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The Effects of Perceived Anonymity and Anonymity States on Conformity and Groupthink in Online Communities: A Wikipedia Study

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Abstract

Groupthink behavior is always a risk in online groups and group decision support systems (GDSS), especially when not all potential alternatives for problem resolution are considered. It becomes a reality when individuals simply conform to the majority opinion and hesitate to suggest their own solutions to a problem. Anonymity has long been established to have an effect on conformity but no previous research has explored the effects of *different* anonymity states in relation to an individual's likelihood to conform. Through a survey of randomly chosen

participants from the English-language Wikipedia community, I explored the effects of anonymity on the likelihood of conforming to group opinion. In addition, I differentiated between actual states of anonymity and individuals' perceptions of anonymity. My findings indicate that while people perceive anonymity differently depending on their anonymity state, different states of anonymity do not have a strong effect on the likelihood of conforming to group opinion. Based on this evidence, I make recommendations for software engineers that have a direct hand in the design of online community platforms.

Introduction

Groupthink occurs when individuals choose to conform in order to minimize conflict and reach a consensus without critical evaluation of all options (Janis, 1972, 1982; Jessup, Connolly, & Galegher, 1990; Miranda, 1994; Miranda & Saunders, 1995; Rose, 2011). Conformity and compliance pressures contribute to this phenomenon (McCauley, 1989, 1998). In turn, anonymity is a factor affecting group dynamics such as conformity (Gavish & Gerdes, 1998; Lea & Spears, 1991; Lea, Spears, Watt, Rogers, & Reicher, 2000; Lea, Spears, & de Groot, 2001) and therefore may have an indirect effect on reducing groupthink. However, the view that anonymity has primarily or only a positive impact in group decision support systems (GDSS) is also challenged by Postmes & Lea (2000), who in their meta-analytic review found no evidence for anonymity as a factor that can improve decision quality, increase the quantity of ideas and solutions, or even increase the satisfaction of participants. Moreover, there is no substantial research that explores the effects of different anonymity states on the likelihood of individuals conforming to the rest of a group and therefore increasing the chances of groupthink behavior.

This article explores the differences between anonymity states and their effects on conformity. I aim to measure conformity as a factor having direct implications on group performance. This is achieved by observing the effects of anonymity states on conformity when it comes to contributing alternative options to a group decision. In turn, the latter influences decision-making, which could lead to groupthink. Additionally, a self-reported perception of anonymity is employed as a measure for objectively assessing the effect of each anonymity state (pseudonymity, anonymity and the use of real names) on conformity. This is a fresh approach that can contribute to the body of work discussing the effects of anonymity on GDSS through demonstrating the direct implications of different anonymity states. A mixed methods

experimental survey design was developed in order to uncover in detail how and why anonymity states affect the contribution of decision-making alternatives for a group. I employ a human-computer interaction perspective that focuses on applying the findings directly to the developmental processes of software engineering and software design.

By understanding whether people behave differently under different anonymity states, whether real or perceived, the decision-making process of groups, and in particular, online communities, could be drastically improved. This knowledge could then be used by software engineers; instead of simply considering the overall effects of anonymity on a community, they can make better-informed decisions and produce better quality software. As Humphrey (1989) describes, "The term quality refers to the degree to which a product meets its users' needs. This may refer to functional content, error rates, performance, extensibility, usability, or any other product characteristics which are important to the users" (p. 82). Quality concerns become particularly important when one considers the expansion of online communities through new technologies, which provide certain advantages for collaboration. Examples such as online learning networks (Hiltz & Turoff, 2002) or wikis and their unique capabilities for producing better information (Kane, 2011) and playing a key role in the academic work of college students today (Lim, 2009) make studies such as this one essential for improving online collaboration processes.

Theoretical Background

Two specific concepts are of particular interest for this study – groupthink and anonymity.

Groupthink and Conformity

Janis (1972) defined "groupthink" as "a mode of thinking that people engage in when they are

deeply involved in a cohesive in-group, when the members striving for unanimity override their motivation to realistically appraise alternative courses of action" (pp. 8-9). Groupthink implies that deterioration of "mental efficiency, reality testing, and moral judgment" (Janis, 1972, p. 9) result from in-group pressures. Subsequent studies not only reformulated Janis' original model but also aimed at finding ways to prevent groupthink (Hart, 1998; Henningsen, Henningsen, Eden, & Cruz, 2006; Jessup et al., 1990; Kroon, Hart, & Van Kreveld, 1991; Miranda, 1994; Miranda & Saunders, 1995). The impetus to prevent groupthink behavior emerged for good reasons. In retrospect, groupthink has been implicated in numerous disasters in human history. One classic example concerns the lack of military readiness in the case of Pearl Harbor (Janis, 1982). Prior to the attack, the U.S. Navy was producing reports trying to rationalize how unlikely it was that the Japanese would attack. Reviews of the literature on groupthink emphasize that such occurrences motivated many case studies that sought to find ways for preventing groupthink (Esser, 1998; Park, 2000; Rose, 2011).

Most of the preventive measures for groupthink have come from identifying its root causes, among which the most prevalent are high group cohesiveness, structural faults, and the situational context (Chen, Tsai, & Shu, 2009; Janis, 1982; Rose, 2011). These are the antecedent conditions for the occurrence of groupthink and it is not mandatory for all three to be present in order for groupthink to occur. Group cohesiveness seems to play a leading role. In a study by Cline (1990), participants exhibiting groupthink characteristics reported significantly greater cohesiveness in their groups than participants that did not engage in groupthink behavior. Although group cohesiveness is a necessary condition in the occurrence of groupthink, it is not sufficient; one or both of the other antecedent conditions must also be present (Hart, 1991; Rose, 2011).

A number of symptoms precipitated by these causes can result in defective decision making, including gross omissions in surveying objectives and/or alternatives, failure to examine the costs and risks of the preferred choice, poor information seeking, selective bias in processing information at hand, failure to reconsider originally rejected alternatives, and failure to work out detailed implementation, monitoring and contingency plans (Henningsen et al., 2006; Janis & Mann, 1977; Rose, 2011). One of the most puzzling symptoms of groupthink occurs when the group as a whole, or individuals, choose to reject alternatives or not explore them in the first place. An individual may withhold information, "going with the flow" instead of committing to his or her favorable alternative. The lack of viable or better alternatives proposed by members of a group may lead to defective decision making, where the optimum solution to a certain problem is not selected or even considered. Put simply, conformity and compliance pressures have an effect on group decision-making processes (Ahlfinger & Esser, 2001; McCauley, 1989; Rovio, Eskola, Kozub, Duda, & Lintunen, 2009).

The above symptoms could be attributed to situational context. Understandably, the pressure to conform could lead an individual to act in a certain way. Conformity is a much studied phenomenon online as well as offline (Bond & Smith, 1996; Cialdini & Goldstein, 2004; Cinnirella & Green, 2007; Hornsey, Majkut, Terry, & McKimmie, 2003; Laporte, Van Nimwegen, & Uyttendaele, 2010; Lee & Nass, 2002; Postmes, Spears, Sakhel, & De Groot, 2001; Reicher, Spears, & Postmes, 1995; Reysen, 2003; Rosander & Eriksson, 2012). Studies on conformity reveal that people make conscious or unconscious decisions to commit to a certain choice, pointing to different types of distortion in their decision-making process, including perceptual, judgmental, and action-based distortion (Asch, 1958, 1992; Levine, 1999; Rosander & Eriksson, 2012). At the level of perception, opinions are distorted by the majority view, and

individuals are not aware of the conflict; they believe the group to be right. At the level of judgment, individuals perceive a conflict but still reject their own judgment and follow the group. Finally, at the level of action, individuals are not only aware of the conflict but they also know that the group is wrong, yet they go along with the group's choice. This distortion is more likely to happen than the other types described above (Allen, 1965). The study elaborated in this article examines the third scenario, at the level of action-based distortion.

