the impulse to help' (Latané & Darley, 1970: 38). In other words, the probability of a person helping *declines with an increasing group size*. This propensity to passivity in the presence of others is called the *bystander effect* or *social inhibition*. With the consequences of the bystander effect in mind, this article aims to shed a new light on the role of group size in knowledge sharing groups and explore whether similar effects that have been observed in physical groups are also true for virtual ones.

The bystander effect

General theory of social inhibition

In 1968, Darley and Latané first investigated the bystander effect or social inhibition. While previous accounts of group helping behaviour were centred on the question of why nobody intervened *even though* there were so many others present (Rosenthal, [1964] 1999), Darley and Latané were the first to base their research on the counter-intuitive assumption that no action was taken, simply *because* of the high number of bystanders. For example, if two people felt they were the only ones able to help when witnessing an attack on the street, they would be – according to social inhibition theory – much more likely to intervene or at least call the police as compared to a group of six. Thus, the likelihood of helping and its promptness decreases with increasing group size.

The effect of group size in Latané' and Darley's (1976) experiments was undoubtedly clear; when the subjects witnessed an epileptic seizure they responded less the larger the number of bystanders. With a group size of two, the probability of helping in an emergency was 85 per cent in an average time of 52 seconds. Increasing the number of bystanders to three and six resulted in these figures dropping to 62 per cent in an average response time of 93 seconds and 31 per cent after an average of 166 seconds respectively. A larger group size therefore decreases the probability and the speed of someone helping, both significant factors in knowledge sharing as well.

A number of additional studies have dealt with, and provided, reliable data on non-emergency settings, in which social inhibition effects proved to be highly influential. Accordingly, subjects were less likely to answer the door (Levy et al., 1972), help with a flat tyre (Hurley & Allen, 1974) or report a broken tape recording (Misavage & Richardson, 1974) when others were or were believed to be present.

In order to explain the underlying processes of helping, two cognitive decision models have been proposed by Latané and Darley (1970) as well as Piliavin et al. (1981). While the earlier identified a five-stage model to helping (noticing the situation, labelling the situation as an emergency, assuming responsibility to help, deciding how to help, implementing the decision to help), the latter introduces an 'arousal: cost–reward model'. In this view, the observation of an emergency situation creates an emotional arousal in bystanders. This arousal may be perceived as fear, disgust or sympathy, depending on different aspects of the situation. Consequently, individuals are thought to weigh the costs and rewards of helping when deciding whether to act or remain inactive. Thus, help is motivated as a way of reducing unpleasant feelings of arousal (see Dovidio et al., 1991; Fritzsche et al., 2000; Piliavin et al., 1981).

More recently, research has shown that even without physically being part of a group, the bystander effect exerts an implicit influence, for instance, through semantic priming, simply activating notions of lacking responsibility and accountability in memory (Garcia et al., 2002).

Three processes of social inhibition

In the context of the bystander effect, three processes are at work. The first process Darley and Latané identified is a *diffusion of responsibility*. Through the presence of others, the psychological costs associated with non-intervention are shared within the group. The knowledge that others could possibly respond as well inhibits helping. This effect is closely associated with social loafing, 'the tendency for people to expend less effort on a given task when working in groups than when working alone' (Latané et al., 1979). The cognitive representation of diffusion of responsibility most people are familiar with in one or the other situation is: 'why do I have to help? There are others who could help, too'.

Social influence or pluralistic ignorance is a second factor that contributes to the bystander effect or social inhibition of helping. Most emergencies are, or at least begin as, ambiguous situations. For instance, seeing a couple having an argument on the street may be interpreted as the beginning of a violent fight, but it may also be seen as just a simple family quarrel. In these situations, individuals tend to look for cues in their environment that may help them to disambiguate what is going on. In other words, each member of a group of naïve bystanders is misled by the apparent inaction of the others into adopting a non-emergency interpretation of the observed scene and ultimately to stay passive. Once all bystanders look to

their peers for cues, resulting in non-action, the group runs into the danger of unwillingly defining non-acting as a social norm. Cialdini (2001) calls the kind of social cues that are used to examine whether or not there is need for action 'social proof'. Accordingly, we 'view other behaviour as correct in a given situation to the degree that we see others performing it' (Cialdini, 2001: 100).

