Photo Sharing and Privacy on Facebook

Andreas GIANNAKOULOPOULOS
>   Department of Audio and Visual Arts, Ionian University, Greece
>   agiannak@ionio.gr

Stefania OIKONOMOU
>   NTLab. Faculty of Communication and Media Studies, University of Athens, Greece
>   stefania.oikonomou@gmail.com

Iraklis VARLAMIS
>   Department of Informatics & Telematics, Harokopio University of Athens, Greece
>   varlamis@hua.gr

Résumé

Ces dernières années, le partage de contenu personnel sur le web et en particulier sur les sites de réseaux sociaux (SRS) est devenu une pratique particulièrement répandue. En fait, le succès de ces sites est fondé, en grande partie, sur le contenu que leurs utilisateurs partagent, qu'il s'agit d'images, textes, vidéos, ou d'autres multimédias. Le partage de photos s'accroit et le fait que les gens utilisent SRS pour se présenter, interagir, et communiquer avec leurs amis et leur famille, est particulièrement intéressant. Malgré le fait que ces sites permettent aux utilisateurs de diffuser des informations très facilement, parfois les utilisateurs rencontrent des difficultés en partageant les informations. De plus, ils ont des préoccupations en ce qui concerne la confiance et l'intimité parce qu'il n'est pas facile de déterminer qui a accès à certaines informations sur ces applications. Le but de cet article est de présenter une analyse étendue de ce phénomène en utilisant à la fois le cadre théorique contemporaine et une recherche sur les paramètres d'intimité, les albums photos et le comportement concernant le partage de photos d'utilisateurs de Facebook.

  Mots-clés: *partage de contenu*, facebook, *intimité*, *albums photos*.

Summary

In recent years, sharing personal content on the web and especially on social networking websites (SNSs) has become a particularly common practice. In fact the success of these websites is based to a large extent on the content their users share whether this consists of images, text, video or other multimedia. Photo sharing is growing and it is of particular interest the fact that people use SNSs to interact, communicate and present themselves to their friends and family. Despite the fact that these websites enable users to easily disseminate information sometimes the lasts one meet difficulties in sharing information and have trust and privacy concerns because it is not that easy to determine who has access to particular information on such applications. The aim of this paper is to present an extended analysis of this phenomenon using both the contemporary theoretical framework and a research on privacy settings, photo albums and photo sharing behavior of Facebook users.

Keywords: content sharing, facebook, privacy, photo albums.

Introduction

In recent years, sharing personal content on the web and especially on social networking websites (SNSs) has become a particularly common practice. In fact the success of these websites is based to a large extent on the content their users share whether this consists of images, text, video or other multimedia. This paper aims to an extended analysis of this phenomenon that consists of the contemporary theoretical framework combined with a research on privacy settings, photo albums and photo sharing behavior of Facebook users.

Photo sharing is no longer limited to prints and physical albums. This raises the question how has the move toward Internet-based photo-sharing technology affected users' concerns about privacy? While digital cameras and camera cell phones proliferate, publishing of personal content becomes easy and photo sharing is growing, as it constitutes a way for friends to share daily experiences. This may lead to disclosure of both social and personal surroundings of users. Aspects of private sphere become accessible and within this context it is important to examine privacy settings provided and how users themselves take advantage of it in order to limit access to their personal content.

Despite the fact that these websites enable users to easily disseminate information sometimes the lasts one meet difficulties in sharing information and have trust and privacy concerns because it is not that easy to determine who has access to particular information on such applications. Usually social network websites allow profile access limitation through the creation of «friends' lists» which is the practice of making a profile open to specific number of contacts. Each user is able to invite friends and family to be added to the list, and can authorize only those people to view content.

As far as content contribution is concerned, apart form the privacy matter, there is also a social aspect associated with the reason why users proceed to sharing information and content related to their personal life or their emotional status. People use SNSs to interact, communicate and present themselves to their network. This way they can both express singularity and mutual interests with other users. These sites are about establishing, presenting and negotiating identity (Kaplan and Haenlein, 2010). Photo albums become a medium of self-presentation through which one's identity delineates. However, it should be mentioned that many users connect with individuals people know from offline environments, rather than for meeting new people online.

