# Interaction Design of Social Network Service – A Case Study of Photo Sharing Functions

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Abstract: The development of social network services (SNS) and mobile applications had reshaped the way we live in the modern day. Currently the most discussed issues in the social interaction design field are personal privacy protection, interface design and how the valuable and interesting content generated to affect people across the different SNS platforms. This research study was conducted based on the Macro HCI concept to help create the SNS interaction related research, which include privacy setting consideration with different contents and SNS usage motivation. The generated results were discussed as follows: (1) the privacy setting with different user generated content (from personal to landscape image) will change the disclose level from "only me" to "the public"; (2) there were eight factors affecting the intention of SNS interface use of photo sharing function application, which were "design aesthetics knowledge", "social norm and peer influence", " reputation and relationship", "perceived of ease use", "altruism", "perceived usefulness", "trust" and "relative advantage." The results of this research study provide advanced sociological interaction thinking to SNS platform interface designers.

Keywords: Social Interaction, Behavior Research, Interface Design, Privacy Setting, Social Network Service, User Generated Content, Human-Computer Interaction

# 1. Introduction

Interface designers of mobile application, especially in photo sharing function, are paying more attention to common users' social behavior in designing goodness of fit interfaces and user experience due to the rapid progress of mobile technology. A good social interaction design needs to attract diverse users with universal and accessible usability consideration [1], and in general, easy facilitator designs, such as bookmark, tag, private or public annotation and comments often emphasize on the content search and browse behaviors [2]. Social network service (SNS) stands a critical role in our new mobile life, and the contents generated across different platforms were spread very fast when the content is valuable or interesting. Design research could contribute to different function applications based on good interaction design concepts, such as popular interface design principles, the cognitive design suggestions, cross social service design research, and scientific user corporation platform investigations [3].

Interaction design thinking is the main application trend accepted in mobile and smart living style. It is not only used in the design discipline area, but also in the cross-disciplinary applications, such as education, smart house, cloud computing and life, social network service, and positive technology based application. In Taiwan, the most

discussed issues were (1) user experience based user-centered design process and concept applied into different industries; (2) the social network service based application for mobile or computing devices. This research study was conducted based on Macro HCI concept [4] to help create the SNS interaction related research including privacy setting consideration with different contents and SNS usage motivation.

Nowadays, ubiquitous and pervasive computing provides access around our living environment no matter in public area or personal house. At the same time, mobile computing made lots of Internet information and interaction available to many users who like to use their mobile devices anytime and anywhere. The Internet social power spread fast than traditional media in many aspects, such as immediate news, entertainment video or images, etc. In particular, the information made by persuasive computing with positive technology implementation content which toward better life concepts always receive lots of responses and feedbacks from different SNS platforms. About the SNS, which began and got attentions from MySpace in 2000, and in 2006, Facebook began to open to the public in America and it became popular in the world until now. There are different content formats of the SNS, such as micro blog (like Twitter), MCS (mobile communication service), image based service (like Pinterest, Tumblr), photo sharing network (like Instagram, Flickr), location-based service (LBS, like Foursquare) and many others showed in the Apps market. The user experience interaction design was the core issue in these different SNS applications implementation. The service and interface usability evaluation could be used to improve service features, and doing user research by ethnography and persona methods for design, market or technology driven innovation [5].

In general, the future human-computer interaction (HCI) design should include not only micro but also macro design concepts with cross-disciplinary issues such as sociology, anthropology, social privacy, aesthetics, service usage motivation and trust of service use, etc. [4]. In addition, the micro economic concept had generated in Taiwan recently, more and more mobile Apps start-ups got a chance and were put on the market. Some new professional products development patterns had generated, such as lean start-up and pivot, which were quickly development concept with circle of build, measure and learn; and the pivot was the concept of how to reverse the old or weakness product performance to replace by new and innovative ideas. In these ideas, the user experience evaluation, quickly prototyping and interaction process were the core concepts built inside, especially to the SNS application product. The popular SNS application includes photo make and sharing Apps, LBS Apps, MCS Apps, etc. In social behavior based applications, the social usage motivation and social privacy setting will construct the service usage experience [6]. This research study focuses on photo sharing Apps to investigate social Apps usage motivation and privacy setting issues.

The increasing user needs and features had influenced the interface design pattern especially in social interaction situation, which was built on mobile and Internet technology mediated communication content [7]. And the mobile devices had become the most used Internet connection products [8]. This research study includes privacy setting research and social usage motivation factors analysis by means of questionnaires survey method.

