Photo Sharing of the Subject, by the Owner, for the Viewer – Examining the Subject's Preference

Auk Kim
Korea Advanced Institute of Science and Technology
Daejeon, South Korea, 305-701
kimauk@kaist.ac.kr

Gahgene Gweon
Korea Advanced Institute of Science and Technology
Daejeon, South Korea, 305-701
ggweon@kaist.ac.kr

ABSTRACT
Photo sharing activities on social networking sites concern not only the person sharing the information (owner) and the person receiving the information (viewer) but also the person who is in the photo (subject). In our exploratory lab study, we asked 29 participants about their comfort level in allowing a photo owner to share a picture containing both the participant (subject) and the owner. Our results show that the photo subject feels more comfortable in sharing a photo when i) the "closeness between the subject and the owner (SO closeness)" is higher, and ii) the "closeness between the subject and the viewer (SV closeness)" is higher. In addition, we observed that both SV and SO closeness are important in determining the subject's picture sharing preference level.

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Information sharing preference; closeness

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H.5.m [Information Interfaces and Presentation]: MISCELLANEOUS

INTRODUCTION

Photo sharing helps create and maintain social relationships, and is becoming part of our daily lives [1, 9]. For example, in Facebook, 25 million photos are uploaded and shared between Facebook users every day [5]. Additionally, many other social networking services (SNS) are incorporating photo-sharing features, allowing users to instantly broadcast daily activities and interests. However, some of these photos are undesirable digital traces. While many people spend time uploading and tagging photos that are taken with others, many others spend time un-tagging some of those photos [1]. There appears to be a gap between the sharing preferences of a person who uploads a photo ("owner") and the person in the photo ("subject").

Such a gap between a photo owner and a subject exists, because a photo uploaded by the owner reveals information about both the owner and the subject in the photo, but the owner and the subject may have different photo sharing preferences depending on who the "viewer" is. Figure 1 shows the relationship between the three parties involved. In our paper, we study interpersonal relationships between each party involved, in terms of closeness, and examine how the strength of interpersonal relationships affects the photo sharing preference of the subject. We will refer to the level of closeness between photo subject and photo owner as "subject-owner (SO) closeness" and to the level of closeness between photo subject and photo viewer as "subject-viewer (SV) closeness". Note that although our study examines the effect of closeness on the photo sharing preference, other variables such as the nature of an event (e.g. drinking event) or the characteristics of the parties involved (e.g. ex-girlfriend) are also important. In our study, we carefully selected images with neutralized content to minimize the impact of these other variables. As shown in Figure 1, the pictures shown in the study were taken in an office environment, and the two people in the picture are standing next to each other, facing the camera.

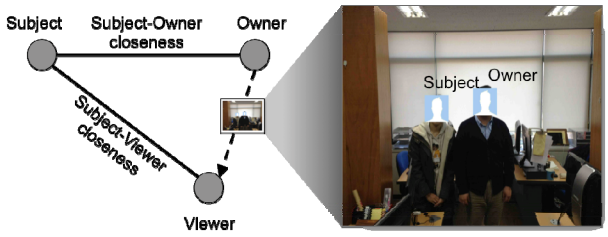

Figure 1. Three types of parties involved in sharing a picture

The effect of strength of interpersonal relationships on information sharing preferences has been demonstrated in previous research [3, 10]. For example, Wiese and his colleagues have examined how tie strength, expressed as closeness, relates to a person's willingness to share information [10]. Insights from such research on how social relationships affect sharing preferences can be used to inform policies for managing photos / information on diverse SNS systems. However, although researchers have examined the relationship between the information sharer (owner) and the receiver (viewer) and how the relationship affects their information sharing preference, the preference of the *subject* in the picture has not been discussed extensively. Therefore, in this paper, we examine the photo subject's information

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sharing preferences, a topic that has received little attention thus far.

The remainder of this paper is organized as follows. We begin by introducing three research questions that deal with two types of closeness influencing a subject's photo sharing preferences. In the next sections, we present the details of our study. Then the results and discussion about the study are presented, followed by the conclusion.

