Facebook Apps and Tagging: The Trade-off Between Personal Privacy and Engaging with Friends

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The use of social network sites offers many potential social benefits, but also raises privacy concerns and challenges for users. The trade-off users have to make between using sites such as Facebook to connect with their friends versus protecting their personal privacy is not well understood. Furthermore, very little behavioral research has focused on how personal privacy concerns are related to information disclosures made by one's friends. Our survey study of 116 Facebook users shows that engaging with friends through tagging activity and third-party application use is associated with higher levels of personal Facebook usage and a stronger emotional attachment to Facebook. However, users who have high levels of personal privacy concern and perceive a lack of effectiveness in Facebook's privacy policies tend to engage less frequently in tagging and app activities with friends, respectively. Our model and results explore illustrate the complexity of the trade-off between privacy concerns, engaging with friends through tagging and apps, and Facebook usage.

Introduction

We constantly strive to maintain a balance between how we protect ourselves and how we connect with others. It is no secret that we have to divulge some personal information about ourselves in order to forge deeper relationships with others (Petronio, 2002). However, once this personal information is shared with others, it becomes co-owned information that requires coordination between the co-owners, so as to not break with social norms or violate privacy boundaries (Child, Pearson, & Petronio, 2009; Petronio, 2002). Yet, this coordination requires trust and discretion between individuals (Altman, 1975; Petronio, 2002), which is often not facilitated through the use of social networking sites (SNSs). SNS research has shown that confidant disclosures, or personal information disclosed by one's friends, is a privacy concern for many SNS users (Wisniewski, Lipford, & Wilson, 2011). For example, information provided by one's Facebook friends affect the impressions that other people form about an individual's credibility and social attractiveness (Walther, Van Der Heide, Kim, Westerman, & Tong, 2008). However, very little research has focused on privacy from the unique perspective of confidant disclosures through friends (Lampinen, Lehtinen, Lehmuskallio, & Tamminen, 2011; Wisniewski, Lipford, & Wilson, 2012); most SNS privacy research has focused predominantly on privacy as information disclosure decisions made by an individual (Stern &

Kumar, 2014; Stutzman, Gross, & Acquisti, 2012; Stutzman, Vitak, Ellison, Gray, & Lampe, 2012; Tufekci, 2008). Therefore, our research focuses on the understudied area of confidant disclosures and how they are related to an individual's personal privacy concerns and SNS usage.

In this article, we examine two prominent Facebook features that promote confidant disclosures: tagging and third-party applications (apps). We focus on tagging and apps because of their widespread use and how they increase "incidental" (Stutzman, Gross et al., 2012) and sometimes thoughtless sharing about friends. Tagging is very prevalent on Facebook; for example, approximately 95% of Facebook users have been tagged in photos, and tagging is most often done by one's friends (as opposed to oneself) (Goldman, 2010). Furthermore, there are over 10 million Facebook apps (Smith, 2013), and it is estimated that one in four Facebook users use apps to play games with their friends (Blasiola, 2013).

Given the popularity of tagging and apps, we would like to further explain how they both facilitate confidant disclosures. Tagging someone on Facebook creates a link between a post or photo uploaded by one individual to the tagged person's Facebook Timeline and News Feed, thereby sharing the tagged information with all of that person's friends. By default, tagged posts and photos do not require a tagged user's permission before sharing with his friends. However, users are able to customize their privacy settings to disable tagging or require tag review. Apps, on the other hand, are created by third-party application developers and run on the Facebook platform to seamlessly provide additional functionality within Facebook. Given user permission when installing an app, apps can access and modify a user's profile information and post on behalf of the user. Apps can also access information from a user's "friends'" Facebook profiles. Facebook users may not realize that, even if they do not use a Facebook app themselves, their friends are able to share pieces of their profile information without their expressed consent (Figure 1). Users can change their privacy

settings so that friends' apps cannot access their personal information, but as with tagging, these types of confidant disclosures are enabled by default. Therefore, with no intervention by the user, this means that friends are automatically given autonomy over various types of personal information that a user may or may not want them to share with others.

The widespread use of tagging and apps, their ability to promote incidental sharing by friends, and the lack of current research regarding confidant disclosure privacy within SNSs make our work a unique contribution to SNS privacy literature. Through a survey study of 116 Facebook users, we explore some of the complex relationships between aspects of privacy, engaging with friends through tagging and apps, and Facebook usage. By doing so, we enhance our understanding of the trade-offs Facebook users make between using Facebook to engage with their friends through these interactive features and protecting their personal privacy. We are also able to discuss some of the key differences in users' perceptions about the privacy implications associated with tagging and app engagement on Facebook.

Background

Facebook Tagging

We define tagging engagement on Facebook as the act of tagging oneself and one's friends in photos or posts, as well as being tagged by friends in photos or posts. Much of the research on Facebook tagging has specifically explored photo tagging. For instance, Burke et al. studied photo tagging as one type of "directed communication," in which a user directly interacts with one of his friends. Their research suggests that directed communication (including, but not limited to, photo tagging) is associated with higher levels of bonding social capital, emotional support of close friends, and lower levels of loneliness (Burke, Marlow, & Lento, 2010). Social capital is defined as the resources and benefits gained through one's social networks, and bonding social capital specifically refers to the benefits garnered through intimate relationships, such as those with actual friends and family (Ellison, Steinfield, & Lampe, 2007; Williams, 2006). Ballam and Fullwood suggest that tagging functions as a means to decrease social distance and "act[s] as a physical manifestations of the links between people," but untagging oneself in photos serves as a way to maintain personal privacy boundaries and control impression management (Ballam & Fullwood, 2010, p. 397). This research highlights the potential benefits from engaging with one's friends through tagging while balancing privacy trade-offs. The remaining literature on tagging, however, focuses on the privacy implications of photo tagging. For example,

Besmer and Lipford (2010a) explored the privacy implications and social tensions of photo tagging on Facebook. They found that users had a sense of helplessness with their friends posting and tagging photos of them, some of which they might not want on the Internet. But, their desires for photo sharing outweighed these concerns. Pesce, Casas,
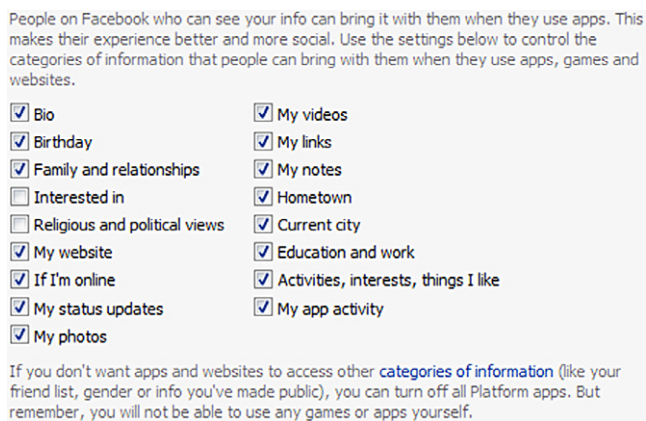

People on Facebook who can see your info can bring it with them when they use apps. This makes their experience better and more social. Use the settings below to control the categories of information that people can bring with them when they use apps, games and websites.