Thirdly, the process of *audience inhibition* can reduce the likelihood of helping. One might run the risk of embarrassment if the situation is misinterpreted, and thus not call for help. More importantly for knowledge sharing, and with regard to trust, is the fact that the presence of others might inhibit helping, because individuals are afraid to make mistakes or give help that is negatively evaluated by onlookers. For example, if one posts an answer with grammatical mistakes in the online helping forum discussed earlier, one runs the danger of publicly ridiculing oneself.

Thus, sharing knowledge and helping share some important characteristics with respect to risks (embarrassment), costs (losing time and reputation) and gains (helping behaviour will be rewarded). While the bystander theory would predict a decrease of helping in terms of speed and quantity (i.e. the probability of receiving an answer), knowledge sharing literature adds a third dimension to this research, namely the quality of the response.

Forms of interaction

In the context of the bystander effect, the form and availability of communication channels have been shown to exert influence on the probability of receiving help as well. Accordingly, a higher degree of communication seems to lead to a greater impact of social inhibition, since the individual receives more cues about the non-helping of others. In a situation in which subjects can see other onlookers and can be seen by them as well, helping was less likely (50%) than in conditions in which they could see and were not being seen by other bystanders or could not see others and be seen themselves by other bystanders (72%). The highest frequency (83%) of helping was observed when subjects could not see the others and could not be seen by other bystanders (Latané & Darley, 1976).

In knowledge sharing forums, members normally can see the responses of others once these are posted and their own response can be equally seen by the other members of the knowledge sharing forum, a condition similar to that with the least likelihood of helping in the above mentioned study. However, it cannot readily be assumed that online interaction is a twin image or direct equivalent to the physical world. Indeed, previous studies have

revealed a number of differences between interaction within the physical and the virtual world (Adrianson & Hjelmquist, 1991; Dubrovsky et al., 1991; Kiesler et al., 1984; Straus & McGrath, 1994).

Since a forum is no real-time environment, the non-acting of others might have different effects than in for instance a chat group, where answers are given instantly and are normally not available any time after the online chat has finished. In this sense, online chat groups are more similar to verbal conversations, while forums are more similar to a bulletin board, which is why they are at times also referred to as electronic bulletin boards. Even if this analogy is far from perfect, it hints at another feature, namely that forums store the postings of their members while these normally disappear after a short time in the case of chat groups. For chat groups with a group size between two and 19 members, Markey (2000) has shown that the time it takes to receive help in online chat groups decreases with group size. The bystander effect in online environments that Markey found has been shown to defuse when directly addressing a person present in the chat room with his or her name.

However, knowledge forums reach out to a much larger membership that far exceeds 19 members. Moreover, the value of knowledge sharing forums lies specifically in the fact that one is able to address all members at once, not singling out a specific member to ask for help. In other words, knowledge forums are partly designed to find the person who is able to help.

Various different areas of research have investigated virtual helping (e.g. psychology, sociology, economics, computer science, management information systems, etc.). Topics of research include but are not limited to social loafing (Williams et al., 1981), cooperation and exchange (Orbell et al., 1988), social identity (Prentice et al., 1994), online communities (Preece, 1999), public goods work (Marwell & Ames, 1979; Marwell & Oliver, 1993) and others. Other authors have also used the bystander effect to help understand virtual non-responses (Barron & Yechiam, 2002; Lewis et al., 2004; Markey, 2000).

In a further study, Yechiam and Barron (2003) investigated virtual diffusion of responsibility by sending an email request to complete an online survey to participants, who were either part of a larger (Listserv) group or addressed individually. Their sample included 20 discussion groups with relatively large sizes of up to a maximum of 800 subscribers. Yechiam and Barron found that those addressed individually accessed the survey more often (16.6%), but afterwards completed it less often (36% of those who accessed the survey) than those in the larger Listserv or group condition (6.4% accessed the survey and 50% of those completed it).

The study found a negative correlation between the group size and the response to the help request, indicating that larger virtual groups respond

less frequently. However, while the comparison between the individual and the group condition was tested with only 20 discussion groups, it is one of the few studies known to the authors that investigate social inhibition for relatively large groups. In addition, another difference to knowledge sharing forums can be found in the fact that responses could not be seen by other bystanders, which is a common condition in knowledge sharing forums.

Therefore, in this study, we seek to investigate the bystander effect in a condition that – with regard to the abovementioned aspects – is somewhat more similar to knowledge sharing forums and studies knowledge sharing. We look to do this in groups that are larger than those found in most present studies, while additionally including a quality measure, which is an important aspect for the practice of knowledge sharing.

