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A Cross-Site Study of User Behavior and Privacy Perception in Social Networks

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A CROSS-SITE STUDY OF USER BEHAVIOR AND PRIVACY PERCEPTION IN SOCIAL NETWORKS

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To my Mom, Dad and Qi, for all the support and love they give me.

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LIST OF ABBREVIATIONS

OSN - Online Social Networks

SSN - Social Security Number

ANOVA - Analysis of variance

URL - Uniform Resource Locator

IRB - Institutional Review Board

GLOSSARY

Privacy attitude	User's general privacy concern toward information privacy. To be specific, it means what information a user considers private and what information she considers public.
Privacy perception	Measures how a user perceives privacy risks while using social networks. In this thesis, such perception refers to how much a user trusts social networking sites.
Privacy behavior	A user's actual behavior that relates to privacy protection or indicates privacy awareness while using social networks. Such behavior includes changing privacy setting, using private profile, etc.
One-way ANOVA	A common technique used to compare means of two or more samples. It tests the null hypothesis that samples in two or more groups are drawn from populations with the same mean values.
Kruskal-Wallis test	Non-parametric equivalent of one-way ANOVA. It's used for testing differences of ordinal variables in this study.
Cohen's guideline	A guideline for interpreting correlation results. According to this guideline, r= 0.5, 0.3 and 0.1 represents large/medium/small correlation respectively (Cohen 1988).

ABSTRACT

Zhang, Yue. M.S., Purdue University, August 2014. A Cross-site Study of User Behavior and Privacy Perception in Social Networks. Major Professor: Melissa Dark.

While online social networking sites have brought convenience and diversity in people's social lives, they have also been the source for information leakage. Researchers have been looking for ways to balance user privacy protection and information disclosure. However, literature suggested that many users either failed to perceive privacy risks correctly or they failed to behave in accordance with privacy awareness even they have already perceived potential risks.

This thesis conducted a survey to measure social network users' privacy attitude, privacy perception and their actual behavior when using social networking sites. The survey targeted at three populations of different cultural contexts: U.S. college students, Chinese students in the U.S. and Chinese students in China. It also targeted at 6 populate sites – Facebook, Twitter. WhatsApp, RenRen, Weibo and WeChat.

Based on the survey results, this thesis conducted a cross-cultural and cross-site study to explore the relationships of social network users' privacy attitudes, privacy perceptions and various user behaviors. It also studied whether cultural contexts and the differences of sites had an impact on privacy attitude, perception and behavior.

CHAPTER 1. INTRODUCTION

The Internet's wide adoption has contributed to online social networking sites' thriving popularity. Facebook, for example had 1.3 billion monthly active users worldwide in 2014 (StatisticBrain, 2014) compared with a total of 835 million in 2012 (Internet World Status, 2012). The nature of social networks is to imitate real world social relationships by providing mechanisms for sharing information, creating personal profiles, establishing relations and communicating with each other. Not surprisingly, at the same time of using such services, people are giving out massive amount of information which may pose real threat to privacy. Documented threats include identity theft, digital stalking, and personalized spam. The problem becomes worse when most people are completely unaware of short-term and long term risks of sharing personal information without restricted access (Schrammel et al., 2009; Krishnamurthy et al., 2008; Acquisti et al.,2006) .

Privacy preserving methods which aim at anonymizing the social graph (Machanavajjhala et al., 2007; Li et al., 2007; Sweeney, 2002), privacy setting management (Squicciarini et al, 2012) or raising privacy awareness by evaluating user's privacy score (Liu et al, 2010), etc. have not been proven successful in protecting user's sensitive information or changing user's information disclosure behavior.

This thesis argued that in order to preserve privacy in social networks, the differences and interactions of multiple social networks should be considered as well as the differences of user's privacy attitudes to better define and mitigate privacy risks. This study took the first step towards evaluating and preserving privacy by studying the differences and interactions of user's privacy, attitude, perception and behavior variables in different social networking sites. It also studied whether people of different cultural contexts would perceive or behave differently when using social networks.

1.1 Motivation and Objectives

Recent literature has identified that using multiple social networks have become an emerging threat to user privacy. The study by Irani et al. (2011) has shown that the more social network a user uses, the more information can be potentially leaked. They argued that, because different social networks have different privacy protections, the risk of information leakage may be dependent on the "weakest point" in the social network ecosystem. Malhora et al. (2012) successfully linked the different profiles in different social networks that belonged to the same user which demonstrated the threats for those users who used multiple social network services.

Therefore, it would no longer be valid that privacy protection can be contained within the boundary of each social network. The information flow among social networks enables profit-seeking individuals or organizations to collect as much "digital footprints" (Irani et al. 2011) as possible by integrating a user's information that she has disclosed from all the sites that she uses.

Though such an emerging risk has been raised for several years, few literatures have focused on such topic and no solutions that attempt to preserve privacy across multiple social networks that have been proven effective.

The above literature assumed that the privacy risks came from the fact that users disclosed different information in different social networks. However, arguments such as "users do not behave inconsistently nor they have inconsistent profiles in different social networks" or "users may not care about the information they have provided at all" may easily debunk the above assumption. To find out a solution that adapts to real life scenario, the fundamental understanding of why and how the usage of different social networks poses threat to privacy is necessary.

Therefore, the main objective of this study is to understand how and why user's privacy perceptions and behaviors differ in different social networks and among different cultural contexts and how the privacy perception influences the information disclosure behavior.

1.2 Significance

As discussed above, previous studies have assumed that users behave differently in social networking sites, however, none of them sufficiently justified their argument either because of lacking empirical data to support their argument or they fail to explore the reasons behind the differences of information disclosure.

Schrammel et al. (2012) took a site-centered approach to explore the difference of information disclosure on different types of social networks. This aggregated approach failed to distinguish the difference within the same type of social networks. Wang's work

on the other hand, did discover the difference of user's tagging behavior between two popular bookmarking websites. However, this research only focuses on only two tagging sites and such an ad-hoc result can't be justifiably generalized to other sites.

To the best of our knowledge, a cross-site study of privacy attitude, perception and behavior on different social networks has not yet been conducted studied the impact of cultural contexts on social network users which have been rarely documented.

Another significance of the study was that it provided an up-to-date survey that investigates diverse aspects of social network privacy. Hopefully it could help researchers in this field better understand the usages, perceptions, attitudes and behaviors of social network users.

1.3 Research Questions

The questions central to this research are as follows:

1. What are users' privacy attitudes when they use the social networks? (e.g. what information do they consider private and what is not?) Are they different?
2. Does culture background have a significant impact on social network users' privacy perceptions and behaviors?
3. What's the relationship among a user's privacy attitudes, perceptions, and behavior in a specific site?

1.4 Assumption

The following assumptions are inherent to this study:

1. The participants are assumed to be honest and to have a basic understanding of the definition of privacy and social networks without major confusion.
2. The participants are assumed to be able to use the Qualtrics online survey system and to navigate and answer the questions correctly.
3. The participants will not retake the survey as not to disproportionally affect the outcomes.
4. The participants are representative of the study population.
5. The survey provides adequate information for the research questions.

1.5 Limitations

The study has the following limitations:

1. The self-reported survey may be biased as the actual behavior of the respondents on social networks may be different from what they reported. The self-reported survey may be biased also because the non-respondents may be more concerned about privacy.
2. Social networking is fast-evolving. The popularity of each site rises and falls. The results of this study including the survey itself are prone to be dated.
3. The design of the survey questions tried to capture the general characteristics of each sites. In many cases, they were of coarse-grained. The profile preference question for example, only had two options – public or private

while in fact the profile settings could be much more complicated in some specific sites such as Facebook.

4. Twitter had an imbalanced sample with an overwhelming majority of American users. WhatsApp had a small sample of 106 respondents. The results may thus be biased.

1.6 Delimitations

The following delimitations are inherent to the study:

1. The study only focused on three different cultural groups – U.S. citizen, Chinese in China and Chinese in the U.S. and the results could not be generalized to other cultures.
2. The study only used a one-time survey that does not include a follow up study to analyze users' change in privacy perceptions or behaviors.
3. The study only focused on six selected sites – Facebook, RenRen, Twitter, Weibo, WhatsApp and WeChat and three cultural groups.
4. The study only studied one-on-one correlation/association between privacy attitude/perception/behavior variables and some of the results. The interactions of multiple variables were not analyzed. Future work will include more complex mediation and multiple-regression analysis.
5. The study only focused on general privacy attitude, trust, profile preference, privacy policies, privacy setting, friend list and information disclosure behavior. Other variables related to privacy such as gender, computer expertise, perception of risks, age, etc. were not covered in this study.

1.7 Summary

This chapter has provided an overview to this study including motivations, purposes, significance, research questions and scope definitions. The next chapter will outline the previously explored information disclosure behavior analysis.

CHAPTER 2. REVIEW OF LITERATURE

2.1 Types of Social Networks

Online social networks (OSNs) have become an important part of people's daily lives. People use traditional social networks for information access, communication and establishing friendships. In recent years, as different forms of social networks popping up, the functionalities of social networks have become more extensive. Schrammel et al. (2009) classified these online communities into 4 types:

Business Networking Sites - These sites are mainly used to maintain and managing professional profiles (resume, contact information, etc) and professional relationships. Typical sites are Xing and LinkedIn.

(Traditional) Social Networks - These sites are mainly used for maintaining private relationships and contacts. The most prominent example for such sites are Facebook, RenRen, and Google+.

Content and Media Sharing Networks - On these sites, the major focus is on sharing content with others rather than maintaining/establishing relationships. People watch, share or comment on videos, pictures or music on these sites. Typical examples are Youtube and Flickr.

Social News and Bookmarking Sites - These sites are used to share and discover interesting links to news and contents in the web. Typical examples are Reddit and Digg.

However, as the functionalities of social networks evolve and new social community sites emerge, many social networks have more than just one characteristic that can't be easily fitted into one of the above categories. For example, Twitter was generally regarded as a bookmarking site where users can share links and bookmarks of interesting contents; however, users also use it as a social networking tool to maintain/establishing friendship. Twitter also allows uploading videos, music and pictures so that it also serves as a *Content and Media Sharing Networks*.

Research has shown interests in studying the possible privacy risks of the usage of social networks. Works have shown that identity resolution (Jain et al.2012), profile matching (Raad et al. 2010) and online social footprint aggregation (Irani et al. 2009) have become emerging threats to the usage of multiple social networks. However, most of these works fail to consider the innate difference of these social networks (usage context) and the difference of users' information disclosure behavior while using them. Furthermore, most existing works about social network privacy have been focusing on a single site (or at best with one type of social network) without considering the interaction of different types of social networks.

2.2 Information Disclosure Behavior across Multiple Social Networks

The work by Schrammel et al. (2009) may be the first one that conducted a systematic comparison of differences in information disclosure behavior on different types of online communities. This work also explores the information disclosure behavior related to demographic variables, usage contexts and usage patterns. The main research questions for this work are "whether there are systematic differences in the amount of

information disclosure in different online communities and whether there is an important influence of the demographic background on the information disclosure behavior?"

The research was based on an online survey with 856 participants. The survey evaluated the following aspects that may have influence on the information disclosure behavior on different communities: types of OSNs, demographic information, employment status, computer knowledge, online time, trust in the social network, # of friends, change default setting or not. The survey was then analyzed using linear regression model to evaluate the influence of these factors on information disclosure behavior.

The result suggested a significant difference in information disclosure behavior in different social networks (see Table 2.1). The main findings were: 1) people disclose much more information on in networking sites with a social or a professional context than in other types of communities; 2) students and pupils are more freehanded in disclosing their information than employed and self-employed persons except in *content and media sharing sites*; 3) trust in the network is related to the information disclosure behavior in all networks. The more the user trusts the provider of the site that he is handling the data with care the more information he provides; 4) women are more cautious in providing information to friends than men; 5) computer expertise has a significant relation to the information disclosure on social networks - the more experienced and skilled a user is the more information he does provide to unknown persons.

Table 2.1

Information Disclosure in Different OSNs (Schrammel et al. 2009)

	Business Networks		Social Networks		Content & Media Sharing		Social News & Bookmarking	
	Stranger	Friend	Stranger	Friend	Stranger	Friend	Stranger	Friend
Real Name	68.5	96.6	55.0	88.2	10.9	31.8	30.1	47.7
Nickname	53.7	59.3	65.1	73.8	75.3	84.7	67.6	78.5
Picture of User	62.9	85.4	65.7	91.1	20.3	35.6	33.8	42.6
Date of birth	25.3	79.0	42.6	82.2	12.5	28.4	16.2	30.2
Network of friends	28.1	86.2	39.8	88.2	20.6	39.7	16.2	35.3
Email-address	8.7	62.6	12.5	64.7	8.1	35.9	16.9	38.2
Physical address	2.2	42.1	2.8	29.6	1.3	11.9	2.2	10.3
Phone number	3.1	46.1	2.1	29.1	1.3	12.6	1.5	8.1
Instant messaging	15.7	63.2	17.6	60.0	9.1	26.9	11.0	21.3
cont.								
Website	42.7	69.1	27.2	50.4	24.1	34.1	30.1	41.9

The author concluded that “There are significant differences in behavior and needs of users depending of the type of community they are in. This suggests the

interpretation that users of networks typically only provide the information that is required to achieve the maximum gains of the membership."

Wang et al. (2011) performed a cross-site study on the user's tagging behavior between two popular bookmarking websites, StumbleUpon and Delicious. They analyzed the tagging behavior of 3,616 users who uses both sites actively. The first experiment tested the *User Vocabulary Size* which refers to the set of unique tags one use. The result showed that 70% of users have an unbalanced vocabulary ratio across social media. The second experiment evaluated *Tag Sharing in User Vocabulary*. They computed Jaccard Index to identify the fraction of vocabulary shared by a user on Delicious and StumbleUpon. The results showed that the majority of the users shared a small set of tags. Specically, 29.2% users shared no tags and around 90% of users shared less than 10% of tags. The third experiment was to study *Tag Sharing in User Neighborhood Vocabulary*. The neibourhood was defined as the user himself and his one-hop network within the dataset. They found out that more than 13% of the user's neighborhood did not share any tags and more than 43% shared fewer than 10 tags across the sites. The fourth experiment was conducted to study the *Tag Sharing in URLs,* which was to investigate how differently a URL was tagged in each sites. For each URL, the tags were compared and the overlaps in tags were calculated. The result turned out that almost 96% of the URLs shared 2 or fewer tags. The final experiment was to study *Time Spent on Delicious and StumbleUpon.* They found that 35% of users never tagged in both websites simultaneously. The result suggested that users seldomly visited the two sites on the same day. These results demonstrated a significant difference in users' tagging behavior across

these sites, giving evidence that even using the same type of OSNs; the users' behavior may still vary greatly.

Another work by Irani et al. (2009) studied the online footprint across different social networks. According to their findings, a user with one social network reveals an average of 4.3 personal information fields. For users with over 8 social networks, this average increases to 8.25 fields. This suggests that user discloses different types/amounts of personal information in different social networks. They retrieved 13,990 profiles and evaluated the types and amounts of the personal information disclosed in each sites. The difference can be shown in the following table:

Table 2.2.

Personal Information Disclosed in Social Networks (Irani et al. 2009)

Social Site:	Name	Location	Sex	Relationship	Hometown	Homepage	Birthday
Del.icio.us	-	-	-	-	53	-	-
Digg	100	67	55	-	-	-	30
Flickr	73	58	82	59	51	74	-
Last.Fm	82	-	87	-	76	77	-
LinkedIn	100	88	-	-	-	-	-
LiveJournal	93	69	-	-	-	68	64
Myspace	94	98	100	72	40	-	100
Technorati	94	-	-	-	-	-	-
Twitter	100	93	-	-	-	89	-
Youtube	68	-	-	-	29	57	73

Dijck (2013) studied the different user behaviors on Facebook and LinkedIn and compared the users' *private self* and *professional self* in online communities. He argues that social networks are the tools for shaping identities and "users have a need for multiple 'stories' about themselves, each story concerning different parts of their identities and addressing a limited audience ". Therefore, users express different personas in different social media by exhibiting different information about themselves. For example, while a user may use Facebook to create a leisure persona (laying on the beach, playing tennis, etc), one may also keep up a completely separate professional profile on LinkedIn (e.g. a high-school teacher in English). A user who posts little (personal) information on Facebook but who keeps up an active profile on LinkedIn makes a statement that he or she cares about keeping his or her personal life private.

Farnham et al.(2011) also argued that assuming singularity of identity of a user's identity may be wrong. Instead, people's lives are "faceted"- that is, people maintain social boundaries and show different facets or sides of their character according to the demands of the current social situation. People segment their lives into bounded areas because various facets of their identities are incompatible. The faceted identity model provided by the authors is shown in the following figure:

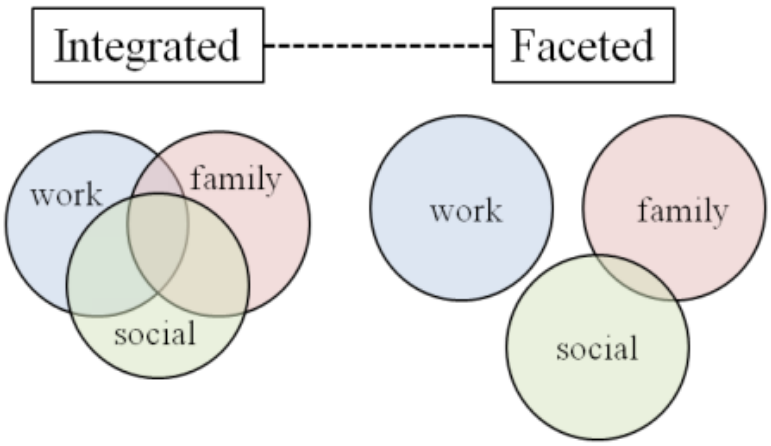


Figure 2.1 Faceted Identities (Farnham et al. 2011)

Through a questionnaire study with 631 respondents from the US, the authors examined how people faceted their identities and their lives, and how these facets were expressed through use of email and Facebook. The questionnaire first asked the basic demographic information of the participants and then asked a series of questions assessing social personality, including faceted identity, facet incompatibility, extraversion, and self – monitoring. The result showed that users selected the most appropriate technology for information sharing depending on the privacy and boundary requirements of their communication- they used email for more private communications and Facebook for keeping in touch with their extended networks. The authors believed that "people are fairly adept at using the appropriate tool for the appropriate communication". This may imply that Internet users may choose to use different online tools (communities) differently in order to maintain the boundaries of their facets of identities.

Users are not the only ones who decide how much information to be disclosed. Stutzman (2006) studied the information disclosure on three different social networks (i.e.

Facebook, MySpace and Friendster) and found out that the amount of information disclosure required by different social networks was different. For example, Facebook offers the possibility of disclosing the most information but only requests the posting of name, e-mail address, academic classification and school information; Friendster and MySpace on the other hand, offer fewer options for information disclosure, but require more by default for registering.

This work showed that the information disclosure behavior may be dependent on the options and mandatory requirements provided by each social network. The innate structure and functionality of each social network may offer different options for user's postings and require different amount/types of information for registering.

In conclusion, Schrammel et al. (2009) conducted the first systematic comparison of user's information disclosure behavior patterns across multiple social networks. He also analyzed the demographic factors that may affect these different patterns. Wang et al. (2011)'s work shows a significant difference in user's behavior in different tagging sites. Stutzman (2006) 's work suggested that user's different information disclosure behavior may be constrained by the options provided by and registration requirements requested by each specific social network. The work by Irani et al. (2009) studied the online social footprints of users and concluded that users disclose different amount and types of information, which can be potential threat to user's privacy. Dijck (2013) and Farnham et al.(2011) claim that Internet users have different facets of identities and they use different social networks as different tools to express the different facets of themselves.

These literature all gave evidence that people have different information disclosure patterns across social networks because of 1) the innate difference of social

networks been used. 2) the need to exhibit different facets of their identities. 3) the extent of trust that the user places to each site. There are other potential factors that may affect one's information disclosure behavior. These factors are discussed in the next section.

2.3 Personal Traits and Privacy Perceptions

The user's personal traits can affect his/her information disclosure online. Datu et al (2013) conducted such research on Facebook users to study whether personal traits can affect users' privacy settings in social networks. They used a "Big Five" model to classified the user's personal traits into 5 dimentisons*: Extraversion, Openness, Conscientiousness, Agreeableness* and *Neuroticism* and then studied whether each trait affect user's privacy setting. There result suggested that *Openness* can be a predictor in differentiating users with public profiles and users with private profiles. *Conscientiousness*, which refers to individuals' predisposition to self-control, regulation, and order influenced individuals' preference Facebook profile setting (e.g. public and private). Basically, this means that people with more self-control tend to be more cautious about their information disclosure while users with public profiles are generally more open-minded than those with private profiles.

However, a similar work conducted by Schrammel et al. (2009) suggested that personal traits do not have a significant influence on information disclosure behavior in social networks. They authors thus made a hypothesis that the actual usage purpose and goal of a user when inter acting with a community is the main driving factor behind the information disclosure behavior. "For example a community member whose main goal is to initiate a romantic relationship might provide very different types and amounts of

information compared to a user interested in exploring new trends or in keeping in touch with old friends."

The relationship between privacy concern, control and information disclosure have been studied by many literatures. Zimmer et al. (2010) argued that the degree of control over information makes people sure about their ability to manage it and so increases their trust in the whole online social network system. The perception of trust seems to have a negative effect on privacy concerns: an increase in trust causes a reduction in the perception of the risk connected with privacy. Taddei et al. (2013) claimed that privacy concerns cannot directly influence the degree of self-disclosure online because that Internet users, and particularly young people, do not have a detrimental fear for their privacy that determines their online behavior, but that control and trust are crucial and more able to influence their effective disclosure behavior.

2.4 Summary

The above literature been discussed is not exhaustive. Though little attention has been casted on the comparison of information disclosure behavior patterns across multiple social networks, these works already leave us "bread crumbs" of how and why people's information disclosure behavior pattern varies across OSNs. One obvious reason is the usage and goal when users use different types of OSNs. Also, several works have shown that people used different social networks to exhibit different representations of themselves (facets of identities) to different groups of people. Furthermore, information disclosure behavior also depends on a user's trust on each social network - the more you trust, the more you disclose. Other factors that might influence information disclosure

behavior in social networks such as personal traits, privacy concern and control are also discussed.