☑ Bio ☑ My videos
☑ Birthday ☑ My links
☑ Family and relationships ☑ My notes
☐ Interested in ☑ Hometown
☐ Religious and political views ☑ Current city
☑ My website ☑ Education and work
☑ If I'm online ☑ Activities, interests, things I like
☑ My status updates ☑ My app activity
☑ My photos

If you don't want apps and websites to access other categories of information (like your friend list, gender or info you've made public), you can turn off all Platform apps. But remember, you will not be able to use any games or apps yourself.

FIG. 1. Facebook privacy setting for "apps others use." [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

Rauber, and Almeida (2012) demonstrated the privacy implications of activities such as photo tagging, which can be used to harvest sensitive information for malicious intent. Using inference algorithms on photo tagging activity from 664 participants, they were able to accurately predict certain user attributes, including gender, current country, and current city. The filtering done by photo tagging made prediction even stronger—and therefore the privacy risk even greater—in attributes that evolve over time, such as music, books, political views, and favorite teams (Pesce et al., 2012). Conversely, though, Klemperer et al. (2012) found that photo tags could be used to automatically create reasonable photo privacy settings for users to improve their photo privacy. A common theme within this research has been the privacy implications associated with photo tagging.

Very little research has examined how engaging in tagging with one's friends is related to an individual's privacy concerns or Facebook usage. We only found one study that focused specifically on the collaborative privacy management of photos by content owners and co-owners. Squicciarini, Xu, and Zhang (2011) developed a Facebook app that facilitated the joint management of co-owned photos. They had users login to a fake Facebook account to explore the features of the app and found that ease of use, usefulness, and likability of the app were significant factors in SNS users' intent to use the app in the future; however, privacy concern was not significantly related to any of the other factors in their model (Squicciarini et al., 2011). Instead of developing an app prototype for managing co-owned information, our study focuses on how SNS users' privacy concerns are related to their current tagging engagement with friends and SNS usage. We believe that our approach will help us better understand how privacy concerns are related to confidant disclosures of co-owned information.

Facebook Apps

We define app engagement on Facebook as adding apps shared by friends, playing game apps with friends, and suggesting apps to friends. Even though some Facebook apps are only for personal use, our definition emphasizes app engagement *with friends*. As with tagging, most of the research on apps has primarily emphasized the negative privacy implications instead of the social benefits of app usage. We could not find any studies that focused on the social benefits of using apps. However, we found a number of studies that focused on app privacy issues. For instance, King, Lampinen, and Smolen (2011) revealed that most users do not understand how apps work, what information they can access, or how they are authored and reviewed. Besmer and Lipford (2010b) found that this resulted in Facebook app users revealing more personal information than they desired to applications. Wang and her coauthors (Wang, Xu, & Grossklags, 2011; Wang, Grossklags, & Xu, 2013) have studied different privacy authorization dialog designs in order to understand users' privacy behaviors and perceptions when choosing to install Facebook apps.

One common theme across these studies is that they all focus on an individual's understanding of apps and his personal privacy decisions regarding app usage. These researchers do not focus on the often unintentional confidant disclosures made by friends who use apps. Additionally, they do not explore whether SNS users have a clear understanding of how their friends can share their personal information with third-party apps. We expand upon the current research in two ways: First, we study some of the potentially positive outcomes of app engagement on overall Facebook use; and second, we focus on the privacy implications associated with app engagement with friends.

SNS Privacy

The relationship between SNS use and privacy has historically been a complicated one, because the goal of connecting and sharing with friends seems to be at odds with the goal of protecting one's private information (Lipford, Wisniewski, Lampe, Kisselburgh, & Caine, 2012). Early Facebook research uncovered what has since been deemed the "privacy paradox," where Facebook users were highly concerned about their privacy, but they still chose to become members of SNSs and to disclose personal information about themselves within their networks (Acquisti & Gross, 2006). Since then, many researchers have embarked on a quest to unpack this privacy paradox (Barnes, 2006; Staddon, Huffaker, & Sedley, 2012; Stutzman & Kramer-Duffield, 2010; Stutzman, Vitak et al., 2012; Wisniewski, 2012; Young & Quan-Haase, 2009). Some researchers have attempted to explain why SNS users choose to disclose personal information despite privacy concerns by applying the "privacy calculus" framework, which suggests that users weigh the rational benefits of self-disclosure with the perceived risks (Krasnova & Veltri, 2010). Thus, SNS privacy researchers began exploring the relationship between privacy, self-disclosure, and positive social networking outcomes. For example, Ellison et al. found that the use of advanced privacy settings was positively correlated with higher levels of social capital (Ellison, Vitak, Steinfield, Gray, & Lampe, 2011). Stutzman, Vitak, et al. found that self-disclosure mediates the relationship between privacy attitudes and social capital and that privacy behaviors that facilitate self-disclosure can indirectly, but positively, influence social capital (Stutzman, Vitak et al., 2012).

The researchers who originally pointed out the apparent paradox between personal privacy attitudes and privacy behaviors published a 7-year longitudinal follow-up study, which uncovered that, though Facebook users are sharing less publically, they are disclosing more personal information within their social networks than ever before (Stutzman, Gross et al., 2012). Two of the main reasons they gave for the increased level of in-network sharing were that: (a) Facebook added third-party apps, which generated additional sharable content on behalf of users and through apps used by

one's friends; and (b) Facebook facilitated "incidental" (Schneier, 2010) sharing of personal information posted by one's friends through features such as photo and location tagging (Stutzman, Gross et al., 2012). Therefore, we believe that our research is a timely exploration of the privacy implications of Facebook tagging and app engagement with friends.