The three levels of distortion mentioned above reflect the ways in which the power of conformity can contribute to a defective decision-making process if the group's favored choice is not the optimum one. However, there appears to be less pressure online for a participant to conform to the group compared to offline settings (Smilowitz, Compton, & Flint, 1988; Wallace, 2001). On the other hand, this view is challenged with rates of high conformity found also on Internet (Rosander & Eriksson, 2012).This makes the online environment an ideal site to explore the need to conform at the action level and seek out ways to reduce distortion in decision making. Moreover, rather than treating conformity as an abstract concept, it is necessary to connect this distortion to the actual consequences of a decision-making process, such as the contribution of alternatives. In other words, if a participant withholds his or her alternative solution to a problem due to conformity pressures, this will have a direct impact on the decision-making process and in turn, potentially lead to groupthink.

Anonymity

Scholars have long investigated the effects of anonymity. Early research sought to delineate the effects of anonymity focused on group collaboration and gave birth to classic deindividuation theory, which seeks to explain the loss of self-awareness among members of groups (Diener,

1980; Zimbardo, 1969). In one case, anonymous participants proved to be more aggressive than visually identifiable participants (Zimbardo, 1969, 2008). Another study that examined trick-or-treaters also observed similar disinhibited behavior by children (Diener, Fraser, Beaman, & Kelem, 1976). These studies, among others, raised questions concerning the underlying process that leads to deindividuation. Some argued that it was a consequence of reduced self-awareness and accountability (Zimbardo, 1969), others saw it as the loss of self (Diener, 1980), and yet others developed self-categorization theory where the perception of self becomes a product of the cognitive system at work (Turner, 1988).

Theories eventually emerged to describe the effects of deindividuation in the online world. One of the most prevalent is the social identity model of deindividuation effects, based on the studies described in the previous paragraph but adapted to account also for computer-mediated communication (Lea & Spears, 1991, 1992; Postmes, Spears, & Lea, 1998; Spears & Lea, 1994; Spears, Lea, Postmes, & Wolbert, 2011). The social identity model suggests that anonymity affects the balance between personal and social identity, which in turn, affects group behavior. The reduced social cues model also addresses online group interactions and the effects of anonymity. It posits that reduced social contextual information have certain effects on groups, such as disinhibition and liberation (Kiesler, Siegel, & McGuire, 1984; Kiesler & Sproull, 1992).

The range of various effects produced by anonymity in online communities makes it difficult for software engineers to decide just how to provide users the option of anonymity. For example, in one study, participants were found to be more comfortable contributing to discussions anonymously, but the receivers' perceptions reflected less source credibility and influence (Rains, 2007). Even though the results were not statistically significant, a similar experimental study of computer conferences found that respondents using pen names (a form of anonymity) had

tendencies toward less disagreement with the final group choice, higher levels of participation, and greater equality of participation (Hiltz, Turoff, & Johnson, 1989). A meta-analytic review that was critical of the hypothesis that anonymity in GDSSs is beneficial for group decision-making showed similar results, with anonymity producing more contributions and especially more critical ones (Postmes & Lea, 2000), representing the potential for reducing groupthink. However, the same study argued that integration of anonymity in phases of group decision support does not reliably guarantee improved performance and argued for the importance of the social context as well as social norms. In another study on anonymity and accountability, Farkas, Ziegler, Meretei, & Lörincz (2002) found that when someone loses credibility, it is probable that a loss of accountability occurred first.

However, anonymity can also have a positive effect in which individuals have reduced anxiety about being positively evaluated by others, which helps create an impersonal, task-oriented focus for group interaction (Lea et al., 2001). McLeod, Baron, Marti, & Yoon (1997) found that expert participants were likely to suppress information in computer-mediated discussions where there was no face-to-face communication. The same study revealed that under the condition of anonymity, expert participants were willing to share information they previously withheld. In sum, regardless of the negative effects of anonymity, it can be beneficial to online collaborative groups and communities by helping to ensure that alternative minority opinions will be heard.

Hypotheses and Research Model

Software engineers have developed many techniques to protect users' anonymity. From a technical perspective, there are complete anonymity, unlinkability, linkability, undetectability, unobservability, and pseudonymity, among others (Pfitzmann & Hansen, 2010). While these

various anonymity states are perceptible to technological professionals, average users may lack the capacity to understand them or even be aware of them. Individuals are more likely to perceive whether they are using their real names, using their nicknames (pseudonyms) or being completely anonymous, and each of these anonymity states is likely to have different effects on their responses, especially with regard to aggression (Tsikerdekis, 2011). Additionally, anonymity has been found to be a factor in reducing conformity pressures (Gavish & Gerdes, 1998; Lea & Spears, 1991; Lea et al., 2000, 2001) but with no significant increase in ideas or solutions for groups (Postmes & Lea, 2000).Considering the above factors, there may be differences in the ways individuals disclose information and/or voice their opinions based on different anonymity states. An individual that might not openly go against group opinion in resolving a problem could reveal potentially useful information or alternative solutions under conditions of anonymity and therefore affecting the chances of groupthink. But would this occur only under conditions of *complete* anonymity? Does partial anonymity, or pseudonymity, make an individual more inclined to suppress information or vice versa? Or is there no difference between the two? These considerations underpin the first hypothesis of the study.

H1: With higher levels of anonymity, the likelihood of not conforming increases.

However, not all users may perceive anonymity states in a similar manner. Research on anonymity in group decision support systems suggests that anonymity is multidimensional and can be subjective and context-dependent (Pinsonneault & Heppel, 1997, 1998). In addition, the same research concluded that factors such as proximity and screen disposition may have an effect, along with situational variables described in social psychology, such as group unity. Other important antecedents include deindividuation, private self-awareness, accountability cues, and attentional cues (Prentice-Dunn & Rogers, 1982). Therefore, a self-reported perception of

anonymity may reflect respondents' thoughts more accurately. Moreover, the perception of anonymity may more accurately reflect the effect of anonymity on the likelihood of a respondent conforming to the group. Two additional hypotheses explore such perceptions.

H2: With higher levels of anonymity, the perception of anonymity increases.

H3: As the perception of anonymity increases, the likelihood of not conforming increases.

Social context can influence group decisions (Postmes & Lea, 2000) and contribute to the emergence of groupthink (Janis, 1982; Rose, 2011). Coincidentally, anonymity can also be dependent on situational context (Pinsonneault & Heppel, 1997, 1998). As such, two hypotheses address the role of social context by introducing a particular scenario in which anonymity is measured.

H4: There will be a relationship between a given scenario and the likelihood of not conforming.

H5: There will be a relationship between a given scenario and the perception of anonymity.