Except for user's point of view there is also that of the designers of social networking websites who seek improvement of the user's experience. This is of great importance as encouraging users to share content is an integral part of a social networking website's existence. The considerations made by users are significant for the design of such systems because they constitute the base on which designers can work either to enhance trust in the site or to facilitate content contribution procedure.

Apart from the theoretical framework in order to note in what extent users present aspects of their personal life and what differences – if any – are there between different age groups (15-24, 25-34, 35-44) or sexes, we examined what kind of privacy settings they apply to their profiles as well as how they manage photo

albums. This is achieved by observing what personal information is included in the profiles (name or pseudonym, country of residence, contact details, personal life details), how many photographs are uploaded and how socialization reforms when the information mentioned before are shared with strangers.

Content sharing

The success of SNSs lay in the balance offered between people, content, feedback and distribution (Burke, Marlow and Lento, 2009). People create a profile, share it with friends and family and feed it with everyday stories, videos, photographs, links, emotional status posts and comments on others' posts. This consolidates a perpetual content sharing procedure necessary both for user's profile to be updated and for the function of the SNS itself. In addition, it should be noted that for some users, these sites may even provide a textual or pictorial documentary of life (Mannan and Orschot, 2008).

Distinction between public and private sphere consists one of the central pillars of western civilization. However, people can only realize themselves through their relationship with others. Within this context identity shifts from private to public sphere (Demertzis, 2002: 184). As far as SNSs are concerned this phenomenon becomes even more intense and complicated, as the lines between the aforementioned spheres tend to fade away. Aspects of one's personal life are visible to the public sphere while a practice inconceivable in the past has become an integral part of quotidian life.

Self-disclosure is an essential part of this process and except for the fact that it is considered crucial in the development of close relationships, it should be noted that within the new environment, it can also occur between complete strangers (Kaplan and Haenlein, 2010). Participation in Facebook involves playful interactions with «friends» and communication that may be one-to-one, one-to-many or many-to-many. Facebook users enact multiple identities and relationships through the same site. The «news-feed» that reports on one's social interactions goes out to one's friends and also one's friends' friends - people one might not know or ever meet (McClard and Anderson, 2008).

Facebook enables a culture of remote connectivity for people maintaining a variety of social ties to primary and secondary groups of contacts. It is a lightweight way to keep in touch with people and the interactions between individuals create the collective content needed (McClard and Anderson, 2008). In addition, it helps maintain relations as people move from one offline community to another. An indicative example is that it may facilitate when students graduate from college, with alumni keeping their school email address and using Facebook to stay in touch with the college community. As pointed by Ellison, Steinfield and Lampe (2007) such connections could even have strong payoffs in terms of jobs, internships, and other opportunities.

People use SNSs to present aspects of themselves to their network. This networked presentation of one's personality involves, among others, posting of photographs. The photographs on a Facebook page are ritualized and present a series of performances strategically chosen by an individual (Mendelson and Papacharissi,

2010). Within this context photo sharing is a widely used form of content contribution. Uploading pictures consist a heavily use feature and it is of particular interest as it requires more time than other forms of content such us posting a link on one's wall. Digital photo sharing is a common mechanism for friends and family to keep current in one another's lives (Counts and Felheimer, 2004).

Proof of the closeness of one's peer group is confirmed by both the quantity and nature of pictures displayed. The closest the relationship the more they appear in photos. However, it should be noted that these photos facilitate the recall of already existing memories and therefore most of the times contextual information is absent (Mendelson and Papacharissi, 2010). This shows that users tend to upload photos in order to present their activities to their friends or family and not to anyone who may has access. Connectedness and group cohesion is driven to a large extent through the sharing of life events with members of aforementioned groups (Counts and Felheimer, 2004).

At this point, it should be noted that photo sharing seems to support the social learning theory. According to Burke, Marlow and Lento (2009) the most consistent result his team found was for learning from friends. An increase in visible friend photo activity was always predictive of increased newcomer contribution. This suggests that showing new users information about the content contributions of their friends makes them more comfortable with contributing themselves. Lack of familiarity and perplexity that new users may present tends to be mitigated as they follow their friends' patterns of content contribution. In order to stay active and interact with their contact list they upload photos, sometimes tag them and wait for comments to be posted. Changing cultural trends, familiarity and confidence in digital technologies, lack of exposure or memory of egregious misuses of personal data by others may all play a role in this unprecedented phenomenon of information revelation (Acquisti and Gross, 2006: 2).