RESEARCH QUESTIONS ON CLOSENESS AND PHOTO SHARING PREFERENCE

In this section, three research questions on closeness with respect to a photo subject and his photo sharing preferences are discussed. Sharing one's own photo is, in a broader sense, an act of self-disclosure because photos contain information about the people in it. Research shows that the degree of self-disclosure in a relationship is affected by the strength of the relationship [4], which is measured by closeness in our study. In addition, research shows that the higher the relationship strength, the higher the trust [6, 7]. Similarly, Weise and his colleagues showed that a higher level of closeness is associated with a higher degree of willingness to share [10].

From a photo subject's perspective, these results suggest that if the degree of closeness between the subject and a photo viewer is high, then the probability of the subject's picture sharing preference with the viewer will be greater due to higher degree of self-disclosure and trust. Extending these results further, we hypothesize that if closeness between a subject and a viewer is already high, then the subject will be comfortable with a friend (owner) sharing a picture because in such a case the owner is just a medium for sharing. Therefore, we present our hypothesis as follows.

Hypothesis 1: If subject-viewer (SV) closeness increases, a subject's picture sharing preference for an owner to share their personal picture with a viewer will also increase.

Another type of closeness that we are interested in is the relationship between a photo subject and an owner (SO closeness), who shares their personal photo. The effect of this relationship on a subject's photo sharing preference can be inferred from previous work that shows when a person has a shared acquaintance, he is more trusting of that acquaintance [11]. In our study, that shared acquaintance is the owner. In addition, literature shows that even without any communication, seeing a person in an online group repeatedly can be a precursor to forming personal attachment [8]. This work suggests that having a common friend (owner) with a high degree of closeness increases the likelihood of seeing that friend's friend (viewer) online, for example, on the owner's Facebook timeline. Therefore, our second hypothesis is summarized as follows.

Hypothesis 2: If subject-owner (SO) closeness increases, a subject's picture sharing preference for an owner to share their personal picture with a viewer will also increase.

In addition to the independent effect of SV closeness and SO closeness on a photo subject's sharing preference, we hypothesize that there will be an interaction effect between the two types of closeness. More specifically, we hypothesize the following.

Hypothesis 3: As subject-viewer (SV) closeness increases, relationships with higher subject-owner (SO) closeness will have a stronger impact than relationships with lower SO closeness on a subject's picture sharing preference for an owner to share their personal picture with a viewer.

Partial support for our reasoning comes from previous research, which shows that people increasingly disclose their inner thoughts and feelings in greater frequency and depth and in a wider range of topics as relationships develop over time [1]. Therefore, we expect that if a photo subject feels close to both an owner and a viewer, the two types of closeness can have a synergy effect, similar to the increasing level of self-disclosure that develops over time.

THE EXPERIMENTAL STUDY

The goal of our study was to examine a person's (subject) picture sharing preferences when his friend (owner) shares a picture that shows both the subject and the owner, to a friend of the owner (viewer).

Participants

We recruited 29 participants by posting ads on a campus online community bulletin board. To participate in the study, a participant had to be a member of Facebook and have at least 70 Facebook friends. The average number of Facebook friends of participants was 435.1 (SD = 220.8). Fifteen participants were female, and fourteen were male. The average participant age was 22.8 (SD = 2.5).

Measurements

Closeness

Closeness measures the degree of intimacy in interpersonal relationships. As used in previous research by Weise and his colleagues [10], we asked our participants the following question: "How close do you feel to X?". Participants rated two groups of people. The first is a list of their Facebook friends (photo owner), and the second is a list of their Facebook friend's friends (photo viewers), who will view photos uploaded by photo owners. To rate photo owners, a Likert scale with five levels of closeness (1: very distant, 3: neither distant nor close, 5: very close) was used. For rating photo viewers, a scale of six levels of closeness ranging from 0 to 5 was used. A rating of "0: do not know" was added because the participant may not know the photo viewer.