Situational context may have a different level of importance for different respondents. A similar study that evaluated the relationships between three anonymity states and aggression showed that the importance of a topic to an individual was critical in determining how significant the difference in responses between anonymity states would be (Tsikerdekis, 2012). Task importance has been found to be a key variable in conformity (Baron, Vandello, & Brunsman, 1996). Additionally, since anonymity can be dependent on situational context (Pinsonneault & Heppel, 1997, 1998), the perception of anonymity may be affected by the level of importance assigned by a user to the given context. For example, the more important an issue is, the more self-aware an

individual may become. Accordingly, two hypotheses measure a topic's level of importance.

H6: As the level of importance assigned to a problem increases, the likelihood of not conforming increases.

H7: As the level of importance assigned to a problem increases, the perception of anonymity decreases.

The research model based on the above hypotheses is depicted in Figure 1. Anonymity state, scenario and level of importance are variables that potentially have an effect on conformity either directly, or indirectly, through the perception of anonymity. Perception of anonymity is also expected to be a more accurate variable for measuring anonymity since it is expected to act as an intermediary for all other variables in the research model. In turn, conformity, in the form of withholding alternative solutions in a problem-solving discussion, is a well-known factor contributing to groupthink.

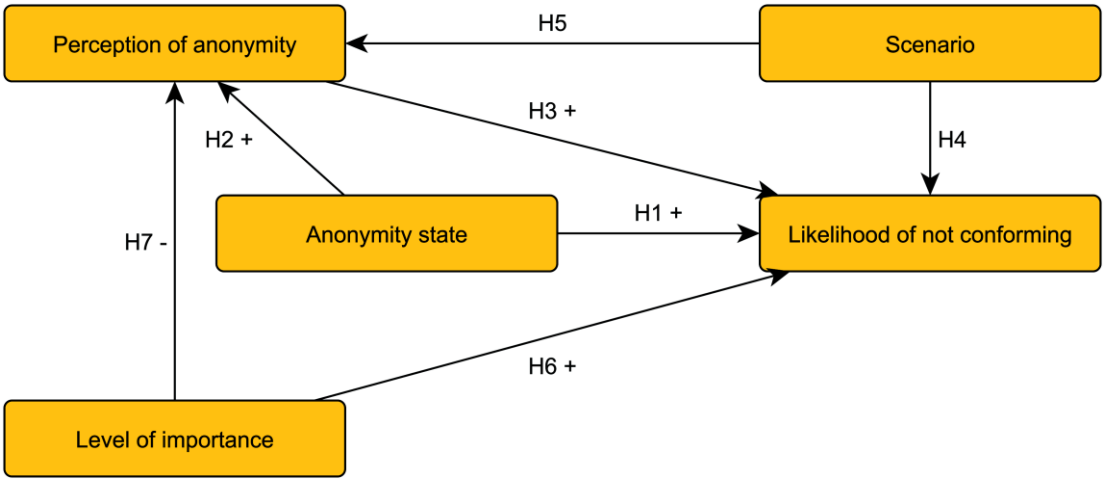


Figure 1: Research model based on the hypotheses of this study.

Research Design

Survey

In order to evaluate the above research model, I created and administered a survey. This methodological approach helps standardize data collection among different groups (Marsden & Wright, 2010). A randomized controlled trial is used in this study, "in which participants are allocated truly randomly to an experimental group and a control group" (Somekh & Lewin, 2005, p. 221), because it is a method that strengthens internal validity.

I created three different vignettes featuring scenarios in which the respondent was a member of a group making a decision about how to resolve a particular problem. The majority of the group had already chosen one of several potential solutions, which was at odds with the respondent's choice. The respondent was asked to indicate whether he or she would propose an alternative solution or not. These scenarios involved: (a) a group of tenants dealing with a noisy/problematic neighbor; (b) a group of office employees whose overtime hours were not compensated; and (c) a group of co-workers asked for recommendations about how to deal with a senior employee that was severely misbehaving. Each scenario was carefully designed so that the individual would have a high incentive to resolve the problem but would also incur some sort of penalty for voicing a dissenting opinion. For example, in the scenario about overtime, the manager of the department would receive a request for resolution that included a list revealing how each employee had voted on the matter. I anticipated that antecedent factors affecting anonymity, such as accountability cues and self-awareness, would contribute to widening the difference between using a real name and being anonymous (see the above section on groupthink). For each scenario, three variations were created, one for each anonymity state. The following section details how I

operationalized the survey.

The first page of the survey (Figure 2) served as an introduction that informed participants they were taking part in a scientific research survey in which there are no right or wrong answers. It also instructed them to answer honestly, as in a real-life situation, and to respond to all questions. In order to ensure the latter, I programmed the survey with JavaScript code that would prompt the user with an error message in case there were unanswered questions.

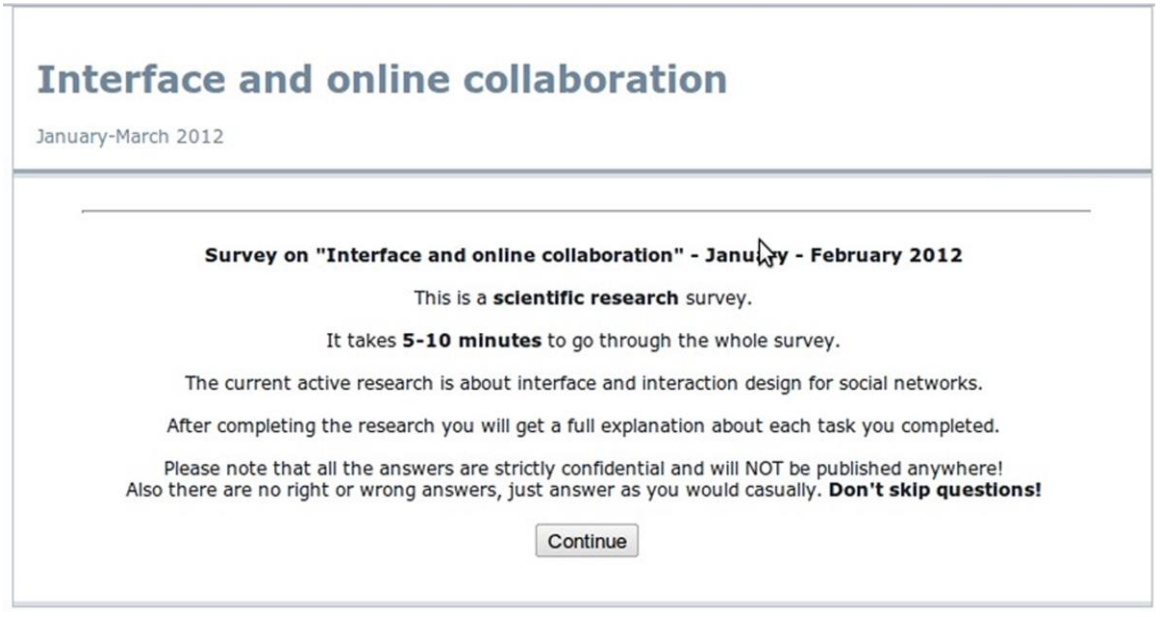


Figure 2: First page of the survey

The second page of the survey (see Figure 3) began with questions about respondents' sex and age. Next, there were questions about each one of the three different scenarios, asking which response participants would choose as the optimum solution. At this stage, the questions were more generic but the description of the problem was the same as would be presented later in the survey. In addition, each respondent was asked to assign a level of importance to resolving each of the problems.