Privacy

In a social network site, privacy regulation is a socio-technical activity that involves interactions with the technological system and the larger group context. Therefore, an individual's privacy behavior in a social network site, and in particular Facebook, involves a mixture of direct and latent strategies (Stutzman and Kramer-Duffield, 2010). The way in which different people make privacy policy decisions differs. It seems that few people use every privacy practice offered while many people leave their profiles open, as they seem either to be indifferent or to ignore the consequences of such a choice (Sun, Hawkey and Beznosov, 2009). In addition, practical issues come up such as difficulties in ensuring close contacts join the same social networking site as the publishing user (just to view a friend's profile), or simply ignorance of the privacy implications of posting personal details on the Internet.

At this point Ahern et al. (2007 p. 357) discrimination is considered essential as far as user's considerations in making privacy decisions about online content is concerned. According to him there are three aspects that should be taken into consideration:

1.	The content and context-based patterns of privacy decisions in an online photo-sharing environment.

2.	Ways in which different people make privacy policy decisions «in the moment».

3.	User behavior regarding location disclosure and systems that maintain, and sometimes expose, long-term and persistent information about their location.

It seems that it is the combination of these three factors, which leads to the disclosure or not of personal content on SNSs.

Facebook has a perception of being a trustworthy social networking website (Fogel and Nehmad, 2009) which results in revelation of highly personal information to friends as well as strangers. Common controls include profile access limitation (friends-only status), item-level access control, and remedies such as blocking and hiding other site users (Stutzman and Kramer-Dufield, 2010).

According to McKeon (2010) Facebook's privacy policy has changed several times since 2005, as well as the classification of users' personal data (demographic data, pictures, friends, likes etc). Facebook in 2005 started as a private communication space, where the user shared information only with a group of users of his/her choice (Opsahl, 2010). The association of users with networks and communities in 2006 changed once again the privacy policy of Facebook, which limited the access to a user's profile information only to her friends and the users in the same school, local area and communities that the user belongs. In 2007 Facebook allowed users to control which network or community will have access to their profile. After April 2010 Facebook's privacy policy gave more power and flexibility to the user, who is now able to control access to personal data in a connection level, i.e. when he/she connects with a network, a friend, a group or installs a Facebook application, he/she is able to grant or deny access to every little piece of information from demographic data, to photo albums, single photos or even comments. The same policy have been also applied to Facebook Timeline, which was introduced in 2011 and gradually replaces Facebook profile.

Research (Acquisti and Gross, 2006) shows that while a relative majority of FB members are aware of the visibility of their profiles, a significant minority is not. According to the results those who are aware seem to rely on their own ability to control the information they disseminate as the preferred means of managing and addressing their own privacy concerns. However, significant dichotomies between specific privacy concerns and actual information revelation behavior have been noted. In addition, misunderstanding or ignorance of the Facebook's treatment of personal data is also very common.

Friends-only status refers to the practice of making a profile private, so it is only viewable by articulated Facebook connections. Setting a Facebook profile to friends-only status is a discrete, privacy-enhancing action with important implications. At the individual level, going friends-only exerts audience control over social network site disclosures. At the network level, friends-only profiles lower the amount of social information available to interested parties (Stutzman and Kramer-Dufield, 2010). Yet, online social networks' security and access controls are weak by design as they seek to leverage their value as network goods and enhance their

growth by making registration, access, and sharing of information uncomplicated. Combined with the decline of costs related to mining and storing data the two features imply that information provided is, effectively, public data, that could exist for as long as anybody has an incentive to maintain it. Many entities - from marketers to employers to national and foreign security agencies - may have those incentives (Acquisti and Gross, 2006: 2).

Mannan (2008) suggests a number of factors in order to explain the violation of privacy. As he describes, these seem to include oppressive administrations or large corporations, a shortage of usable tools to guard online privacy, apathy towards privacy and a misunderstanding of the implications of this attitude. The persistent nature of such online media could expose rich aggregate information about the owner, and subjects, of the content (Eckles, 2007). Therefore these sites need explicit policies and data protection mechanisms in order to deliver the same level of social privacy found offline (Dwyer, Hiltz and Passerini 2007).