Assuming the different information disclosure pattern among different social networks is true, the aggregation of online social footprints of user's profile on each social network site will be a great threat to user's privacy. How to preserve user's privacy in a multiple social networks context thus becomes an interesting and urgent task.

The next chapter will introduce the methodology used in this study.

CHAPTER 3. METHODOLOGY

3.1 Research Population and Sample Size

This research is a descriptive study based on self-reported survey. The study aimed at the culture factor that may influence behavior and perception in social networks. Therefore, 3 populations were included for this study- Chinese college students currently living in China, Chinese college students currently studying in the U.S. and U.S. college students. The purpose was to find out whether there are significant differences in behavior and perception between Chinese users and American users when using online social networks and to study that when a shift in a culture environment happens, will it affect such differences.

First, the population sizes were estimated using existing statistics. The total number of U.S. college enrollment 17,487,475 (National Center for Education Statistics, 2013); the population of Chinese college students 25.365647 million (Chinese Statistics Digest, 2012), and the Chinese students who studied abroad in the US 0.23 million.(Institutes of International Education, U.S. Bureau of Culture and Education Affairs, 2013). There was no consensus on what's the actual percentage of colleges students were actually social network users. According to Lenhart et al. (2010), 72% of all college students had a social media profile. However, a recent study by Martin (2013) showed that 96% of college students had a Facebook account. In this study, 96% was

used as an estimation of percentage of social network users for all three groups. Therefore, the population of social network users were calculated as total number of enrollment * 96%.

The sample size needed to achieve 5% marginal error and 95% confidence level was then calculated. The population and corresponding sample size was listed in the following table.

Table 3.1.

Estimated Population and Targeted Sample Size

Population	Confidence Level	Marginal Error	Sample Size Needed
U.S. college students who are social network users	95%	5%	384
Chinese college students in China who are social network users	95%	5%	384
Chinese students studying in the U.S. who are social network users	95%	5%	384

To reach the threshold of 384 respondents, a sample of 1,234 valid responses were collected including: 404 U.S students, 417 Chinese students living in the U.S. and 413 Chinese students currently living in China.

3.2 Data Collection

The date for data collection began on Jan 26, 2014 and finished on May 15, 2014. Survey was used to gather the necessary data. The survey included demographic, general privacy attitude, and questions about user behavior and perceptions in specific sites (see Appendix A).

A survey using the Qualtrics software was created and launched online. An anonymous link was then generated so that we caould distribute the survey by sending the link through email. Various methods were used to collect responses: more than 3,000 email invitations were sent and social media platforms such as Facebook, Twitter, QQ and WeChat were leveraged to get as many responses as possible.

In order to protect the respondent's anonymity and confidentiality, each respondent was provided with a randomly assigned ID number by the database. Thus, the responses to the questionnaires could not be linked or matched to any particular participant because no identifying information will be requested. Also, the participants were taken to the informed consent web page and instructed to read the contents (see Appendix A). If the participants agreed, they could check the "I have read, understood the above consent form and desire of my own free will to participate in this study. " button to take part in the survey. They were then asked to fill out the survey, which required approximately 2-5 minutes to complete. The data was stored electronically in an encrypted format to ensure confidentiality, as well.

3.3 Data Analysis Methods

Descriptive statistics was applied to analyze the data. The basic statistics such as frequency distribution, median, mean, variance etc. will be analyzed using the survey report tools provided by Qualtrics. One-way ANOVA, Kruskal Wallis tests, and correlation analysis were applied to study the relationships among variables using Minitab.

3.4 IRB Protocol

The survey participants were the general public with Internet access and 18 years of age or older; an exempt research (Category 2) was applied and granted (see Appendix B).

3.5 Summary

This chapter introduces the methodology for preparing the research, collecting data and for analyzing data. In the next chapter, the detailed process of data analysis is introduced and the results are demonstrated.

CHAPTER 4. PRESENTATION AND ANALYSIS OF DATA

4.1 Data Summary

A total of 1,410 responses were collected in the raw dataset including 130 respondents that did not fall into any of the three populations. The dataset also had 47 respondents who claimed that they did not use any social network service at all. So these responses were exclude from the dataset and we ended up with a sample of 1,234 valid respondents including: 404 U.S students, 417 Chinese students living in the U.S. and 413 Chinese students currently living in China (Table 4.1).

Table 4.1.

Dataset Summary

Groups	Total Response	None Social Network Users	Valid Responses
U.S. citizen	426	22	404
Chinese citizen living in the U.S.	437	20	417
Chinese citizen living in China	417	4	413
None of the above	130	1	0
Total	1,410	47	1,234

Figure 4.1 shows that among these 1,234 respondents, a majority of them reported to have 2-4 social network accounts.

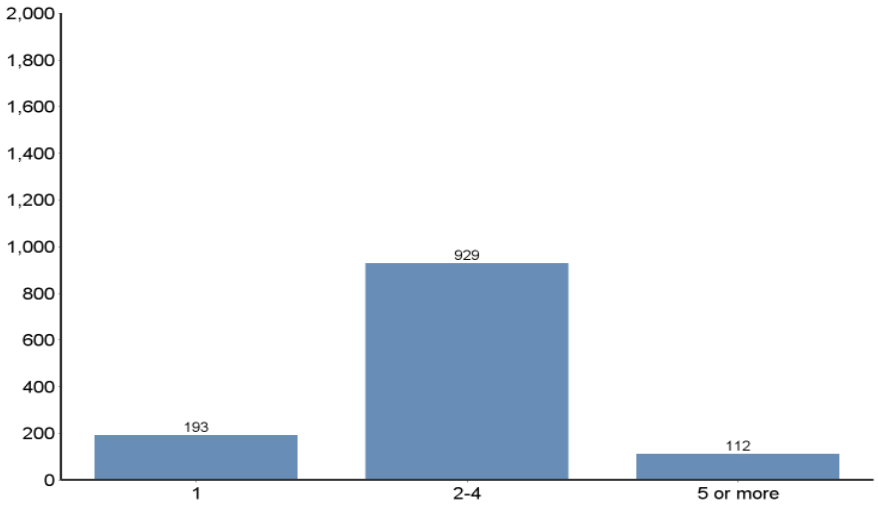


Figure 4.1 How Many Sites Do you Use?

The dataset included 677 Facebook users, 309 Twitter users, 106 WhatsApp users, 513 RenRen users, 565 Weibo users and 699 WeChat users. The summary of social network usage is illustrated in Figure 4.2 and Table 4.2. Note that less than 10% of the respondents reported that they were WhatsApp users and the small sample size may make the results less representative to all WhatsApp users.

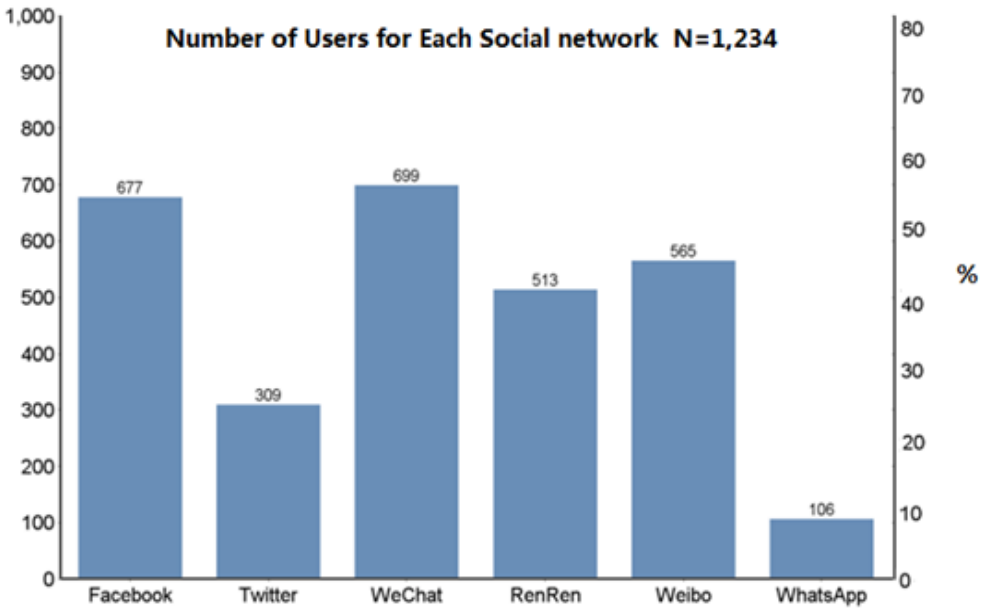


Figure 4.2 Number of Users for Each Site

Table 4.2.

Number of Users for Each Site

Sites	Response	Total Respondents	%
Facebook	677	1234	54.86%
Twitter	309	1234	25.04%
WeChat	699	1234	56.65%
RenRen	513	1234	41.57%
Weibo	565	1234	45.79%
WhatsApp	106	1234	8.59%
None of the above	47	1234	3.81%

4.1.1 General Privacy Attitude

In the survey, the respondents were asked to rate their general privacy concerns of 16 different types of information as “public”, “moderate privacy concern” or “very private” when they were using the social network. Fig. 4.3 illustrates how these social network users perceive the extent of privacy for each information category. Based on the responses, “SSN or other identification number” raised most privacy concerns as around 86% of the respondents rated it as “very private” and only 2.5% of the respondents considered it as “public”. Gender was the type of information that raised the least privacy concern – 75.5% of the respondents rated it as “public”.

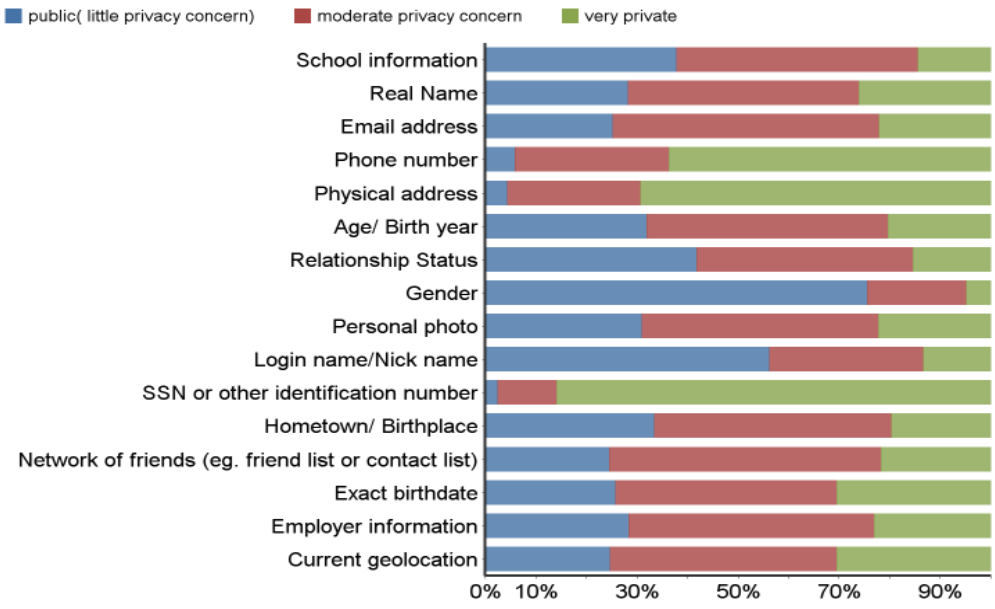


Figure 4.3 General Privacy Attitude N=1,234

Table 4.3.

General Privacy Attitude

Types of information	Public	Moderate privacy concern	Very Private	Total Responses
School information	467	589	178	1234
Real name	349	564	321	1234
Email address	312	649	273	1234
Phone number	72	376	786	1234
Physical address	55	324	855	1234
Age/ Birth year	395	589	250	1234
Relationship Status	517	527	190	1234
Gender	932	242	60	1234
Personal photo	383	576	275	1234
Login name/Nick name	694	375	165	1234
SSN or other identification number	31	143	1060	1234
Hometown/Birthplace	413	579	242	1234
Network of friends (eg. friend list or contact list)	303	663	268	1234
Exact birthdate	319	540	375	1234
Employer information	350	600	284	1234
Current geolocation	304	554	376	1234

4.1.2 Privacy Setting

The respondents were asked how often they changed their privacy settings for each selected social network. The options were “Never”, “Seldom”, “Sometimes” and “Often”. To avoid ambiguity of the choices, the survey defined, for example, “Seldom” as “Once a year or less”; “Sometimes” as “Several times a year” and “Often” as “Monthly or weekly”. For all across the social networks, most of the respondents reported that they either “Seldom” or “Never” changed their privacy settings.

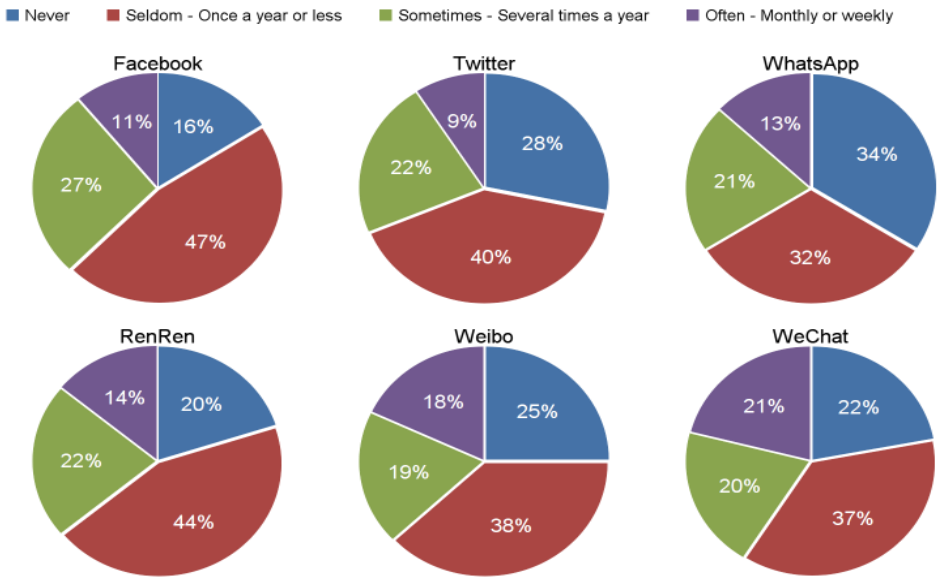


Figure 4.4 Frequency of Changing Privacy Settings N=1,234

Table 4.4.

Frequency of Changing Privacy Settings

Sites	Never	Seldom	Sometimes	Often	Total Responses
Facebook	107	318	180	72	677
Twitter	88	125	69	27	309

Table 4.4 (continued)

Frequency of Changing Privacy Settings

WhatsApp	36	34	22	14	106
RenRen	101	225	114	73	513
Weibo	140	213	110	102	565
WeChat	153	261	140	145	699

4.1.3 Privacy Policy

The respondents were asked "have you ever read the privacy policies for each site?". The options were "No", "Yes, but not carefully" and "Yes, I've read them carefully". Not surprisingly, very few of the respondents said that they had read the privacy policies carefully in any of the selected social networks.

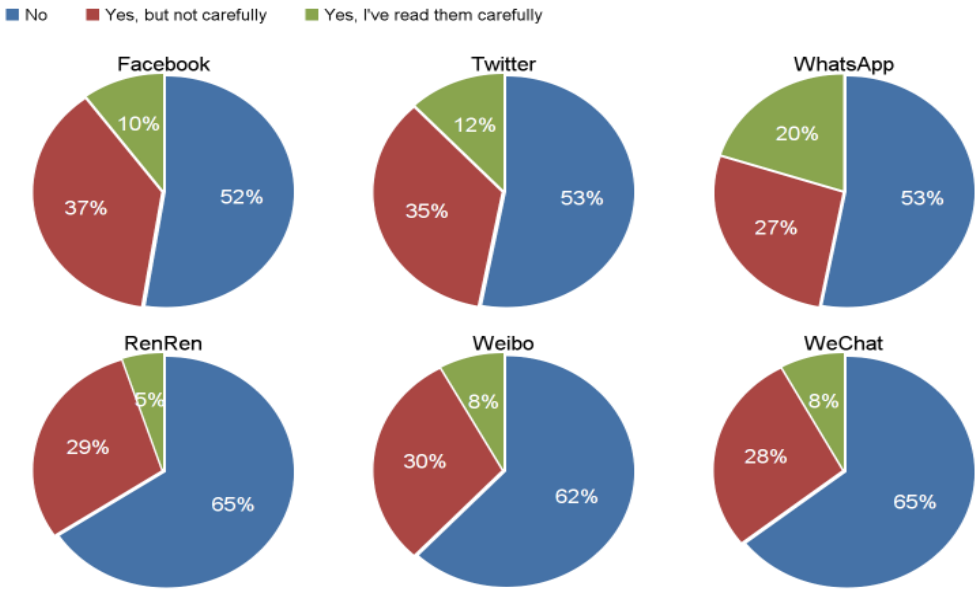


Figure 4.5 Have You Read Privacy Policies? N=1,234

Table 4.5.

Have You Read Privacy Policies?

Sites	No	Yes, but not carefully	Yes, I've read them carefully	Total Responses
Facebook	353	253	71	677
Twitter	163	108	38	309
WhatsApp	56	29	21	106
RenRen	334	151	28	513
Weibo	349	170	46	565
WeChat	452	193	54	699

4.1.4 Extent of Trust

The study would like to find out whether the extent of trust would reflect users' privacy perceptions or influence user behaviors. Therefore, the respondents were asked to rate their extent of trust when they were using each selected social network. They could select either "T don't trust it at all", "I'm suspicious that it may misuse my information", or "I trust it won't misuse my information". Although the majority of respondents reported that they did not completely trust the social network platform by choosing either "I don't trust" or "I'm suspicious", there were still large proportion of people who would like to trust these social networks, especially Weibo and WeChat users (46% and 50% respectively).

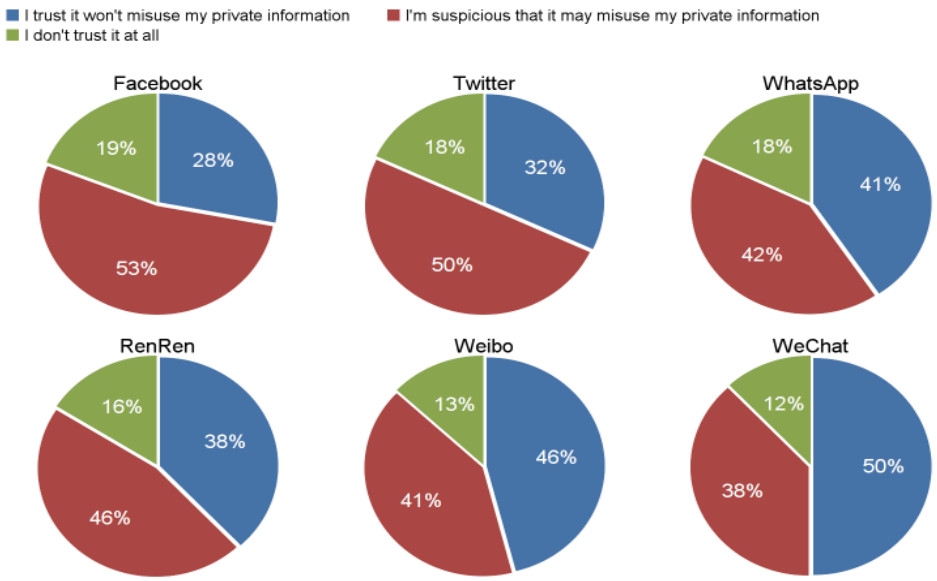


Figure 4.6 Extent of Trust N=1,234

Table 4.6.

Extent of Trust

Sites	I trust it	I'm suspicious	I don't trust it at all	Total Responses
Facebook	188	357	132	677
Twitter	99	155	55	309
WhatsApp	43	44	19	106
RenRen	196	237	80	513
Weibo	260	229	76	565
WeChat	348	267	84	699

4.1.5 Profile Preference

The profile preference were considered in this study as a potential indicator of users' privacy perception with the assumption that people who use private profiles may be more aware of privacy. So the respondents were asked whether they were using a "public" profile or a "private" profile in each selected social networks. The results were shown in Fig. 4.7 and Table 4.7. Most users in Twitter and its Chinese "replica" Weibo were using public profiles as most users in the other four sites were using private profiles.

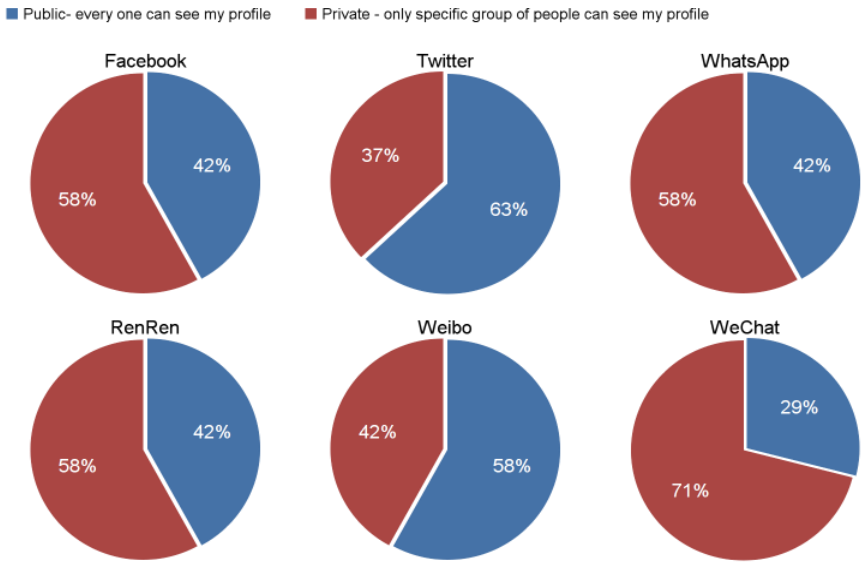


Figure 4.7 Profile Preference N=1,234

Table 4.7.

Profile Preference

Sites	Public	Private	Total Responses
Facebook	283	394	677
Twitter	194	115	309

Table 4.7 (continued).

Profile Preference

WhatsApp	45	61	106
RenRen	213	300	513
Weibo	330	235	565
WeChat	200	499	699

4.1.6 Constituents of Friend List

The respondents were asked to choose how many people in their friend list or contact lists were the people they actually knew in real world. The assumption was that the percentage of real life friends may have an influence on user behavior in social networks. Five choices.“<10%”, “10-40%”, “40-60%”,”60-90%” and “>90%” were offered.