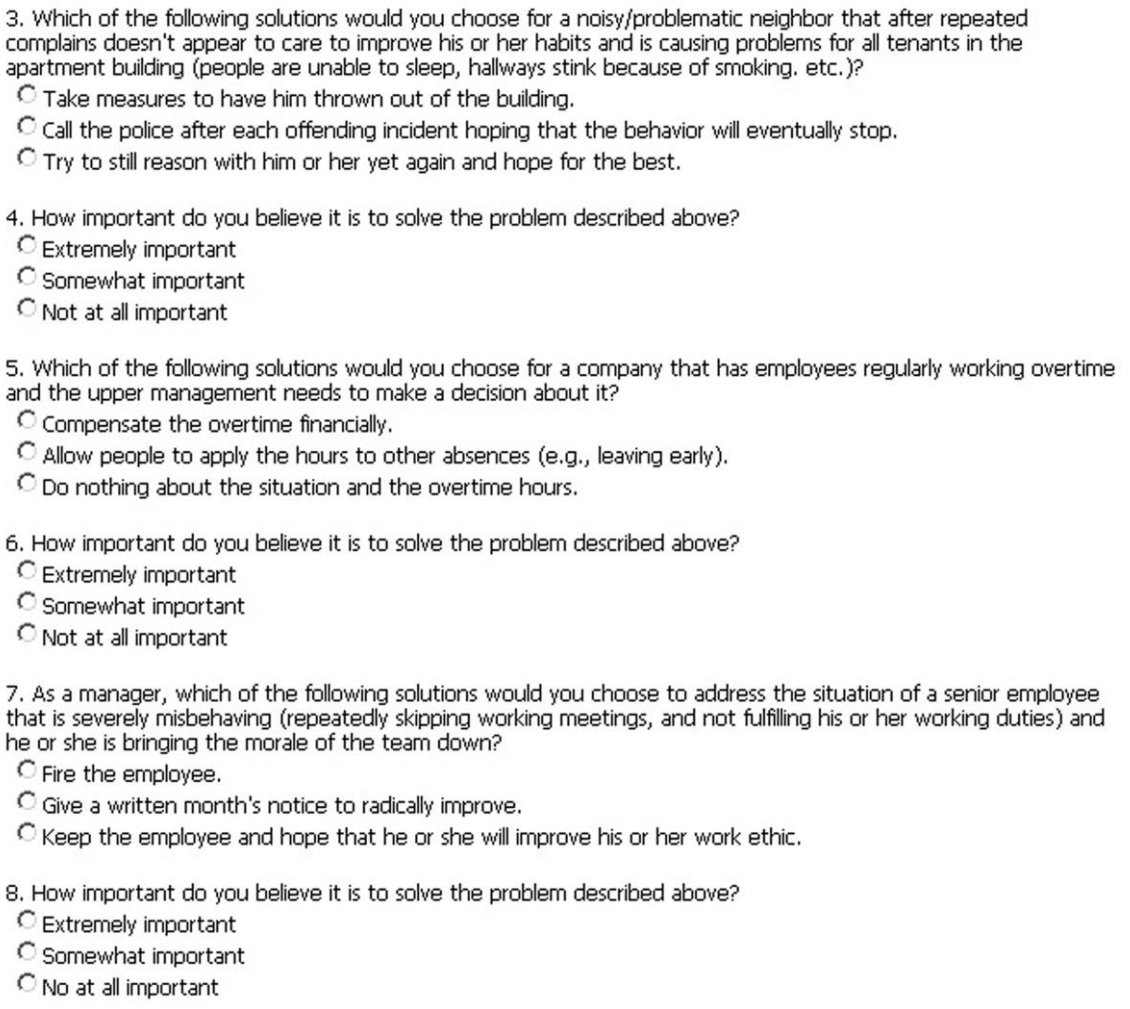
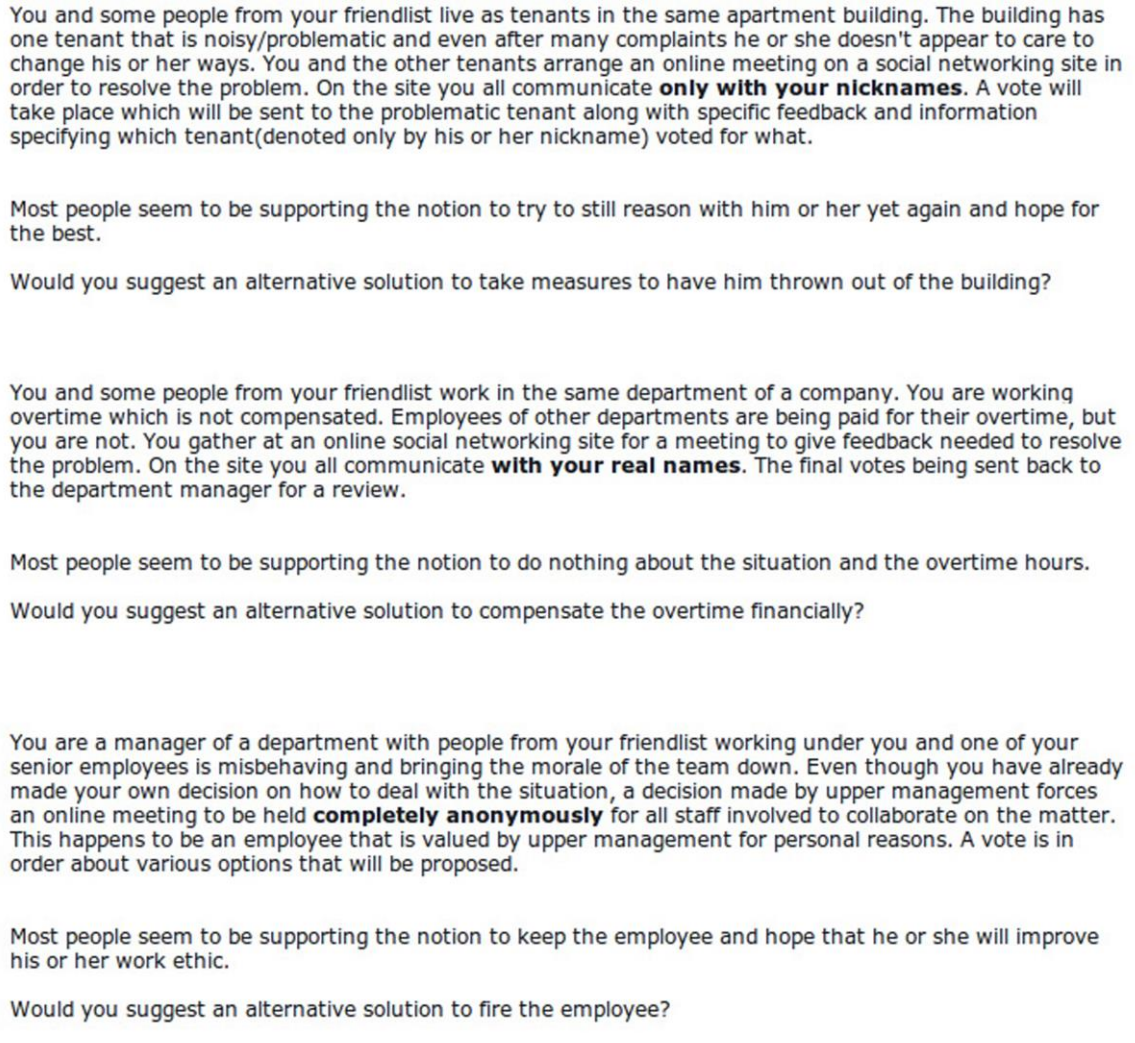


Figure 3: Part of the second page of the survey.