Based on our review of the extant literature, our research makes the following contributions to SNS privacy research. First, we create an integrative model that includes both tagging and app engagement with friends. Previous research tends to separate tagging and app behavior into two separate streams of research, which prevents any kind of comparative analysis. Second, our model examines tagging and app engagement with friends in relation to privacy and Facebook use. Past research focused solely on the privacy implications of tagging and apps, not on the potential relationship with overall Facebook usage. Third, by focusing on tagging and app engagement with friends, we extend privacy research beyond the individual level to incorporate the interactional aspects of privacy related to co-owned information shared between friends. Fourth, we examine all of these relationships in depth, within one cohesive model in order to facilitate a better understanding of the trade-offs that exists between personal privacy and engaging with friends on Facebook. Finally, we include a post-hoc analysis that delves into Facebook users' mental models of tagging and app privacy, as well as examining self-reported privacy behaviors related to tagging and apps. In the next section, we will discuss our research framework and introduce our hypotheses.

Research Framework

Figure 2 depicts the visual representation of our research model. In this section, we define each of the constructs in our model and justify our hypothesized relationships between these constructs. Eight hypotheses are developed, which portray the trade-offs Facebook users must make between maintaining their privacy and engaging with their friends through Facebook.

Intensity of Facebook Use

Facebook has become a pervasive means of social interaction and communication among adults. Quite a bit of research has linked Facebook usage to positive social outcomes, such as the generation of social capital (Ellison et al., 2007), increased self-esteem, and a heightened sense of well-being (Burke et al., 2010; Ellison, Steinfield, & Lampe, 2011). According to the Pew Internet & American Life Project, Facebook users "get more than they give" when participating on Facebook (Brenner, 2013). For example, an average of 12% of users tagged friends in photos, whereas 35% have themselves been tagged in a photo (Brenner, 2013). We are interested in how engaging with friends through tagging and apps is related to personal Facebook usage. Specifically, we define two dependent variables for intensity of Facebook use: (a) frequency of use: the amount of time an individual spends on Facebook (Ellison et al., 2007); and (b) emotional attachment to Facebook: an attitudinal measure of the emotional connection to Facebook and how enmeshed Facebook is with an individual's daily life (Ellison et al., 2007).

Engaging with Friends

Social networking is an interactional and interpersonal experience, and we believe that engaging with one's friends through Facebook should influence an individual's overall experience on Facebook. This general proposition can be supported through the concept of network effects, where an individual's benefit from using a product or service is exponentially increased when more users within a group also use that product or service (BusinessDictionary.com, 2013). When a Facebook user is more embedded in their Facebook community, we propose that this level of engagement can increase how frequently they use Facebook and how emotionally attached they are to Facebook. We examine two specific types of Facebook engagement with friends: tagging and apps.

Tagging is a popular and frequently used feature of Facebook. Individuals are often notified when they get tagged in a photo and subsequently log on to Facebook to review the
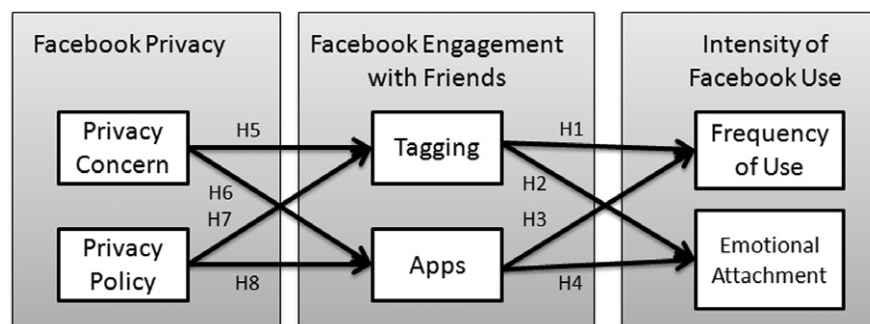

FIG. 2. Research model.

photo. As we mentioned earlier, Burke et al. classified photo tagging as a type of directed communication that was positively associated with bonding social capital and negatively associated with loneliness (Burke et al., 2010). Other research also found a significant and positive relationship between social capital and intensity of Facebook use (Ellison et al., 2007). We propose that higher levels of tagging engagement with friends will also be associated with higher levels of Facebook use and emotional attachment to Facebook. Though these hypotheses may seem obvious, we want to verify that alternative hypotheses are ruled out. For instance, an individual may be tagged frequently by his friends, but not spend much time on Facebook himself. Alternatively, the individual may use Facebook very frequently, but abstain from tagging.

H1: Higher levels of tagging engagement with friends will be associated with higher levels of Facebook usage.

H2: Higher levels of tagging engagement with friends will be associated with higher levels of emotional attachment to Facebook.

Similarly, when individuals engage directly with their friends through Facebook apps, for example, playing games such as "Words with Friends," this, too, should increase one's frequency of Facebook use and emotional attachment to Facebook:

H3: Higher levels of app engagement with friends will be associated with higher levels of Facebook usage.

H4: Higher levels of app engagement with friends will be associated with higher levels of emotional attachment to Facebook.

Privacy Concern

Privacy concern is defined as one's level of concern over loss of privacy as a result of information disclosure to Facebook (Xu, Dinev, Smith, & Hart, 2011). Past research suggests that privacy concern is negatively associated with how individuals engage on Facebook; individuals who had higher levels of privacy concern tend to visit Facebook, post photos or statuses, comment, and "Like" less frequently than those with lower levels of privacy concern (Staddon et al., 2012). However, they did not specifically study how privacy concern related to engaging with one's friends through tagging and apps. Because privacy concern has been linked to lower levels of other types of SNS engagement (Staddon et al., 2012), it follows that it would also be linked to lower levels of tagging and app engagement with friends. We believe that an individual's struggle to manage co-owned personal information when engaging with friends (Wisniewski, 2012) may inhibit their overall engagement with friends on Facebook. Individuals develop privacy linkage rules (Child et al., 2009) or strategies that help them manage who co-owns their personal information. If an individual has a heightened sense of privacy concern, they may be less likely to engage with their friends for fear that their personal privacy may be breached, even if unintentionally,

by others. Therefore, they may take measures, such as restricting access to this information from others (Child et al., 2009).

Although tagging can be a bonding experience, previous research has also shown that tagging can become a privacy issue. For example, people are often annoyed when others tag them in unflattering photos. This has become so much of an issue that some individuals feel they have to constantly monitor Facebook for unwanted tags and have even changed their offline behavior so as to not get captured in a compromising photo (Wisniewski, 2012; Wisniewski et al., 2012). In addition, research suggests that privacy concern is a predictor of privacy-related behavior (Buchanan, Paine, Joinson, & Reips, 2007), and if an individual's confidant disclosure boundaries are violated, he may cope with this breach by withdrawing from future social interactions (Wisniewski et al., 2012). Thus, we propose:

H5: Higher levels of privacy concern will be associated with lower levels of tagging engagement with friends.