We can clearly see some similar trends in similar sites. For example, both WeChat and WhatsApp had a large proportion of respondents who had more than 90% real life friends in their friend lists. The responses are illustrated as follows:

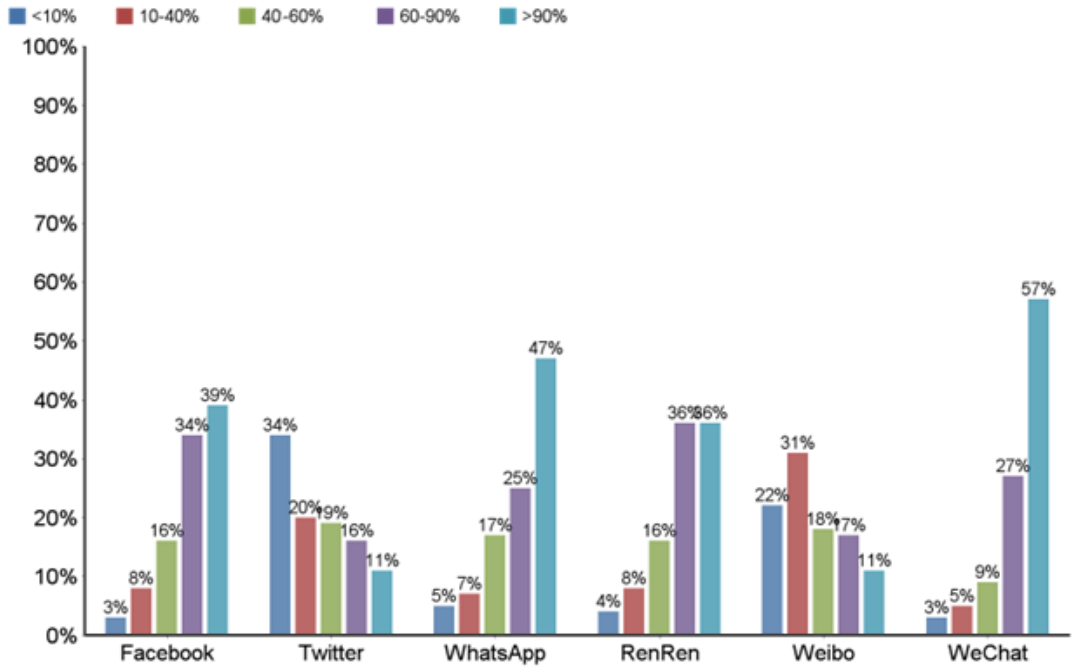


Figure 4.8 Constituents of Friend List N=1,234

Table 4.8.

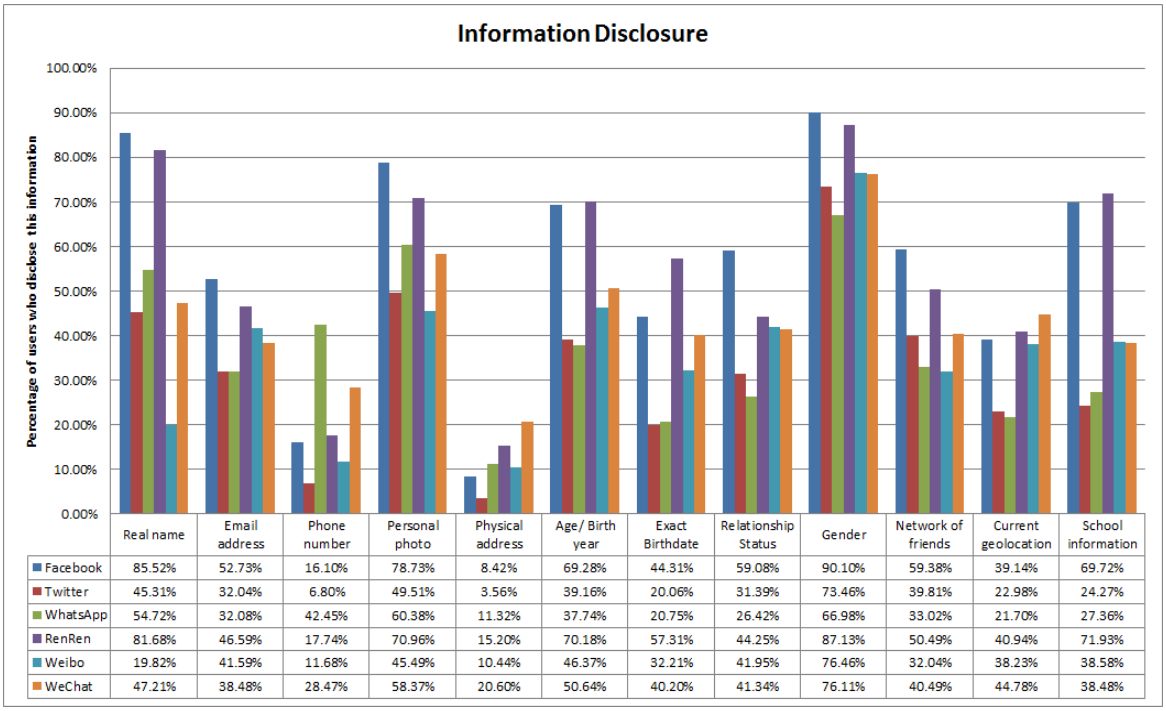
Constituents of Friend List

Sites	<10%	10-40%	40-60%	60-90%	>90%	Total Responses
Facebook	21	57	110	227	262	677
Twitter	104	63	58	49	35	309
WhatsApp	5	7	18	26	50	106
RenRen	20	40	80	187	186	513
Weibo	125	177	104	95	64	565
WeChat	18	32	64	187	398	699

4.1.7 Information Disclosure

Finally, the survey asked the respondents what kind of information they actually disclosed on each site. 13 types of personal information were picked out of the previous 16 categories in the general privacy attitude question. It seems that Facebook users and three Chinese sites users were more willing to disclose information in each category while WhatsApp users and Twitter users were most reluctantly in disclosing most types of information.

The results are illustrated blow:



	Real name	Email address	Phone number	Personal photo	Physical address	Age/ Birth year	Exact Birthdate	Relationship Status	Gender	Network of friends	Current geolocation	School information
Facebook	85.52%	52.73%	16.10%	78.73%	8.42%	69.28%	44.31%	59.08%	90.10%	59.38%	39.14%	69.72%
Twitter	45.31%	32.04%	6.80%	49.51%	3.56%	39.16%	20.06%	31.39%	73.46%	39.81%	22.98%	24.27%
WhatsApp	54.72%	32.08%	42.45%	60.38%	11.32%	37.74%	20.75%	26.42%	66.98%	33.02%	21.70%	27.36%
RenRen	81.68%	46.59%	17.74%	70.96%	15.20%	70.18%	57.31%	44.25%	87.13%	50.49%	40.94%	71.93%
Weibo	19.82%	41.59%	11.68%	45.49%	10.44%	46.37%	32.21%	41.95%	76.46%	32.04%	38.23%	38.58%
WeChat	47.21%	38.48%	28.47%	58.37%	20.60%	50.64%	40.20%	41.34%	76.11%	40.49%	44.78%	38.48%

Figure 4.9 Information Disclosure N=1,234

Table 4.9.

Information Disclosure

Types of information	Facebook	Twitter	WhatsApp	RenRen	Weibo	WeChat
Real name	579	140	58	419	112	330
Email address	357	99	34	239	235	269
Phone number	109	21	45	91	66	199
Personal photo	533	153	64	364	257	408
Physical address	57	11	12	78	59	144
Age/ Birth year	469	121	40	360	262	354
Exact Birthdate	300	62	22	294	182	281
Relationship Status	400	97	28	227	237	289
Gender	610	227	71	447	432	532
Network of friends	402	123	35	259	181	283
Current geolocation	265	71	23	210	216	313
School information	472	75	29	369	218	269
Employer information	295	51	19	175	134	184

4.2 Exploring Cultural Differences

In the previous section, we provide an overview of the dataset and demonstrated the results and statistics for each survey question. In the following sections, we perform detailed data analysis in order to answer the following research questions: 1) Is culture background a significant factor in influencing social network users' privacy perceptions

and behaviors? 2) What's the relationship between privacy attitude and actual information disclosure behavior? 3) What's the relationship among the various privacy perception and behavior variables?

4.2.1 Cultural Differences in General Privacy Attitude

This subsection discusses whether social network users with different cultural background would have significantly different privacy attitudes. In this study we specifically focus on three population- U.S. citizen, Chinese citizen studying in the U.S. and Chinese citizen living in China. The following figure breaks down the responses into the three groups and gives a contour of how different groups differ in their privacy attitudes. For example, we can see from the figure that Chinese in China were more concerned about their "Real name" than the other two groups, while the U.S. users were more concerned about their "Nickname" and "Current geolocation".

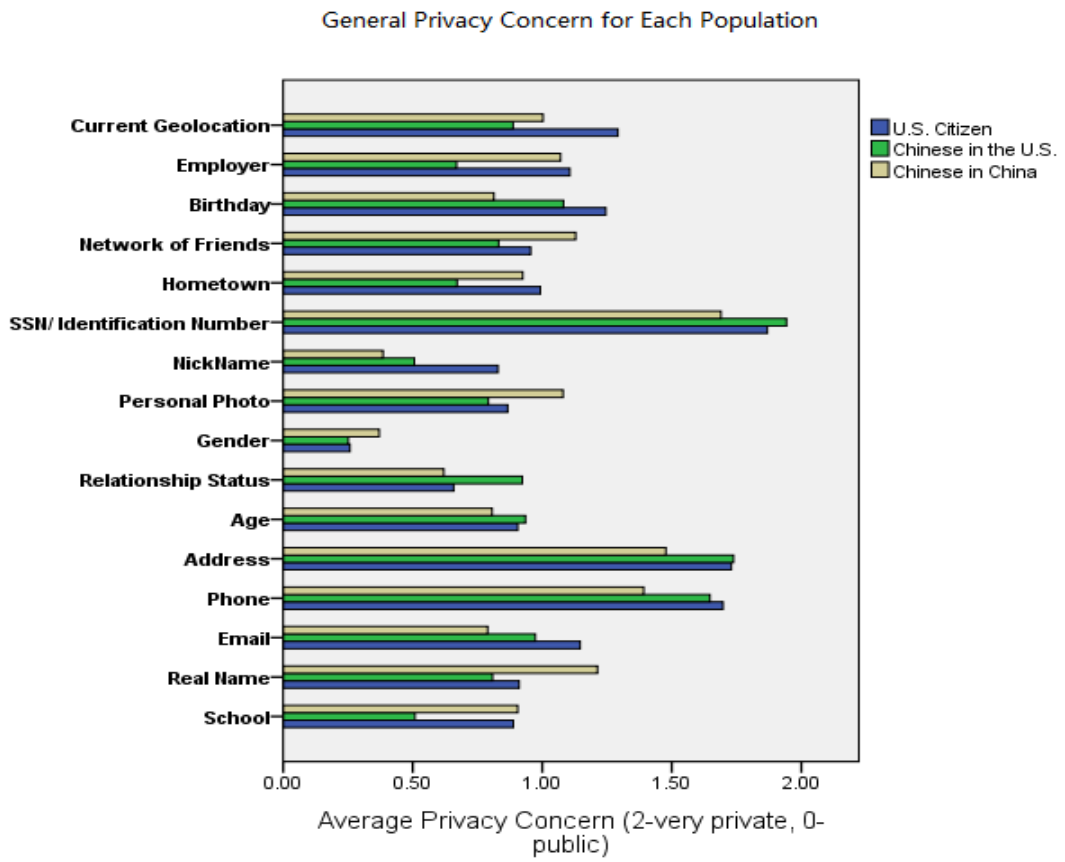


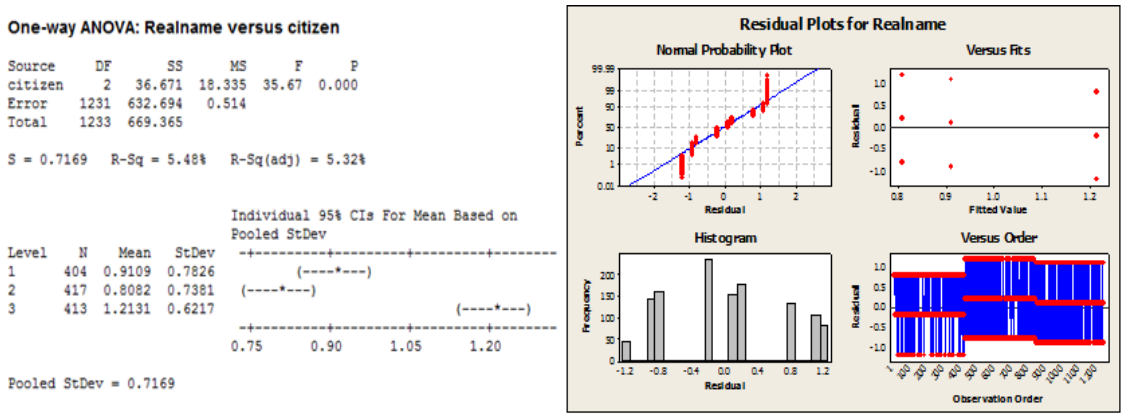
Figure.4.10 General Privacy Attitudes N=1,234, =404, =417, =413

In order to take a closer look, we perform detailed One-way ANOVA tests to find out whether there are significant differences among the three groups. We use a Kruskal-Wallis test (non-parametric) to verify the result and finally we perform a Turkey Post hoc test to find out the exact differences. We first performed the tests on "Real name" to see whether there were significant differences in privacy attitudes in this type of information among the three groups. The hypotheses were:

There's no difference in the mean of privacy attitudes among the three groups.

H_1 – There's significant difference in the mean of privacy attitudes between at least two groups.

The One-way ANOVA results are shown as follows:



One-way ANOVA: Realname versus citizen

Source	DF	SS	MS	F	P
citizen	2	36.671	18.335	35.67	0.000
Error	1231	632.694	0.514		
Total	1233	669.365			

S = 0.7169 R-Sq = 5.48% R-Sq(adj) = 5.32%

Individual 95% CIs For Mean Based on Pooled StDev

Level	N	Mean	StDev	-+---------+---------+---------+--------
1	404	0.9109	0.7826	(----*---)
2	417	0.8082	0.7381	(----*---)
3	413	1.2131	0.6217	(----*---)
				-+---------+---------+---------+--------
				0.75 0.90 1.05 1.20

Pooled StDev = 0.7169

Figure.4.11 One-way ANOVA Results

The p value was less than 0.05 which indicated that the null hypothesis was rejected. So there existed at least a pair of groups that have significant differences in their average privacy attitude. The residual plot on the right side showed that the normality and equal variance assumptions for the ANOVA test were met so that the results are valid.

Since the test result can only tell there were significant differences among the three groups. We had to find out which exact groups are different from each other. Therefore, a post hoc test was performed (see Figure. 4.12).

```
Grouping Information Using Tukey Method

citizen    N    Mean  Grouping
3        413  1.2131  A
1        404  0.9109    B
2        417  0.8082    B

Means that do not share a letter are significantly different.


Tukey 95% Simultaneous Confidence Intervals
All Pairwise Comparisons among Levels of citizen

Individual confidence level = 98.06%


citizen = 1 subtracted from:

citizen    Lower   Center   Upper  -------+---------+---------+---------+--
2        -0.2199  -0.1027  0.0144            (---*--)
3         0.1848   0.3022  0.4196                      (---*---)
                                  -------+---------+---------+---------+--
                                      -0.30      0.00      0.30      0.60


citizen = 2 subtracted from:

citizen   Lower  Center   Upper  -------+---------+---------+---------+--
3        0.2884  0.4049  0.5214                       (--*---)
                                 -------+---------+---------+---------+--
                                    -0.30      0.00      0.30      0.60
```

Figure.4.12 Post-hoc Results

The result suggested that (Chinese living in China) was significantly different from both (U.S. Citizen) and (Chinese respondents in the U.S.). However, and .did not have significant differences. To be more precise, the results gave evidence that the Chinese users in China were more concerned about their real names than Chinese users in the U.S. and U.S. users while the latter two groups did not have significant differences.

We performed the same tests for all the 16 types of information. The results are listed in the following table.

Table 4.10.

Results for Testing Differences in General Privacy Attitudes

Types of Information	p-value (ANOVA)	p-value (Kruskal-Wallis)	Post hoc Result
Real name	0.000	0.000	P1 vs. P2: not significant
			P1 vs. P3: significant <
			P2 vs. P3: significant <
Email address	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: significant >
			P2 vs. P3: significant >
Phone number	0.000	0.000	P1 vs. P2: not significant
			P1 vs. P3: significant >
			P2 vs. P3: significant >
Physical address	0.000	0.000	P1 vs. P2: not significant
			P1 vs. P3: significant >
			P2 vs. P3: significant >
Age/birthday	0.024	0.030	P1 vs. P2: not significant
			P1 vs. P3: not significant
			P2 vs. P3: significant >
Gender	0.002	0.007	P1 vs. P2: not significant
			P1 vs. P3: significant <
			P2 vs. P3: significant <
Hometown/ birthplace	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: not significant

			P2 vs. P3: significant <

Table 4.10 (continued).

Results for Testing Differences in General Privacy Attitudes

Network of friends	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: significant <
			P2 vs. P3: significant <
Birthday	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: significant >
			P2 vs. P3: significant >
Employer information	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: not significant
			P2 vs. P3: significant <
School information	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: not significant
			P2 vs. P3: significant <
Current geolocation	0.000	0.000	P1 vs. P2: significant >
			P1 vs. P3: significant >
			P2 vs. P3: not significant

Note. Confidence level: 95%, α=0.05, n=1234, N=1,234, N_1 =404, N_2 =417, N_3 =413 "</>"denotes "significantly smaller/larger than"

The above table illustrates a detailed relationship among the three groups in terms of their differences in privacy attitudes in different types of information. The results suggested that there existed significant differences in each type of information among the three groups. U.S. citizens were more concerned about their "current geolocation","email address", "login name/nick name" and "birthday". Chinese users in the U.S. were more concerned about "Relationship status" while they are less concerned about "school information", "employer information" ,"hometown" and "network of friends" than the other two groups. The Chinese users in China, however, were significantly more concerned about "real name", "gender", "network of friends" and "personal photo" but significantly less concerned about "email address", "phone number", "physical address", "SSN or other identification number" and "birthday". The conclusion is that cultural differences did play an important role in differentiating users' general privacy attitudes when they were using the social networks. People with different cultural background may have very different privacy attitudes. However, we also found out that in some cases, people with different cultural background may not have significant differences in privacy attitudes in specific types of information (for example P1 and P3 did not have significant differences in "employer information", "school information", "hometown" and "relationship status"). The comparison between two Chinese groups suggests that a shift in the cultural environment may have potential impact on privacy attitudes.

4.2.2 Cultural Differences in Trust

In this subsection, we compare Chinese and American respondents by studying how much they trust each social network. Since Facebook and the other U.S. sites are

blocked in China and U.S. students rarely use the three Chinese social networks, we are only able to conduct a pair wise comparison in each social network. The constituent of respondents for each social network is listed in the following table:

Table 4.11.

Constituents of Respondents for Each Social Network

	U.S.	Chinese in the U.S.	Chinese in China
# of Facebook users	376 (96%)	301 (73%)	-
# of Twitter users	233 (60%)	76 (18%)	-
#of WhatsApp users	66 (17%)	40 (10%)	-
# of RenRen users	-	325(79%)	188(49%)
# of Weibo users	-	269(65%)	296(77%)
# of WeChat users	-	345(84%)	354(92%)

The following figures and tables demonstrate how each of the three groups trusted their social networks:

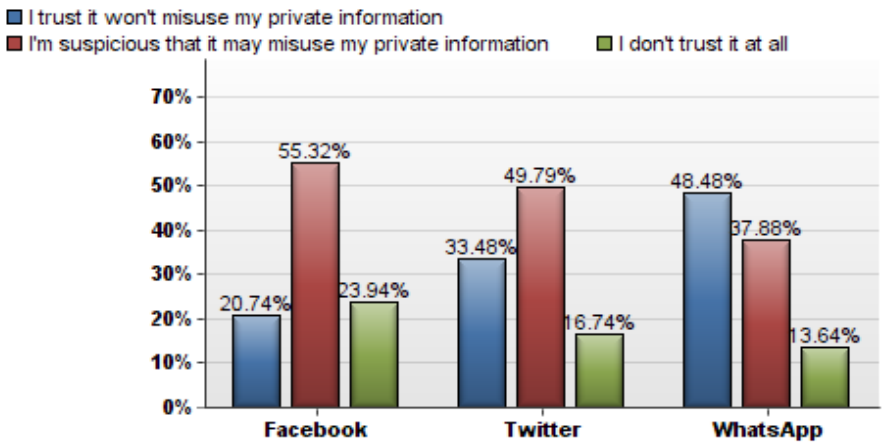


Figure.4.13 Extent of Trust: U.S. citizen N=404

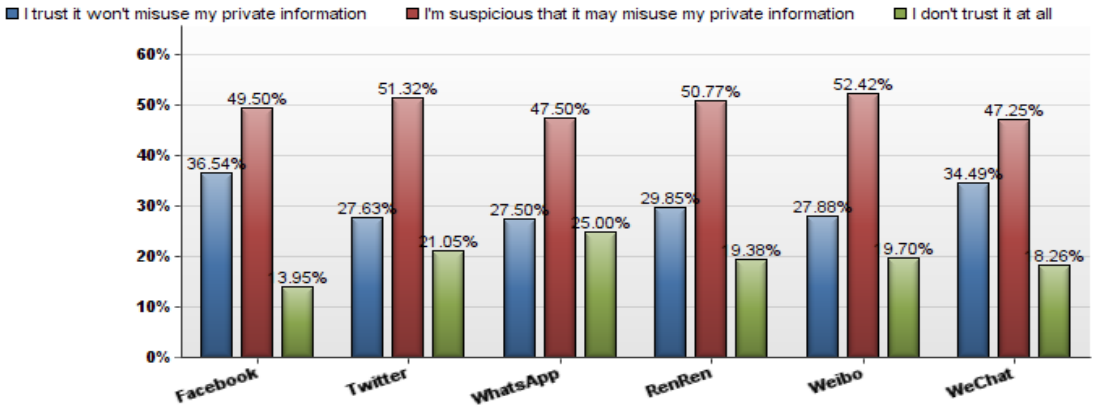


Figure.4.14 Extent of Trust: Chinese in the U.S. N=417

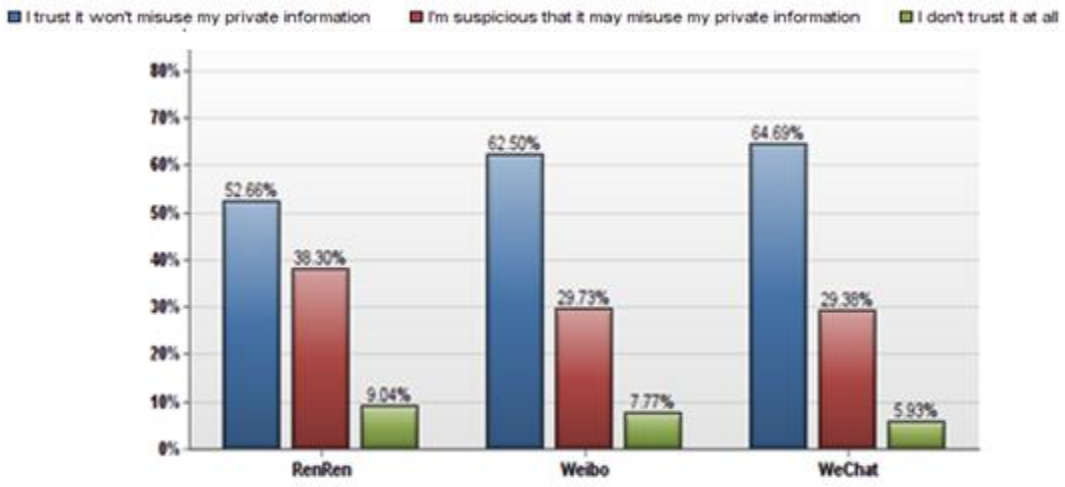


Figure.4.15 Extent of Trust: Chinese in China N=413

Table 4.12.