The participants were then directed to the second stage of the survey. At this point, algorithms would randomize not only the order in which the vignettes concerning each scenario would appear but also which scenario would occur under which anonymity state. In other words, users received a completely random order of scenarios and anonymity states, with one vignette displayed per page. In this stage of the survey, respondents faced a more detailed and personalized version of each scenario. Even though each scenario varied according to anonymity state, the content and the meaning remained identical. In other words, individuals answered the

same questions for the same scenarios but under different anonymity states. In order to create the impression that the rest of the group within a given scenario supported a solution other than the one the respondent favored, I utilized algorithms that obtained the answers provided on the second page and chose a random solution other than the one selected by the respondent (see Figure 4). The respondent was asked to assess the likelihood for proposing his or her alternative solution on a seven-point Likert scale. Compared to a choice between "yes" or "no," a Likert scale provides sensitivity in measuring a response.


You and some people from your friendlist live as tenants in the same apartment building. The building has one tenant that is noisy/problematic and even after many complaints he or she doesn't appear to care to change his or her ways. You and the other tenants arrange an online meeting on a social networking site in order to resolve the problem. On the site you all communicate **only with your nicknames**. A vote will take place which will be sent to the problematic tenant along with specific feedback and information specifying which tenant(denoted only by his or her nickname) voted for what.

Most people seem to be supporting the notion to try to still reason with him or her yet again and hope for the best.

Would you suggest an alternative solution to take measures to have him thrown out of the building?

You and some people from your friendlist work in the same department of a company. You are working overtime which is not compensated. Employees of other departments are being paid for their overtime, but you are not. You gather at an online social networking site for a meeting to give feedback needed to resolve the problem. On the site you all communicate **with your real names**. The final votes being sent back to the department manager for a review.

Most people seem to be supporting the notion to do nothing about the situation and the overtime hours.

Would you suggest an alternative solution to compensate the overtime financially?

You are a manager of a department with people from your friendlist working under you and one of your senior employees is misbehaving and bringing the morale of the team down. Even though you have already made your own decision on how to deal with the situation, a decision made by upper management forces an online meeting to be held **completely anonymously** for all staff involved to collaborate on the matter. This happens to be an employee that is valued by upper management for personal reasons. A vote is in order about various options that will be proposed.

Most people seem to be supporting the notion to keep the employee and hope that he or she will improve his or her work ethic.

Would you suggest an alternative solution to fire the employee?

Figure 4: Each scenario found in the survey under a different anonymity state.

In addition, each page contained a ten-point Likert scale asking the participant to rate his or her perception of anonymity, with 1 being fully known and 10 being completely anonymous. This measure not only allowed for correlation analyses based on each anonymity state but also provided the ability to correlate the likelihood of participants sticking to their opinions based on their perception of anonymity. The survey concluded with an open-ended question asking respondents to elaborate on their choices ("Why are you likely or not likely to propose an alternative choice? Please elaborate."). My decision to add a qualitative component to the study reflects the fact that a mixed-methods analysis allows for triangulation, which in turn increases internal validity and paints a more complete picture of the results (Bryman, 2012).

Context

In this study, I sought to investigate existing online communities that collaborate under various anonymity states. Wikipedia was the ideal choice since it satisfied all of these conditions. According to its "about" page, Wikipedia is "a multilingual, web-based, free-content encyclopedia project based on an openly editable model," which is "written collaboratively" and "users can contribute anonymously, under a pseudonym, or with their real identity, if they choose" (2012).

Wikipedia is built on "wiki" technology, which includes a set of linked web pages created through incremental development by a group of collaborating users (Leuf & Cunningham, 2001) and the software used to manage the web pages (Khosrowpour, 2008). The domain of wiki technology is not restricted to encyclopedias. In fact, it covers a broad spectrum of adaptations of the software made to suit a community's needs. Wikis can be used to create collaborative research papers and even to facilitate debates (West & West, 2009). They can be applied in

numerous ways within the field of education (Duffy & Bruns, 2006), and they represent a useful tool for project collaboration by students (Chao, 2007).

For this study, I chose the English-language branch of Wikipedia, which is not restricted to native speakers of English. In fact, many of the participants stated in their personal pages that their native language was not English and/or that they came from non English speaking countries. Hence, the survey covered a global Wikipedia community of editors (called Wikipedians) coming from various backgrounds. The size of the community becomes apparent if one considers that at the time of the survey, Wikipedia had in total 26,189,383 pages and 16,222,081 registered users (Wikipedia, 2012b). Out of the total registered users, some are solely readers while others are Wikipedians. But there is a consensus among many researchers that just a small fraction of these Wikipedians are the ones contributing most of the content, in terms of quality and quantity (Kittur, Chi, Pendleton, Suh, & Mytkowicz, 2008; Kittur, Suh, Pendleton, & Chi, 2007; Panciera, Halfaker, & Terveen, 2009; Priedhorsky et al., 2007). These active editors were my target population, which I estimated at the time of the study was 146,208.

I registered this study and applied for approval from the Wikimedia Foundation Research Committee in September 2011. The Wikimedia Foundation Research Committee (RCom) is a committee consisting of Wikimedia volunteers, researchers, and Wikimedia Foundation staff with a mandate to help organize policies, practices and priorities around Wikimedia-related research (Wikipedia, 2012c). Furthermore, since the study involved human subjects, my research protocols adhered to the rules and guidelines set forth by the Research Committee, as well by the Ethics Board of Masaryk University and the American Sociological Association Code of Ethics.

Once I received approval from RCom in January 2012, I conducted a pilot survey with 15

random editors to determine if there were any errors, assess the community's reaction, and establish the expected response rate. I sent invitations to each editor's "talk page" with a unique identifier in a form of an 8-digit number in order to avoid attracting a volunteer sample. The user talk pages allow for editors to exchange messages with one another. I sent a reminder two weeks after the initial contact. The final response rate from the pilot was 53 percent. I found no serious errors, but I did make one revision suggested by a participant; I added "don't want to say" as an option to the questions regarding sex and age.

After the pilot survey, I selected a random sample of 250 participants and sent out invitations beginning on February 2, 2012. Participants received a second invitation approximately three weeks into the study. Each participant also received a Barnstar award for participation in the study. These are awards exchanged between editors for a variety of achievements in the community. I closed the survey on March 22, 2012.

Results

In total, 106 editors from the English-language Wikipedia community responded to the survey, which indicates a response rate of 42.4 percent. This result is similar to previous survey research on Wikipedia (Nov, 2007) and higher than those found among past studies on email survey response rates (Sheehan, 2001). Since the pilot sample was drawn from the same population of active editors and significant changes were not made in the survey's design, I added it to my final sample (n=114) to increase the validity of the results.

Table 1 provides the general demographics of the sample. The median age group was 26-39 years old, with a range that included teenagers and people aged 60 or older. The overwhelming

majority were male (91.2 percent), which is not surprising if one considers the demographics of Wikipedia. A 2010 survey that contained 170,173 contributors and editors, across all different language versions of Wikipedia, shows a similar gap between the two sexes, especially when it comes to editors (Glott, Schmidt, & Ghosh, 2010).