Research methodology

The purpose of the present study is to verify the hypothesis that the bystander effect inhibits helping in terms of speed, quantity and quality in knowledge sharing groups. Following social inhibition theory, we hypothesized that larger groups would respond after more time, were less likely to respond overall and with lower quality.

In order to also be able to investigate the virtual bystander effect for very large groups, we chose Yahoo!Groups as our research environment. Yahoo!Groups are online forums that are dedicated to a specific topic. In these forums, members regularly post questions or comments to which other members of that group post an answer, which is then visible for all members of that particular group. Therefore, when help is given, the answer and the virtual identity of the helper can be seen by all group members. Yahoo!Groups are online communities of interest which cover a wide range of topics, such as business, finance, entertainment, politics, hobbies, music, religion, and science, to select just a few. Examples include groups that are politically oriented grassroots organizations, groups helping to find 'pet-sitters' in a certain area, fan groups of celebrities, as well as groups who are interested in sharing their knowledge about collector's items.

Procedure

Subjects were members of 333 different Yahoo!Groups or online communities. The cumulative membership of the groups included in this study amounted to 197,419 people. The groups were randomly chosen from the large variety of groups available at Yahoo!, ranging in size from seven to

10,532 members. Groups with fewer than three new postings within the last seven days were not included in the study, since these groups were thought to currently not be active or at least not frequently used.

Over a 34-day period, a question was posted in all 333 forums or groups, asking the following question: 'I'm so happy that I found this group. However, I have one question: Does anyone know how I can upload more than one picture at once. Thanks, Sam'. Group members were therefore asked how to upload more than one picture at once within Yahoo!Groups. This question was chosen, since there are not only a couple of different ways to actually upload pictures depending on the knowledge of the respondent, but it was also a question that was not too hard to answer while being equally applicable for the broad range of group topics that were included in the study.

While the question was formulated in a way that would possibly trigger an equal response rate across the many topic areas that are included in Yahoo!Groups and this study, the researchers took care to select different group sizes in each topic area. In this way – by having a neutral request and the variation of group size within each topic area – the influence of a group's topic of interest on the response rate was minimized and differences could be mainly attributed to the variations in other variables, such as for instance group size.

Moreover, the person asking for help additionally wrote 'I am so happy I found this group' in order to further raise response rates. Following previous research (see, for example, Levin & Isen, 1975), this strategy proved to be successful, raising positive affect and thus the response rate from only 13 per cent in a pre-study, in which the help seeker did not express this kind of positive emotion, to 24 per cent. Finally, even though gender effects were shown to have no major influence on the bystander effect (Latané & Nida, 1981; Markey, 2000), the name chosen for the postings (Sam) could be both interpreted as male (for Samuel) or female (Samantha) in order to further reduce possible gender effects. Accordingly, no difference in the responsiveness of male and female respondents could be observed ($r(333) = -.008$, $p < .944$).

After having posted the question in all 333 forums, the researchers recorded group size, response number per group,[1] the number of new messages within the last seven days, and the number of new members within the last seven days.

Finally, the exact time of the posting and the exact time of the answer were documented, in order to arrive at a response time for each posting. If no response was given within 21 days, no response was recorded for that group, while a response was defined as any acknowledgement of the question asked by any group member.

In order to *assess the quality* of responses, the answers were rated on a five-point Likert scale (not helpful, slightly helpful, somewhat helpful, helpful and very helpful). Without prior awareness of any other data concerning the origin of the message, such as group and group size, two experts achieved an intercoder reliability of 87 per cent. The differences in the remaining 13 per cent were in no case bigger than one rating point apart and were resolved by a discussion in which both experts agreed upon the same rating.

Results

In order to rule out that the predicted effects would be caused by lower activity in larger groups, a correlation between group size and activity level was conducted. To have a proxy for group activity, we assessed the number of postings during the last seven days. As expected, a group's activity was higher the larger it was. Accordingly, there was a highly significant positive correlation of group size and new postings made during the last seven days ($r(333) = .586$, $p < .000$), as well as between group size and the number of new members who joined the group during the previous week ($r(333) = .377$, $p < .000$). Consequently, if the predicted negative correlation of group size and likelihood of response were to be found (i.e. the bystander effect was present), the cause would not be explained by a lower activity of larger groups.