Extent of Trust: U.S. Citizen

Sites	I trust it won't misuse my private information	I'm suspicious that it may misuse my private information	I don't trust it at all	Total Responses
Facebook	78	208	90	376
Twitter	78	116	39	233
WhatsApp	32	25	9	66
RenRen	0	0	0	0

Weibo	0	0	0	0
WeChat	0	0	0	0

Table 4.13.

Extent of Trust: Chinese in the U.S.

Sites	I trust it won't misuse my private information	I'm suspicious that it may misuse my private information	I don't trust it at all	Total Responses
Facebook	110	149	42	301
Twitter	21	39	16	76
WhatsApp	11	19	10	40
RenRen	97	165	63	325
Weibo	75	141	53	269
WeChat	119	163	63	345

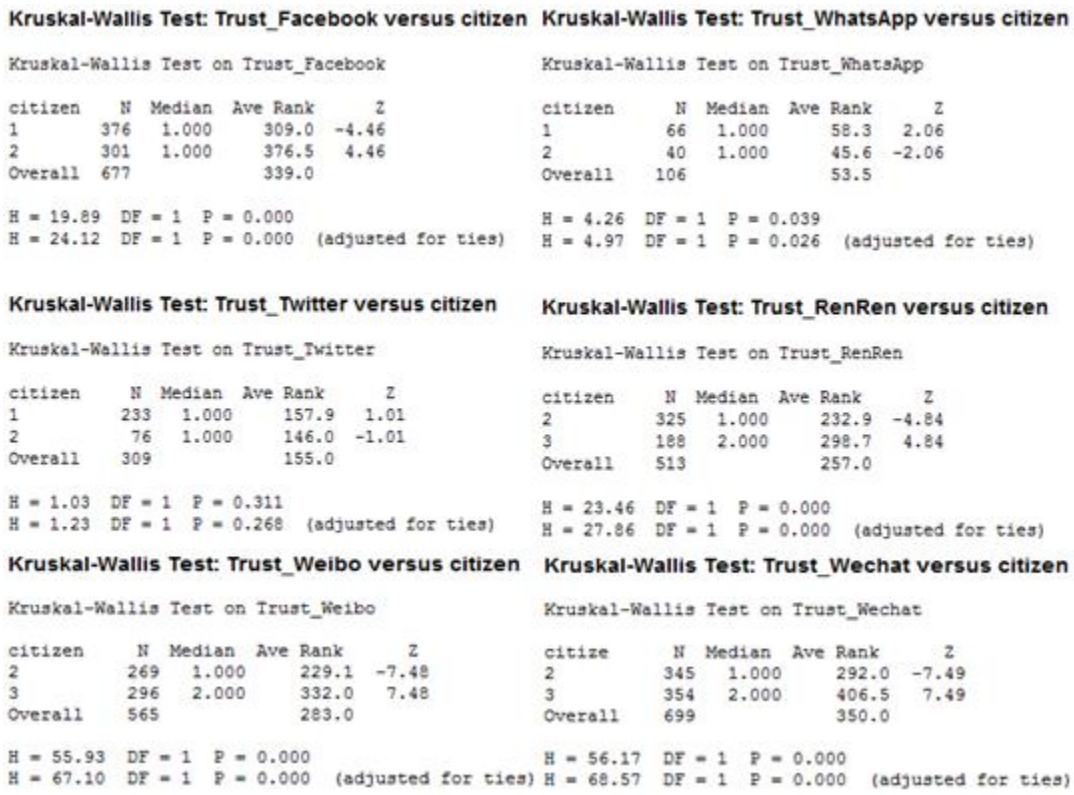
Table 4.14.

Extent of trust: Chinese in China

Sites	I trust it won't misuse my private information	I'm suspicious that it may misuse my private information	I don't trust it at all	Total Responses
Facebook	0	0	0	0
Twitter	0	0	0	0
WhatsApp	0	0	0	0

RenRen	99	72	17	188
Weibo	185	88	23	296
WeChat	229	104	21	354

To look at the differences, we performed a Kruskal-Wallis test for each social network. The results are shown in Figure 4.16 and Table 4.15:



Kruskal-Wallis Test: Trust_Facebook versus citizen

Kruskal-Wallis Test on Trust_Facebook

citizen	N	Median	Ave Rank	Z
1	376	1.000	309.0	-4.46
2	301	1.000	376.5	4.46
Overall	677		339.0	

H = 19.89 DF = 1 P = 0.000
H = 24.12 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Trust_WhatsApp versus citizen

Kruskal-Wallis Test on Trust_WhatsApp

citizen	N	Median	Ave Rank	Z
1	66	1.000	58.3	2.06
2	40	1.000	45.6	-2.06
Overall	106		53.5	

H = 4.26 DF = 1 P = 0.039
H = 4.97 DF = 1 P = 0.026 (adjusted for ties)

Kruskal-Wallis Test: Trust_Twitter versus citizen

Kruskal-Wallis Test on Trust_Twitter

citizen	N	Median	Ave Rank	Z
1	233	1.000	157.9	1.01
2	76	1.000	146.0	-1.01
Overall	309		155.0	

H = 1.03 DF = 1 P = 0.311
H = 1.23 DF = 1 P = 0.268 (adjusted for ties)

Kruskal-Wallis Test: Trust_RenRen versus citizen

Kruskal-Wallis Test on Trust_RenRen

citizen	N	Median	Ave Rank	Z
2	325	1.000	232.9	-4.84
3	188	2.000	298.7	4.84
Overall	513		257.0	

H = 23.46 DF = 1 P = 0.000
H = 27.86 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Trust_Weibo versus citizen

Kruskal-Wallis Test on Trust_Weibo

citizen	N	Median	Ave Rank	Z
2	269	1.000	229.1	-7.48
3	296	2.000	332.0	7.48
Overall	565		283.0	

H = 55.93 DF = 1 P = 0.000
H = 67.10 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Trust_Wechat versus citizen

Kruskal-Wallis Test on Trust_Wechat

citize	N	Median	Ave Rank	Z
2	345	1.000	292.0	-7.49
3	354	2.000	406.5	7.49
Overall	699		350.0	

H = 56.17 DF = 1 P = 0.000
H = 68.57 DF = 1 P = 0.000 (adjusted for ties)

Figure.4.16 Kruskal-Wallis Test Results: Trust

Table 4.15.

Summary of Results for Extent of Trust

Sites	Population Been Compared	Sample Sizes	Hypothesis	P-value

Facebook	P_1 vs. P_2	N_1 = 376 N_2 = 301 N = 677	H_0: There's no significant differences in the extent of trust between U.S. Facebook users and Chinese Facebook users in the U.S.	0.000

Table 4.15 (continued).

Summary of Results for Extent of Trust

Twitter	P_1 vs. P_2	N_1 = 233 N_2 = 76 N = 309	H_0: There's no significant differences in the extent of trust between U.S. Twitter users and Chinese Twitter users in the U.S.	0.311
WhatsApp	P_1 vs. P_2	N_1 = 66 N_2 = 40 N = 106	H_0: There's no significant differences in the extent of trust between U.S. WhatsApp users and Chinese WhatsApp users in the U.S.	0.039
RenRen	P_3 vs. P_2	N_2 = 325 N_3 = 188 N = 513	H_0: There's no significant differences in the extent of trust between Chinese RenRen users in China and Chinese RenRen users in the U.S.	0.000
Weibo	P_3 vs. P_2	N_2 = 269	H_0: There's no significant differences	0.000

		N_3 = 296 N = 565	in the extent of trust between Chinese Weibo users in China and Chinese Weibo users in the U.S.	
WeChat	P_3 vs. P_2	N_2 = 345 N_3 = 354 N = 699	H_0 : There's no significant differences in the extent of trust between Chinese WeChat users in China and Chinese WeChat users in the U.S.	0.311

The null hypothesis was rejected in all cases except for Twitter. There's no evidence that Chinese Twitter users and U.S. Twitter users were significantly different from each other in terms of trust. However, evidence showed that Chinese Facebook users trusted the social network more as compared with their American counterparts. Yet, Chinese WhatsApp users trusted less than the U.S. WhatsApp users. For the three Chinese sites – RenRen, Weibo and WeChat, Chinese users in China significantly trusted these sites more than those studying in the U.S.

4.2.3 Cultural Differences in Reading Privacy Policies

In this section, we try to answer the question: Are there significant differences in reading privacy policies between American users and Chinese users? An overview of the responses is illustrated below:

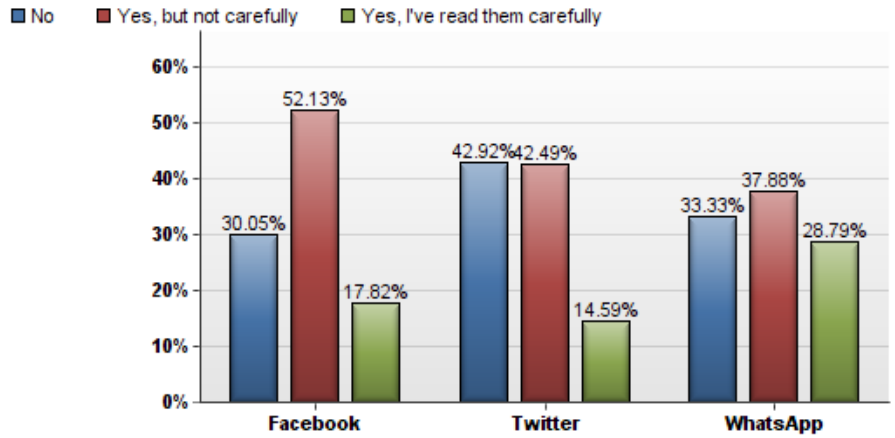


Figure.4.17 Reading Privacy Policies: U.S. Citizen N=404

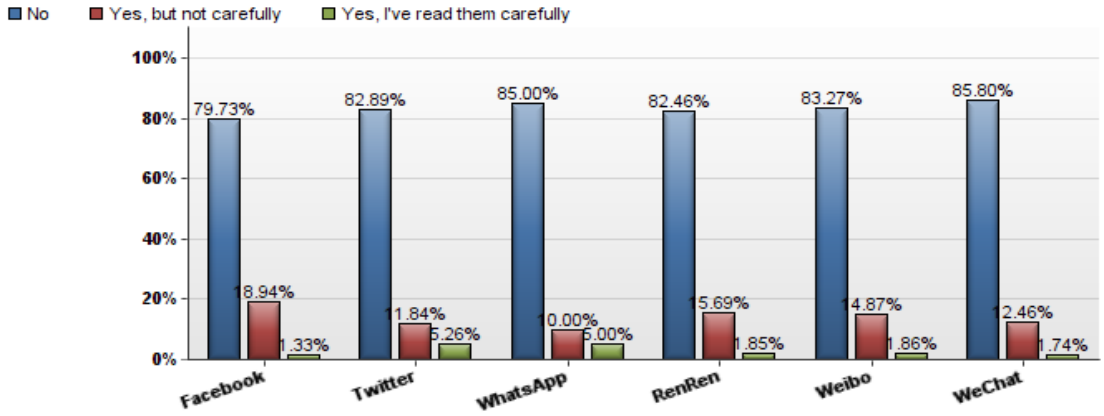


Figure.4.18 Reading Privacy Policies: Chinese in the U.S. N=417

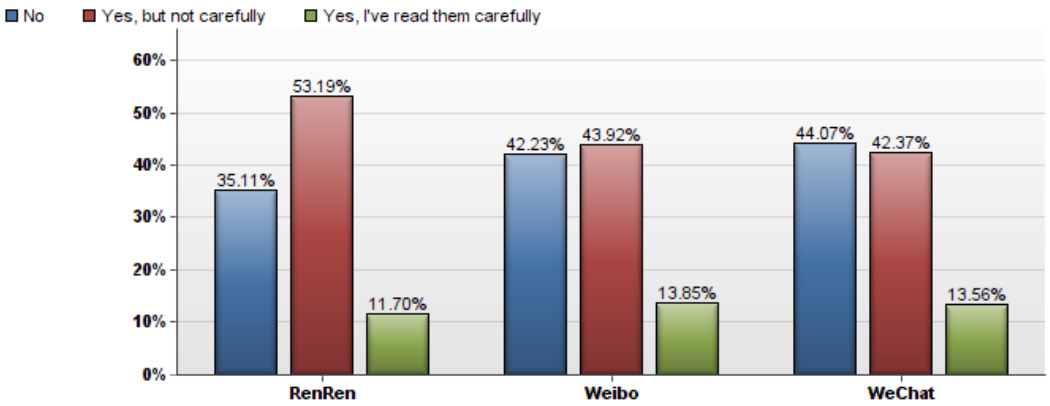


Figure.4.19 Reading Privacy Policies: Chinese in China N=417

Table 4.16.

Reading Privacy Policies: U.S. Citizen

Sites	No	Yes, but not carefully	Yes, I've read them carefully	Total Responses
Facebook	113	196	67	376
Twitter	100	99	34	233
WhatsApp	22	25	19	66
RenRen	0	0	0	0
Weibo	0	0	0	0
WeChat	0	0	0	0

Table 4.17.

Reading Privacy Policies: Chinese in the U.S.

Sites	No	Yes, but not carefully	Yes, I've read them carefully	Total Responses
Facebook	240	57	4	301
Twitter	63	9	4	76
WhatsApp	34	4	2	40
RenRen	268	51	6	325
Weibo	224	40	5	269
WeChat	296	43	6	345

Table 4.18.

Reading Privacy Policies: Chinese in China

Sites	No	Yes, but not carefully	Yes, I've read them carefully	Total Responses
Facebook	0	0	0	0
Twitter	0	0	0	0
WhatsApp	0	0	0	0
RenRen	66	100	22	188
Weibo	125	130	41	296
WeChat	156	150	48	354

Figure 4.20.and Table 4.19 summarizes the results of Kruskal-Wallis tests.

Kruskal-Wallis Test: Policy_Facebook versus citizen

Kruskal-Wallis Test on Policy_Facebook

citizen	N	Median	Ave Rank	Z
1	376	1.000000000	417.8	11.72
2	301	0.000000000	240.6	-11.72
Overall	677		339.0	

H = 137.31 DF = 1 P = 0.000
H = 170.59 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Policy_WhatsApp versus citizen

Kruskal-Wallis Test on Policy_WhatsApp

citizen	N	Median	Ave Rank	Z
1	66	1.000000000	64.0	4.53
2	40	0.000000000	36.1	-4.53
Overall	106		53.5	

H = 20.52 DF = 1 P = 0.000
H = 24.89 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Policy_Twitter versus citizen

Kruskal-Wallis Test on Policy_Twitter

citizen	N	Median	Ave Rank	Z
1	233	1.000000000	170.0	5.17
2	76	0.000000000	109.0	-5.17
Overall	309		155.0	

H = 26.69 DF = 1 P = 0.000
H = 33.01 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Policy_RenRen versus citizen

Kruskal-Wallis Test on Policy_RenRen

citizen	N	Median	Ave Rank	Z
2	325	0.000000000	211.7	-9.10
3	188	1.000000000	335.3	9.10
Overall	513		257.0	

H = 82.88 DF = 1 P = 0.000
H = 118.68 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Policy_Weibo versus citizen

Kruskal-Wallis Test on Policy_Weibo

citizen	N	Median	Ave Rank	Z
2	269	0.000000000	220.4	-8.69
3	296	1.000000000	339.9	8.69
Overall	565		283.0	

H = 75.46 DF = 1 P = 0.000
H = 102.45 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Policy_Wechat versus citizen

Kruskal-Wallis Test on Policy_Wechat

citizen	N	Median	Ave Rank	Z
2	345	0.000000000	274.5	-9.76
3	354	1.000000000	423.6	9.76
Overall	699		350.0	

H = 95.35 DF = 1 P = 0.000
H = 134.66 DF = 1 P = 0.000 (adjusted for ties)

Figure.4.20 Kruskal-Wallis Test Results: Privacy Policy

Table 4.19.

Summary of Results for Reading Privacy Policies

Sites	Population Been Compared	Sample Sizes	Hypothesis	P-value
Facebook	P_1 vs. P_2	N_1 = 376 N_2 = 301 N = 677	H_0: There's no significant differences in reading privacy policies between U.S. Facebook users and Chinese Facebook users in the U.S.	0.000

Twitter	P_1 vs. P_2	N_1 = 233 N_2 = 76 N = 309	H_0: There's no significant differences in reading privacy policies between U.S. Twitter users and Chinese Twitter users in the U.S.	0.000
WhatsApp	P_1 vs. P_2	N_1 = 66 N_2 = 40 N = 106	H_0: There's no significant differences in reading privacy policies between U.S. WhatsApp users and Chinese WhatsApp users in the U.S.	0.000
RenRen	P_3 vs. P_2	N_2 = 325 N_3 = 188 N = 513	H_0: There's no significant differences in reading privacy policies between Chinese RenRen users in China and Chinese RenRen users in the U.S.	0.000

Table 4.19 (continued).

Summary of Results for Reading Privacy Policies

Weibo	P_3 vs. P_2	N_2 = 269 N_3 = 296 N = 565	H_0: There's no significant differences in reading privacy policies between Chinese Weibo users in China and Chinese Weibo users in the U.S.	0.000

WeChat	P_3 vs. P_2	N_2 = 345 N_3 = 354 N = 699	H_0: There's no significant differences in reading privacy policies between Chinese WeChat users in China and Chinese WeChat users in the U.S.	0.000

The null hypothesis was rejected in all cases. For all the three U.S. social networks, we can see that American users were more willing to read privacy policies than Chinese users in the U.S. While for all the three Chinese sites, we found out that Chinese users in China were more willing to read privacy policies than those Chinese users who were living in the U.S.

4.2.4 Cultural Differences in Privacy Settings

In this section, we try to answer this question: Are there significant differences in the frequency of changing privacy settings between American users and Chinese users? The survey results are illustrated in the following figures and tables:

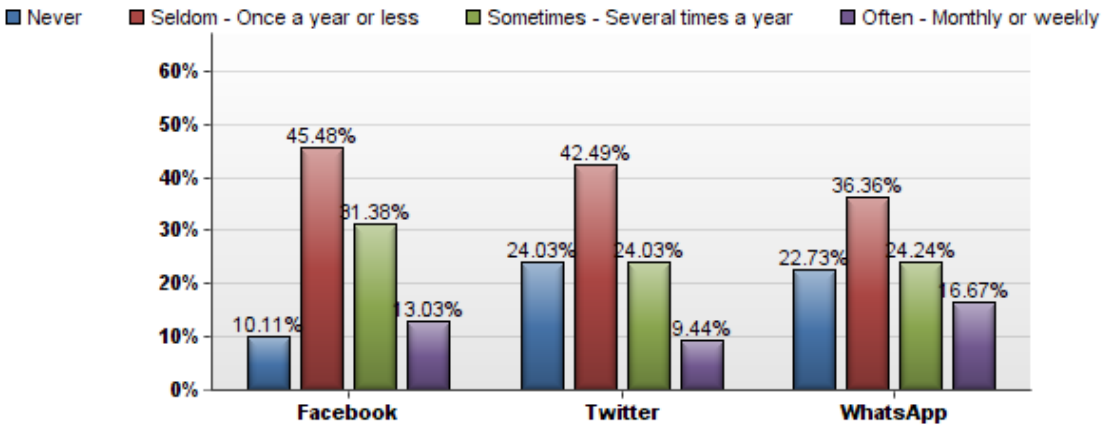


Figure.4.21 Changing Privacy Settings: U.S. Citizen N=404

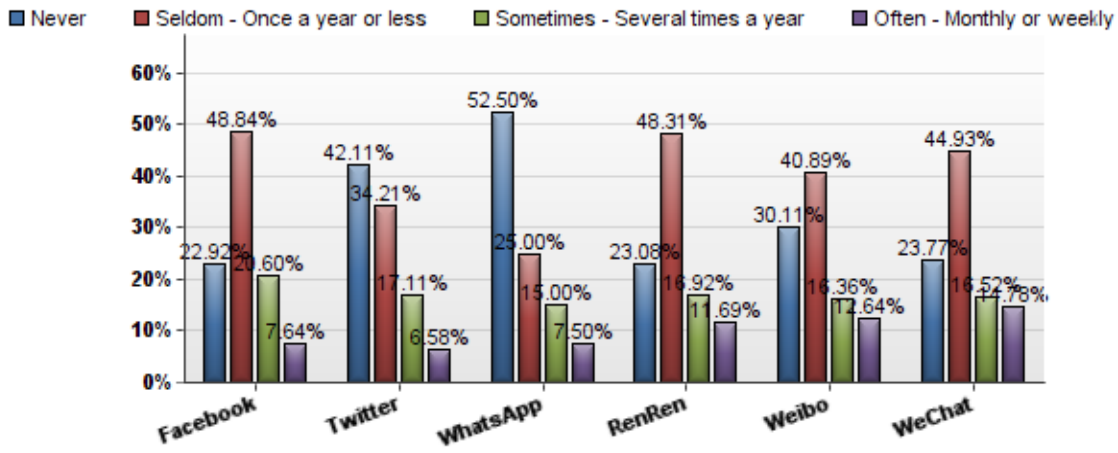


Figure.4.22 Changing Privacy Settings: Chinese in the U.S. N=417

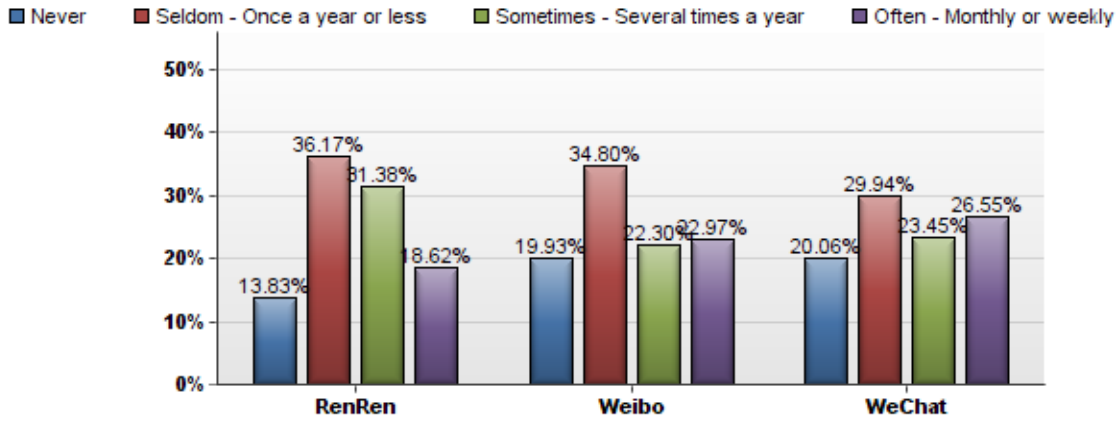


Figure.4.23 Changing Privacy Settings: Chinese in China N=413

Table 4.20.