## 2. Social Content and Interface Design

## **2.1 Internet Content Research**

As in the research on web content interface, four dimensions of web personalization content are addressed, i.e., "content", "structure", "usage" and "user profile"[9]; and the usage-based web personalization research model

includes "user profiling", "log analysis and web usage mining", "content management", "web site publishing" and "information acquisition and searching" [10]. The multiple and cross fields user interactive experience of social content had been developed fast, and the developers or publishers should pay more attention on the distinctive and accurate content offering [11]. According to the references, three aspects should be discussed pertinent to mobile SNS research, i.e., "interface design and usability research", "user experience and cognition research", and "social content analysis."

### **2.2 Social Application Interface**

Smart devices are often used as the platform for social applications. According to the previous research [12], the social recommendation function may influence users' motivation of purchasing behaviors, and the public social interface should be designed with consistency principle and focus on the most important functions by reducing system operation sequences. In the same research, the privacy setting acquired serious feedbacks from real users while they used the public social user interfaces. Real users would not easily sign in the service interface, and upload their personal photos either. In the research of social photo sharing interface [13], the icon design suggestions were "most concreteness", "less complexity", "most familiarity" and "suitable semantic distance." And for young design students, the "man like" images had been used most as the social function icons. In the follow up research [14], the privacy setting may change with different social contents which user generated based on public and personal devices use situations. The social network service (SNS) had deeply influence on our modern life, and the interesting and valuable user-generated content will share and spread quickly in very short time, and at the same time, the good feature design of user interface will influence user experience regarding usability issue and service acceptance [14]. Related to the research of HCI area, the good interface design principles, user cognition, and multi platforms service design research would be scientific and cross disciplinary applications [3]. According to the mobile user experience research [15], participants who have or do not have the smart mobile use experience reveal different performance of interface readability and perception of usefulness. Therefore, participants of this study were all equipped with mobile and SNS use experience.

## 3. Privacy Setting of Social Network Service

The privacy setting of social share may be the influencing factor of social application usage motivation. There were complicated privacy set situation depending on different population and usage motivation. Users could tweet messages on Twitter anywhere, share friends with our activities photos on Facebook immediately using mobile phones, or collect and share interesting webpages on Google+ with different group circles. Privacy setting makes the disclosed Internet world more personal controls. According to the end-user views of privacy in design factors regarding usable privacy solutions [6], managing privacy must be simple and efficient, and user could control over access pervasive devices and easy to use, fast and flexible while at social computing scenario with data disclosure situation. In addition, one of the design factors impacting usable security [6] was trade-offs relationship between usability and security mechanism. As research of friend-only privacy settings in Facebook, the content sharing will be limited and reduced the social network power, e.g., knowing new friends, but at the same time, the tagging mechanism will disclose some individual profiles and contents (if someone was tagged by friends)[16]. In the research of privacy study regarding students, they would make privacy protection behavior of self-censorship or set friends-only profiles disclose situation to control the audience [17]. On the other hand, people who concerned

their privacy issue and understood how to control their data disclosed in Facebook, their behaviors showed something different from their thought, which disclosed their personal data even a sizeable people actually did not know how to use the privacy design mechanism [18]. Designers' inability to anticipate how users' Internet data could be used would bring out the invasion of privacy in the network world [19]. And the privacy design consideration of HCI designers when they design technology-mediated communication methods could include philosophical, legal, and practical dimensions to integrate into domain of the field of HCI [6]. For example, as the group mechanism of Facebook, more and more commercial group added people they did not know and gave these people commercial ads and messages they did not agree to post on their walls. These kinds of commercial invasion of privacy were increased in recent years. To avoid the invasion, trust is an important consideration in users' acceptance of online service. And HCI researchers and designers could provide good and easily understood ways for users to realize and control their appropriate trust on different online situations; in addition, the influence factors retrieved as the knowledge for design basis would become more important issues [6]. According to the above references, HCI designers should pay attention on online information control mechanism and upgrade user perception of Internet knowledge.