Likelihood of responding – group size and helping in online groups

According to social inhibition theory, the likelihood of helping declines with group size. However, the analysis of all responses does not confirm this relationship. In contrast to previous studies on social inhibition and helping (Darley & Latané, 1968; Markey, 2000; Yechiam & Barron, 2003) we found no significant linear relationship between group size and response rate ($r(333) = -.050$, $p < .363$) or group size and the time needed for responding ($r(81) = -.097$, $p < .388$). Similarly, quality and group size did not show a significant correlation ($r(84) = -.066$, $p < .550$). Since these results stand in vast contrast to the literature, we examined possible reasons for this non-linearity.

One important difference to most previous studies was among others the wider range of group sizes, including 101 groups with more than 500 members. Regarding this difference, it seemed unlikely that the bystander effect would also be similarly strong in very large groups, since here

anonymity might reduce the risks associated with posting and the negative effects of social influence within the group: once a certain group size is reached, the bystander effect might halt with growing group size. Moreover, we theorized that the probability of at least finding one person willing to help might rise if the groups were just big enough. However, according to the literature review conducted for this study, in the physical world, the bystander effect has only been shown for a group of up to 20 people (Latané & Nida, 1981), and in online environments up to a group size of 76 (see Hudson & Bruckman, 2004). Another study (Yechiam & Barron, 2003) found diffusion of responsibility to negatively influence the propensity to comply with an email request sent to groups with a maximum size of 800 as compared to emails sent to individuals.

Following the above thoughts, we examined the data in more detail. Due to the high number of non-responses, no insightful regression model could be attained. Therefore we divided the sample into four groups or categories[2] that would allow us to investigate possible non-linear changes in social inhibition between different group sizes. Thus, we could compare the response rates of groups of different size. In order to trace a possible increase in response rate within the larger group sizes, we divided the sample into the following size categories: small (0–99), medium (100–250), large (251–500) and very large (500–10,523). This categorization coincides with our intuitive observations in Yahoo!Groups as to what qualifies as a small, medium, large or very large group and in addition, results in four categories with approximately a similar number of cases ($N = 87$, $N = 77$, $N = 68$ and $N = 101$, respectively).

We conducted a chi-square test to determine whether or not the probability of receiving a response was randomly distributed among the four categories of group sizes. They were not ($\chi^2(3, N = 333) = 12.62$, $p < .001$). When comparing the frequency with which the medium-sized groups were responding with the three other groups (combined), we found that medium-sized groups respond significantly less often ($\chi^2(1, N = 333) = 10.57$, $p < .001$).

Accordingly, in the medium-sized groups, the likelihood of receiving help was smaller (with a response rate of 11%) than in the small group category (34%) and in the large (24%) and very large groups (28%). Thus, the probability of receiving a response was highest in the small groups (35%), while lowest in the medium-sized groups (11%).

The finding that helping declines with increasing group size, as is the case for the response rate from small to medium-sized groups, would support previous research on the bystander effect (e.g. Latané & Nida, 1981; Markey, 2000). However, this trend did not continue and response rate increased
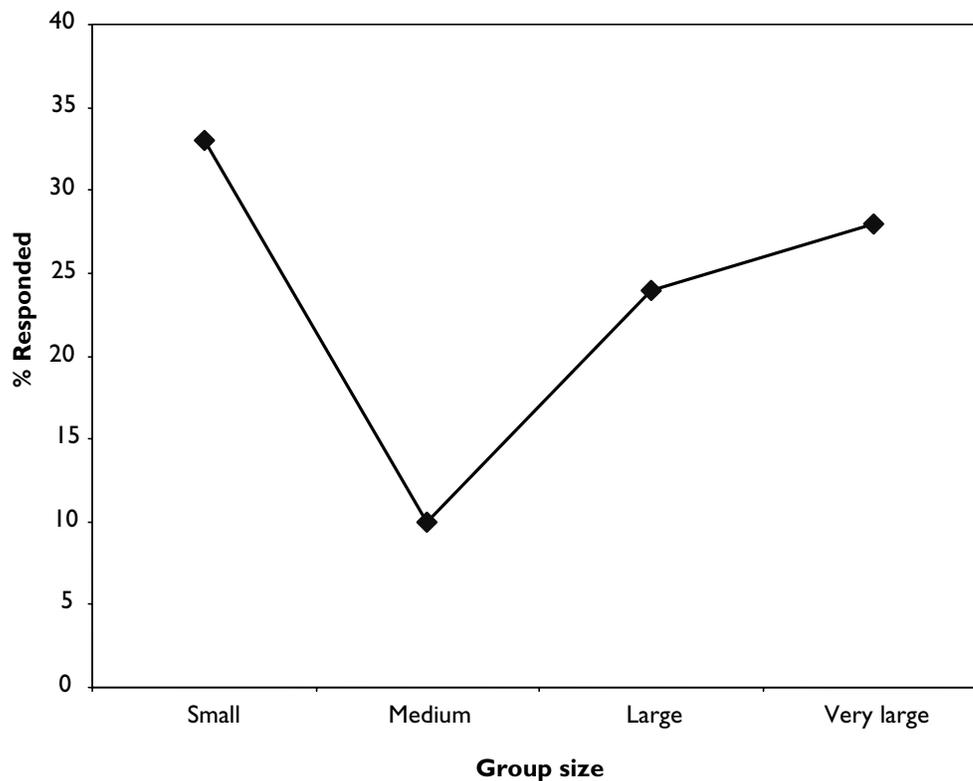
Figure 1 Response likelihood in terms of group size categories