Picture Sharing Preference

We also measured picture sharing preference, which is the degree of comfort level that a participant feels towards a photo sharing activity. We asked the participant, "How comfortable do you feel about <photo owner> sharing this picture with <photo viewer>?". We used a five level Likert

scale (1: definitely not comfortable, 3: no preference, 5: definitely comfortable) to measure the participant's comfort levels for photo disclosure.

Method

We conducted a laboratory study, which lasted about 60 – 90 minutes depending on how quickly the participants answered questions. After signing a consent form for the study, each participant was first asked to login to his Facebook account so that our system can have access to the participant's Facebook friends. Next, the participant answered a brief questionnaire consisting of background questions such as gender and age. The following three steps describe the procedure used to collect our data.

Step 1. Rating Photo Owners in terms of Closeness and Generating a Photo Owner List

In step 1, a participant was asked to rate the closeness between him and his friend, who was selected randomly by our system from the participant's Facebook friends. This friend is the "photo owner" and the participant is the "photo subject" in our study. Since we wanted photo owners from all five levels of closeness, our system randomly selected a Facebook friend until it collected at least one photo owner friend per closeness category. For example, after rating five friends, if the participant rated friend #1 as closeness 2, friend #2 as closeness 3, friend #3 as closeness 5, friend #4 as closeness 1, and friend #5 as closeness 4, then this participant satisfied the requirement of having at least one friend in each closeness category. Therefore, the participant would be done with rating photo owners. However, after rating 5 friends, if the participant rated friend #1, #2, and #3 as closeness 3, and friend #4, and #5 as closeness 1, then the participant has to keep rating friends until he satisfied our requirement. On an average, a participant rated forty Facebook friends before satisfying our requirement, and took about twenty minutes to complete this task. Once the participant satisfied the requirement of having at least one photo owner friend per closeness category, we randomly selected one person from each closeness category to generate a "photo owner list" for each subject.

Step 2. Rating Photo Viewers in terms of Closeness and Generating a Photo Viewer List

Next, the participant was asked to rate a photo owner's randomly selected Facebook friend (photo viewer) in terms of closeness. As in step 1, the system presented a photo viewer until the participant identified at least one viewer for each of the six closeness categories for the selected owner from the photo owner list. Once the participant satisfied this requirement, we randomly selected one person from each closeness category to generate a "photo viewer list". This list consists of thirty viewers (five photo owners * six closeness levels). On an average, the participant rated 22 Facebook users before identifying at least one user per category.

Step 3. Rating the Picture Sharing Preference

In this step, we asked a participant to indicate their comfort level towards a photo owner's act of sharing a picture. In addition to the question, a modified version of the photo shown in Figure 1 was presented. The participant/ subject and the owner's faces shown in the photo were replaced with their Facebook profile images. We told the participant that the photo was taken from an event for the owner, e.g. owner's birthday.

RESULTS AND DISCUSSION

We conducted a mixed model analysis of variance (multi-level model) predicting picture sharing preference as the outcome variable. Each column in table 1 shows the five regression models predicting the sharing preferences using a different set of predictors. Because we had 30 ratings per participant, we included the participant in all five models as a random effect to control for non-independence of the data.

n = 870	**Sharing preference, M = 3.44 (1.17)**				
age		-0.09*	-0.10*	-0.10*	-0.10*
gender = male		-0.22			
SV closeness			0.30**		0.20**
SO closeness				0.28**	0.19**
SV x SO close					0.04**
Intercept	3.44**	5.63**	4.87**	4.79**	4.30**
Conditional R^2	0.18	0.18	0.38	0.30	0.51
Model name	User	Age	Viewer	Owner	All

Table 1. Multi-level Regression models sharing preference, controlling for each participant. The data in each cell are non-standardized β, except for last row which is conditional R^2. Significance: *p<0.05; **p<0.001

The second column (model name = User, $R^2 = 0.18$) shows a model that only has the effect of the participant, which accounts for individual differences. Data shows that 18% of variance is due to individual differences. The third column (model name = Age, $R^2 = 0.18$) shows the participant-level effect of gender and age. Only the effect of age was statistically significant. Participants were less comfortable with an owner sharing photos as they get a year older (2% less preference in sharing per year, $\beta = -0.09$, $p < 0.01$). However, this result many not hold for the general population since our user population is limited in terms of age, ranging from 19 to 32. Given the significant effect of age from this model, we included age as a fixed effect for the rest of the models.

