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**ABSTRACT**

In this paper, we describe the formatting guidelines for ACM SIG Proceedings.

**Categories and Subject Descriptors**

D.3.3 [**Programming Languages**]: Language Contructs and Features – *abstract data types, polymorphism, control structures.* This is just an example, please use the correct category and subject descriptors for your submission*.* The ACM Computing Classification Scheme: <http://www.acm.org/class/1998/>

**General Terms**

Design, Human Factors

**Keywords**

Keywords are your own designated keywords.

# INTRODUCTION

The proceedings are the records of the conference. ACM hopes to give these conference by-products a single, high-quality appearance. To do this, we ask that authors follow some simple guidelines. In essence, we ask you to make your paper look exactly like this document. The easiest way to do this is simply to down-load a template from [2], and replace the content with your own material.

# RELATED WORK

Several research domains have emerged that focus on social networking.

## General Research into Social Networks

Social networking sites, such as Facebook, Twitter, and MySpace, have changed the landscape of interpersonal communication over recent years. Pempek et al. [Pempek] cited 2006 statistics from Wiley and Sisson that found that 91% of Midwest US university students polled in a study are Facebook users. Fogel and Nehmad confirm this finding as well [Fogel and Hehmad]. This staggering majority corresponds to another study in Pempek et al. [Pempek] finding that college students use Facebook for 10 to 30 minutes daily. As a result of these tendencies, psychologists remind us that identity challenges are often addressed through self-disclosure and that the Internet’s pervasive use by today’s use may exercise a profound influence on cognitive development through the peer feedback provided via social networking [Pempek]. Due to proliferate use of social networking, several security issues arise. Based on questionnaires of college students, these can be categorized broadly as discussed by Fogel and Nehmad [Fogel and Nehmad] as follows:

* *Risks –* college students utilizing social networking sites tend to engage in riskier behaviors correlating to a statistically significant p-value of 0.046.
* *Trust –* mean scores of Facebook and MySpace users indicated that consumers of these sites placed a high level of trustworthiness in social network providers.
* *Privacy –* mean scores were statistically significant when testing if information disclosure on social networking sites was less important than through other media. In other words, users were less apprehensive about sharing information about themselves through social networking sites.

These findings are indicative of a lack of concern in general with regards to security and privacy online. David Rosenblum [Rosenblum] discusses such presumptions of privacy and their inherent risks as follows:

* *Online Intimacy –* users believe that marginal anonymity is provided by the virtual nature of online disclosure, which can act as a cloak over a person’s actual identity.
* *Privacy Redefined –* although social networking sites frequently share private information, users still unwittingly believe that online communications are private.
* *Blurring the Public/Private Line –* Net generation is engulfed in self-voyeurism online and often define themselves through online identities that portray questionable behaviors.
* *Hybrid Nature of Net Culture –* users of social networking sites often fail to correlate that online actions and speech can have profound effects and ramifications in the real world.

These assertions can be summarized broadly into risks that proliferate social networks. Internally, Net speech and broad dissemination of information virtually eliminates privacy and anonymity on the Net. Externally, many social networking sites are sharing information with third parties, such as advertisers, potential employers, and even deviant predators, which further degrade any perception of privacy. The existence of such risks places privacy as a top concern with regards to social networking.

## User Behavior on Social Networks

Research into behavior of social networking users has yielded some additional concerns with regards to privacy and security. In a 2010 study of Facebook users, Reynolds et al. [Reynolds et al.] were able to discern several anomalies with regards to online behavior and privacy. They partially confirmed that online behavior does not coincide with privacy beliefs. Privacy concerns vary among different demographics, whereby young adults tend to be less concerned with privacy and change their privacy settings less frequently than older populations. Furthermore, gender also impacted privacy, where females tended to be more concerned with privacy when compared to their male counterparts. Additional studies conducted by Stutzman and Kramer-Duffield [Stutzman and Kramer-Duffield] analyzed friend networks as a means of enhancing privacy and compared the intended audience to the expected audience. The resulting expectancy violations found that the tendency to set privacy settings to friends only did not always yield results congruent with users’ expectations. Additionally, several authors have discussed the tendency of user’s to regret posts made to social networking sites, such as Facebook [Wang et al.]. The findings of Wang et al. found that regretful posts were made as a result of several issues. These included unintended audience, unforeseen consequences, unfamiliarity with technology, usability issues with social networking site, etc. Furthermore, they found that users responded to posting information that was later regretted utilizing several mechanisms, including: establishing rules for sharing, censoring, delaying posting of information, apologizing, deleting regretful information, establishing multiple accounts, or listening to the advice of friends and/or family. Such adjustments of posting behavior are confirmed by the GitHub studies conducted by Dabbish et al. [Dabbish et al.], whereby transparency of coding behavior raised the awareness of users’ behavior within a repository. In short, research suggests that online behavior is strongly related to privacy and that there is a blatant disconnect between user perceptions and actual privacy.