#### 3.1 User-Generated Content and Privacy Setting Behavior

The "Reader-to-Leader Framework" was generated to describe the user generated content levels (UGC), the four levels are: (1) Reader: people who only did browsing and information searching; (2) Contributor: people who would like to compare, annotate, read, and provide content to social platform; (3) Collaborator: build relationship and co-work to generate content; (4) Leader: promotion, teach new users and maintain the social rules [3]. After focus group discussion, this study added second level of "sharer" to describe people who read information and would like to share it to others (see Figure 1). The focus group was built with one professional SNS manager, two mobile UI team managers, and one SNS researcher in Taiwan. The SNS researcher brought out the references and public information of social media research of different mobile platforms. Two mobile UI team managers focused on how the mobile content could be well represented and helped set the privacy principle of mobile interface privacy design cases. Finally, the SNS manager brought out the integrated ideas with commercial operative experience and found the lack of the "Sharer" role. The UGC level was refined by the focus group, and the privacy setting of social sharing mechanism was defined as well.



Figure.1 UGC levels (refined from [3])

The privacy setting of social sharing was based on Facebook and Google+ patterns. In Facebook, the levels are public, friends' friend, your friends, special friends and only me; and in Google+, the levels were public, extended circles, your circles, special circles and close share (see Figure 2).



Figure.2 SNS privacy setting levels

This research study used different photos content attributes to investigate different privacy setting behaviors. UGC levels will influence user behavior of information control. This study also adopted online questionnaires survey and collected opinions from 117 users' information and then sampling with 75 contributor level of users. A total of forty two males and thirty three females were selected, and the age range of 80% participants was 20-29 years old. About the mobile internet usage experience, 80% of participants had more than one year usage experience. All the participants had the experience of photo uploading and sharing to SNS sites. Test with one-way ANOVA (see Table 1), used five points Likert scale to measure the public (1) to only me (5) setting considerations. According to Table1, there was significant different with different photo contents (F=21.61, p=.000<.01). The LSD post hoc was used to explain that personal photos privacy setting higher than others and it means the more public content the photos present, the more public privacy set will be.

Variable	Level	Mean	S.E.	SS	df	MS	F	Р	Post hoc
	1.Landscape	2.08	0.11						
Photo	2.Life	2.41	0.10	20.23	3	6.74	21.61	0.000**	4>3=2>1
contents	3.Friend	2.55	0.11						
	4.Personal	2.80	0.11						

Table 1. One-way ANOVA statistics of different photo contents

\*\* Significant exist in alpha=0.01 level.

#### 4. Usage Motivation Research of SNS Interface

Use the same questionnaires survey data and sampling to 87 users who all have mobile online experience. And the data was analyzed to establish influencing factors by confirmatory factor analysis method.

## 4.1 Questionnaire Design

The unified theory of acceptance and use of technology (UTAUT) was used to design the questionnaire with several dimensions to investigate social interaction and usage motivation [20]. The dimensions include "Trust" [21], "Social norm and peer influences" [21, 22], "Perceived ease of use" [23], "Perceived usefulness" [23], "Expected relationships" [21], "Related advantage" [22] and "Altruism" [21]. According to the previous research description, this study adopt the assumption that "Design aesthetics knowledge" had influence on social interface usage motivation, and five questions were analyzed using factor analysis. The mentioned factors were used to explain users "intention" [23] use of the SNS interface.

## 4.2 Questionnaire Analysis and Results

First, the internal consistency reliability was tested, and Cronbach's alpha= 0.83 (F=76.44, p=.000 <.001), it meant the questionnaire had good internal reliability. In generally, this kind of data and questionnaires design should be used by structural equation model (SEM) analysis, but in this study, the participants' numbers were too small to use the SEM analysis. The two questionnaires questions [21, 22] had been integrated and translated into Chinese by experts, and then used confirmatory factor analysis to retrieve the factors.

Second, ten factors were retrieved from questionnaire with PCA method and orthogonal varimax method. The KMO (Kaiser-meyer-olkin) value was 0.78 closed to 0.8, which meant the questionnaire was almost closed to good, but only too few samples used. The whole explained variance value was 73.60 %, and Bartlett chi square was 2953.31 (df=903, p=.000 <.01) to explain the correlation matrix was good to use for factor analysis. After

removing the factors which only had two questions and less explain performance, eight factors remained. The KMO value was 0.78, and whole explained variance value was 73.41%, and Bartlett chi square was 2249.87 (df=561, p=.000 < .01). The eight factors were illustrated as: (1) design aesthetics knowledge; (2) social norm and peer influence; (3) reputation and relationship; (4) perceived of ease use; (5) altruism; (6) perceived usefulness; (7) trust and (8) relative advantage.

The research generated these eight factors to describe social interface usage motivation of "intention to use", and in the future, the acceptance and motivation model will be constructed with enough participants' data, and take the dimension of "design aesthetics knowledge" into account.