Next, we examined how well the two different closeness types (SV and SO) predicted the picture sharing preference as stated in hypotheses 1 and 2. For hypothesis 1, as hypothesized, the effect of SV closeness on picture sharing preference was statistically significant. The fourth column of table 1 (model name = Viewer, $R^2 = 0.38$) shows that subjects feel more comfortable when their personal photos are shared by an owner whom they are closer to ($\beta = 0.30$, $p < 0.01$). A one-point gain in SO closeness accounts for a 6% increase in sharing preference. Similarly, for RQ2, the effect

of SO closeness on picture sharing preference was statistically significant. The fifth column of table 1 (model name = Owner, $R^2 = 0.30$) shows that a one-point gain in SO closeness accounts for a 5.6% increase in sharing preference ($\beta = 0.28$, $p < 0.01$).

When comparing the conditional R^2 values of the viewer and the owner models, one can see that SV closeness is a better predictor than SO closeness when explaining a subject's picture sharing preference. This result is not surprising, because SV closeness is a direct measure of relationship strength between a subject and a viewer and the owner acts like a medium for sharing a photo. However, although SO closeness is a more indirect measure compared to SV closeness, it still explains much of the variance ($R^2 = 0.30$) and is potentially a useful measure. Furthermore, the beta coefficients associated with the two predictors are similar ($\beta = 0.30$ vs. 0.28), thus suggesting that both types of closeness can account for changes in picture sharing preference at a similar level.

For hypothesis 3, we wanted to examine the relationship between SV closeness and SO closeness in a subject's picture sharing preference. The last column of table 1 (model name = All, R^2=0.51) shows a model that uses SV closeness, SO closeness, and the interaction of these two types of closeness. Our data shows that in addition to SV closeness and SO closeness, the interaction between the two is also significant. Namely, the effect of SV closeness on the picture sharing preference of a subject is greater for relationships that have higher SO closeness than for relationships with lower SO closeness ($\beta = 0.04$, $p < 0.01$). In this model, the beta coefficients for SV closeness and SO closeness are similar in value (0.20 and 0.19 respectively), suggesting that they are both important factors in predicting a subject's picture sharing preference. In addition, the model that uses both SV closeness and SO closeness as predictors (R^2=0.51) is better than a model that uses only one of the closeness types (R^2=0.30 or 0.38).

CONCLUSION

As support for photo sharing activities increases in SNS systems, privacy concerns emerge as well. This paper presents our preliminary study on a photo *subject*'s sharing preferences. Our results show that the photo subject feels more comfortable in sharing a photo when i) the SV closeness is higher, and ii) the SO closeness is higher. In addition, we observed that both SV and SO closeness are important in determining the subject's picture sharing preference level.

Currently, most SNS systems allow photo owners to post pictures to viewers and leave the photo subject's picture sharing preference at the total discretion of the owners. Results from our study can be used in supplementing these SNS systems so that the photo sharing preferences are recommended automatically or semi-automatically. However, our main findings on SV and SO closeness on the photo sharing preference may not hold when additional factors, which were controlled for in this study, are considered. For example, although SV closeness may be high between family members, if the event in which the photo was taken is not neutral in nature (e.g. drinking event), the sharing preference may not be as high as what's predicted from our study. Nevertheless, by examining a photo subject's sharing preference in a neutral setting, our study presents a first step towards improving the experience of sharing. Another limitation of our study is that the data used in the study are self-reported, and thus some of the answers may not be as accurate as hard data. In addition, the study results may not generalize, given that our user population is limited in terms of demographics, such as age and background diversity. As a next step, we plan to explore more complex scenarios, such as how different types of pictures affect sharing preferences.

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