## Privacy Policies in Social Networks

The determination of the appropriate privacy policies in any software system is an active area of research, which has unique implications in the realm of social networking. This task is difficult due to the large proportion of unique privacy preferences across a vast user base that encompasses facets from all realms of society. Therefore, some research suggests that mechanisms be implemented to assist users in setting the appropriate privacy policies with regards to their social networks. Ravichandran et al. [Ravichandran et al.] devised a system to help users choose the appropriate privacy policy, which was centered about machine learning techniques. Even with such complex algorithms, ascertaining the desired policy was not feasible and urged researchers to focus on the inclusion of more appropriate default policies. Unfortunately, the default privacy settings, such as those provided by Facebook, do not align well with users expectations of privacy. A study conducted by Liu et al. [Liu et al.] revealed that default policies on Facebook shared photos with people who the user did not wish to share such photos with. This overly permissive policy resulted in a mismatch of 63% with regards to who users expected to share their photos with and who actually had access to them.

Due to the rampant failure of social networking privacy policies, some researchers have evaluated alternative techniques geared towards mitigating the risk of information leakage. For example, Danezis [Danezis] argues that the labeling privacy in social networking sites utilizing traditional privacy policies is both unusable and inapplicable due to the frequency of communication and lack of consistent context. Instead, he proposes to extract meaningful social contexts utilizing an algorithm that pulls contexts from basic information. Although results are promising, they are prone to low user acceptance ratings that may make implementation of such a system difficult. Another novel approach to addressing privacy concerns in social networks is discussed by Singh, Bloha, and Lee [Singh, Bloha, and Lee] with regards to their XBook platform. XBook focuses on the eliminating the leakage of data to third party application providers, which has been a source of numerous security issues in social networks. XBook does not hinder the ability of a user to utilize applications within sites, such as Facebook, but rather it retains the anonymity of the user. Although this system offers further privacy protection to users, it still requires the user to make a decision about whether or not to trust the application provider. Since these trust decisions are made based on experience and knowledge, novice users may fall still unwittingly reveal private information. Although many such solutions exists that attempt to designate the appropriate privacy in social networks, none are a complete fix to this complex problem.

## Privacy and Grouping

# METHODOLOGY

We recruited 10 users to participate in a weeklong diary study designed to surface instances where participants self-censored their facebook posts. We instructed our participants to report any content that they thought about sharing on Facebook but decided not to, which we referred to as “unshared content.” At the end of the diary study, we invited qualifying participants to a semi-structured interview where we could discuss their unshared content in more detail. At the time of this paper, 6 out of the 10 participants took part in the interview stage, and will be included in the reported data set. We coded all data according to a set of heuristics presented in [Table 1/Appendix 1], and we evaluated these using a combination of qualitative and quantitative analyses. We explain each step in more detail in the coming subsections.

## Participant Recruitment & Demographics

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Symposium On Usable Privacy and Security (SOUPS) 2012, July 11-13, 2012, Washington, DC, USA.

Participants were solicited from a campus participant pool website and flyers posted around the Carnegie Mellon University campus. Solicited participants were directed to an online screening questionnaire. Our screening criteria for participants included: high English proficiency, a minimum age of 18, at least 6 months of Facebook use; frequent Facebook usage defined by sharing content on Facebook more than once per week, the ability to send and receive text messages, and having frequently held back content - defined by not sharing at least 3 pieces of content that the participant thought about sharing at some point.

The 6 participants who completed the full study ranged in age from x to x (mean: x, sd: x) and were predominantly undergraduate students (5 out of 6). There was 1 male and 5 females.. Participants were appropriately compensated for their contributions to the study.

## Diary Study

The diary study lasted 7 days. During this time participants were prompted to send an SMS text message to a pre-determined phone number with a short description of any unshared content they thought about during the day, following an approach described in [1]. This approach enables users to contribute to the diary study without requiring them to carry around a notebook or spend very much time in the moment that the event occurs.