## 4.3 The Relationship between Image Content and Privacy Setting Behavior

Furthermore, there were four different content level photos with different privacy setting investigation by T test, and seventy five participants who were selected above the "reader who shared" UGC level position. There were five UGC levels which included reader, sharer, contributor, collaborator and leader. And the content levels of photo were landscape without people, life related image, friend related image and personal image (see Figure 3). The results showed that there was more private select trend from landscape image to personal image (T=-6.27, P=0.00<0.05). There were significant difference in three UGC levels with different privacy setting (chi-square value=16.196, p=.040<.05). Table 2 showed the distribution of total seventy five participants who all set on the UGC level above "sharer and reader." And the correlation density was very low between UGC levels and privacy setting (Kendall's tau-c value= -.095, p=.443>.05). In addition, there existed no significant difference in different gender to predict privacy setting behaviors (Goodman and Kruskal tau value=.005, p=.834>.05). About the personal image photos privacy setting, the male participants' proportion was 14.3%: 16.7%:57.1%:9.5%:2.4%; and the female participants privacy setting proportion was 9.1%:12.1%:57.6%:18.2%:3.0%.



Figure.3 Photo contents

Table 2.	Descriptiv	e statistics	of r	personal	image	set distribution
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		Personal Image							
Privacy Setting		Public	Friends' circle	Friends	Special Friends	Personal			
UGC	Contributor	6 (10.2%)	7 (11.9%)	37 (62.7%)	7 (11.9%)	2 (3.4%)	59		
Level	Collaborator	1 (12.5%)	4 (50%)	3 (37.5%)	0 (0)	0 (0)	8		
	Leader	2 (25%)	0 (0)	3 (37.5%)	3 (37.5%)	0 (0)	8		
Sum		9 (12%)	11 (14.7%)	43 (57.3%)	10 (13.3%)	2 (2.7%)	75		
Total		75							

According to the user behavior analysis, the most photo sharing users spent lots of time conducting the task, and usage experience will influence sharing behavior. The privacy setting changes with different contents, which influence the interface flow and information architecture design. In the future, there will be more related social behavior and application interface design factors integrated into further research.

### 5. Conclusions

This study was constructed with social privacy setting and social interface application usage motivation to practice the macro HCI concept into cross disciplinary contents. The main idea was generated to help provide more references for further research on HCI area. The results showed that personal photos privacy was set higher than others and it meant that the more public content of the photos present, the more public privacy set would be needed. It meant that users would like to control their privacy while they generated content to SNS. But the privacy setting of SNS was not clear to understand and not easy to use [18], it is a challenge but also an opportunity for interaction designers to explore. Interaction or SNS designers can use the behavior intention result as user behavior knowledge and incorporate it into the information architecture design. The privacy management function innovation will be a needed idea to implement. According to user behavior analysis, the most photo sharing users spent lots of time doing the task, and usage experience will affect their sharing behavior. The privacy setting changes with different contents, which will affect the interface flow and information architecture design. In the future, there will be more social behavior and application interface design factors integrated into further research.

In the end, there were eight factors generated to affect the intention of SNS interface use of photo sharing application, which are "design aesthetics knowledge", "social norm and peer influence", " reputation and relationship", "perceived of ease use", "altruism", "perceived usefulness", "trust" and "relative advantage." The research results provide the sociological interaction thinking to the SNS platform or interface designers. The result addressed that SNS designs need to involve various aspects of thinking based on cross-disciplinary knowledge, not only the design aesthetics and interface usability, but also the psychology and social relationship should be emphasized. In the future research and application, these factors can be used to help create innovative SNS design model, and provide iterative user feedbacks.

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#### 6. References

- [1] Rainie, L. and Tancer, B. (2007) Wikipedia: When in doubt multitude seeks it out. Pew Internet & American Life Project. Pewresearch.org/pubs/460/wikipedia.
- [2] Fischer, G. (2007) *Designing socio-technical environments in support of meta-design and social creativity*. In Proceedings of Conference on Computer Supported Collaborative Learning (CSCL '2007), pp 1-10.
- [3] Preece, J. and Shneiderman, B. (2009) The Reader-to-Leader Framework: Motivating Technology-Mediated Social Participation. AIS Transactions on Human-Computer Interaction, vol.1, no.1, pp 13-32.