again once groups became bigger. Thus, in large and very large groups, the likelihood of receiving help was considerably higher (24% and 28%, respectively) than in the medium-sized groups, while not yet reaching the high levels of the smallest groups. The insignificant results for the overall linearity of the sample can be explained by this rise in response rate that has been observed within the large and the very large category (see figure 1). Accordingly, a simple correlation of group size – only for groups within the small and medium range (i.e. groups smaller than 250) – with response rate confirmed the negative effect of increasing group size on the likelihood of receiving a response ($r(162) = -.236$, $p < .002$).

Variance in response time

Utilizing the four above group size categories, we analysed the relationship between group size and time needed to respond. As indicated above, no linear correlation was found between group size and response time ($r(81) = -.097$, $p < .388$). While just marginally significant ($F(3, 77) = 2.024$, $p < .118$), the results of an analysis of variance may imply a slight tendency, indicating that

small (M_s = 12.9h) and large (M_l = 41.0h) groups may need more time to reply than medium (M_m = 8.6h) and very large groups (M_{vl} = 6.1). However, once outliers (four cases in total that took longer than 72h to respond) are excluded, no significance can be found any more ($F(3, 73)$ = .583, $p < .628$) and the mean response time is fairly similar across all four group size categories (M_s = 10.2h; M_m = 8.6h; M_l = 7.5h and M_{vl} = 6.1h). In addition, post-hoc comparisons using the Fisher LSD test revealed no further significant differences between group size categories.

Group size and quality

Since high quality help is of vital importance for knowledge forums, we analysed the influence of group size on the likelihood of receiving a high quality response (helpful and very helpful) versus the probability of receiving a low quality response (not helpful at all and not helpful). Again, no correlation could confirm a linear relationship ($r(84)$ = −.066, $p < .550$). Accordingly, in a chi-square analysis, we found a significant difference ($p < .004$) in the likelihood of providing a high or low quality response among the four categories. The probability to receive a high quality answer exceeded that of receiving a low quality answer in the small (38% versus 28%) and the medium-sized group (50% versus 13%), whereas in the two large groups high quality help was observed to be much less likely (18% versus 59% and 10% versus 52% respectively). Thus, the small and medium-sized groups provided higher quality responses than the large and very large groups (see figure 2).
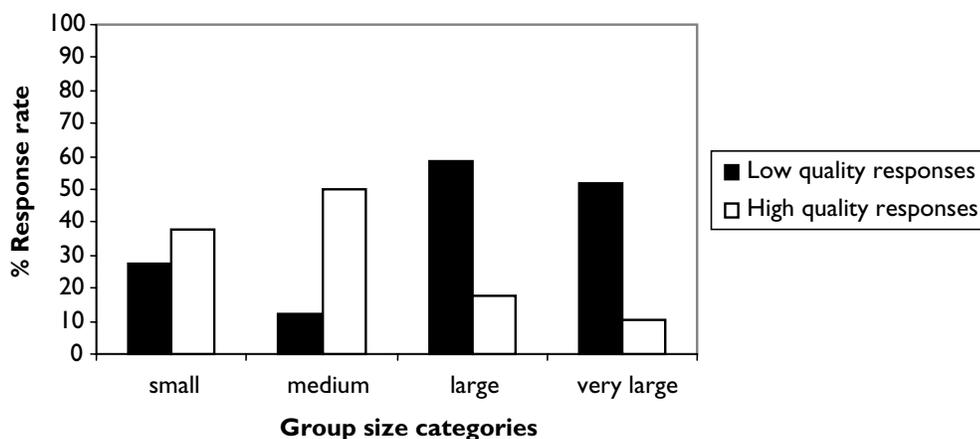