Every night, participants were sent an email with a link to a questionnaire with a set of questions about each SMS message they sent during the previous day. The nightly questionnaire afforded participants a medium to provide finer grained descriptions about the context behind the unshared content and their rationale for not posting the content on Facebook. Further, participants were prompted with a question about groups of people with whom they especially would have liked to share the content and another question about people with whom they especially did not want to share the content. These questions were open ended, which allowed participants to either name specific friends, or define their own notions of what subset of their “friends” constituted a “group” of people without introducing experimenter bias.

If participants did not report any unshared content during the day, the nightly questionnaire web interface allowed them to dynamically add unshared content to the list. This option was provided so that participants were not bound by the SMS messaging system.

To ensure a baseline level of effort to complete nightly questionnaires and to minimize the incentive of participants to fabricate data, participants who did not report any unshared content were given the opportunity to complete a nightly survey if they filled out one of two auxiliary questionnaires. The first questionnaire was designed for participants who did not have any unshared content that day, but still shared content on Facebook. The survey prompted these participants to explain the content they shared on Facebook. The second questionnaire was designed for participants who simply did not use Facebook at all that day. The survey prompted these participants to explain why they did not use Facebook that day. All three nightly questionnaires are provided in Appendix X.

The SMS/nightly questionnaire system was implemented for several reasons. The first reason is that users may think of unshared content at any time during the day. We wanted to capture these moments as they occurred without requiring participants to carry around additional materials, such as a notebook, as is often done in a diary study., and SMS offered us an instantaneous, ubiquitous medium to do so. A second reason was effort offloading. We wanted to allow participants to provide us detailed information at a comfortable time to ensure high quality responses. The SMS system allowed participants to offer a quick “digest” of the unshared content if they were busy, and return to it at a less busy time of the day to provide more detailed information. Finally, SMS messaging systems are generally cheap for both developers and users. Most college students have cell phones with SMS messaging enabled, and there are many SMS messaging services (e.g. [2]) that make receiving SMS messages trivial. On the other hand, many college students still do not have data plans, which would be required for a mobile based web interface in any location without WiFi access.

## Semi-Structured Interview

Participants who completed at least 4 of the 7 nightly questionnaires qualified for a final interview upon completion of the diary study. We choose to follow a semi-structured approach for our interview. This approach allowed us to have captured similar types of data across all of the interviews while maintaining the flexibility explore the variety of different diary study entries reported by our participants. The set of questions that comprise the high-level outline of the interview is provided in Appendix X.

The interviews each lasted approximately one hour and occurred on the CMU campus. In each interview one researcher asked all of the questions and interacted with the participant, while a second researcher took high-level notes of the questions asked and resulting dialogue. Additionally, we audio-recorded all interviews using a microphone.

At the highest level, we designed the interviews to surface the underlying motivations buttressing participants’ Facebook sharing patterns, with a specific emphasis on the naturally emerging groups that participants think about when discussing their sharing habits. The focus of the interview was to understand the connections between the natural way participants grouped their interpersonal relationships, what the important factors of sharing decisions were, and the types of content they thought appropriate for these different groupings.

Prior to launching our study we piloted it with two participants. This pilot study allowed us to refine our nightly surveys, test and debug our technical infrastructure, and ensure that our interview protocol could provide sufficient insight into participants’ posts. Based on the pilot results we updated our surveys and fixed a variety of technical bugs.

## Data Cleaning

[[Meta: Talk about how the data was coded and cleaned. I can’t talk about this yet since we have done any of it.]]

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## Data Analysis

[[Meta: Talk about how the data was analyzed (regression, heuristic evaluation, whatever qualitative analysis we use – grounded theory?]]

## Page Numbering, Headers and Footers

Do not include headers, footers or page numbers in your submission. These will be added when the publications are assembled.

# FINDINGS

As described in the Methodology section, we coded each piece of unshared content according to several high-level categories that emerged from the data based on why the participant would want to share the post and why the participant would not want to share the post. We also found that participants thought about the groups of people who should and should not be able to view such content at various levels, including specific groups of people (e.g. a set of close friends), people with specific features (e.g. classmates), and more ambiguous people who might relate or not relate to the content (e.g. people who felt the same way as them or people who might criticize them).

## Why not share?

The posts that we collected in this study were specifically posts that participants thought about sharing and decided not to share, so an important factor to examine was why the participant decided not to post. Participants gave a variety of answers that fell into several broad categories: avoiding unnecessary overload or appearing boring, avoiding offending others, avoiding negativity, believing that not everyone would understand the post, being afraid of potential criticism, and feeling that posting would require too much effort.