Changing Privacy Settings: U.S

Sites	Never	Seldom	Sometimes	Often	Total Responses
Facebook	38	171	118	49	376

Twitter	56	99	56	22	233
WhatsApp	15	24	16	11	66
RenRen	0	0	0	0	0
Weibo	0	0	0	0	0
WeChat	0	0	0	0	0

Table 4.21.

Changing Privacy Settings: Chinese in the U.S.

Sites	Never	Seldom	Sometimes	Often	Total Responses
Facebook	38	171	118	49	376
Twitter	56	99	56	22	233
WhatsApp	15	24	16	11	66
RenRen	0	0	0	0	0
Weibo	0	0	0	0	0
WeChat	0	0	0	0	0

Table 4.22.

Changing Privacy Settings: Chinese in China

Sites	Never	Seldom	Sometimes	Often -	Total Responses

Facebook	0	0	0	0	0
Twitter	0	0	0	0	0
WhatsApp	0	0	0	0	0
RenRen	26	68	59	35	188
Weibo	59	103	66	68	296
WeChat	71	106	83	94	354

We coded the responses as: 3- “often”, 2 – “sometimes”, 1 – “seldom” and 0- “never”. We performed the same analysis as privacy policies. The results are listed below:

Kruskal-Wallis Test: Setting_Facebook versus citizen

Kruskal-Wallis Test on Setting_Facebook

citizen	N	Median	Ave Rank	Z
1	376	1.000	372.0	4.91
2	301	1.000	297.7	-4.91
Overall	677		339.0	

H = 24.13 DF = 1 P = 0.000
H = 27.66 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Setting_WhatsApp versus citizen

Kruskal-Wallis Test on Setting_WhatsApp

citizen	N	Median	Ave Rank	Z
1	66	1.000000000	60.0	2.80
2	40	0.000000000	42.8	-2.80
Overall	106		53.5	

H = 7.82 DF = 1 P = 0.005
H = 8.53 DF = 1 P = 0.003 (adjusted for ties)

Kruskal-Wallis Test: Setting_Twitter versus citizen

Kruskal-Wallis Test on Setting_Twitter

citizen	N	Median	Ave Rank	Z
1	233	1.000	162.4	2.55
2	76	1.000	132.3	-2.55
Overall	309		155.0	

H = 6.51 DF = 1 P = 0.011
H = 7.24 DF = 1 P = 0.007 (adjusted for ties)

Kruskal-Wallis Test: Setting_RenRen versus citizen

Kruskal-Wallis Test on Setting_RenRen_1

citizen	N	Median	Ave Rank	Z
2	325	1.000	235.8	-4.25
3	188	1.500	293.6	4.25
Overall	513		257.0	

H = 18.10 DF = 1 P = 0.000
H = 20.25 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Setting_Weibo versus citizen

Kruskal-Wallis Test on Setting_Weibo

citizen	N	Median	Ave Rank	Z
2	269	1.000	254.1	-4.01
3	296	1.000	309.3	4.01
Overall	565		283.0	

H = 16.11 DF = 1 P = 0.000
H = 17.56 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Setting_Wechat versus citizen

Kruskal-Wallis Test on Setting_Wechat

citizen	N	Median	Ave Rank	Z
2	345	1.000	318.6	-4.05
3	354	1.500	380.6	4.05
Overall	699		350.0	

H = 16.44 DF = 1 P = 0.000
H = 17.86 DF = 1 P = 0.000 (adjusted for ties)

Figure.4.24 Kruskal-Wallis Test Results: Privacy Setting

Table 4.23.

Summary of Results for Changing Privacy Settings

Sites	Population Been Compared	Sample Sizes	Hypothesis	P-value
Facebook	P_1 vs. P_2	N_1 = 376 N_2 = 301 N = 677	H_0 : There's no significant differences in changing privacy settings between U.S. Facebook users and Chinese Facebook users in the U.S.	0.000

Table 4.23 (continued).

Summary of Results for Changing Privacy Settings

Twitter	P_1 vs. P_2	N_1 = 233 N_2 = 76 N = 309	H_0 : There's no significant differences in changing privacy settings between U.S. Twitter users and Chinese Twitter users in the U.S.	0.011
WhatsApp	P_1 vs. P_2	N_1 = 66 N_2 = 40 N = 106	H_0 : There's no significant differences in changing privacy settings between U.S. WhatsApp users and Chinese WhatsApp users in the U.S.	0.005
RenRen	P_3 vs. P_2	N_2 = 325 N_3 = 188 N = 513	H_0 : There's no significant differences in changing privacy settings between Chinese RenRen users in China and Chinese RenRen users in the U.S.	0.000

Weibo	P_3 vs. P_2	N_2 = 269 N_3 = 296 N = 565	H_0 : There's no significant differences in changing privacy settings between Chinese Weibo users in China and Chinese Weibo users in the U.S.	0.000
WeChat	P_3 vs. P_2	N_2 = 345 N_3 = 354 N = 699	H_0 : There's no significant differences in changing privacy settings between Chinese WeChat users in China and Chinese WeChat users in the U.S.	0.000

The results suggested that there were significant differences in the frequency of changing privacy settings in every social network. In the three U.S. social networks, American users changed their privacy settings more frequently than Chinese social network users in the U.S. In the three Chinese sites, Chinese users in China also changed their privacy settings more frequently than Chinese users living in the U.S.

4.2.5 Cultural Differences in Friend Lists

In this section, we studied whether culture differences affect users' constituents of their friend list. The survey results are illustrated in the following figures and tables:

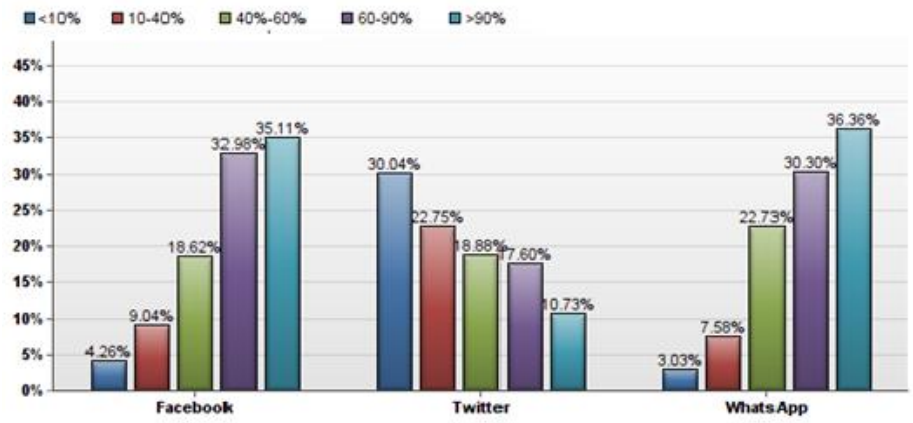


Figure.4.25 Percentage of Real World Friends in Friend List: U.S. Citizen

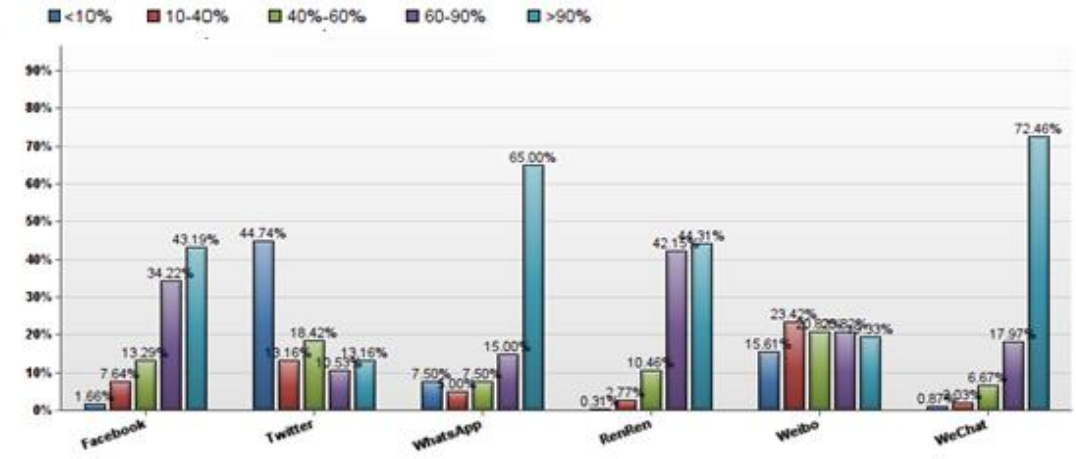


Figure.4.26 Percentage of Real World Friends in Friend List: Chinese in the U.S N=417

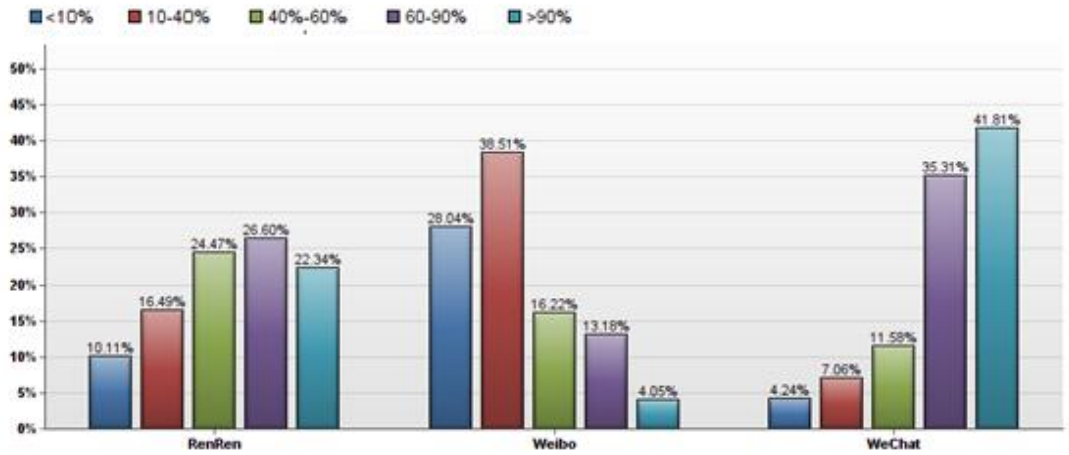


Figure.4.27 Percentage of Real World Friends in Friend List: Chinese in China N=413

Table 4.24.

Percentage of Real World Friends in Friend List: U.S. Citizen

Sites	<10%	10-40%	40%-60%	60-90%	>90%	Total Responses
Facebook	16	34	70	124	132	376
Twitter	70	53	44	41	25	233
WhatsApp	2	5	15	20	24	66
RenRen	0	0	0	0	0	0
Weibo	0	0	0	0	0	0
WeChat	0	0	0	0	0	0

Table 4.25.

Percentage of Real World Friends in Friend List: Chinese in the U.S.

Sites	<10%	10-40%	40%-60%	60-90%	>90%	Total Responses
Facebook	5	23	40	103	130	301
Twitter	34	10	14	8	10	76
WhatsApp	3	2	3	6	26	40
RenRen	1	9	34	137	144	325
Weibo	42	63	56	56	52	269
WeChat	3	7	23	62	250	345

Table 4.26.

Percentage of Real World Friends in Friend List: Chinese in China

Sites	<10%	10-40%	40%-60%	60-90%	>90%	Total Responses
Facebook	0	0	0	0	0	0
Twitter	0	0	0	0	0	0
WhatsApp	0	0	0	0	0	0
RenRen	19	31	46	50	42	188
Weibo	83	114	48	39	12	296
WeChat	15	25	41	125	148	354

We performed Kruskal-Wallis tests to test the influence of cultural background on friend list. The tests results are shown as follows:

Kruskal-Wallis Test: Friend_Facebook versus citizen

Kruskal-Wallis Test on Friend_Facebook

citizen	N	Median	Ave Rank	Z
1	376	4.000	337.4	-0.23
2	301	4.000	341.0	0.23
Overall	677		339.0	

H = 0.05 DF = 1 P = 0.816
H = 0.06 DF = 1 P = 0.807 (adjusted for ties)

Kruskal-Wallis Test: Friend_WhatsApp versus citizen

Kruskal-Wallis Test on Friend_WhatsApp

citizen	N	Median	Ave Rank	Z
1	66	4.000	53.8	0.11
2	40	4.000	53.1	-0.11
Overall	106		53.5	

H = 0.01 DF = 1 P = 0.914
H = 0.01 DF = 1 P = 0.908 (adjusted for ties)

Kruskal-Wallis Test: Friend_Twitter versus citizen

Kruskal-Wallis Test on Friend_Twitter

citizen	N	Median	Ave Rank	Z
1	233	2.000	158.6	1.23
2	76	2.000	144.1	-1.23
Overall	309		155.0	

H = 1.51 DF = 1 P = 0.219
H = 1.61 DF = 1 P = 0.205 (adjusted for ties)

Kruskal-Wallis Test: Friend_RenRen versus citizen

Kruskal-Wallis Test on Friend_RenRen

citizen	N	Median	Ave Rank	Z
2	325	4.000	266.5	1.90
3	188	3.000	240.6	-1.90
Overall	513		257.0	

H = 3.62 DF = 1 P = 0.057
H = 4.03 DF = 1 P = 0.045 (adjusted for ties)

Kruskal-Wallis Test: Friend_Weibo versus citizen

Kruskal-Wallis Test on Friend_Weibo

citizen	N	Median	Ave Rank	Z
2	269	3.000	322.7	5.52
3	296	2.000	246.9	-5.52
Overall	565		283.0	

H = 30.43 DF = 1 P = 0.000
H = 32.17 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Friend_Wechat versus citizen

Kruskal-Wallis Test on Friend_Wechat

citizen	N	Median	Ave Rank	Z
2	345	4.000	387.5	4.84
3	354	4.000	313.5	-4.84
Overall	699		350.0	

H = 23.45 DF = 1 P = 0.000
H = 29.48 DF = 1 P = 0.000 (adjusted for ties)

Figure.4.28 Kruskal-Wallis Test Results: Friend List

Table 4.27.

Summary of Results for Friend List

Sites	Population Been Compared	Sample Sizes	Hypothesis	P-value
Facebook	P_1 vs. P_2	N_1 = 376 N_2 = 301 N = 677	H_0: There's no significant differences in constituent of friend lists between U.S. Facebook users and Chinese Facebook users in the U.S.	0.816
Twitter	P_1 vs. P_2	N_1 = 233 N_2 = 76 N = 309	H_0: There's no significant differences in constituent of friend lists between U.S. Twitter users and Chinese Twitter users in the U.S.	0.219

Table 4.27 (continued).

Summary of Results for Friend List

WhatsApp	P_1 vs. P_2	N_1 = 66 N_2 = 40 N = 106	H_0: There's no significant differences in constituent of friend lists between U.S. WhatsApp users and Chinese WhatsApp users in the U.S.	0.914
RenRen	P_3 vs. P_2	N_2 = 325 N_3 = 188 N = 513	H_0: There's no significant differences in constituent of friend lists between Chinese RenRen users in China and Chinese RenRen users in the U.S.	0.057
Weibo	P_3 vs. P_2	N_2 = 269 N_3 = 296 N = 565	H_0: There's no significant differences in constituent of friend lists between Chinese Weibo users in China and Chinese Weibo users in the U.S.	0.000
WeChat	P_3 vs. P_2	N_2 = 345 N_3 = 354 N = 699	H_0: There's no significant differences in constituent of friend lists between Chinese WeChat users in China and Chinese WeChat users in the U.S.	0.000

Only in Weibo and WeChat could we identify evidence that indicated significant differences in the percentage of real life friends in the friend lists between Chinese users in China and Chinese users in the U.S.

Chinese users in the U.S. had more real life friends than those in china. In the other four social networks, no evidence was found that support significant differences.

4.2.6 Cultural Differences in Profile Preferences

In this section, we want to know whether culture differences affect users' profile management. The survey results are illustrated in the following figures and tables:

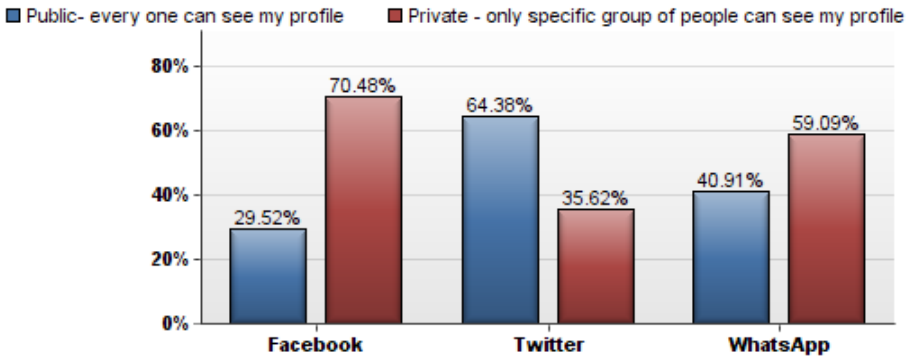


Figure.4.29 Profile Preference: U.S. Citizen N=404

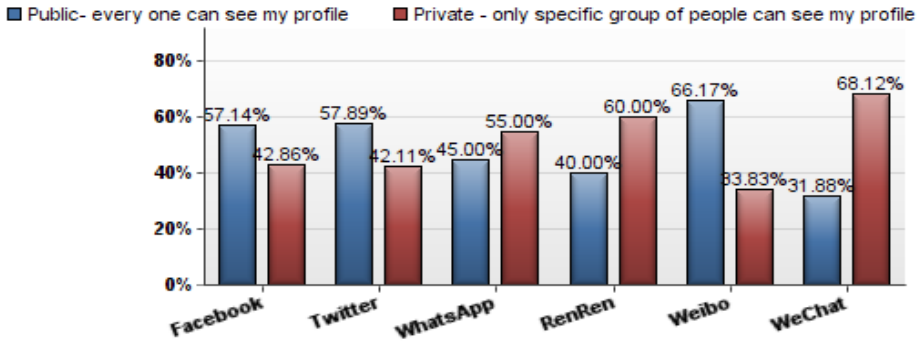


Figure.4.30 Profile Preference: Chinese in the U.S. N=417

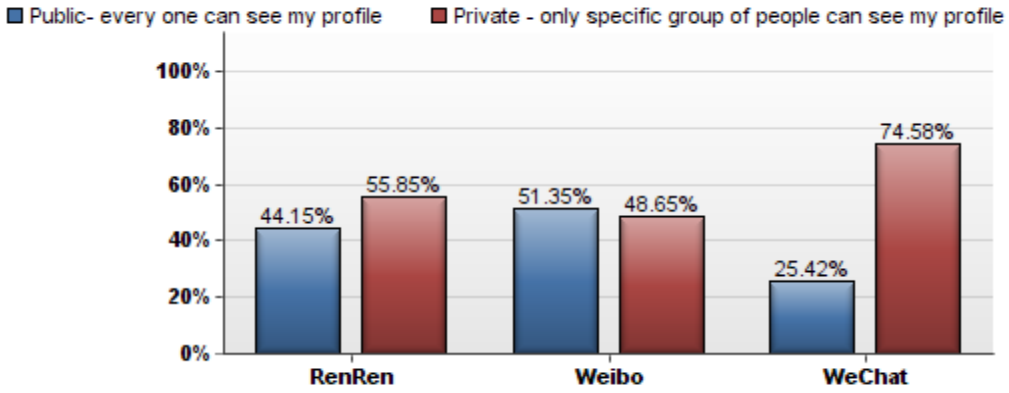


Figure.4.31 Profile Preference: Chinese in China N=413

Table 4.28.

Profile Preference: U.S. Citizen

Sites	Public	Private	Total Responses
Facebook	111	265	376
Twitter	150	83	233
WhatsApp	27	39	66
RenRen	0	0	0
Weibo	0	0	0
WeChat	0	0	0

Table 4.29.

Profile Preference: Chinese in the U.S.

Sites	Public	Private	Total Responses
Facebook	172	129	301
Twitter	44	32	76

Table 4.29 (continued).

Profile Preference: Chinese in the U.S.

WhatsApp	18	22	40
RenRen	130	195	325
Weibo	178	91	269
WeChat	110	235	345

Table 4.30.