H6: Higher levels of privacy concern will be associated with lower levels of app engagement with friends.

Privacy Policy

Another factor that may affect engaging with friends through Facebook is an individual's perceived effectiveness of Facebook's privacy policy, which is defined as a user's confidence that Facebook is acting in good faith to protect their personal information (Xu et al., 2011). According to Xu et al. (p. 805), "institutional privacy assurances" are the actions a company takes to instill confidence in consumers that they are taking appropriate measures to protect one's personal information (Xu et al., 2011, p. 805). They found that users' perceived effectiveness of privacy policy is positively associated with perceived privacy control and negatively associated with perceived privacy risk (Xu et al., 2011). Thus, we have included a measure for the perceived effectiveness of Facebook's privacy policy in our model. We argue that higher levels of perceived effectiveness of Facebook's privacy policy are associated with higher levels of Facebook engagement with friends. Alternatively, individuals who lack trust in the effectiveness of Facebook's privacy policy may engage less frequently with their friends on Facebook:

H7: Higher levels of perceived effectiveness of Facebook's privacy policy will be associated with higher levels of tagging engagement with friends.

H8: Higher levels of perceived effectiveness of Facebook's privacy policy will be associated with higher levels of app engagement with friends.

Methods

Recruitment

Participants were recruited in two ways. First, we recruited participants using snowball sampling (Babbie,

2004) through the Facebook and personal e-mail accounts of two first-year master's students associated with the project, asking their personal contacts to distribute the survey to individuals who were 18 years of age or older and had an active Facebook account. We intentionally did not seed the sample through the primary researchers' accounts to avoid drawing from a sample of privacy research peers. Second, we further recruited participants through an e-mail distribution list provided by our university's registrar. At this time, all new survey participants were given the option to be included in a drawing for one of twenty, $5 Starbucks gift cards.

Survey Measures

We used prevalidated measures to operationalize intensity of Facebook use and emotional attachment to Facebook (Ellison et al., 2007), privacy concern (Xu, Dinev, Smith, & Hart, 2008), and perceived effectiveness of Facebook's privacy policy (Xu et al., 2011). For frequency of use and emotional attachment to Facebook, we adapted a measure widely used in SNS research called Intensity of Facebook Use (FBI) (Ellison et al., 2007). The FBI is comprised of two subscales. The first subscale measures frequency of use based on the amount of time spent using Facebook. The second subscale reflects attitudinal measures of the extent to which a Facebook user has become emotionally connected to Facebook and has integrated Facebook into his daily life (Ellison et al., 2007). We chose to separate the subscales of the FBI based on an exploratory factor analysis of our data that demonstrated two separate dimensions of the FBI's respective items. We further confirmed these two subscales of the FBI through the analysis of discriminant validity (see Appendix A, Table A1).

We created our own measures for Facebook engagement with friends through tagging and apps. We asked participants, "How often do you perform the following activities on Facebook?" They were presented with options on a 5-point scale, ranging from 1 (*never*) to 5 (*every day*). We also captured contextual variables and other information regarding Facebook usage relevant to tagging and apps. Before launching the survey, we piloted our measures with a group of 26 computing students within our college. The final psychometric properties of our constructs are presented in Appendix B, Table A2.

Survey Procedure

Participants accessed the web-based survey through a hyperlink that brought them to Survey Share, an online survey platform. Before participating in the survey, participants were presented with a statement of informed consent and had to agree before continuing on to the main survey. Participants answered questions for each of the constructs outlined earlier, as well as questions regarding specific behaviors, privacy settings, and perceptions of tagging and apps. Initially, they answered these questions without looking at their Facebook profiles, so as to provide a baseline for their overall perceptions. In a later part of the survey, we asked them to log into their own Facebook accounts and report actual usage and privacy settings for their accounts. For instance, we asked participants how many Facebook friends they had or what specific permissions they allowed through their privacy settings. Participants were allowed to save their answers and finish the survey at a later date. The survey took participants an average of 27 minutes to complete, with a median time of 19 minutes.

Analysis

Data were analyzed using a second-generation causal modeling statistical technique; SmartPLS 2.0 was chosen because of the early stage of theoretical development. We first tested the measurement model to assess the construct validity of our measures by examining the convergent validity and discriminant validity of our measures. Then, we tested the structural model in order to determine the statistically significant relationships between our constructs. We used a one-tailed *t* test to determine statistical significance of the paths in our structural model. In addition, we also performed a post-hoc analysis of the additional variables that were collected through the survey.

Results

Descriptive Statistics

We recruited 116 participants; 43% were male, 56% were female, and one of unreported gender. The youngest participant was 18, and the oldest was 71, with an average age of 30. Thirty-one percent of our sample was university students. The education level of our participants was as follows: high school equivalent, 11%; some college, 37%; bachelors, 33%; masters, 16%; PhD or professional degree, 3%; unreported, 1%. We asked our participants, "What is your level of (general technical/Facebook) expertise? The majority of our participants had at least an intermediate level of expertise on both Facebook and with technology. Fifty-one percent of our participants considered themselves as having intermediate expertise on Facebook, and 64% considered themselves intermediate to advanced users of technology in general. Means and standard deviations associated with each of the constructs in our model are reported in Appendix B, Table A2.

Protective Privacy Behaviors

Before evaluating our model, we wanted to take a look at the self-reported protective privacy behaviors that our participants used as a means to manage their confidant disclosures through tagging and apps. The following summary statistics characterize privacy protective behaviors for tagging exhibited by our participants:

- 45% had turned tag review on
- 37% had tag notifications turned on
- 66% have untagged themselves from photos
- 50% have tried to stay out of photos so that they will not be tagged on Facebook
- 46% have contacted a friend to remove a photo or tag
- 29% have unfriended because of photo tagging
- 26% have asked a friend to remove a photo or tag through the Facebook interface
- 13% have blocked a friend because of photo tagging

These results are consistent with past research that found that Facebook users prefer untagging themselves from photos over asking a friend to remove the tag or photo (Wisniewski, 2012). However, we would like to particularly note the high frequency in which individuals chose to stay out of photos so that they would not be tagged. This shows evidence that engaging with friends through tagging on Facebook has an influence on real-world behaviors. Although less frequent, we also saw participants who severed relationships on Facebook because of tagging, which shows that privacy is a major concern when it comes to co-owned tagged information. This strongly suggests that Facebook users are aware of privacy implications of engaging in tagging with friends. A little over half of our participants had chosen to take a proactive approach to managing confidant disclosures through turning on tag review. Eighty-four percent of our participants had changed their default setting for tag visibility from "Friends of Friends." Of those who adjusted this setting, 66.3% did so to be more private. Fifty-six percent of our participants reported their privacy setting for tag visibility was set to only "Friends."