Designer's point of view

Social networking sites depend on content contribution and it becomes vital for developers to encourage it, as each individual's experience is dependent on the contributions of that person's particular set of connections (Burke, Marlow and Lento, 2009). The considerations made by users during the content sharing process are crucial for the design of systems that support the creation of such content (Ahern et al., 2007). Furthermore, new users may be unwilling or unable to make contributions, either because they do not understand the norms and values of the community, they do not fully understand how to use the technology, or both (Burke, Marlow and Lento, 2009).

Social network designers' ultimate goal should be to foster a sense of true commitment in their users. Vasalou, Joinson and Courvoisier (2010: 723) note that true commitment is signaled when users engage in three target behaviors: ''create value and content'', ''involve others'' and ''stay active and loyal''. Users create value and content and involve others by using various features offered within the site. To give an example, posting photographs creates value and content whereas tagging photographs involves others. In addition, users stay active and loyal by investing time in the site, for instance, by visiting the site frequently (Nov, Naaman and Ye, 2009). Furthermore, designers of SNSs should also find ways to support newcomers with varying behavioral patterns. For newcomers who are active, highlighting opportunities for others to leave them feedback and allowing the newcomers to increase the size of their audience may be particularly effective. For newcomers who are relatively inactive, designers should find ways to encourage their friends to pay more attention to them (Burke, Marlow and Lento, 2009).

Web 2.0 access policies for personal content are authored by users without special technical skills, and are enforced by mutually untrusted walled gardens (Karger and Siberski, 2010) there are many challenges remaining to address. Two of the most important challenges are usability and trust. An average Web user must be able to comprehend the language to ensure that an access policy matches the owner's sharing intention. In order to achieve that, as pointed by Sun, Hawkey and

Besnozov (2009) the user-experiences provided by the sharing mechanism must leverage the Web skills and experiences that a Web user already has. In addition, it is considered of great importance to create a safe environment in order to built trust and complacent users as far as their content disclosure is concerned. Undoubtedly trust consists one of the fundamental characteristics of human sociability (Demertzis, 2006) and as such it should be one of the primary concerns of SNSs designers.

Research

In an attempt to increase users' security, Facebook has developed a privacy management mechanism for its users. Since, Facebook offers several mechanisms for blocking unwanted access to users' profiles, the aim of our experiments, was to test users' awareness of these mechanisms. A typical Facebook user has several types of information that shares with others, e.g. list of friends, list of photos and albums, interests, etc. This information has different levels of privacy (accessible to anyone, to people in the same group, to friends of friends, to the user's friends, to the user only) and the user is able for granting or denying access.

The main aim of our experiments was to examine the privacy of users' photos and photo albums. Since Facebook's privacy management mechanism offers four distinct levels of privacy -all, friends only, friends of friends, selected users only- we decided to examine privacy separately for the first three levels.

Facebook is a huge social network, with 900 million active users, so it is almost impossible to test its privacy mechanism in every distinct user. Additionally, testing the privacy of a user's album or photo requires at least 3 different users to log in to Facebook, a friend account, a FOAF (friend of a friend) account and a random user account. For these reasons, we decided to use only the Facebook accounts of the authors and check the ability to access the photos and albums of their friends and their FOAFs. The results presented in the remaining of this section, are the average results on these accounts.

In order to automate our experiments we developed a Java program, which takes as input the credentials of a Facebook user U and attempts to access: a) the list of friends of the direct friends of U, b) the photos and albums of the friends of U, c) the photos and albums of the friends of the friends (FOAFs) of U.
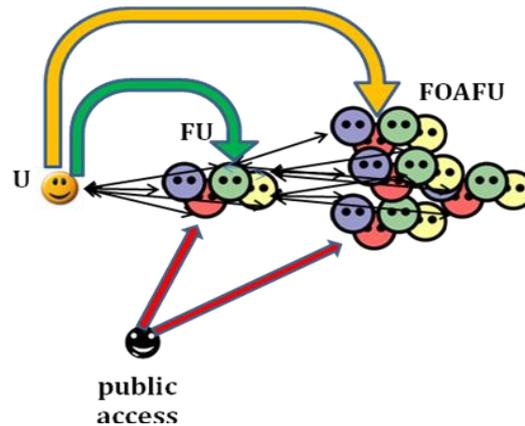
Figure 1. The structure of a user's U network

The program works in four rounds. First processes the list of friends of U and creates the set FU. Secondly, it accesses the pages of all users in FU and gets all their friends, their photos and their albums. The union of all these friends is the FOAFs of U (set FOAFU). Thirdly, the program accesses the photos and albums of users in FOAFU and reports the accessibility statistics. Finally, the program attempts to access the photos of all users in FU and FOAFU without impersonating user U.