Table 2: Demographics of the editors in the sample

	Frequency	Percent
Age group		
13-17	10	8.8
18-25	34	29.8
26-39	24	21.1
40-59	38	33.3
60 and above	7	6.1
Unknown	1	0.9
Sex		
Male	104	91.2
Female	10	8.8

The design of the survey permitted data analysis based on each scenario as well as across all scenarios to ascertain if there were effects of the various anonymity states. I begin with the latter case.

Analyzing data across scenarios

Respondents' self-reported levels of perception of the level of anonymity had a mean value of 4.49 with a standard deviation of 3.013 and a standard error of the mean at 0.163. One of the primary hypotheses of this study (H2) was the expectation such perception would depend on the anonymity state assigned to a given scenario. Not surprisingly, I found a medium effect of correlation between the anonymity state and the respondents' reported perception of anonymity,

r_s = .466, p < .001 (1-tailed). It is clear from the results reported in Figure 5 that the mean of participant perception is different *across* different anonymity states. However, the standard deviations do not vary much between anonymity states. Thus, three points of standard deviation for the perception scale implies that *within* different anonymity states, opinions vary, an assertion further supported by Spearman results that explain only 21.71 percent of the total variance.

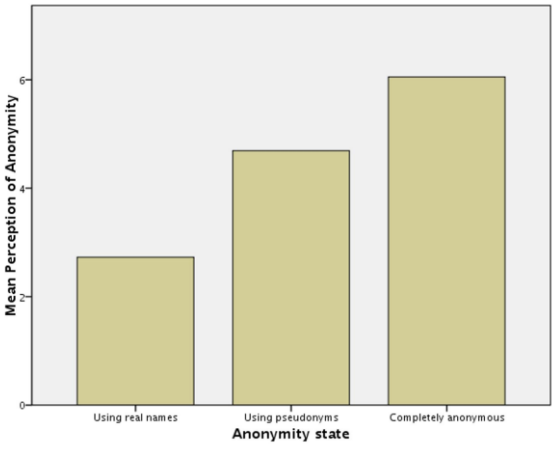


Figure 5: Mean for perception of anonymity under each anonymity state.

Based on the Spearman results, approximately 80 percent of unaccounted variance remains. To establish if other variables play a role, I conducted further analyses.

The first reasonably suspect variable was the type of scenario (H5). Different scenarios contained different "penalties," which varied from information being revealed to a superior in the workplace (more serious) or to a neighbor (presumably less serious). Hence, since the pressure to conform varied between scenarios, it may have affected the result. Remarkably, it did not; a Pearson's chi-square between the two variables (perception of anonymity and scenario), showed no difference, χ^2 (18) = 20.02, p > .05.

Another variable that could potentially affect the correlation of interest that supported H2 measured the level of importance assigned to resolving a given problem. My suspicion concerning this variable arose from the small negative effect found between the reported importance for resolving a problem and the level of perception of anonymity, r_s = -.103, p < .05 (1-tailed). This provided support for H7. Since questions about the importance of problem resolution came prior to the vignettes describing the different scenarios, in which participants rated their level of perception of anonymity, it is safe to assume that the level of importance could cause the perception of anonymity to decrease. In this case, however, it only explained one percent of the total variance between the two variables. A partial correlation controlling for this variable showed an extremely small difference in the final result, r_s = .464, p < .001 (1-tailed).

Based on the above results and considering the effect size between anonymity state and perception of anonymity by individuals, I took the analysis a step further. Using ordinal logistic regression, I created a table to predict the probability of an individual selecting a certain level of perception based on the anonymity state and the level of importance for resolving a given problem. Because the 10-point scale I used to measure perception of anonymity would create 10 different threshold levels, which in turn could make the results harder to interpret, I reduced the scale to five levels. Table 2 summarizes the results.

Table 2: Ordinal regression analysis for the 5-point scale of perception of anonymity using anonymity state and importance of resolving a problem as the predictor variables.

		95% CI for Odds Ratio		
	B(SE)	**Lower**	**Odds Ratio**	**Upper**
Thresholds				
Perception(1)	-1.67 (0.22)***	0.12	0.19	0.29
Perception(2)	-.89 (0.20)***	0.28	0.41	0.61
Perception(3)	.21 (0.20)	0.84	1.23	1.82

Perception(4)	1.27 (0.22)***	2.32	3.56	5.40
Anonymity State				
Using real name	-2.35 (0.27)***	0.06	0.10	0.16
Using pseudonym	-.86 (0.24)***	0.26	0.42	0.68
Being completely anonymous	0			
Importance of resolving a problem				
Not at all Important	-.67 (0.56)	0.17	0.51	1.53
Very Important	.49 (0.21)*	1.08	1.63	2.46
Extremely Important	0			
Note: R^2 = .227 (Cox & Snell), .238 (Nagelkerke). Model χ^2 (4) = 88.273, p < .001. Test of parallel lines χ^2 (12) = 10.377, p > .05. * p < .05, ** p < .01, *** p < .001				

We can use this table to establish the probability of a participant choosing a particular level of perception of anonymity based on the two factors – anonymity state and the level of importance assigned to resolving a given problem. For instance, when rating problem resolution as "extremely important," participants that use their real names have a 66 percent (first point in the scale) chance of perceiving that they are completely known, compared with participants that use a pseudonym (31 percent). In contrast, the highest probability of someone under the completely anonymous state is 26 percent, which corresponds to the third point in the scale. After establishing how anonymity states affect perception and ascertaining an existing relationship between those two, it is clear that both factors must be considered measures that affect the likelihood of conforming to the group. Now, we arrive at the core of the study and the main hypothesis (H1), which asserts that with higher levels of anonymity the likelihood of not conforming increases as well. Perception was also expected to have a greater effect than anonymity states since the scale for perception was higher and the standard deviation of perception within different anonymity states varied. Simply put, two different people may perceive anonymity in different ways even if they are both in the same anonymity state (e.g. using pseudonyms), and as such, the likelihood of conforming to the group could vary (H3).

A Spearman's correlation between anonymity states and the likelihood of conforming showed a statistically significant result, $r_s = .102$, $p < .05$ (1-tailed). However, the effect is small. In fact, the amount of variance explained by this correlation is just one percent. I obtained a similar result when correlating the likelihood of conformity with the perception of anonymity, $r_s = .101$, $p < .05$ (1-tailed). Due to such small effects, I correlated other variables to discover whether they might contribute to the likelihood of conforming.

Taking into account that the level of importance assigned to problem resolution was correlated with the perception of anonymity, I conducted an analysis to measure the correlation between the level of importance and the likelihood of conformity, but it showed no statistical significance, $r_s = .057$, $p > .05$. This did not provide support for H_6. However, a partial correlation between perception of anonymity and the likelihood of conformity while controlling for the level of importance, was significant, $r_s = .107$, $p < .05$ (1-tailed), but the effect was small. I followed the same procedure for the second variable I suspected might have an effect – the type of scenario (H4). A Pearson's chi-square achieved statistical significance, $\chi^2 (12) = 35.69$, $p < .001$, $V = .228$. The result shows that 46.6 percent of the respondents stated that they would definitely propose their idea to the group under the scenario about unpaid overtime, compared to the other two scenarios, where percentages for the highest choice in the likelihood scale were 18.4 and 20.2 percent.