There are even fewer ways to manage confidant disclosures through third-party apps. The one Facebook privacy setting for changing "How people bring your info to apps they use" is only recognized by 52% of Facebook users (Wisniewski, 2012). Thirty-four percent of our participants erroneously believed that their personal information could only be shared through apps if they added the app themselves, whereas another 11% were unsure. We also found that 62% of our participants said that they have provided incorrect or incomplete profile information in the past in order to prevent third-party apps from collecting their personal information. Whereas this coping strategy (Wisniewski et al., 2012) would prevent personal use of third-party apps and app sharing inadvertently through friends, the missing or inaccurate information could also reduce the benefits garnered from engaging with friends through apps.

Based on self-reported settings, 35% of our participants had disabled app sharing of any personal information through apps by friends, but the majority still allowed friends to share their information through third-party apps. Birthday, app activity, bio, current city, and family and relationship were among the most frequently shared types of personal information through friends' app sharing, being shared by 41–45% of our participants. In contrast, "Interested in" and "Religious and Political Views" were the least
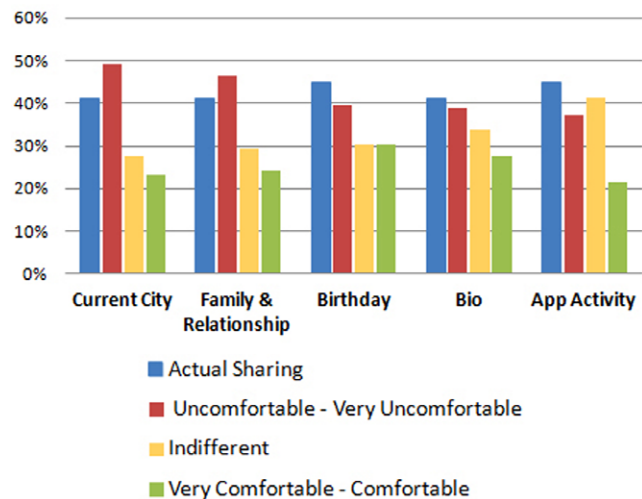
FIG. 3. Comfort sharing information through apps. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

frequently shared types of information through friends (shared by only 7–8% of our participants), most likely because they are the only two pieces of information not shared by Facebook's privacy settings by default. Figure 3 suggests that our participants' friends were often able to share more information than our participants were comfortable with them sharing. In all cases, actual sharing (blue bars) was much higher than the percentage of participants comfortable or very comfortable (green bars) sharing this information. Generally, participants were mostly or very uncomfortable (red bars) with their friends sharing their personal information through apps, even though it was being shared.

Using the Wilcoxon signed-rank tests (McDonald, 2009), we compared participants' comfort level in sharing each of the most frequently shared types of information from Figure 3 and found that participants were significantly less comfortable sharing their current city (mean [M] = 3.42, standard deviation [SD] = 1.35) than their bios (M = 3.18, SD = 1.30, Z = −2.26, p = .024) and birthdays (M = 3.16, SD = 1.39, Z = −2.35, p = .019). However, we also compared participant's comfort level sharing their current city (which was shared by 41% of our participants) to their comfort level sharing "Interested in" and "Religious and Political Views," the least frequently shared types of information by our participants (8% and 7% of participants, respectively). We found that participants were significantly less comfortable sharing their current city than both "Interested in" (M = 2.93, SD = 1.24, Z = −4.18, p = .000) and "Religious and Political Views" (M = 3.04, SD = 1.29, Z = −3.17, p = .002). This difference suggests an apparent disconnect between user sharing preferences and Facebook's privacy default settings.

Evaluating the Measurement Model

We evaluated the reliability of our constructs by examining the convergent validity and discriminant validity of our survey measures (Cook & Campbell, 1979). We assessed item reliability by examining the loading of each item on the construct and found that the reliability scores for all items exceeded the suggested criterion of 0.70 (Nunnally, 1978) (see Appendix B, Table A2). The average variances extracted for the constructs were all above Fornell and Larcker's criterion of 50% (Fornell & Larcker, 1981). To test discriminant validity, the square root of the variance shared between a construct and its measures should be greater than the correlations between the construct and any other construct in the model (Campbell & Fiske, 1959). Appendix A, Table A1 reports the results of discriminant validity, which may be seen by comparing the diagonal to the nondiagonal elements. All items in our experiment fulfilled the requirements of convergent and discriminant validity. Finally, we ran Harman's single-factor test to test for common method bias. If common method variance were a serious problem in the study, we would expect a single factor to emerge that accounts for most of the covariance among measures. A one-factor, unrotated solution only accounted for 26% of the total variance in our model, suggesting that common method variance is unlikely to be a serious problem in the data.

Hypotheses Testing

After establishing the validity of the measures, we conducted hypotheses tests by examining the sign and significance of the path coefficients. Figure 4 summarizes the results of our model.

The structural model explained 15.9% of the variance in the frequency of Facebook use and 13.2% of the variance in emotional attachment to Facebook. These values exceed the recommended threshold of 10% as an indication of substantive explanatory power in social sciences (Falk & Miller, 1992). Because tagging and apps are only two of many ways individuals engage with their friends through Facebook, we feel that this model provides adequate explanatory power for our dependent variables. We found a statistically significant relationship between both tagging ($b = 0.30$, $t = 3.95$) and app engagement with friends ($b = 0.22$, $t = 2.54$) and frequency of Facebook use. Based on the comparison of path coefficients, it seems that engaging with friends through tagging ($b = 0.30$) has a slightly stronger effect on frequency of use than app engagement with friends ($b = 0.22$). We also found a significant relationship between tagging ($b = 0.30$, $t = 3.69$) and app engagement with friends ($b = 0.16$, $t = 1.93$) and emotional attachment to Facebook. While both factors are significant, the effect of app engagement with friends on emotional attachment to Facebook is relatively weak.

We also explored the role of privacy concern on engaging with friends through tagging and apps. Privacy concern was a significant factor for engaging with friends through tagging ($b = -0.23, t = 2.59$), but it was not significant for app engagement ($b = -0.12, t = 1.14$). Participants who had high levels of privacy concern engaged significantly less frequently in tagging activities with their friends than participants with lower levels of privacy concern. Next, we examined the effect of Facebook's privacy policy on engaging with friends through tagging and apps. Perceived effectiveness of Facebook's privacy policy had a significant effect on app engagement ($b = 0.21, t = 2.41$), but it was not significant for tagging ($b = 0.04, t = 0.39$). When participants lacked confidence in Facebook's privacy policy, they engaged significantly less frequently with their friends through apps than those who trusted Facebook's privacy policies.