- [4] Shneiderman, B. (2012) The Expanding Impact of Human-Computer Interaction. In J. A. Jacko (Ed.), The Human-Computer Interaction Handbook—Fundamentals, Evolving Technologies, and Emerging Application (3rd), CRC Press, Boca Raton, pp xv-xvi.
- [5] Chen, C.-H., Hsiao, W.-H., Chen, S.-C., Huang, Y.-C. and Wang, S.-H. (2012) *Innovative product development* research of persona methodology. In Proceedings of 2012 Ming Chi Technology and Methodology Conference.
- [6] Karat, J., Karat, C.M. and Brodie, C. (2012) Privacy, Security, and Trust—Human-Computer Interaction Challenges and Opportunities at Their Intersection. In J. A. Jacko (Ed.), The Human-Computer Interaction Handbook—Fundamentals, Evolving Technologies, and Emerging Application (3rd), CRC Press, Boca Raton, pp 669-698.
- [7] Moore, T. D. and Serva, M. A. (2007) Understanding member motivation for contributing to different types of virtual communities: A proposed framework. In Proceedings of ACM SIGMIS-Conference on Personnel Research, pp153-158.
- [8] Lasica, J. D. (2008) *Civic Engagement on the Move: How Mobile Media can Serve the Public Good.* The Aspen Institute, Washington DC.
- [9] Srivastava, J., Cooley, R., Deshpande, M. and Tan, P. N. (2000) Web Usable Mining: Discovery and Applications of Usage Patterns from Web Data. ACM SIGKDD, vol.1, no.2, pp 12-23.
- [10] Eirinaki, M. and Vazirgiannis, M. (2003) Web Mining for Web Personalization. ACM Transactions on Internet Technology, vol.3, no.1, pp 1-27.
- [11] Crumlish, C. and Malone, E. (2009) Designing Social Interfaces. O'Reilly Media, Sebastopol.
- [12] Chen, C.-H., Hsiao, W.-H., Chen, S.-C. and Huang, Y.-C. (2012) User experience research of kiosk service with social network function. In Proceedings of the 3rd International Service Innovation Design Conference (2012 ISIDC), pp 295-303.
- [13] Chen, C.-H., Hsiao, W.-H., Chen, S.-C., Huang, Y.-C. and Wang, S.-H. (2012) Research on the photo sharing interface functions of social network applications in smart phones. In Proceedings of 2012 Conference of Taiwan Institute of Kansei, pp 587-591.
- [14] Chen, C.-H., Hsiao, W.-H., Chen, S.-H. and Kang, Y.-Y. (in press) Usability study of icon designs with social network functions. Paper accepted by the 15th International Conference on Human-Computer Interaction (HCI International 2013).
- [15] Hsiao, W.-H., Chen, C.-H., Chen, S.-C., Huang, Y.-C. and Wang, J.-M. (2011) Research on user experience and usability of smart mobile devices interfaces. In Proceedings of 2011 Interactive Experience Design & Digital Archive Service/ Application Conference.
- [16] Stutzman, F. and Karamer-Duffield, J. F. (2010) Only: Examining a privacy-enhancing behavior in Facebook. In Proceedings of the 28th International Conference on Human Factors in Computing Systems, pp 1553-1562.
- [17] Strater, K. and Lipford, H. R. (2008) *Strategies and struggles with privacy in an online social networking community*. In The Proceedings of the 22nd British HCI Group Conference on HCI 2008, pp 111-119.
- [18] Acquisti, A. and Gross, R. (2006) Imagined Communities: Awareness, Information Sharing, and Privacy on the Facebook. Springer eBook, Berlin.
- [19] Adams, A. and Sasse, A. (2001) Privacy in multimedia communications: Protecting users, not just data. In A. Blandford, J. Vanderdonkt & P. Gray (Eds.), People and Computer XV—Interaction without Frontiers. Joint Proceedings of HCI2001 and ICM2001, Springer, pp 49–64.
- [20] Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. (2003) User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, vol.27, no.3, pp 425-478.

- [21] Hsu, C. -L. and Lin, J. C.-C. (2008) Acceptance of Blog Usage: The Roles of Technology Acceptance, Social Influence and Knowledge Sharing Motivation. Information & Management, vol.45, pp 65-74.
- [22] Kim, K. K., Shin, H. K. and Kim, B. (2011) *The Role of Psychological Traits and Social Factors in Using New Mobile Communication Services.* Electronic Commerce Research and Applications, vol.10, pp 408-417.
- [23] Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1989) User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science, vol. 35, no. 8, pp 982-1003.