Profile Preference: Chinese in China

Sites	Public	Private	Total Responses
Facebook	0	0	0
Twitter	0	0	0
WhatsApp	0	0	0
RenRen	83	105	188
Weibo	152	144	296
WeChat	90	264	354

We performed Kruskal-Wallis tests to test the influence of cultural background on profile preference. The tests results are shown as follows:

Kruskal-Wallis Test: Profile_Facebook versus citizen

Kruskal-Wallis Test on Profile_Facebook

citizen	N	Median	Ave Rank	Z
1	376	2.000	380.6	6.18
2	301	1.000	287.1	-6.18
Overall	677		339.0	

H = 38.21 DF = 1 P = 0.000
H = 52.35 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Profile_WhatsApp versus citizen

Kruskal-Wallis Test on Profile_WhatsApp

citizen	N	Median	Ave Rank	Z
1	66	2.000	54.3	0.35
2	40	2.000	52.1	-0.35
Overall	106		53.5	

H = 0.12 DF = 1 P = 0.725
H = 0.17 DF = 1 P = 0.681 (adjusted for ties)

Kruskal-Wallis Test: Profile_Twitter versus citizen

Kruskal-Wallis Test on Profile_Twitter

citizen	N	Median	Ave Rank	Z
1	233	1.000	152.5	-0.85
2	76	1.000	162.6	0.85
Overall	309		155.0	

H = 0.72 DF = 1 P = 0.396
H = 1.03 DF = 1 P = 0.311 (adjusted for ties)

Kruskal-Wallis Test: Profile_RenRen versus citizen

Kruskal-Wallis Test on Profile_RenRen

citizen	N	Median	Ave Rank	Z
2	325	2.000	260.9	0.78
3	188	2.000	250.3	-0.78
Overall	513		257.0	

H = 0.61 DF = 1 P = 0.433
H = 0.84 DF = 1 P = 0.359 (adjusted for ties)

Kruskal-Wallis Test: Profile_Weibo versus citizen

Kruskal-Wallis Test on Profile_Weibo

citizen	N	Median	Ave Rank	Z
2	269	1.000	261.1	-3.04
3	296	1.000	302.9	3.04
Overall	565		283.0	

H = 9.27 DF = 1 P = 0.002
H = 12.72 DF = 1 P = 0.000 (adjusted for ties)

Kruskal-Wallis Test: Profile_Wechat versus citizen

Kruskal-Wallis Test on Profile_Wechat

citizen	N	Median	Ave Rank	Z
2	345	2.000	338.6	-1.48
3	354	2.000	361.1	1.48
Overall	699		350.0	

H = 2.18 DF = 1 P = 0.139
H = 3.56 DF = 1 P = 0.059 (adjusted for ties)

Figure.4.32 Kruskal-Wallis Test Results: Profile Preference

Table 4.31.

Summary of Results for Profile Preference

Sites	Population Been Compared	Sample Sizes	Hypothesis	P-value
Facebook	P_1 vs. P_2	N_1 = 376 N_2 = 301 N = 677	H_0 : There's no significant differences in profile preferences between U.S. Facebook users and Chinese Facebook users in the U.S.	0.000
Twitter	P_1 vs. P_2	N_1 = 233 N_2 = 76	H_0 : There's no significant differences in profile preferences between U.S. Twitter	0.396

		N = 309	users and Chinese Twitter users in the U.S.	

Table 4.31 (continued).

Summary of Results for Profile Preference

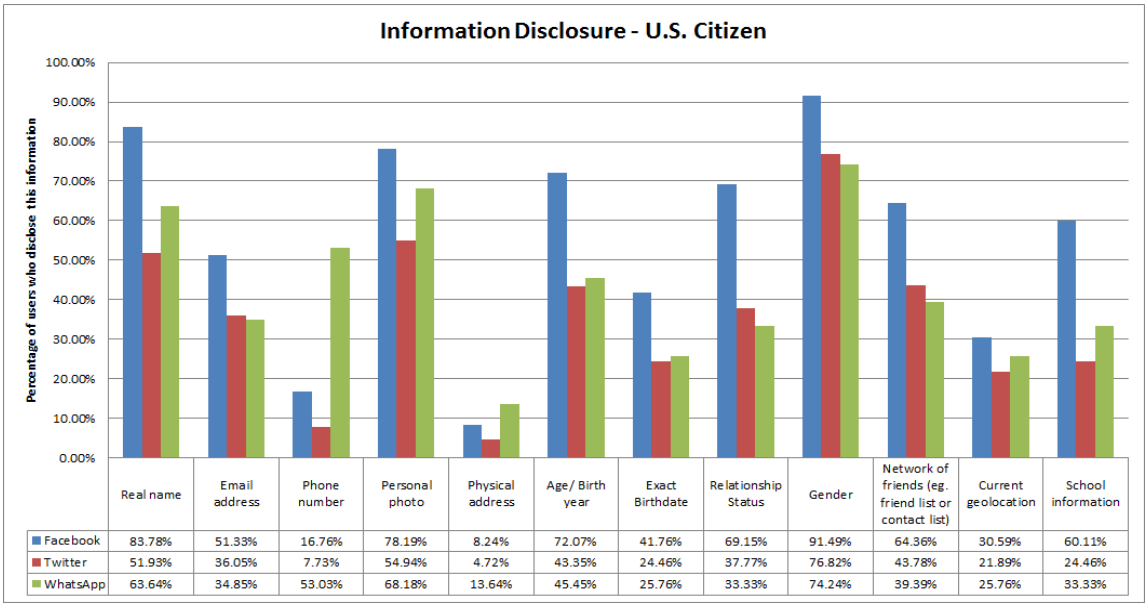
WhatsApp	P_1 vs. P_2	N_1 = 66 N_2 = 40 N = 106	H_0 : There's no significant differences in profile preferences between U.S. WhatsApp users and Chinese WhatsApp users in the U.S.	0.725
RenRen	P_3 vs. P_2	N_2 = 325 N_3 = 188 N = 513	H_0 : There's no significant differences in profile preferences between Chinese RenRen users in China and Chinese RenRen users in the U.S.	0.433
Weibo	P_3 vs. P_2	N_2 = 269 N_3 = 296 N = 565	H_0 : There's no significant differences in profile preferences between Chinese Weibo users in China and Chinese Weibo users in the U.S.	0.002
WeChat	P_3 vs. P_2	N_2 = 345 N_3 = 354 N = 699	H_0 : There's no significant differences in profile preferences between Chinese WeChat users in China and Chinese WeChat users in the U.S.	0.139

The results suggested that American Facebook users were more likely to use a private profile than their Chinese counterparts. Chinese Weibo users in China were also more likely to use a private profile than those Chinese users in the U.S. For the other four

sites, we did not have evidence that there existed significant differences in profile preference between different groups.

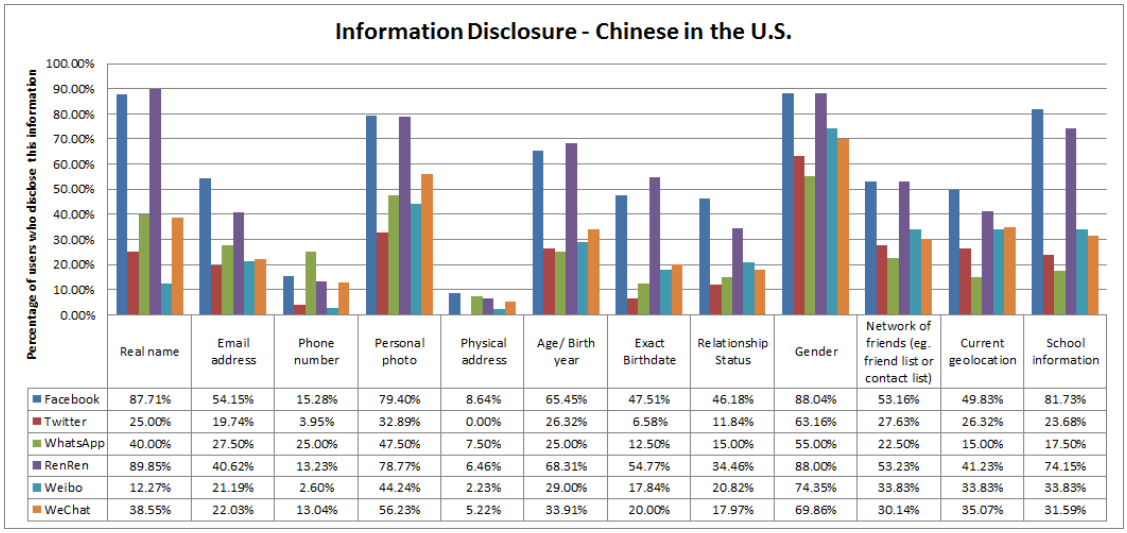
4.2.7 Cultural Differences in Information Disclosure

In this section, we want to know whether culture differences affect users' information disclosure behavior. We first give an overview of the responses.



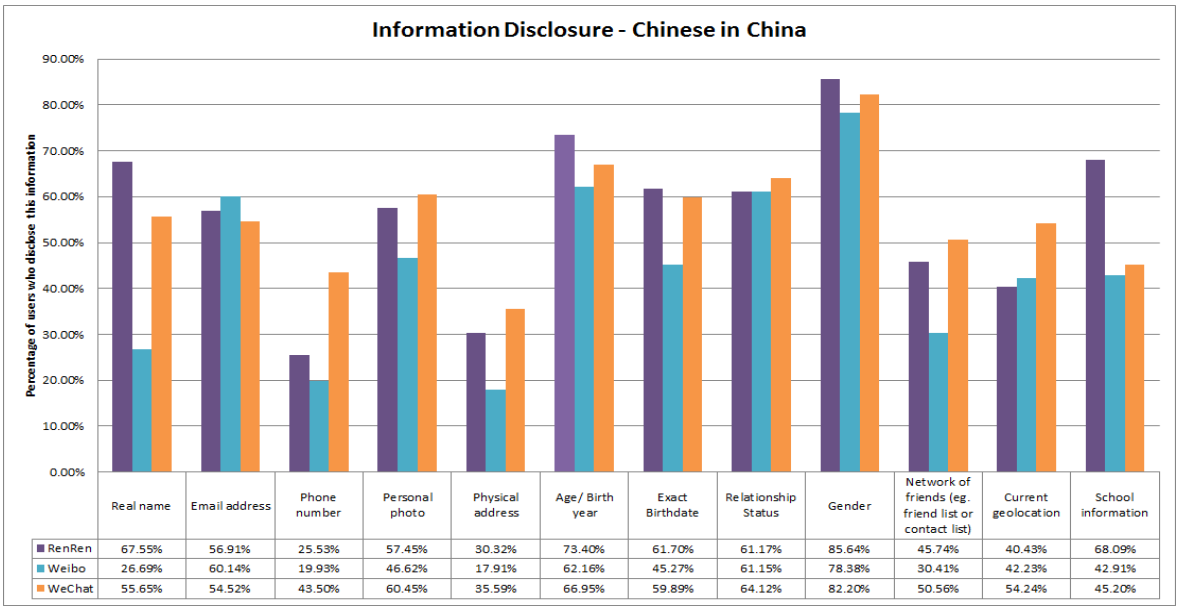
	Real name	Email address	Phone number	Personal photo	Physical address	Age/ Birth year	Exact Birthdate	Relationship Status	Gender	Network of friends (eg. friend list or contact list)	Current geolocation	School information
Facebook	83.78%	51.33%	16.76%	78.19%	8.24%	72.07%	41.76%	69.15%	91.49%	64.36%	30.59%	60.11%
Twitter	51.93%	36.05%	7.73%	54.94%	4.72%	43.35%	24.46%	37.77%	76.82%	43.78%	21.89%	24.46%
WhatsApp	63.64%	34.85%	53.03%	68.18%	13.64%	45.45%	25.76%	33.33%	74.24%	39.39%	25.76%	33.33%

Figure.4.33 Information Disclosure: U.S. Citizen N=404



	Real name	Email address	Phone number	Personal photo	Physical address	Age/ Birth year	Exact Birthdate	Relationship Status	Gender	Network of friends (eg. friend list or contact list)	Current geolocation	School information
Facebook	87.71%	54.15%	15.28%	79.40%	8.64%	65.45%	47.51%	46.18%	88.04%	53.16%	49.83%	81.73%
Twitter	25.00%	19.74%	3.95%	32.89%	0.00%	26.32%	6.58%	11.84%	63.16%	27.63%	26.32%	23.68%
WhatsApp	40.00%	27.50%	25.00%	47.50%	7.50%	25.00%	12.50%	15.00%	55.00%	22.50%	15.00%	17.50%
RenRen	89.85%	40.62%	13.23%	78.77%	6.46%	68.31%	54.77%	34.46%	88.00%	53.23%	41.23%	74.15%
Weibo	12.27%	21.19%	2.60%	44.24%	2.23%	29.00%	17.84%	20.82%	74.35%	33.83%	33.83%	33.83%
WeChat	38.55%	22.03%	13.04%	56.23%	5.22%	33.91%	20.00%	17.97%	69.86%	30.14%	35.07%	31.59%

Figure.4.34 Information Disclosure: Chinese in the U.S. N=417



	Real name	Email address	Phone number	Personal photo	Physical address	Age/ Birth year	Exact Birthdate	Relationship Status	Gender	Network of friends (eg. friend list or contact list)	Current geolocation	School information
RenRen	67.55%	56.91%	25.53%	57.45%	30.32%	73.40%	61.70%	61.17%	85.64%	45.74%	40.43%	68.09%
Weibo	26.69%	60.14%	19.93%	46.62%	17.91%	62.16%	45.27%	61.15%	78.38%	30.41%	42.23%	42.91%
WeChat	55.65%	54.52%	43.50%	60.45%	35.59%	66.95%	59.89%	64.12%	82.20%	50.56%	54.24%	45.20%

Figure.4.35 Information Disclosure: Chinese in China N=413

Table 4.32.

Information Disclosure: U.S. Citizen

Types of information	Facebook	Twitter	WhatsApp	RenRen	Weibo	WeChat

Real name	315	121	42	0	0	0
Email address	193	84	23	0	0	0
Phone number	63	18	35	0	0	0
Personal photo	294	128	45	0	0	0
Physical address	31	11	9	0	0	0
Age/ Birth year	271	101	30	0	0	0
Exact Birthdate	157	57	17	0	0	0
Relationship status	260	88	22	0	0	0
Gender	344	179	49	0	0	0
Network of friends	242	102	26	0	0	0
Current geolocation	115	51	17	0	0	0

Table 4.32 (continued).

Information Disclosure: U.S. Citizen

School information	226	57	22	0	0	0
Employer information	150	39	13	0	0	0

Table 4.33.

Information Disclosure: Chinese in the U.S.

Types of information	Facebook	Twitter	WhatsApp	RenRen	Weibo	WeChat
Real name	264	19	16	292	33	133
Email address	163	15	11	132	57	76
Phone number	46	3	10	43	7	45
Personal photo	239	25	19	256	119	194
Physical address	26	0	3	21	6	18
Age/ Birth year	197	20	10	222	78	117

Exact Birthdate	143	5	5	178	48	69
Relationship status	139	9	6	112	56	62
Gender	265	48	22	286	200	241
Network of friends	160	21	9	173	91	104
Current geolocation	150	20	6	134	91	121
School information	246	18	7	241	91	109
Employer information	145	12	6	111	49	63

Table 4.34.

Information Disclosure: Chinese in China

Types of information	Facebook	Twitter	WhatsApp	RenRen	Weibo	WeChat
Real name	0	0	0	127	79	197
Email address	0	0	0	107	178	193
Phone number	0	0	0	48	59	154
Personal photo	0	0	0	108	138	214
Physical address	0	0	0	57	53	126
Age/ Birth year	0	0	0	138	184	237
Exact Birthdate	0	0	0	116	134	212
Relationship status	0	0	0	115	181	227
Gender	0	0	0	161	232	291
Network of friends	0	0	0	86	90	179
Current geolocation	0	0	0	76	125	192
School information	0	0	0	128	127	160

Employer information	0	0	0	64	85	121

The same *Kruskal-Wallis* tests were performed for each type of information and for each social network. The results are summarized in the following table.

Table 4.35.

Cultural Differences in Information Disclosure

	Facebook	Twitter	WhatsApp	RenRen	Weibo	WeChat
	N1=376	N1=233	N1=66	N2=325	N2=269	N2=345
	N2=301	N2=76	N2=40	N3=188	N3=296	N3=354
Real name	p=0.379	p=0.000	p=0.042	p=0.000	p=0.017	p=0.000
		P1>P2	P1>P2	P2>P3	P2<P3	P2<P3
Email address	p=0.528	p=0.033	p=0.527	p=0.002	p=0.000	p=0.000
		P1>P2		P2<P3	P2<P3	P2<P3
Phone number	p=0.742	p=0.621	p=0.016	p=0.020	p=0.000	p=0.000
			P1>P2	P2<P3	P2<P3	P2<P3
Personal photo	p=0.786	p=0.004	p=0.036	p=0.000	p=0.655	p=0.258
		P1>P2	P1>P2	P2>P3		
Physical address	p=0.930	p=0.573	p=0.598	p=0.000	p=0.012	p=0.000
				P2<P3	P2<P3	P2<P3

Age	p=0.138	p=0.026 P1>P2	p=0.036 P1>P2	p=0.336	p=0.000 P2<P3	p=0.000 P2<P3
Birthday	p=0.198	p=0.019 P1>P2	p=0.254	p=0.190	p=0.000 P2<P3	p=0.000 P2<P3
Relationship status	p=0.000 P1>P2	p=0.001 P1>P2	p=0.039 P1>P2	p=0.000 P2<P3	p=0.000 P2<P3	p=0.000 P2<P3
Gender	p=0.440	p=0.074	p=0.042 P1>P2	p=0.656	p=0.128	p=0.000 P2<P3
Network of friends	p=0.012 P1>P2	p=0.035 P1>P2	p=0.074	p=0.157	p=0.158	p=0.000 P2<P3

Table 4.35 (continued).

Cultural Differences in Information Disclosure

Current geolocation	p=0.000 P1<P2	p=0.562	p=0.195	p=0.879	p=0.312	p=0.000 P2<P3

On Facebook, we found out that Chinese users in the U.S. were less willing to disclose their relationship status and network of friends but more willing to share their school information and current geolocation. This matched the results of the privacy attitudes where Chinese in the U.S. were more concerned about their relationship status and network of friends but less concerned about school information and current geolocation. Mismatches happened where American users were more concerned about the email address and birthday, however no significant difference in disclosure of these two types of information was found.

Twitter had a very imbalanced sample - 233 U.S. citizens vs. 76 Chinese users. WhatsApp had a small sample size for each population - 66 U.S. citizens and 40 Chinese users. The results may be biased.

On WeChat, Chinese users in China were significantly more willing to disclose each type of information except for personal photo which no significant difference was identified. On Weibo, Chinese users in China were also more willing to disclose all types of information except for personal photo, gender, network of friends, current geolocation and school information.

On RenRen, Chinese users in the U.S. were more willing to disclose their real names and personal photos but less willing to disclose email, phone number, physical address and relationship status.

4.3 Privacy Attitude and Information Disclosure Behavior

In this section, we want to study: What's the relationship between privacy attitude and actual information disclosure behavior? If a person consider "real name" as "very private", does that imply he would not disclose such information in social network? Does privacy attitude guide/imply information disclosure behavior?

With these questions, we performed chi-square analysis to find out the association between the two variables - *Privacy Attitude* and *Information Disclosure Behavior.*

As introduced above, the privacy attitudes were coded as "0" - "public", "1- moderate privacy concern" and "2" - "very private". The information disclosure was coded as "0" - the specific information was not disclosed and "1"- the information was disclosed.

We performed the chi-square analysis in all 6 social networks and the results for each social network are shown as follows:

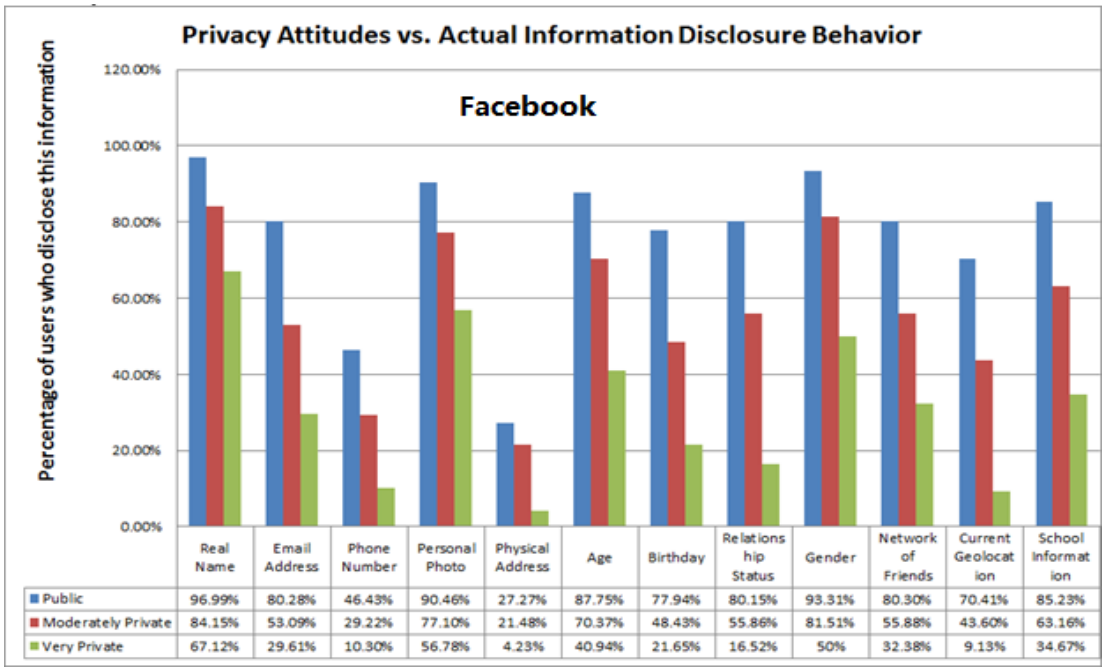


Figure 4.36 Privacy Attitude vs Information Disclosure: Facebook N=677

Table 4.36.

Privacy Attitude vs Information Disclosure: Facebook

Types of information	Privacy attitudes vs. Actual disclosure behavior	Chi-square (DF=2)	Sig.
Real Name	"public" – 258/266 (96.99%) "moderately private" – 233/265 (84.15%) "Very private"- 98/146 (67.12%)	68.593	0.000
Email Address	"public" –114/142 (80.28%) "moderately private" – 189/356 (53.09%) "Very private"- 53/179(29.61%)	81.624	0.000
Phone Number	"public" – 13/28 (46.43%)	51.007	0.000

	"moderately private" – 45/154(29.22%) "Very private"- 51/495 (10.30%)		

Table 4.36 (continued).