We conducted further tests to confirm the statistical power of our research model using G*Power software that is based on the F test for multiple regression (Faul, Erdfelder, Lang, & Buchner, 2007). The minimum acceptable statistical power of the model should be 80% (Cohen, 1988). The calculated statistical power of our research design is 97.5%, which confirms that the results of this study are statistically valid given our sample size. Table 1 summarizes the hypotheses testing results from our structural model.

Mediation Effects

To test the mediation effects of our model, we ran the fully saturated model in SmartPLS per the recommendations
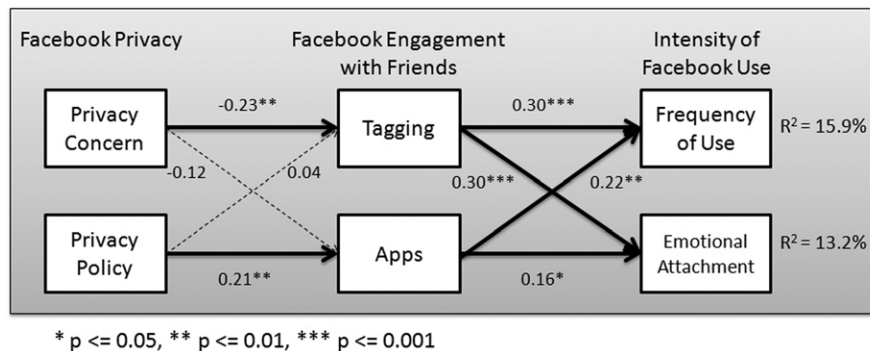

FIG. 4. Structural model and results.

by Gefen, Rigdon, and Straub (2011). We included four additional paths examining the direct effects of privacy concern and privacy policy to our dependent variables. Comparing the saturated model (Figure 5) with our hypothesized model (Figure 4), we first can see that all the significant paths in our hypothesized model also remain significant in the saturated model, with the only exception of the path between app engagement and emotional attachment. The only additional path that had direct effect on the dependent variables was privacy policy on emotional attachment.

Adding the additional paths changed the R^2 for frequency of Facebook use from 15.9% to 16.9%, giving a nonsignificant effect size of 0.012. For emotional attachment, the R^2 changed from 13.2% to 17.8%, giving a small effect size of 0.056. This demonstrates that the saturated model did not explain significantly more R^2 than did our original model. This set of results suggests three potential mediation effects: (a) The effect of privacy concern on frequency of Facebook use is exhibited through mediation by tagging engagement; (b) the effect of privacy concern on emotional attachment to Facebook is exhibited through mediation by tagging engagement; and (c) the effect of privacy policy on frequency of Facebook use is exhibited through mediation by app engagement. However, app engagement did not mediate the effect of privacy policy on emotional attachment. While the

significance of the direct effect of privacy policy to emotional attachment is relatively small, possible theoretical underpinning of this relationship should be considered in future research. Yet, the main implication from our saturated model is that privacy concern has no direct relationship with frequency of Facebook use or emotional attachment to Facebook, and that the perceived effectiveness of Facebook's privacy policy is not directly associated with frequency of Facebook use. In these cases, negative privacy perceptions only influence Facebook use and emotional attachment when they are directly associated with a reduction in how frequently Facebook users engage in tagging and app activities with their friends. By identifying these important mediating relationships, we are able to help further explain the underlying mechanisms that link privacy perceptions to SNS outcomes.

Post-Hoc Analysis

We further investigated hypotheses 6 and 7 that were not supported in our model. Based on our results, an individual's information privacy concern was not a significant factor when it came to app engagement with friends, but it was for tagging. In contrast, the perceived effectiveness of Facebook's privacy policy was a significant factor in app engagement with friends, but not in tagging. In our post-hoc analysis, we further investigate these results.

While tagging and apps are two ways individuals engage with their friends on Facebook, there are clear differences between how the engagement occurs. Tagging between friends is transparent to the individuals involved. When a friend tags another in a photo or post, that friend either receives a request to review the tag, a notification that they were tagged, or, in the very least, sees the photo or post they were tagged in on their timeline the next time they log in to Facebook. However, confidant disclosures through apps can be less transparent. While individuals understand direct engagement with friends through games, they are less aware that friends can share their information through apps even if they do not use the app themselves.

TABLE 1. Hypotheses results.

Hypotheses	Supported?
H1: Tagging engagement → frequency of use (+)	Yes
H2: Tagging engagement → emotional attachment to Facebook (+)	Yes
H3: App engagement → frequency of use (+)	Yes
H4: App engagement → emotional attachment to Facebook (+)	Yes
H5: Privacy concern → tagging engagement (−)	Yes
H6: Privacy concern → app engagement (−)	No
H7: Privacy policy → tagging engagement (+)	No
H8: Privacy policy → app engagement (+)	Yes
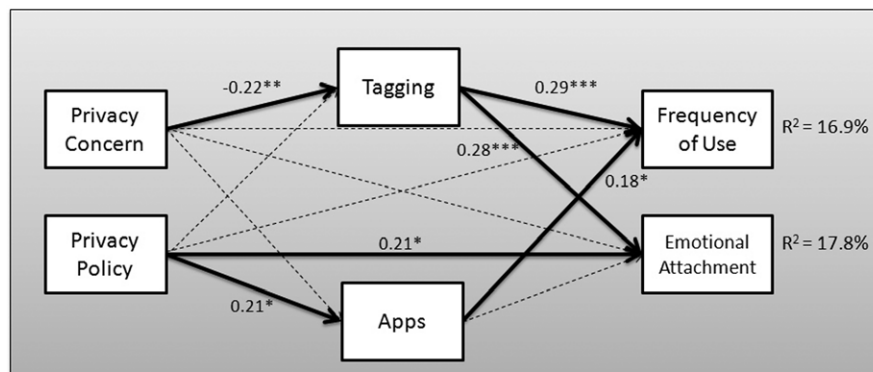
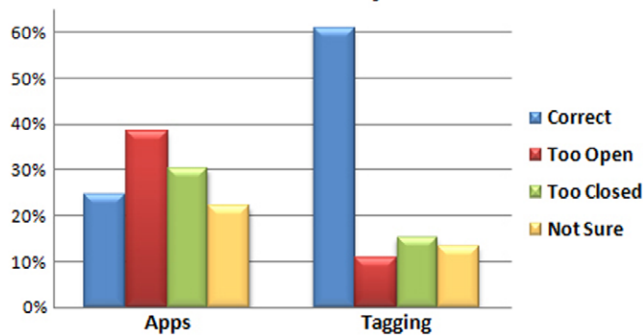FIG. 5. Saturated model.