In the first experiment, our program logged using a Facebook account and then imitated the user behavior in the browser. For this reason, we employed the HtmlUnit API[1], a «GUI-Less browser for Java programs», which models HTML documents and provides an API for invoking pages, filling out forms, clicking links, etc (Table 1).

	User U
Direct friends (FU)	156
Friends of U that allow U to access their friend list	153
Friends of U that allow U to access their photos	151
Average number of photos (users in FU)	108.17
Friends of a friend of U (FOAFU)	9691
FOAFs of U that allow U to access their photos (at least 2)	6635 (68%)
Average number of photos	42.08

Table 1. Statistics on the accessibility of photos and friends' list of friends and FOAFs.

---

[1] http://htmlunit.sourceforge.net/

In a second experiment, we employed the Facebook Graph API[2], which presents a simple, consistent view of the Facebook social graph, uniformly representing objects in the graph (e.g., people, photos, events, and pages) and the connections between them (e.g., friend relationships, shared content, and photo tags). The API allows to easily access all public information about an object (user, people, etc) without permission, and requires extended permissions in order to access all other information. The permissions' system works exactly like all other Facebook applications and requires the user's consent in order to gain access to classified information.

The main restriction of the Facebook Graph API, is that it operates as a Facebook application and thus has limited access to the user profile. However, this restriction was very helpful in our case, since in the four round of our program, we want to check the public access to the photos of users in the union of FU and FOAFU. Using the Facebook Graph API, we attempted to access the list of friends of user U and consequently to access several items from the pages of these friends (e.g. friends of friends, photos of friends etc.). Table 2 presents some useful statistics:

	User U
Direct friends (FU)	156
Friends of a friend of U (FOAFU)	9691
Users in (FU and FOAFU) that allow Graph API to access their photos (public access)	108 (1.1%)
Average number of photos	1.64

Table 2. Statistics on the public accessibility of photos and friends' list of facebook users.

It is worthy to note here, that the results presented in Table 2, are strongly affected from the fact that the Facebook Graph API works as a Facebook application and thus has limited (only on the public information of user profiles). Typical Facebook applications (e.g. games, social applications etc) usually ask for more permission during install and rarely people deny them. Additionally, accessing the Facebook information manually, through a web browser, allows for a more extended access to the lists of friends, photos etc. as well as some of their profile information, than using the API.

---

[2] http://developers.facebook.com/docs/reference/api/
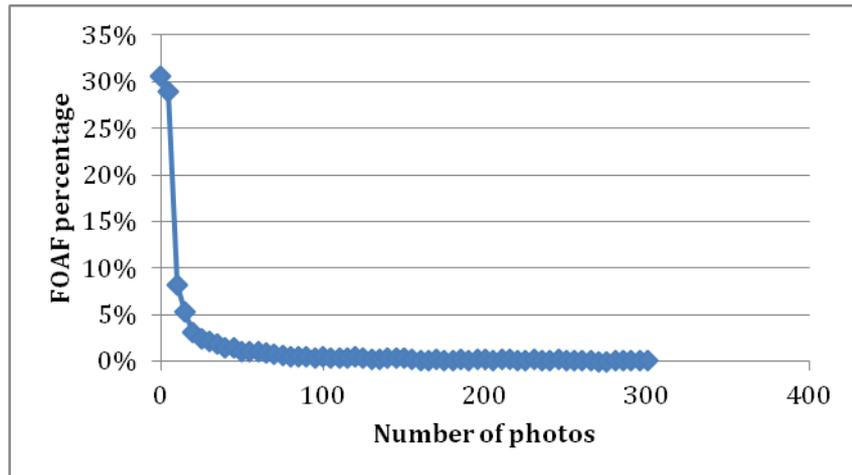
Figure 2. The distribution of the examined users (FOAFs of U) based on the number of exposed photos

As depicted in Figure 2, a 30% of the examined Facebook users denied access to all their photos to a friend of a friend and another 30% in total allows access to 10 or more photos. There are still users that allow unrestricted access to all their albums.