Figure 2   High and low quality responses per group size category

Discussion

Previous accounts of the bystander effect seem to exclusively find a negative linear trend in which bigger groups generally perform worse than small groups with regard to compliance (e.g. Darley & Latané, 1968; Markey, 2000; Yechiam & Barron, 2003). This study, additionally taking into account very large group sizes, indicates that this tendency does not continue in the realm of groups that have more than 250 members. While we found this kind of relationship for the lower end of our data, that is, the small and medium-sized groups displayed the effects of social inhibition that coincide with earlier bystander literature, we found a relative decline of the strength of the bystander effect reflected in a higher response rate in groups with more than 250 members. Therefore, the likelihood of receiving a response from large and very large groups did not continue to decline, but increased again.

One cause of this finding might be that growing anonymity in large and very large groups serves as a protection against the process of audience inhibition, for example, the risk of embarrassment (Ardichvili et al., 2003). While in small and medium-sized groups it might still be possible to know or recognize the majority of the group members, it becomes increasingly unlikely within larger groups. In groups with memberships greater than, for instance, 500, members are relatively anonymous and even if they make a contribution which is perceived by others to be inappropriate, the costs or risk associated with it are still relatively low. In addition, since future contact with the person in need is less likely, so are the associated potential costs for not helping (Toi & Batson, 1982). For respondents in small groups, the costs for non-helping might be higher, because of a heightened sense of we-ness, which has been shown to increase helping behaviour (Dovidio et al., 1991).

This way of explanation appears to correspond with the arousal cost–reward model (Piliavin et al., 1981). According to this framework, members of large and very large groups might perceive a lower possible cost associated with responding to all members (i.e. critique from others and resulting decrease of status), while the reward – the admiration and recognition that comes with being the one who helps – might be greater in large and very large groups. This speculation might be supported by the fact that medium-sized groups were most likely to provide a high quality response, but least likely to respond overall. Following this line of thought, in medium-sized groups members might experience the highest pressures to contribute high quality, which in turn might raise the costs of helping.

However, one has to keep in mind that the arousal as well as the costs and rewards connected with online helping are minimal in comparison to studies conducted in real-life environments. Still, there seems to be a response

pattern that favours small and very large group sizes in terms of response likelihood and possibly small and medium-sized groups in terms of quality.

While audience inhibition might be neutralized by the growing anonymity of large and very large groups, the process of diffusion of responsibility might also be counterbalanced by the mere statistical probability that the group contains more members who are generally willing to help. In other words, large and very large groups have a higher probability of hosting individual members that are generally willing to help. These 'perpetual helpers' might belong to a group of individuals for whom help is something they do irrespective of the circumstances, in small and large groups alike, because of their increased acceptance of responsibility (Briggs et al., 1986) and because they might perceive themselves as helpers (Piliavin & Callero, 1991; Smith & Shaffer, 1986).

However, despite the increases in response rate in the larger groups, groups with a group size below 100 still have the highest response rates within our sample. With 35 per cent, small groups are still 1.4 times more likely to respond than groups with more than 250 members (26%) and about three times more likely than groups that have between 100 and 250 members (11%). However, from a knowledge perspective, small groups might not provide a sufficiently large knowledge basis (i.e. individuals that possess this knowledge) in order to answer questions for which the knowledge required is much less common than that of uploading a number of pictures in an online forum. For knowledge of high scarcity, therefore, the larger forum sizes might be a solution, while medium-sized groups seem to be disadvantageous in any respect, because they appear to help less often than both small and large groups, while the quality they provide seems to still be insufficient for most applications to balance out the low likelihood of receiving a response.