Perceptions of App and Tagging Privacy

FIG. 6. Apps and tagging mental models. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

We wanted to examine Facebook users' mental models of how tagging and apps varied regarding the management of confidant disclosures. In the survey, we asked participants the following questions: (a) Who can see photos or posts that your friends have tagged you in?; (b) Photos I am tagged in only show up on my timeline or wall if I approve them (true/false); (c) Which types of your profile information are your friends able to share through apps?; and (d) A Facebook app can only access my profile information if I add the app (true/false). After answering these questions, we asked our participants to log in to their Facebook accounts and report their actual privacy settings. We compared their actual settings to what they believed to be true about tagging and apps. We classified their answers into four categories: "Correct" meant that their mental model reflected their actual privacy settings; "too open" meant that they thought they were more private than they actually were; "too closed" meant that they thought they were more open than they actually were; and "not sure" meant that they either answered "I don't know" or we could not categorize their answer clearly based on their privacy settings or because of missing data.

Figure 6 shows that our participants had a much more accurate mental model of tagging than they did for app sharing with friends. The majority of our participants correctly answered (blue bars) the questions regarding tagging, but this was not the case for app sharing. What is most concerning, however, is that more participants were too open (red bars) than any other condition when it came to their mental models about app sharing. Participants thought that they were being more private that they actually were. Thus, our research has made the following important observations about SNS users' and app engagement with friends: (a) Participants tend to share more information through apps by friends than they are comfortable sharing; (b) yet, participants do not perceive privacy concern as a significant factor in their app engagement with friends; (c) the perceived effectiveness of Facebook's privacy policy, however, is a significant factor when engaging with friends

through apps; and (d) participants are generally unaware that they are sharing more information through apps by friends than they believe they are. The cumulative effect of these three observations is that SNS users are exposing themselves to potentially harmful privacy breaches because they are not making appropriate privacy decisions based on an appropriate level of privacy concern, and they are unaware that they are failing to do so. Furthermore, if privacy breaches should occur through app sharing by friends, SNS users are more likely to blame Facebook for these breaches, instead of themselves or their friends, because Facebook's privacy policy, not their personal privacy concern, is the significant factor in how frequently they engage with their friends through apps.

In contrast, tagging is a very transparent process to Facebook, and as a result, they are better able to assess their privacy concerns and act accordingly. Our participants have fairly accurate mental models of how their information is shared through tagging with friends, and thus their level of privacy concern is a significant factor in how they engage with friends in this manner, not the effectiveness of Facebook's privacy policy. Instead of placing the onus on Facebook's privacy policy to protect them from potential privacy breaches from tagging, our participants seemed to understand that their friends were responsible for confidant disclosures made through tagging.

We believe that the theory of contextual integrity (Nissenbaum, 2004) helps explain the perceived privacy differences between engaging with friends through apps and tagging. When the flow of information between sender and recipient is not transparent, such as the case with apps, then contextual integrity of the information flow is compromised because the context by which information is gathered and disseminated is not clear to the individual (Nissenbaum, 2004). Therefore, in this case, SNS users may attribute privacy breaches to the SNS instead of to their friends. However, because tagging is transparent and directly tied to the responsible party, Facebook users can attribute confidant disclosure decisions directly to the individual who co-owns that tagged information.

Discussion

Our model shows that engaging with friends through tagging and apps is positively associated with both frequency of Facebook use and an individual's emotional attachment to Facebook. This finding highlights the social value that individuals place on being able to interact with their friends through SNSs. Past research has linked frequency of use and emotional attachment to Facebook to beneficial social outcomes for Facebook users, such as higher levels of social capital (Ellison et al., 2007), increased self-esteem, and a heightened sense of well-being (Burke et al., 2010; Ellison et al., 2011). Similarly, past research has linked passive consumption of information on Facebook without interactions among friends to lower levels of social capital and loneliness (Burke et al., 2010).

Transitively, this suggests that higher levels of engagement with friends through tagging and apps are likely to translate into social benefits for SNS users. From a design perspective, integrating more interactive features, similar to tagging and apps that promote direct engagement with one's friends on social networking platforms, may increase SNS users' frequency of use and emotional attachment to an SNS. Because tagging and app engagement are only two ways to directly engage Facebook users with their friends, other means, such as encouraging commenting or likes, could also be explored in future research.

However, our research also highlights the importance of privacy implications in design. We found that privacy concern is a significant factor that is negatively associated with tag engagement with friends, and the effectiveness of Facebook's privacy policy is associated with how individuals choose to engage with their friends through apps. Therefore, designers need to find a way to balance promoting engagement with friends and protecting user privacy. One example to illustrate the importance of balancing the trade-offs between increased engagement with friends and privacy is Facebook's Tag Suggestions. In 2011, Facebook rolled out Tag Suggestions, which implemented facial recognition technology in order to identify one's Facebook friends in photos and ask SNS users if they would like to tag their friends (Facebook, 2013). This feature promoted tagging engagement with friends by prompting users to tag their friends in even more photos. However, many users and even government regulators were concerned by the use of facial recognition software, believing that such an invasive technology was a violation of personal privacy (Mukherjee & Shih, 2013). This may have led some users to engage less with friends through tagging and, even more broadly, to disengage from Facebook.

We also saw a very interesting difference play out in users' perceptions of privacy when it came to tagging and app engagement with friends. Even though both promote engagement through co-owned personal information being shared between and through friends, the privacy implications were perceived differently. For app engagement, individual privacy concern was not a significant factor. However, the effectiveness of Facebook's privacy policy was an important factor to Facebook users when associated with app engagement with friends. In this case, we believe that the lack of transparency of the information flow (Nissenbaum, 2004) reduced users' privacy awareness of the responsibility shared by their friends to appropriately share their personal information. Instead, Facebook users seem to place this responsibility on Facebook even though Facebook apps are third-party modules independent of Facebook. A crucial implication for SNS designers then becomes the level of control they give to third-party app developers when integrating with their SNS platforms. Users expect SNSs' privacy policies to protect them when they engage with their friends through apps; therefore, failure to do so may reduce SNS users' emotional attachment to the SNS site, even if a breach was caused by an SNS user's friend or a third-party app developer.