The results presented above show that the majority of Facebook users grant their friends with access to their profile, they provide limited access to the Friends of their Friends and of course they are more restrictive to the public access that they provide to unfamiliar users (restrictions on the Graph API). However, these limitations are easily bypassed when the user grants access to a Facebook application.

It is part of our future work to create a Facebook application that request access to users' profile information and check users' awareness on the privacy management mechanisms of Facebook.

References

Acquisti A. and Gross R. (2006). «Imagined communities: awareness, information sharing, and privacy on the Facebook», *Privacy Enhancing Technologies*, 36-58.

Ahern, S., Eckles, D., Good, N., King, S., Naaman, M., & Nair, R. (2007). «Over-exposed? Privacy patterns and considerations in online and mobile photo sharing». In Proceedings: ACM CHI 2004, Conference on Human Factors in Computing Systems, San Jose, CA, 357–366.

Burke, M., Marlow, C., and Lento, T (2009). «Feed me: motivating newcomer contribution in social network sites». In Proceedings: ACM CHI 2009: Conference on Human Factors in Computing Systems, Boston, MA, 945-954.

Counts, S. & Fellheimer, E. (2004). «Supporting social presence through lightweight photo sharing on and off the desktop». In Proceedings: ACM CHI 2004, Conference on Human Factors in Computing Systems, Vienna, Austria, 599-606.

Demertzis, N. (2002). *Political Communication. Risk, Publicity & Internet.* Athens: Papazisis.

Demertzis, N. (2006). «Trust as a social emotion». *Science and Society*, 16.

Dwyer, C., Hiltz, S.R. and Passerini, K., (2007). «Trust and Privacy Concern Within Social Networking Sites: A Comparison of Facebook and MySpace». In Proceedings of the Thirteenth Americas Conference on Information Systems, Keystone, Colorado, USA.

Ellison, N., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook ''friends'': Exploring the relationship between college students' use of online social networks and social capital. *Journal of Computer-Mediated Communication*, 12 (3).

Fogel, J. and Nehmad, E. (2008). «Internet social network communities: Risk taking, trust, and privacy concerns». *Computer Human Behavior*, 25(1), 153-160.

Kaplan, A. M. & Haenlein, M. (2010). «Users of the world, unite! The challenges and opportunities of social media», *Business Horizons*, 53 (1), 59-68.

Ǩarger, P. and Siberski, W. (2010). «Guarding a walled garden − semantic privacy preferences for the social web». In Proceedings of the 7th Extended Semantic Web Conference. Springer-Verlag Berlin Heidelberg, 151–165.

Mannan, M., van Oorschot, P.-C.: «Privacy-enhanced sharing of personal content on the Web». In: International World Wide Web Conference, Beijing, China, 487–496.

McClard, A. and Anderson, K. (2008). «Focus on Facebook: Who are we anyway?», *Anthropology News*, 49 (3), 10-12.

McKeon, M. (2010). «The evolution of privacy on Facebook». [Online, http://mattmckeon.com/facebook-privacy/, consulted 18/08/2012]

Mendelson A and Papacharissi Z (2010). «Look at us: collective narcissism in college student facebook photo galleries». In: Papacharissi Z. (ed) *The networked self: identity, community and culture on social network sites*. New York: Routledge, 151–173.

Opsahl, K. (2010). «Facebook's eroding privacy policy: a timeline». [Online, http://www.eff.org/deeplinks/2010/04/facebook-timeline, consulted 18/08/2012]

Stutzman, F. and Kramer-Duffield, J. (2010). «Friends Only: Examining a Privacy-Enhancing Behavior in Facebook». In Proceedings: ACM CHI 2010, Conference on Human Factors in Computing Systems, Atlanta, GA, 1553-1562.

Sun, S.T., Hawkey, K. and Beznosov, K. (2009). «Secure web 2.0 content sharing beyond walled gardens». In Proceedings: 25th Annual Computer Security Applications Conference (ACSAC), Orlando, Florida.

Vasalou A., Joinson A. and Courvoisier D. (2010). «Cultural differences, experience with social networks and the nature of true commitment in Facebook». *Human-Computer Studies*, 68 (10), 719–728.