A second factor is the time it takes to receive a response to a question posed in the online forum. The differences in response rate, however, are not equalled by the time these groups need to respond. Accordingly, our findings do not show a significant difference in response time across the four group size categories and thus do not coincide with previous accounts of social inhibition (e.g. Darley & Latané, 1968; Markey, 2000). The absence of this effect might be due to the greater size of the group size categories that were compared as well as the longer overall response times, in which small differences of, for example, 30 minutes do have a comparably small impact on the results.

The literature on social inhibition focuses on the response rate and the response time. However, for knowledge sharing, the quality is of vital importance as well. In this context it is often assumed that larger groups are able to provide more knowledge and thus higher quality (see, for example, Buckman, 2004; Probst et al., 2000). While the assumption might be true

that the variety of available knowledge is larger, one needs to differentiate between the amount and kind of knowledge and the way this knowledge is shared. Accordingly, we conclude that a trade-off must exist between the size of the knowledge base and the quality with which this knowledge is shared between members. The small and the medium group size categories (0–99 and 100–250) were shown to provide significantly more high quality answers than the large and the very large group (250–500 and 500+).

In summary, in this study: a) the bystander effect appears to be stronger among the groups sized below 250[3]; b) response rate increases again with group sizes larger than 250; c) the response time is fairly similar for all group size categories examined; d) the chance of receiving a high quality answer is highest for the small and medium-sized groups.

While the two smaller group size categories (small and medium) provided high quality answers, the medium-sized groups did so three times less frequently than those belonging to the small group size category.

This finding might be associated with two mechanisms which need to be addressed further in future research. First, those individuals that do help in the larger groups might have to help relatively more often than members of small groups, where nearly everyone feels obliged to help or at least fewer feel impeded to provide help due to social inhibition. Time is naturally limited and once the 'perpetual helpers' in the larger groups help more frequently than their counterparts in the smaller groups, time and effort spent on each response decreases. Consequently, the 'perpetual helper's' response-quality might decrease as a function of time and total amount of help/responses provided. In other words, because respondents in large groups might have to respond more often, since a large group will receive more requests and possibly also because respondents are less frequent in relation to group size, they will tend to spend less time on each answer.

Second, while the bystander effect exerts its influence within the smaller groups, it might not only lower the general response rate, but also increase the effort of respondents to provide quality answers. The subtle urge to respond in a qualitative manner is slightly higher for the medium-sized groups, but at the same time may keep some possible respondents from answering at all. Therefore it seems likely that social inhibition indeed plays an important role in obstructing members in medium-sized groups from answering and at the same time increases the quality of those who actually *do* answer.

Practical implications

These results should be of interest to those managing knowledge sharing groups. The results of this study provide valuable insights into possible

effects of group size on important features of knowledge sharing, namely likelihood of receiving a response and response quality.

Our findings suggest that, generally, small groups are more likely to respond or engage in the act of knowledge sharing, while still providing a comparably high level of knowledge. Therefore, if possible, the design of knowledge sharing forums and groups should aim at small group sizes, for instance by promoting small topical expert forums with a limited membership of less than 100 members. Audience inhibition as one of three processes described by the bystander literature can lead to a subtle risk perception and consequently impede helping behaviour. However, the effect of audience inhibition might be turned around and used in order to increase the quality of contributions, while not having to jeopardize too much in terms of responsiveness, which can also be achieved by smaller group sizes.

The most direct implication of this research is that splitting bigger groups into smaller ones can be very effective, especially on topics that are less specialized. In the end, three groups of 60 will be more likely to help than one group with 180 members.

In case knowledge is highly dispersed and hard to locate, large groups with a certain level of anonymity might facilitate the provision of higher levels of response rates and overall success. Following from the findings of this study, it seems least beneficial to maintain groups that contain 100 to 250 members. Even though these groups provided a slightly higher quality in answers than the small groups, this fact is negligible due to the threefold likelihood of receiving no answer at all.

In order to decrease the fear of being embarrassed by others in front of others, a culture of trust within the knowledge sharing community is essential. Only when an employee feels safe that s/he is not going to be ridiculed for any contribution will s/he actively participate. This includes, for example, language mistakes and contributions possibly perceived to be insignificant. To foster bonds and trust for a higher quality exchange of knowledge, small knowledge sharing groups should be given the opportunity to meet face to face or certain rules of conduct might be introduced. In this way the negative effects of audience inhibition can be minimized, while its positive side is strengthened.