Finally, our research adds a new dimension when trying to unpack the privacy paradox: confidant disclosures through engaging with friends. We confirmed that Facebook users still have a fairly high level of privacy concern, but it does not translate to their frequency of Facebook use or their emotional attachment to Facebook. Instead, our research suggests that personal privacy is a trade-off many SNS users make so that they can engage with their friends through Facebook. This theory is supported by our saturated model, which shows that tagging and app engagement with friends mediate the relationship between privacy concern and intensity of use. Past research primarily has focused on the privacy paradox from the perspective of how an individual's privacy concern is related to his personal information disclosures (Hughes-Roberts, 2013). While some research has related privacy concerns to general SNS nonuse (Baumer et al., 2013), our model is one of the first that explore how privacy concerns are related to social engagement and/or social withdrawal within SNSs. Future research should explore other mediators or moderators that may further explain the effect of privacy perceptions on social interactions that are mediated by SNSs.

Limitations and Conclusion

There are a number of limitations to our study that present useful opportunities for further research. First, we would like to address the concerns on our sampling approach. We chose snowball sampling to increase the diversity of our sample. However, such sampling is a nonrandomized approach that does not target a specific audience and potentially blurs the sampling frame. To further assess the generalizability of our findings, future studies that build upon our research should consider different sampling approaches.

Second, we modified our recruitment strategy after the study was first launched in order to obtain a larger sample size. We did this by offering a small incentive and adding an additional seed to our snowball sampling procedure, which targeted students within our university. Before this, we targeted a more generalized sample of adult Facebook users. To ensure that there were no significant differences between participants recruited earlier in the study and those who were recruited once the incentive was added, we tested the between-group differences on Facebook expertise, general technical expertise, and all variables from our model. We found no significant differences in any of these variables, except in app engagement. Earlier snowball participants ($N = 84$, $M = 1.72$, $SD = 0.802$, $p = .004$) tended to have higher levels of app engagement with their friends than the later snowball participants ($N = 32$, $M = 1.26$, $SD = 0.60$), who were mostly students. However, this between-group difference mirrored the difference we observed between nonstudents and students in our entire sample. Nonstudents ($M = 1.7$, $SD = 0.81$, $p = .03$) tended to use apps to engage with their friends more frequently than students ($M = 1.36$, $SD = 0.66$). Therefore, we believe that this difference is most

likely attributable to the characteristic of student versus non-student, not because of our sampling approach. As such, student versus nonstudent populations may be an interesting comparison for future researchers to assess differences in app engagement with friends.

Third, we base our findings on perceived measures (e.g., privacy concerns) and self-reported behavioral measures (e.g., participants logging in to their Facebook accounts). We did not have access to Facebook log data nor is this information (level of engagement with friends through apps and tagging) available through the Facebook API. We did a test to see whether participants' perceived levels of app engagement with friends was significantly correlated to their self-reported measure of how many apps they had used within the last 6 months (as reported from looking at their Facebook app activity). We found that app engagement and use were highly correlated ($b = 0.46$, $t = 5.72$), which is consistent with past research that has shown a high correlation between user self-reports and their actual behavior (Acquisti & Gross, 2006). Although perceived measures may serve as appropriate approximation for behavior in this study, it would be interesting to capture observed behavioral measures to strengthen our current findings. Finally, additional studies may further enhance our findings by employing mixed or qualitative methods, such as direct observation, semistructured interviews, or questionnaires to gain deeper insights into users' perceptions and the rationale behind their choices to engage and disengage with others through SNSs.

In conclusion, our research expands on existing research in SNS privacy by examining confidant disclosures through engaging with friends through tagging and apps on Facebook. Our results can both help to explain why users' privacy concerns and behaviors do not appear to line up, as well as point to design issues that affect these concerns and behaviors. While both tagging and app engagement involve friends' disclosing a user's personal information, the difference in transparency and understanding of those features resulted in different privacy concerns being relevant to their usage.

Acknowledgments

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Appendix A

TABLE A1. Discriminant validity of constructs.

Construct	APP	EMO	USE	PCON	POL	TAG
App engagement (APP)	0.89					
Emotional attachment (EMO)	0.21	0.79				
Facebook use (USE)	0.27	0.58	0.88			
Privacy concern (PCON)	−0.16	−0.15	−0.15	0.78		
Privacy policy (POL)	0.24	0.25	0.17	−0.21	0.92	
Tag engagement (TAG)	0.17	0.33	0.34	−0.23	0.09	0.81

Appendix B

TABLE A2.   Scale items and psychometric properties of the measurement model.

Measures of constructs	Item loading	Composite reliability	Cronbach's alpha	AVE
Frequency of Facebook use (*M* = 3.66, *SD* = 0.93)		0.91	0.87	0.78
In the past week, on average, approximately how many minutes per day have you spent on Facebook? (ranges from less than 10 minutes to more than 3 hours)	0.82			
Facebook is part of my everyday activity.	0.93			
Facebook has become part of my daily routine.	0.90			
Emotional attachment to Facebook (*M* = 3.13, *SD* = 0.93)		0.87	0.79	0.62
I am proud to tell people I'm on Facebook.	0.78			
I feel out of touch when I haven't logged on to Facebook for a while.	0.76			
I feel I am part of the Facebook community.	0.78			
I would be sorry if Facebook shut down.	0.82			
App engagement with friends (*M* = 1.59, *SD* = 0.78)		0.92	0.86	0.78
Add apps shared by friends	0.91			
Add apps to play games with friends	0.86			
Suggest apps to friends	0.89			
Tagging engagement with friends (*M* = 2.78, *SD* = 0.78)		0.85	0.74	0.66
Tag yourself in photos posted on Facebook	0.76			
Tag Facebook friends in photos or posts	0.95			
Facebook friends tag you in photos or posts?	0.70			
Privacy concern (*M* = 3.75, *SD* = 0.73)		0.86	0.79	0.61
It bothers me when Facebook asks me for this much personal information.	0.73			
I am concerned that Facebook is collecting too much personal information about me.	0.80			
I am concerned that Facebook may keep my personal information in a nonaccurate manner.	0.75			
I am concerned about submitting information to Facebook.	0.83			
Perceived effectiveness of privacy policy (*M* = 2.77, *SD* = 0.96)		0.95	0.92	0.85
I feel confident that Facebook's privacy statements reflect their commitments to protect my personal information.	0.92			
With their privacy statements, I believe that my personal information will be kept private and confidential by Facebook.	0.96			
I believe that Facebook's privacy statements are an effective way to demonstrate their commitments to privacy.	0.90			