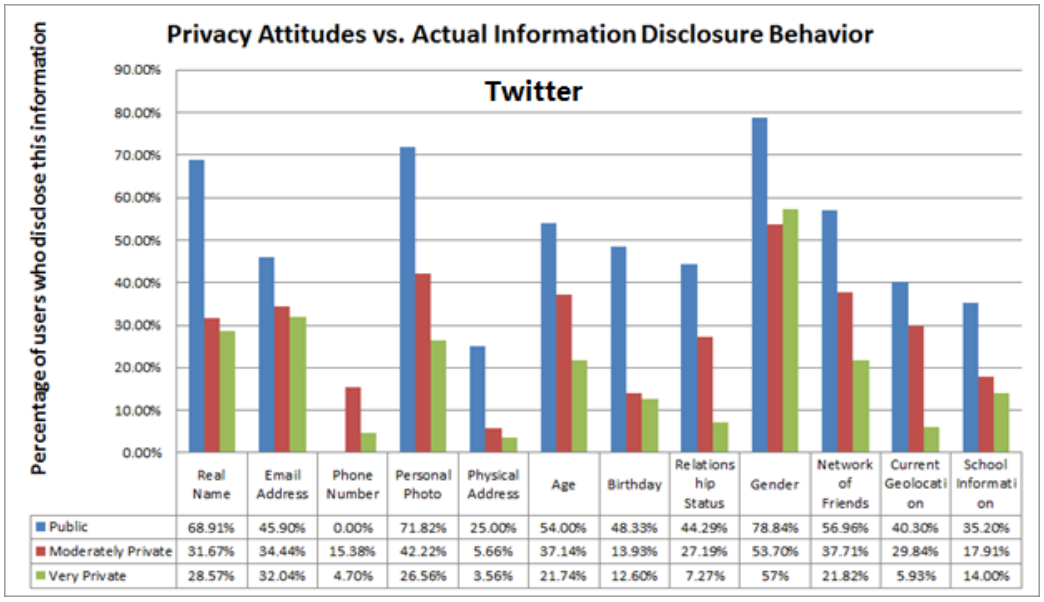
Privacy Attitude vs Information Disclosure: Facebook

Personal Photo	"public" – 237/262(90.46%) "moderately private" – 229/297(77.10%) "Very private"- 67/118(56.78%)	55.939	0.000
Physical address	"public" – 6/22 (27.27%) "moderately private" – 29/135(21.48%) "Very private"- 22/520 (4.23%)	51.846	0.000
Age	"public" – 179/204(87.75%) "moderately private" – 228/324(70.37%) "Very private"-61/149(40.94%)	88.843	0.000
Birthday	"public" – 106/136(77.94%) "moderately private" – 139/287(48.43%) "Very private"- 55/254(21.65%)	117.148	0.000
Relationship Status	"public" – 218/272(80.15%) "moderately private" – 162/190(55.86%) "Very private"- 19/115(16.52%)	137.181	0.000
Gender	"public" – 502/538 (93.31%) "moderately private" – 97/119(81.51%) "Very private"- 10/20 (50%)	51.420	0.000
Network of Friends	"public" – 159/198 (80.30%) "moderately private" – 209/374(55.88%) "Very private"- 34/105(32.38%)	69.566	0.000

Table 4.36 (continued).

Privacy Attitude vs Information Disclosure: Facebook

Current Geolocation	"public" – 119/169 (70.41%) "moderately private" – 126/289 (43.60%) "Very private"- 20/219(9.13%)	154.584	0.000
School Information	"public" – 254/298(85.23%) "moderately private" – 192/304(63.16%) "Very private"- 26/75(34.67%)	83.830	0.000



	Real Name	Email Address	Phone Number	Personal Photo	Physical Address	Age	Birthday	Relationship Status	Gender	Network of Friends	Current Geolocation	School Information
Public	68.91%	45.90%	0.00%	71.82%	25.00%	54.00%	48.33%	44.29%	78.84%	56.96%	40.30%	35.20%
Moderately Private	31.67%	34.44%	15.38%	42.22%	5.66%	37.14%	13.93%	27.19%	53.70%	37.71%	29.84%	17.91%
Very Private	28.57%	32.04%	4.70%	26.56%	3.56%	21.74%	12.60%	7.27%	57%	21.82%	5.93%	14.00%

Figure.4.37 Privacy Attitude vs Information Disclosure: Twitter N=309

Table 4.37.

Privacy Attitude vs Information Disclosure: Twitter

Types of information	Privacy attitudes vs. Actual disclosure behavior	Chi-square (DF=2)	Sig.
Real Name	"public" – 82/119 (68.91%) "moderately private" – 38/120 (31.67%) "very private"- 20/70 (28.57%)	43.670	0.000
Email Address	"public" –28/61 (45.90%) "moderately private" – 52/151 (34.44%) "very private"- 99/309(32.04%)	12.689	0.002
Phone Number	"public" – 0/10 (0.00%) "moderately private" – 10/65(15.38%) "very private"- 11/234 (4.70%)	9.920	0.007
Personal Photo	"public" – 79/110(71.82%) "moderately private" – 57/135(42.22%) "very private"- 17/64(26.56%)	38.249	0.000
Physical address	"public" – 3/12 (25.00%) "moderately private" – 3/53(5.66%) "very private"- 11/309(3.56%)	18.370	0.000
Age	"public" – 54/100(54.00%) "moderately private" – 52/140(37.14%) "very private"-15/69(21.74%)	18.272	0.000
Birthday	"public" – 29/60(48.33%) "moderately private" – 17/122(13.93%)	37.167	0.000

	"very private"- 16/127(12.60%)		

Table 4.37 (continued).

Privacy Attitude vs Information Disclosure: Twitter

Relationship Status	"public" – 62/140(44.29%) "moderately private" – 31/114(27.19%) "very private"- 4/55(7.27%)	26.596	0.000
Gender	"public" – 190/241 (78.84%) "moderately private" – 29/54(53.70%) "very private"- 8/14 (57.14%)	16.299	0.000
Network of Friends	"public" – 45/79 (56.96%) "moderately private" – 66/175 (37.71%) "very private"- 12/55(21.82%)	17.451	0.000
Current Geolocation	"public" – 27/67 (40.30%) "moderately private" – 37/124 (29.84%) "very private"- 7/118(5.93%)	34.028	0.000
School Information	"public" – 44/125(35.20%) "moderately private" –24/134(17.91%) "very private"- 7/50(14.00%)	13.942	0.000

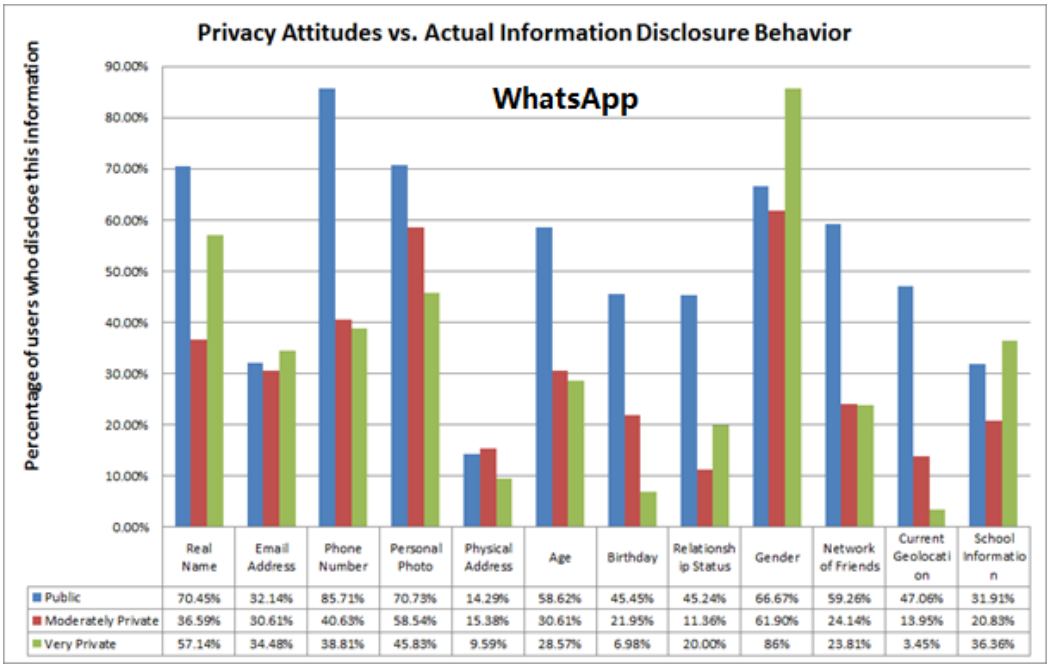


Figure.4.38 Privacy Attitude vs Information Disclosure: WhatsApp N=106

Table 4.38.

Privacy Attitude vs Information Disclosure: WhatsApp

Types of information	Privacy attitudes vs. Actual disclosure behavior	Chi-square (DF=2)	Sig.
Real Name	"public" – 31/44 (70.45%) "moderately private" – 15/41 (36.59%) "very private"- 12/21 (57.14%)	9.888	0.007
Email Address	"public" –9/28 (32.14%) "moderately private" – 15/49 (30.61%) "very private"- 10/29(34.48%)	0.125	0.939
Phone Number	"public" – 6/7 (85.71%) "moderately private" – 13/32(40.63%) "very private"- 26/67 (38.81%)	5.771	0.056

Table 4.38 (continued).

Privacy Attitude vs Information Disclosure: WhatsApp

Personal Photo	"public" – 29/41(70.73%) "moderately private" – 24/41(58.54%) "very private"- 11/24(45.83%)	4.018	0.134
Physical address	"public" – 1/7 (14.29%) "moderately private" – 4/26(15.38%) "very private"- 7/73 (9.59%)	0.707	0.712
Age	"public" – 17/29(58.62%) "moderately private" – 15/49(30.61%) "very private"-8/28(28.57%)	7.443	0.024
Birthday	"public" – 10/22(45.45%) "moderately private" –9/41(21.95%) "very private"- 3/43(6.98%)	13.159	0.001
Current Geolocation	"public" – 16/34 (47.06%) "moderately private" –6/43 (13.95%) "very private"- 1/29(3.45%)	20.074	0.000
School Information	"public" – 15/47(31.91%) "moderately private" – 10/48(20.83%) "very private"- 4/11(36.36%)	1.968	0.374

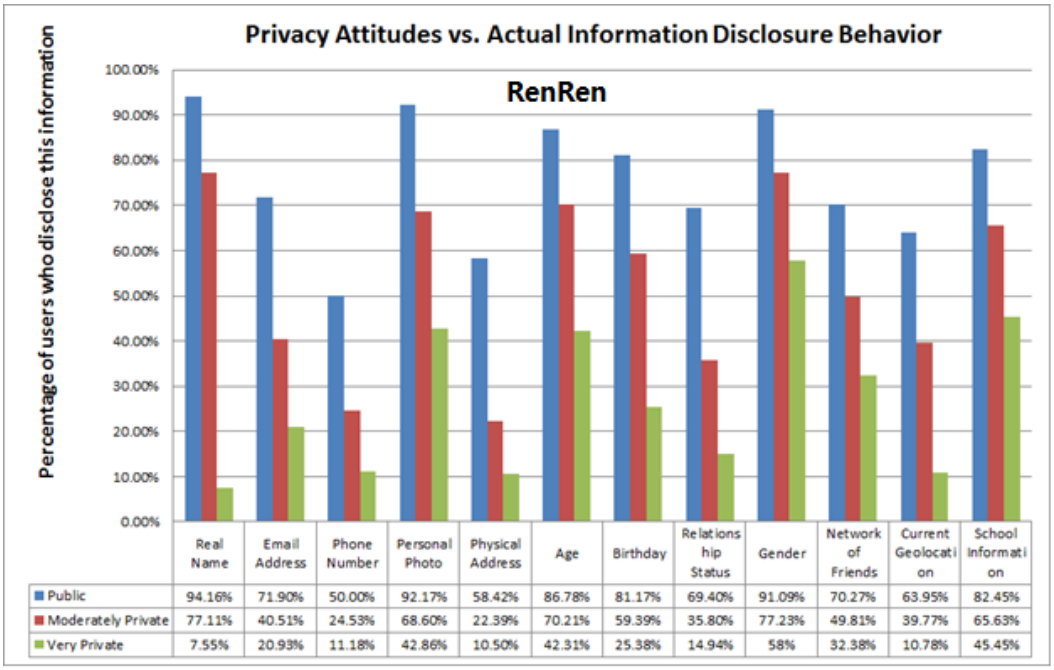


Figure.4.39 Privacy Attitude vs Information Disclosure: RenRen N=513

Table 4.39.

Privacy Attitude vs. Information Disclosure: RenRen

Types of information	Privacy attitudes vs. Actual disclosure behavior	Chi-square (DF=2)	Sig.
Real Name	"public" – 145/154 (94.16%) "moderately private" – 192/249 (77.11%) "Very private"- 82/110 (74.55%)	23.234	0.000
Email Address	"public" –110/153 (71.90%) "moderately private" – 111/274 (40.51%) "Very private"- 18/86(20.93%)	66.198	0.000
Phone Number	"public" – 16/32 (50.00%) "moderately private" – 39/159(24.53%) "Very private"- 36/332 (11.18%)	37.339	0.000

Table 4.39 (continued).

Privacy Attitude vs. Information Disclosure: RenRen

Personal Photo	"public" – 153/166(92.17%) "moderately private" – 166/242(68.60%) "Very private"- 45/105(42.86%)	77.126	0.000
Physical address	"public" – 10/17 (58.82%) "moderately private" – 30/134(22.39%) "Very private"- 38/362 (10.50%)	36.672	0.000
Age	"public" – 151/174(86.78%) "moderately private" – 165/235(70.21%) "Very private"-44/104(42.31%)	61.516	0.000
Birthday	"public" – 125/154(81.17%) "moderately private" – 136/229(59.39%) "Very private"- 33/130(25.38%)	90.393	0.000
Relationship Status	"public" – 127/183(69.40%) "moderately private" – 87/243(35.80%) "Very private"- 13/87(14.94%)	84.238	0.000
Gender	"public" – 358/393 (91.09%) "moderately private" – 78/101(77.23%) "Very private"- 11/19 (57.89%)	28.829	0.000
Network of Friends	"public" – 104/148 (70.27%) "moderately private" – 130/261(49.81%) "Very private"- 25/104(32.38%)	52.323	0.000
Current Geolocation	"public" – 94/147 (63.95%) "moderately private" – 105/264 (39.77%) "Very private"- 11/102(10.78%)	70.689	0.000

Table 4.39 (continued).

Privacy Attitude vs. Information Disclosure: RenRen

School Information	"public" – 202/245(82.45%) "moderately private" – 147/224(65.63%) "Very private"- 20/44(45.45%)	33.112	0.000

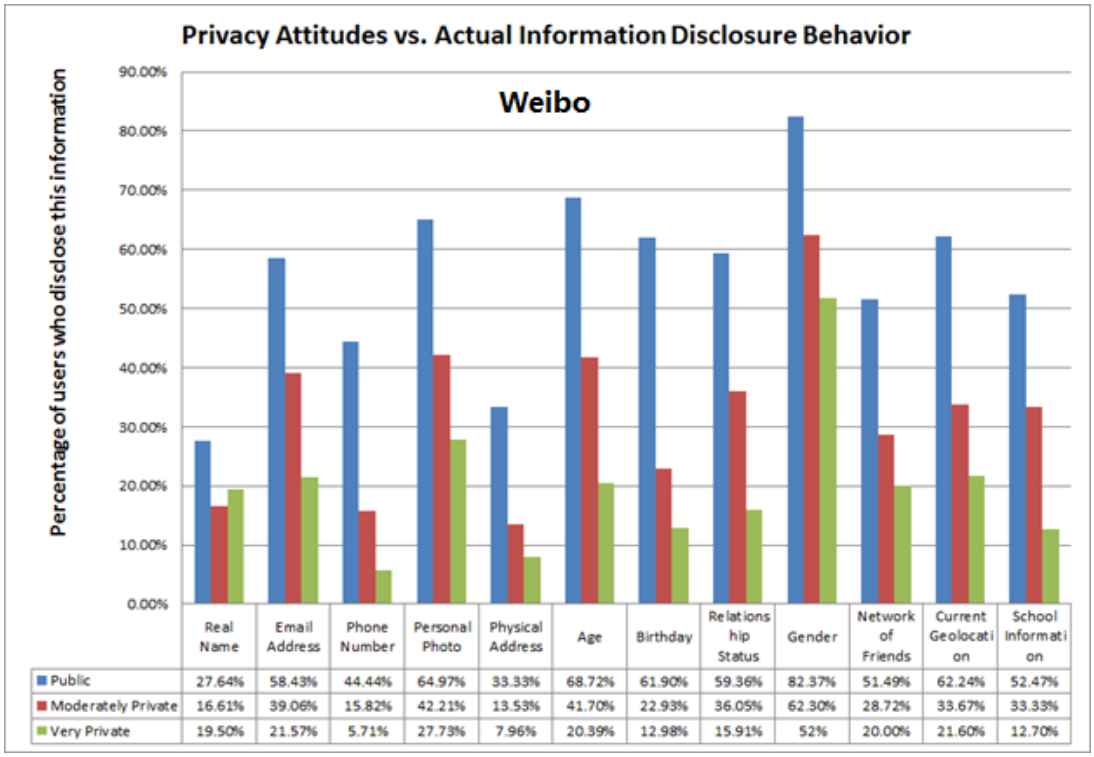


Figure 4.40 Privacy Attitude vs. Information Disclosure: Weibo N=565

Table 4.40.

Privacy Attitude vs. Information Disclosure: Weibo

Types of information	Privacy attitudes vs. Actual disclosure behavior	Chi-square (DF=2)	Sig.
Real Name	"public" – 34/123 (27.64%) "moderately private" – 47/283 (16.61%) "Very private"- 31/159 (19.50%)	6.583	0.038
Email Address	"public" –97/166 (58.43%) "moderately private" – 116/297 (39.06%) "Very private"- 22/102(21.57%)	37.002	0.000
Phone Number	"public" – 16/36 (44.44%) "moderately private" – 31/196(15.82%) "Very private"- 19/333 (5.71%)	52.230	0.000
Personal Photo	"public" –102/157(64.97%) "moderately private" – 122/289(42.21%) "Very private"- 33/119(27.73%)	40.408	0.000
Physical address	"public" – 6/18 (33.33%) "moderately private" – 23/170(13.53%) "Very private"- 30/377 (7.96%)	51.846	0.001
Age	"public" – 123/179(68.72%) "moderately private" – 118/283(41.70%) "Very private"-21/103(20.39%)	66.384	0.000
Birthday	"public" – 104/168(61.90%) "moderately private" – 61/266(22.93%) "Very private"- 17/131(12.98%)	100.519	0.000

Table 4.40 (continued).

Privacy Attitude vs. Information Disclosure: Weibo

Relationship Status	"public" – 130/219(59.36%) "moderately private" – 93/258(36.05%) "Very private"- 14/88(15.91%)	55.460	0.000
Gender	"public" – 341/414 (82.37%) "moderately private" – 76/122(62.30%) "Very private"- 15/29 (51.72%)	31.485	0.000
Network of Friends	"public" – 69/134 (51.49%) "moderately private" – 85/296(28.72%) "Very private"- 27/135(20.00%)	33.779	0.000
Current Geolocation	"public" – 89/143 (62.24%) "moderately private" – 100/297 (33.67%) "Very private"- 27/125(21.60%)	52.157	0.000
School Information	"public" – 117/223(52.47%) "moderately private" – 93/279(33.33%) "Very private"- 8/63(12.70%)	39.196	0.000

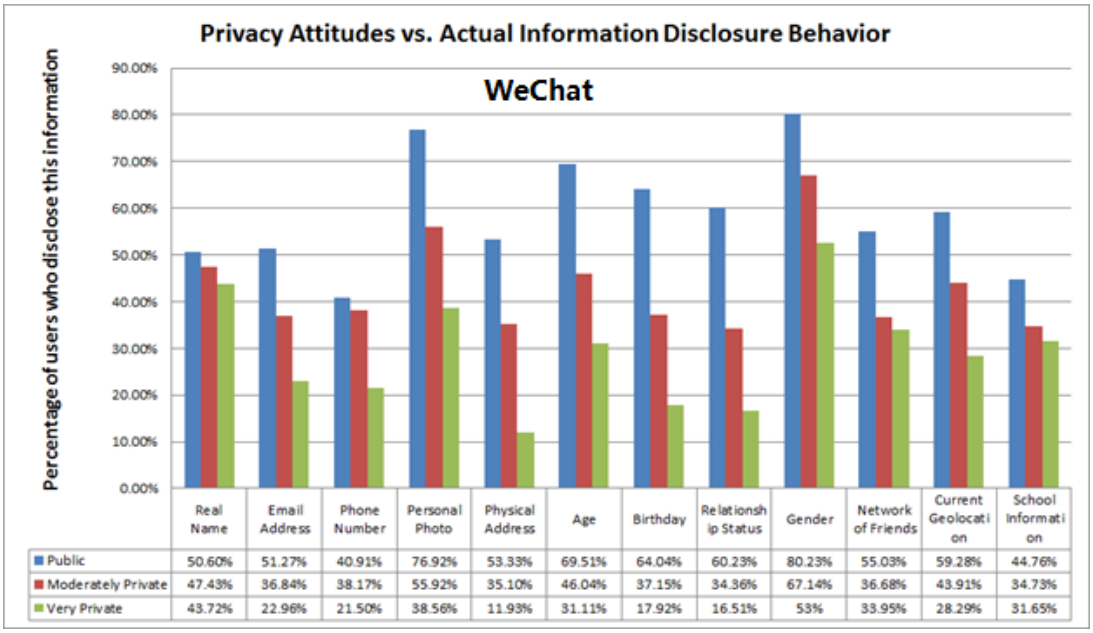


Figure.4.41 Privacy Attitude vs. Information Disclosure: WeChat N=699

Table 4.41.