Analyzing data for each scenario

While combining data across all scenarios may make the results easier to generalize, a complete investigation into each type of scenario allows us to evaluate the survey findings in depth and establish if people would indeed behave similarly across different scenarios. Table 3 summarizes

the results of my analysis for each scenario.

Table 3: Correlations for each type of scenario. While anonymity has an effect on the likelihood of conforming for the first and third scenario, the level of importance is a more important factor for the scenario about the unpaid overtime.

Comparison/ Scenario	Noisy Neighbor	Unpaid Overtime	Misbehaving Employee
Anonymity State * Likelihood of Conforming	r_s = .178*	r_s = .001	r_s = .160*
Perception of Anonymity * Likelihood of Conforming	r_s = .071	r_s = .031	r_s = .182*
Level of Importance * Likelihood of Conforming	r_s = .099	r_s = .222**	r_s = .056
Anonymity State * Perception of Anonymity	r_s = .431**	r_s = .530***	r_s = .432***
Note: * p < .05 (1-tailed), ** p < .01 (1-tailed), *** p < .001 (1-tailed)			

Two of the scenarios (noisy/problematic neighbor and misbehaving employee) exhibit similarities. In fact, the correlations seem to agree with the results of the analysis in which all scenarios were combined. Neither the anonymity state nor or the perception of anonymity seem to largely contribute to the likelihood of an individual conforming to a group's decision; the effect sizes are small. However, when it comes to the likelihood of conforming, the scenario with the unpaid overtime seems to put more weight on the level of importance assigned to problem resolution rather than on the anonymity state; essentially providing support for H_6. This is also visible when creating a contingency table for this specific scenario. Across all anonymity states, the likelihood of conforming remains more or less the same, but there is a dramatic shift as the level of importance changes from "very important" to "extremely important."

We must interpret these results cautiously. While the number of cases reporting problem

resolution as “very” or “extremely” important was substantial (n=330), there were few responses (n=12) at the level coded as "Not at all important," in all scenarios and under all anonymity states. Since all of the problems presented in the scenarios were in fact serious problems, I did not expect many participants to assign the lowest level of importance to them. While recommended conditions about sample size for this type of analysis were satisfied, some survey researchers consider the presence of such a small subgroup of cases problematic (Lewin, 2005). To verify the effect (or the lack of effect) of the category “Not at all important,” I ran the correlation tests again without it. Although they varied, the results were in line with the original correlation test results reported in Table 3. That leaves us still with a scenario in which respondents might behave completely differently from the other two.

Qualitative findings

The survey provided respondents the option of answering an open-ended question in which they could elaborate their decision to conform or not within each scenario. While the results of the quantitative analysis conducted for this study indicate the general behavior that participants might exhibit if placed in one of the scenarios, the qualitative findings tell us something not only about the motivations of the majority but also about those that deviated from the overall sample. Moreover, these results assist in validating the quantitative results; misinterpretation has been a common pattern in past studies on conformity, as argued by Friend, Rafferty, & Bramel, (1990).

To systematically analyze respondents’ qualitative statements, I coded them according to the primary "drive" underlying the decision-making process, whether conforming or not. I wanted to ascertain if the presence of a perceived threat in a given scenario or perceived anonymity played a role in whether the individual made a decision based on emotional, rational or other factors.

Thus, I utilized six unique categories, Emotional, Rational, Threat, No Threat, Protected by Anonymity and Other. Hence, a statement would be coded under the category of "Protected by Anonymity" only when respondents made an explicit reference to anonymity. Emotional and rational reasons dominated in respondents' decision to conform or not, accounting for 21.1 and 58.5 percent respectively. "No Threat," "Protected By Anonymity," and "Threat" accounted for 4.1, 2.0, and 10.6 percent respectively. This finding dovetails with the quantitative results that showed the likelihood of conforming is only minimally affected by anonymity state or the perception of anonymity.

On the other hand, the answers from the respondents become particularly important because they may offer evidence as to why the results concerning one scenario were so much different from those of the other two.

The qualitative findings reveal that a respondent's likelihood of conforming was not affected by the state of anonymity or the level of importance assigned to a problem, a result that supports the quantitative findings. Respondents seemed eager to explain the rationale behind their choices and responses with strong emotions were common. The following respondent, using his or her real name, commented on the scenario about unpaid overtime: "I do not let anyone take advantage of the department I am in; I will attempt to stop the injustice even if others are ambivalent or indifferent to it." Another respondent, under conditions of pseudonymity, made a similar proclamation: "To bring up issues of fairness, justice, and self-interest." Their words echoed the response of a completely anonymous participant: "Because I deeply consider my opinion is the best (in this specific case) and will do my best to make it heard.". Although not all respondents rationalized their choices this explicitly, most of them were willing to suggest their alternative and disregard the anonymity state.

In contrast to the above statements, responses to the scenario about the problematic neighbor were, overall, not nearly as powerful. In fact, this scenario provoked statements of compassion: "It would be good for the others to be aware of other alternatives, and I'd also feel bad for the man [because] he may have nowhere else to go." And while the scenario about the misbehaving employee engendered statements supporting non-conformity to the group ("You feel that it's right and you are that person's boss"), there were cases in which people appeared to conform to the group because of situational pressures. One respondent cited self-interest as a reason to conform: "Too much personal risk, but the importance [of the problem] is for the company and not really personal." Another participant, even though conforming to the decision to give the misbehaving employee another chance, could not hide his anger about the problem: "Because upper management loves this lazy oxygen-thief for some reason. This, not helped by the fact that the plebs are also swaying to the softly softly [sic] approach, which is also probably due to the fact they're scared 'upper management' will destroy their lives."

The above statements paint a better picture of how participants evaluated the different types of scenarios and rationalized their decisions.

Discussion

The results of this study provide insight into a largely unknown and underexplored territory – the various states of anonymity found in online communities. As an enormous online community with editors from all over the world, Wikipedia is the perfect site to explore the three anonymity states investigated in this study. It is reasonable to assume that Wikipedia editors are also members of other online communities. As such, their thoughts and behaviors observed in this study would probably be found in online communities beyond Wikipedia.

It should be of no surprise that a moderate effect was found between an individual's perception of anonymity and the state of anonymity that the individual is actually under. Additionally, while the different scenarios did not affect the perception of anonymity, the self-reported level of importance for a topic did. In terms of hypotheses, H2 and H7 were supported while analysis for H5 did not achieve statistical significance. A regression analysis was conducted using the variables available in an attempt to help formalize a model for predicting perceptions of anonymity. What is surprising, however, is the amount of variance that cannot be accounted for by the regression model based on these data. While we can make predictions about the perception of anonymity based on the anonymity state and the level of importance assigned to resolving a problem, the qualitative findings point to other variables that could significantly improve the current model, such as trust. The following statement from one participant reveals hesitation and a concern for appearances: "I would still be worried about my anonymity. That and the reality [that] all employees being involved in this meeting might work to make the employee aware of his/her behavior and how it comes across which could cause positive change." Indeed, participants seem to realize that the promise of anonymity can be deceptive in a world where everything can traced and individuals leave their footprints no matter how well shielded.