Limitations and further research

As this is the first study to examine the bystander effect also in terms of quality and one of the first studies to investigate social inhibition within knowledge sharing groups of considerable size (i.e. 101 groups have over

500 members), the findings here not only provide new insight to extant literature but also suggest potential avenues for future research. Furthermore, future investigations might help to overcome some of the limitations that this study displays.

One of the limitations concerns the applicability of the present study towards corporate knowledge sharing forums. Yahoo!Groups are very similar to knowledge sharing forums such as for instance Siemens ShareNet, in particular the urgent request forums and other communities of interest. In both cases, individuals form communities of interest and share knowledge about their specific topic in order to help and guide each other. Siemens ShareNet provides a mixture of explicit and tacit forms of knowledge sharing and can be seen as one of the few success stories of global knowledge sharing (Voelpel & Davenport, 2004). In this respect, the use of an online forum or group has the advantage of being very similar to the process in question, while covering a wide range of topics and encompassing members from a much more diverse background than those present in a company. Independent of the topic in question, serious or fun, all these groups are ultimately natural communities of interest that are concerned with an area of common interest. Thus, the results are not necessarily limited to specific corporate environments with a fairly similar background and a shared company culture. However, on the one hand this diversity of topics poses an advantage as explained above; on the other hand, due to the necessity to address all topic groups equally, a generally applicable question – in this case regarding the way to upload pictures – might pose a disadvantage. At this point we can only hypothesize the difference in responses if the groups had been asked a specifically targeted question that relates to their topical focus. In addition, further studies might be able to better control for the topical focus that might alter the response rate, as some groups that help others as an integral part of their interest might also respond more often.

In targeted questions such as above, the level of expertise needed is most probably higher too. Often highly specialized requests also require a large knowledge base or, in other words, a larger group to which a certain question is addressed: while the knowledge of uploading pictures might be rather common, a question concerning insurance details for the installation of a pipeline in a rainforest area is a lot more specialized. Accordingly, results might turn out to be different for such specialized questions for which only few experts exist. Bystander literature in fact suggests that expertise enhances the likelihood of individuals helping (Bickman, 1971; Ross et al., 1973).

The phrasing of the help request is yet another area for possible further investigation. The expression of positive emotion ('I am so happy I found this group') might have triggered a positive affect in the potential respondent,

raising the response rate from 13 per cent to 24 per cent. Thus, it could be interesting to further investigate this mechanism, especially in the context of virtual environments.

The heightened sense of responsibility for helping might also be present in the individuals that were helping within the very large groups. From the observations made, it seems that the motivation to help and share the knowledge of how to upload pictures is different between the small and the large groups. Thus, there might be different kinds of individual(s) helping in small and large groups: in small groups, respondents might require more trust in order to counterbalance the effects of social inhibition, while in large groups it is possible that some rare kind of 'perpetual helpers' tend to constantly help more.

Are there fixed percentages of individuals within a population that simply enjoy sharing their knowledge with others and like to help others per se? If this is the case, one could ask how to enhance the level of 'perpetual helpers' in large groups. This might be an interesting future research direction, one in which, based on this study, we can only take educated guesses.

Furthermore, additional research needs to be done in order to investigate the exact reasons why the large and very large group size categories displayed a higher level of responses than the medium-sized groups. In this study we suggested that respondents feel less threatened because of the higher degree of anonymity that might diminish the perceived risk for those members of groups larger than 250. However, this causal link still requires further evidence. In case anonymity plays an enhancing role, such findings could also be of help to research in other fields such as sociology and the discussion on social capital (e.g. Putnam, 2000), among others.

Finally, it seems important to state that the division of group size categories used in this study does not preclude that for instance 250 is the turning or inflection point, after which increasing group size leads to higher response rates. In fact, as this is an exploratory study, further research needs to investigate the group size ranges more closely and maybe provide further insights into when and why the bystander effect decreases in influence.

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Notes

1   Due to the fact that only three out of 81 groups yielded more than one response, this variable has been transformed into a dichotomous variable.
2   In order not to confuse the actual group size of a single case, that is, a specific instance of a group with the four group size ranges, we will refer to the latter as categories: small (0–99), medium (100–250), large (251–500) and very large (500–10,532).
3   This does not mean that a group size of 250 necessarily is the breaking point. However, while group size matters, further research is needed, for instance, with regard to the optimal group size.

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