### Avoiding unnecessary overload or appearing boring

The primary reason our participants reported not sharing a pieces of content was that they thought the content was not interesting enough for their friends to read and that they did not want to "clog up their news feed". \_\_ of \_\_ participants cited this as a reason for not posting, and in total \_\_ out of \_\_ posts were not shared for this reason [[TODO: should have a table with these numbers for all of the codes]]. Participants often seemed sensitive to both the quality and the quantity of the posts that they were sharing, suggesting that this factor was closely tied to the desire to maintain a certain image on Facebook (as suggested by [NEED CITE]).

For example, P14 considered posting an economics article she found funny but decided against it both because the article was too long and because she had posted too much content already. Several other participants decided not to post what they considered relatively minor updates from their daily lives, such as a picture of food or posts related to finals stress. For example, P7 considered posting a status updated about “"need to ptfo already. This week neeeeeeeeds to end! " but decided that “[she] felt it was just unnecessary to post.”

### Avoiding Being Offensive

Many of our participants reported that they did not want their posts to offend or anger anybody. As [CITE] found, such participants were managing their content for multiple audiences. In particular, posts that discussed religion or politics were likely candidates for this category of self-censorship. For example, P8 said that he wanted to avoid angering people by only sharing political content with people with similar views; however, he also wanted to fairly represent both sides of argument.

### Avoiding Negativity

We performed the study immediately prior to finals and the majority of our participants were students, a great deal of the unshared content related to stress or frustration. Some participants expressed a general desire to be upbeat or happy in their Facebook posts. were afraid that being negative might reflect poorly on them, reflecting [CITE – d boyd?]’s finding that social network users manage an outward image. Others were concerned about adding more angry energy to people that were already unhappy. P13, for example, thought about posting “Want to sleep.... So badly.... ,“ but decided not to because she didn’t want to further stress out other students.

### Believing the post might be misunderstood

As in verbal interactions, participants felt that some posts might not make sense absent specific contextual information or were based on a particular event or incident that did not lend well to broader sharing. In some cases, participants were afraid of the different ways readers might misinterpret a post without contextual information. For example, P14 thought about posting “double fisting in the morning!” in reference to holding a latte and a cup of water at the same time, but decided not to share because the reference might be misinterpreted. In some cases, participants had specific friends who they felt were "a part of the joke" but believed that a broader audience would not understand.

### Being afraid of criticism

Several of our participants described social pressures, and, specifically the potential for negative feedback kept them from posting. For example, P13 considered posting “Tetris is ruining my life,” but decided not to because she was concerned that she would be criticized for not studying. P8 decided not to post because he was afraind that his friends would find it “lame” [IS THIS AN ACTUAL QUOTE?].

### Feeling it required too much effort

Some participants felt that it was not worth the effort required to post, either because circumstances made it more difficult to post or because the post had trivial payoff. In one case, P14 was going to post about a product that she saw on a sale website, but realized that the sale site would change, so she could not just post the link to the site. Even though she thought the product was cool and that other friends would find it cool, she didn't want to bother to track down a link for the product, so she forgot about it. Other participants decided not to post because they were too tired or because they did not have a laptop convenient.

## Who to Share With

We found that the people users specifically wanted to share with, and didn't want to share with also fell into several broad groups and tended to cluster by category of reasons for wanting to share or not share. These groups tended to either be small, carefully defined groups (e.g. family, small set of close friends), broad, clearly defined groups (e.g. organizations), or loosely defined groups characterized by behavioral attributes (e.g. "people who feel the same way as I do").

# DISCUSSION

This study both provided several potential insights for developing social network grouping tools and serves to inform a potential, future broader study on exploring how better grouping mechanims can be used to promote sharing on social networks.

Our results have several potential implications for developing social network grouping tools…

We also intended this study as a pilot for a potential broader study to better understand how we could improve grouping tools to promote sharing. Based on the results of this study we found that…

# CONCLUSION

# ACKNOWLEDGMENTS

Our thanks to ACM SIGCHI for allowing us to modify templates they had developed.

# REFERENCES

1. Joel Brandt, Noah Weiss, and Scott R. Klemmer. 2007. txt 4 l8r: lowering the burden for diary studies under mobile conditions. In CHI '07 extended abstracts on Human factors in computing systems (CHI EA '07).
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Columns on Last Page Should Be Made As Close As Possible to Equal Length