On the other hand, the perception of anonymity seems to have a minimal effect in the decision to conform. While analyses provided support for hypotheses H1 and H3, the effects were small. In fact, results from combining all the levels in the likelihood scale that favor non conformity (see Table 4) show that most respondents would not conform under any anonymity state. Specifically, when using real names, 66 percent indicated they would not conform, rising to 71 percent when using pseudonyms and 76 percent under a completely anonymous state. However, while these differences may appear large, correlation analysis indicates otherwise. The small effect of

anonymity on the likelihood of conforming is a promising result for online communities and the future of online communication. Given that non-conformity in this study meant ensuring a contribution of alternatives to the group, this is a positive outcome for preventing groupthink. Moreover, it seems to be in agreement with previous research conducted more than two decades ago (Smilowitz et al., 1988). Whether it is distance that makes individuals feel safer or the lack of face-to-face group interaction, people seem make decisions based on cognitive processes affected by other factors than just anonymity. This is also supported by the qualitative findings.

Table 4: Responses for the likelihood of conforming according to anonymity state

Anonymity State		Frequency	Percent	Cumulative Percent
Real name	Definitely	26	22.8	22.8
	Very probably	24	21.1	43.9
	Probably	25	21.9	65.8
	Uncertain	23	20.2	86.0
	Probably not	5	4.4	90.4
	Very probably not	2	1.8	92.1
	Definitely not	9	7.9	100.0
	Total	114	100.0	
Pseudonymous	Definitely	32	28.1	28.1
	Very probably	24	21.1	49.1
	Probably	25	21.9	71.1
	Uncertain	8	7.0	78.1
	Probably not	15	13.2	91.2
	Very probably not	5	4.4	95.6
	Definitely not	5	4.4	100.0
	Total	114	100.0	
Anonymous	Definitely	38	33.3	33.3
	Very probably	27	23.7	57.0
	Probably	22	19.3	76.3
	Uncertain	6	5.3	81.6
	Probably not	13	11.4	93.0

Anonymity State		Frequency	Percent	Cumulative Percent
	Very probably not	5	4.4	97.4
	Definitely not	3	2.6	100.0
	Total	114	100.0	

The overall findings of this study, while encouraging for online communication, should not be overestimated. The qualitative results reveal that approximately 10 percent of the respondents did perceive some form of danger, whether due to the lack of anonymity or because of the type of scenario, and only two percent actually felt protected by anonymity. These cases contradict the quantitative results and imply that for at least some individuals, anonymity does have an effect on the likelihood of conforming. As one respondent put it, “If I believe this is the right thing to do, I would raise it anonymously. If it was [sic] not anonymous, I would have to think hard about the situation.” This type of statement should serve as a warning. No matter how small the effect of anonymity may be for a majority of a population, there are always cases where people may decide to conform because of the lack of anonymity and therefore denying a group much needed alternatives to be considered. In addition, even under a state of complete anonymity, there are still individuals that would not believe that they are truly anonymous. A participant stated, “I think that compensation [sic] people working more hours is the correct solution but I would be worried about how anonymous in [sic] really is.” The unaccounted variance for predicting the perception of anonymity supports the existence of such sentiments. Moreover, support for H4 indicates that situations can also affect the likelihood of conforming and indirectly the effects of anonymity; both cases showing dependence on situational context (Janis, 1982; Pinsonneault & Heppel, 1997, 1998).

My goal in this study was to try to assert what happens in online communities and groups where groupthink could represent a real danger. Based on the evidence provided by the analyses I conducted, groupthink is less likely to occur online because the likelihood of individuals presenting potential alternatives instead of simply conforming to the group is higher. The presence of alternatives is crucial for preventing groupthink. Statistically significant evidence show that anonymity may play a small role in preventing groupthink, along with the level of importance an individual assigns to a particular issue. However, as the qualitative evidence collected in this study suggests, sometimes, alternatives may not be proposed due to issues such as the lack of trust in the existence of a truly an anonymous collaborative process. This finding is especially relevant if one considers that trust in community-driven knowledge environments is considered significant for the continuing growth and long-term viability of information systems (Kim & Han, 2009).

Groupthink is a multidimensional phenomenon, with many antecedents and symptoms that can contribute to its occurrence. While the importance of having multiple alternatives for problem resolution among groups is just one piece of the puzzle, I argue that it is an important piece, if not the most important. It is problematic for a group when individuals are prevented from voicing their opinions. Pseudonymity or complete anonymity can be liberating and help improve collaboration in a group. Moreover, my findings clearly show that even though the effect is small, as the perception of anonymity rises, the potential for alternatives rises as well. This is an important relationship, which should not be ignored by software developers.

Recommendations

The results of this study point to the need for software engineers to consider providing options for

anonymous or pseudonymous posting an important priority when designing platforms for online communities and GDSS. These options should be provided especially in social media that are designed for collaboration and currently offer users communication only under their real names. These options will help ensure that individuals with a minority opinion can voice their opinions and problem-solving alternatives, which in turn could help prevent the emergence of groupthink. There is also the issue of trust between community members and community platform owners and developers. Anonymity is not always accepted by users as a given, even if promised. A future study that aims to improve on the current predictive model for the perception of anonymity should also include trust as a potential variable. By having a more accurate estimate of the perception of anonymity for each anonymity state we can further assess more effectively its effect on conformity, which in turn is a factor in groupthink.

However, the effect of anonymity on conformity and groupthink can also vary between different situational contexts. Additionally, the context itself offers factors that affect the likelihood of conformity. Software engineers can take into account some of these factors, to help them assess the durability and effectiveness of the software against groupthink. For example, the level of importance of a topic for a user is one such factors identified in this study, which had a direct as well as an indirect effect on conformity through the perception of anonymity depending on the scenario. Software engineers can seek out information on this variable prior to collaborative sessions and help assess its influence on conformity. A low reported level of importance should raise concerns for the leaders of the group that may decide to assign evaluators that are more critical or “devil’s advocates.”

Limitations

This study explored different states of anonymity across a broad spectrum of scenarios. However, social reality is extremely diverse, and as such, one could envision dozens of scenarios with different tradeoffs that could affect an individual's decision-making process. Moreover, while the population of Wikipedia editors may be expected to behave in a similar manner, the same cannot be necessarily assumed for other types of online communities. Wikipedia members share certain personality traits, such as openness, agreeableness and extroversion, crucial to participating in an online community (Amichai-Hamburger, Lamdan, Madiel, & Hayat, 2008).

Final words

Software development for online communities and collaborative social media projects such as Wikipedia (Kaplan & Haenlein, 2010) is rapidly advancing and breaking new ground. Just a decade ago, the level of communication provided by online services was significantly more limited, not to mention that the idea of a free, user-generated encyclopedia was brand new. Yet, as the development of these services grew, research about online user interaction was and still remains limited. Issues such as the ones addressed in this study – groupthink and anonymity – affect online communities worldwide and the choices software engineers make affect decision-making processes. While it is important that innovation not be limited, one must still ask if software design is the product of educated guesses or evidence-based choices. Without empirical studies that probe the still largely uncharted realm of user interactions, software development for online communities may unwittingly create new victims of groupthink. This scenario represents a paradox because the choice for a community to go online is often made to connect people who are socially marginalized or geographically isolated (Papadakis, 2003) and to improve communication among its members. Therefore, considerations such as providing anonymity are not trivial choices but rather an important link in the chain of a community that could either make

it or break it.

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