Privacy Attitude vs. Information Disclosure: WeChat

Types of information	Privacy attitudes vs. Actual disclosure behavior	Chi-square (DF=2)	Sig.
Real Name	"public" – 84/166 (50.60%) "moderately private" – 166/350(47.43%) "very private"- 80/183 (43.72%)	1.670	0.434
Email Address	"public" –101/197 (51.27%) "moderately private" – 140/380 (36.84%) "very private"- 28/122(22.96%)	26.469	0.000
Phone Number	"public" – 18/44 (40.91%) "moderately private" – 92/241(38.17%) "very private"- 89/414 (21.50%)	24.371	0.000

Table 4.41 (continued).

Privacy Attitude vs. Information Disclosure: WeChat

Personal Photo	"public" – 160/208(76.92%) "moderately private" – 189/338(55.92%) "very private"- 59/153(38.56%)	55.005	0.000
Physical address	"public" – 16/30 (53.33%) "moderately private" – 73/208(35.10%) "very private"- 55/461 (11.93%)	67.556	0.000
Age	"public" – 155/223(69.51%) "moderately private" – 157/341(46.04%) "very private"-42/135(31.11%)	55.239	0.000
Birthday	"public" – 130/203(64.04%) "moderately private" – 120/323(37.15%) "very private"- 31/173(17.92%)	84.965	0.000
Current Geolocation	"public" – 115/194 (59.28%) "moderately private" – 155/353 (43.91%) "very private"- 43/152(28.29%)	33.316	0.000
School Information	"public" – 128/286(44.76%) "moderately private" – 116/334(34.73%) "very private"- 25/79(31.65%)	8.299	0.016

In each social network, we found strong association between privacy attitudes and information disclosure – the less a respondent considered the information privacy, the more likely he would disclose such information and vice versa. This provides further justification for us to pay attention to cultural differences as we have already found out that people with different cultural background may have very different private attitudes.

However, we did not see such strong association in several types of information on WhatsApp. One major reason may be we only had a small sample of 106 WhatsApp users.

4.4 Relationships among Privacy Perceptions and Behaviors

In this chapter, correlation analyses are used to find out whether there were strong relations among: 1) privacy policy, 2) trust in the social network, 3) privacy setting 4) profile preference and 5) constituent of friend lists. We performed the same correlation analyses for each social network and we also break down the users into different groups (, ,). The results are shown in the following matrix. In each cell, the correlation coefficients - Pearson's r and Spearman's rho were recorded.

Table 4.42.

Correlation Matrix All Facebook Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.298 rho= 0.290	-	-	-	-
Profile preference	r= 0.210 rho= 0.218	r= 0.174 rho= 0.186	-	-	-
Friend list	r= 0.004 rho= -0.002	r= -0.026 rho= 0.032	r= 0.022 rho= 0.017	-	-
Trust	r= -0.080	r= -0.150	r= -0.244	r= 0.032	-

	rho= -0.084	rho= -0.148	rho= -0.245	rho= 0.016	

Table 4.43.

Correlation Matrix U.S. Facebook Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.328 rho= 0.322	-	-	-	-
Profile preference	r= 0.094 rho= 0.092	r= -0.022 rho= -0.019	-	-	-
Friend list	r= 0.038 rho=0.034	r= 0.005 rho=-0.004	r= 0.039 rho=0.025	-	-
Trust	r= -0.096 rho=-0.094	r= -0.044 rho= -0.045	r= -0.210 rho= -0.210	r= 0.049 rho= 0.037	-

Table 4.44.

Correlation Matrix Chinese Facebook Users in the U.S.

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.076 rho= 0.089	-	-	-	-
Profile preference	r= 0.247 rho= 0.249	r= -0.169 rho= -153	-	-	-
Friend list	r= -0.036 rho=-0.041	r= - 0.071 rho=-0.056	r= 0.017 rho=0.017	-	-
Trust	r= -0.018 rho=-0.006	r= -0.119 rho= -0.113	r= -0.190 rho= -0.084	r= 0.200 rho= 0.227	-

Interpreting correlation is tricky. We have to define what a "strong" correlation is and what a "weak" correlation is. The correlation analysis did give us a p value, however, as the sample size increases, the p value tend to be very small even if the r is also small. For example, in our case, we have a p value=0.000 while r/rho<0.1. Therefore, using p-value as an indicator for whether we have a "strong" correlation was not applicable.

According to Cohen, r=0.5 represents a "large" correlation coefficient in social science, r=0.3 implies medium correlation and r=0.1 implies small correlation (Cohen, 1988). Our study leveraged this guideline and defined a "medium correlation" as r/rho=0.3, a "strong correlation" as r/rho=0.5 and a "weak correlation" as r/rho = 0.1.

In Facebook, we saw a medium positive correlation between privacy settings and reading privacy policies - the more people read privacy policies, the more frequently he/she would change their privacy settings. However, such correlation was not consistent across different groups. The correlation was identified "weak" among U.S. Facebook users and not as significant among Chinese users.

Table 4.45.

Correlation Matrix All Twitter Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.430 rho= 0.423	-	-	-	-
Profile preference	r= 0.131	r= 0.139	-	-	-

	rho= 0.149	rho= 0.139			

Table 4.45 (continued).

Correlation Matrix All Twitter Users

Friend list	r= 0.189	r= 0.199	r= 0.119	-	-
	rho= 0.185	rho= 0.194	rho= 0.112		
Trust	r= -0.081	r= -0.115	r= -0.245	r= 0.006	-
	rho= -0.072	rho= -0.106	rho= -0.242	rho= 0.024	

Table 4.46.

Correlation Matrix U.S. Twitter Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.454	-	-	-	-
	rho= 0.453				
Profile preference	r= 0.112	r= 0.159	-	-	-
	rho= 0.134	rho= 0.167			
Friend list	r= 0.209	r= 0.183	r= 0.131	-	-
	rho= 0.201	rho= 0.185	rho= 0.130		
Trust	r= -0.112	r= -0.132	r= -0.193	r= 0.023	-
	rho= -0.108	rho= -0.126	rho= -0.191	rho= 0.032	

Table 4.47.

Correlation Matrix Chinese Twitter Users in the U.S.

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.245 rho= 0.205	-	-	-	-
Profile preference	r= 0.226 rho= 0.215	r= 0.194 rho= 0.130	-	-	-
Friend list	r= 0.111 rho= 0.131	r= 0.235 rho= 0.156	r= 0.098 rho= 0.081	-	-
Trust	r= -0.029 rho= 0.004	r= -0.184 rho= -0.155	r= -0.388 rho= -0.386	r= -0.052 rho= -0.011	-

In Twitter, again we saw a medium positive correlation between privacy settings and reading privacy policies - the more people read privacy policies, the more frequently he/she would change their privacy settings. We also identified a medium negative correlation between Trust and Profile preference – the less users trust, the more they'd like to use private profiles, which is intuitively true.

Table 4.48.

Correlation Matrix All WhatsApp Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.346 rho= 0.339	-	-	-	-
Profile preference	r= 0.148 rho= 0.156	r= 0.271 rho= 0.266	-	-	-
Friend list	r= -0.094 rho= -0.162	r= 0.022 rho= -0.036	r= 0.006 rho= -0.084	-	-
Trust	r= -0.153 rho= -0.160	r= 0.032 rho= 0.029	r= -0.100 rho= -0.87	r= 0.018 rho= 0.030	-

Table 4.49.

Correlation Matrix U.S. WhatsApp Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.268 rho= 0.264	-	-	-	-
Profile preference	r= 0.043 rho= 0.051	r= 0.383 rho= 0.385	-	-	-
Friend list	r= -0.055 rho= -0.095	r= 0.001 rho= -0.051	r= -0.110 rho= -0.161	-	-

Trust	r= -0.150 rho= -0.163	r= 0.064 rho= 0.052	r= -0.089 rho= -0.087	r= -0.030 rho= -0.036	-

Table 4.50.

Correlation Matrix Chinese WhatsApp Users in the U.S.

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.245 rho= 0.095	-	-	-	-
Profile preference	r= 0.311 rho= 0.260	r= 0.059 rho= -0.021	-	-	-
Friend list	r= -0.204 rho= -0.354	r= 0.010 rho= -0.063	r= 0.197 rho= 0.041	-	-
Trust	r= -0.157 rho= -0.134	r= 0.000 rho= 0.066	r= -0.121 rho= -0.088	r= 0.124 rho= 0.207	-

In WhatsApp, we gain saw a medium positive correlation between privacy settings and reading privacy policies. For American users, we also identified a medium negative correlation between privacy policy and profile preference – the more they read privacy policy, the more likely they would use a private profile. For Chinese users, a positive correlation between privacy setting and profile preference was identified – the more frequently they change your privacy setting, the more possible that they would use a private profile.

Table 4.51.

Correlation Matrix All RenRen Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.240 rho= 0.213	-	-	-	-
Profile preference	r= 0.184 rho= 0.189	r= 0.087 rho= 0.092	-	-	-
Friend list	r= -0.090 rho= -0.098	r= -0.102 rho= -0.103	r= -0.006 rho= -0.001	-	-
Trust	r= -0.015 rho= -0.003	r= -0.089 rho= 0.092	r= 0.007 rho= 0.013	r= 0.011 rho= 0.002	-

Table 4.52.

Correlation Matrix Chinese RenRen Users in the U.S.

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.070 rho= 0.054	-	-	-	-
Profile preference	r= 0.181 rho= 0.192	r= 0.131 rho= 0.144	-	-	-
Friend list	r= -0.129 rho= -0.125	r= -0.116 rho= -0.080	r= -0.040 rho= -0.023	-	-

Trust	r= 0.025 rho= 0.035	r= -0.064 rho= -0.070	r= -0.022 rho= -0.013	r= -0.040 rho= -0.030	-

Table 4.53.

Correlation Matrix Chinese RenRen Users in China

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.298 rho= 0.283	-	-	-	-
Profile preference	r= 0.220 rho= 0.218	r= 0.110 rho= 0.112	Profile preference	r= 0.220 rho= 0.218	r= 0.110 rho= 0.112
Friend list	r= -0.011 rho= -0.028	r= 0.001 rho= -0.019	r= 0.014 rho= 0.018	-	-
Trust	r= 0.011 rho= 0.020	r= 0.056 rho= 0.060	r= 0.025 rho= 0.037	r= 0.011 rho= 0.009	-

In RenRen, we didn't found any interesting correlation.

Table 4.54.

Correlation Matrix All Weibo Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.350 rho= 0.331	-	-	-	-
Profile preference	r= 0.096	r= 0.067	-	-	-

	rho= 0.099	rho= 0.061			
Friend list	r= 0.078	r= 0.096	r= -0.070	-	-
	rho= 0.082	rho= 0.073	rho= -0.069		

Table 4.54 (continued).

Correlation Matrix All Weibo Users

Trust	r= -0.014	r= -0.111	r= -0.023	r= -0.055	-
	rho= -0.020	rho= -0.117	rho= -0.037	rho= -0.050	

Table 4.55.

Correlation Matrix Chinese Weibo Users in the U.S.

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.142	-	-	-	-
	rho= 0.136				
Profile preference	r= 0.117	r= 0.020	-	-	-
	rho= 0.132	rho= 0.017			
Friend list	r= 0.069	r= 0.193	r= 0.024	-	-
	rho= 0.079	rho= 0.210	rho= 0.026		
Trust	r= -0.019	r= -0.016	r= -0.074	r= -0.157	-
	rho= -0.044	rho= -0.031	rho= -0.088	rho= -0.163	

Table 4.56.

Correlation Matrix Chinese Weibo Users in China

	Privacy setting	Privacy policy	Profile	Friend list	Trust

			preference		
Privacy policy	r= 0.405 rho= 0.397	-	-	-	-

Table 4.56 (continued).

Correlation Matrix Chinese Weibo Users in China

Profile preference	r= 0.035 rho= 0.036	r= -0.001 rho= -0.009	-	-	-
Friend list	r= 0.170 rho= 0.179	r= 0.237 rho= 0.209	r= -0.106 rho= -0.077	-	-
Trust	r= 0.053 rho= 0.056	r= -0.051 rho= -0.045	r= 0.070 rho= 0.063	r= -0.056 rho= -0.066	-

In Weibo, we found out a medium positive correlation between privacy settings and reading privacy policies considering all the users. Such correlation was much more significant among Chinese users in China (rho=0.397) than those in the U.S. (rho=0.136)

Table 4.57.

Correlation Matrix All WeChat Users

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.296 rho= 0.287	-	-	-	-
Profile preference	r= 0.113 rho= 0.112	r= 0.0206 rho= 0.019	-	-	-

Friend list	r= -0.002 rho= 0.009	r= -0.029 rho= -0.039	r= 0.020 rho= -0.008	-	-
Trust	r= -0.047 rho= -0.042	r= -0.045 rho= -0.056	r= 0.076 rho= 0.081	r= 0.067 rho= 0.042	-

Table 4.58.

Correlation Matrix Chinese WeChat Users in the U.S.

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.092 rho= 0.089	-	-	-	-
Profile preference	r= 0.247 rho= 0.258	r= 0.099 rho= 0.116	-	-	-
Friend list	r= -0.040 rho= -0.039	r=0.045 rho= 0.054	r= 0.053 rho= 0.036	-	-
Trust	r= -0.027 rho= -0.022	r= 0.067 rho= 0.058	r= 0.020 rho= 0.036	r= 0.018 rho= 0.006	-

Table 4.59.

Correlation Matrix Chinese WeChat Users in China

	Privacy setting	Privacy policy	Profile preference	Friend list	Trust
Privacy policy	r= 0.345 rho= 0.342	-	-	-	-
Profile preference	r= -0.031 rho= -0.032	r= -0.079 rho= -0.091	-	-	-
Friend list	r= 0.073	r= 0.071	r= 0.024	-	-

	rho= 0.093	rho= 0.061	rho= -0.001		
Trust	r= -0.035	r= 0.042	r= 0.034	r= 0.076	-
	rho= -0.026	rho= 0.077	rho= 0.033	rho= 0.059	

In WeChat, we identified a medium positive correlation between privacy settings and reading privacy policies among Chinese users in China, while Chinese users in the U.S. did not have as strong a correlation.

4.5 Summary

This chapter introduces detailed data analysis procedures and results. The findings and future work are discussed in the next chapter.

CHAPTER 5. DISCUSSION OF RESULTS

This study tries to answer the following research questions

1. What are users' privacy attitudes when they use the social networks? (e.g. what information do they consider private and what is not?) Are they different?
2. Does cultural background have a significant impact on social network users' privacy perceptions and behaviors?
3. What's the relationship among a user's privacy attitude, perception, and a user's behavior in a specific site?

With these questions in mind, the thesis targeted at three different populations – U.S. citizens, Chinese students in the U.S. and Chinese students in China in order to find out the impact of cultural background. Six different social networks were then selected in order to get a broader view of how people perceive and behave in different social networks.

A survey was carefully designed and a dataset of 1,234 responses with more than 400 for each population were collected. Statistical analyses such as ANOVA tests, chi-square tests, correlation/association analysis, etc. were applied to explore the relationships among variables and compared the differences between groups in Chapter 4.

5.1 Modeling Privacy Attitude, Perception and Behavior

To understand user behavior and perception in social networks, the study introduced and focused on four categories of variables:

Privacy attitude variable – *General privacy attitude*

Perception variable *– Trust*

Behavior variables *– Profile preference, privacy setting, constituent of friend list and privacy policies, information disclosure behavior*

Grouping variables- *cultural context and site* were used to divide users into subgroups based on citizenship and sites.

To capture the relationships among these variables, a cube model was developed, as shown in the following figure.

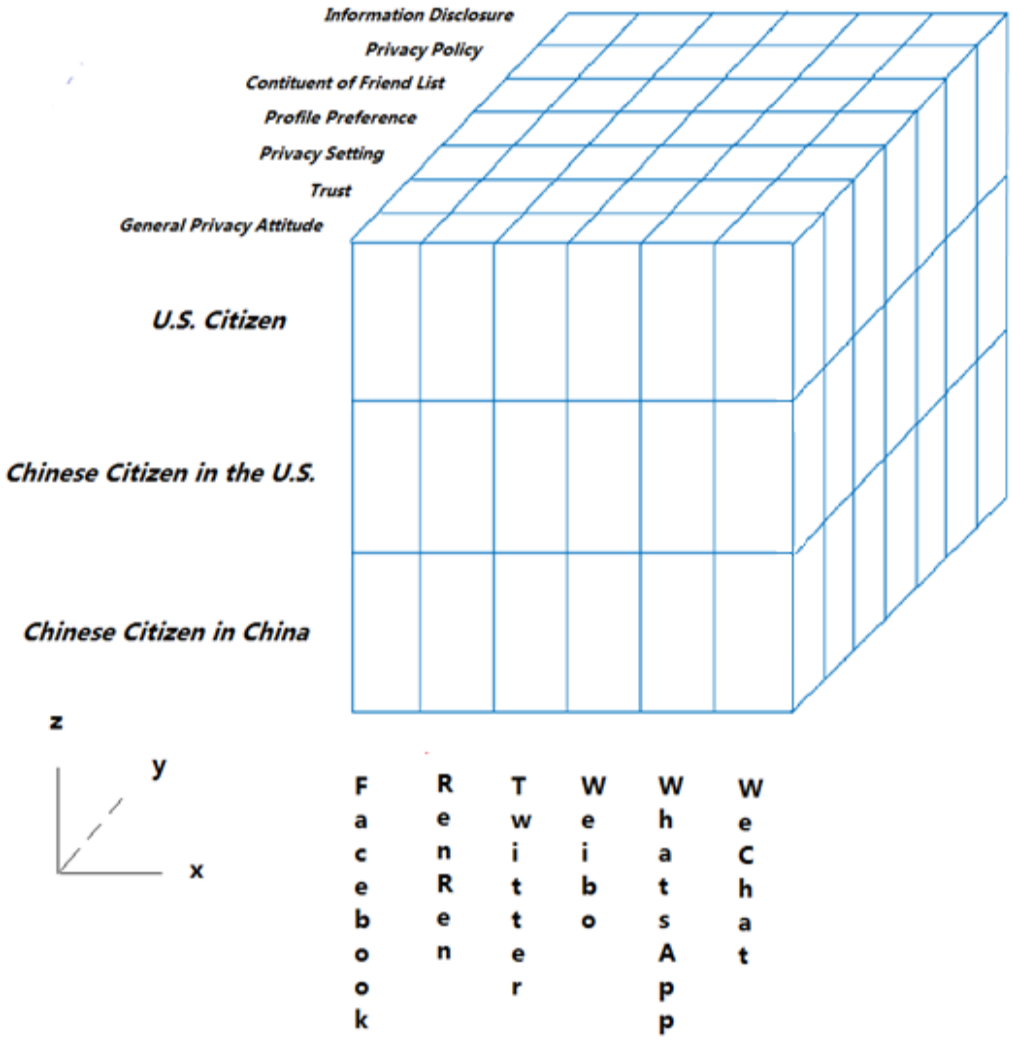


Figure 5.1 The Cube Model

As discussed above, the cube is divided by: six sites on the x-axis, three different cultural backgrounds on the z-axis and seven attitude/perception/behavior variables on the y-axis. Therefore, the cube is consisted of a total of 126 cells. Each cell identifies a specific question (see Figure 5.2 as an example).

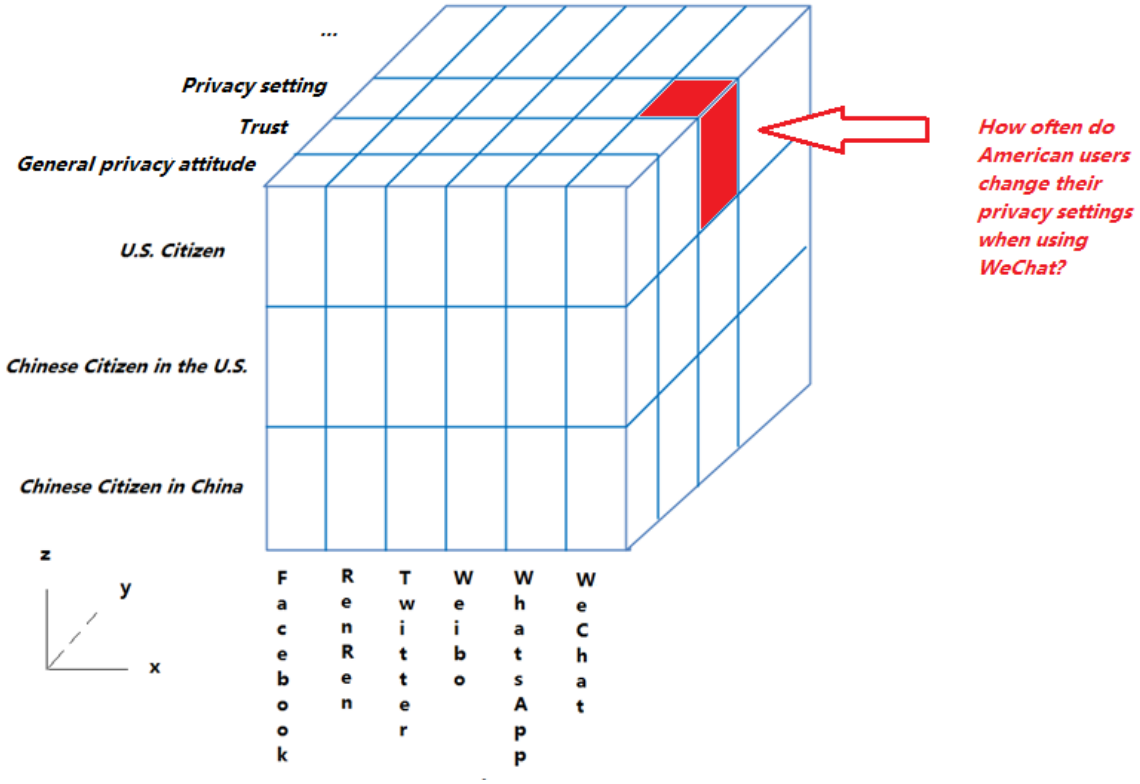


Figure 5.2 The Cube Model-Construction Phase

By comparing each cell along the x-axis, a cross-site study was performed to study the differences of users of different sites or the different characteristics of social network sites. By comparing the cells along the z-axis, a cross-cultural study was performed to study the impact of cultural background on outcome variables such as privacy perceptions or behaviors.

By analyzing the correlation/association of the variables on the y-axis, the study could investigate the relationships among these variables and interactions. This study only performed one-on-one correlation/association analysis which is discussed later. Using multiple regression techniques, the interaction of multiple variables could be analyzed which will be the goal of future study.

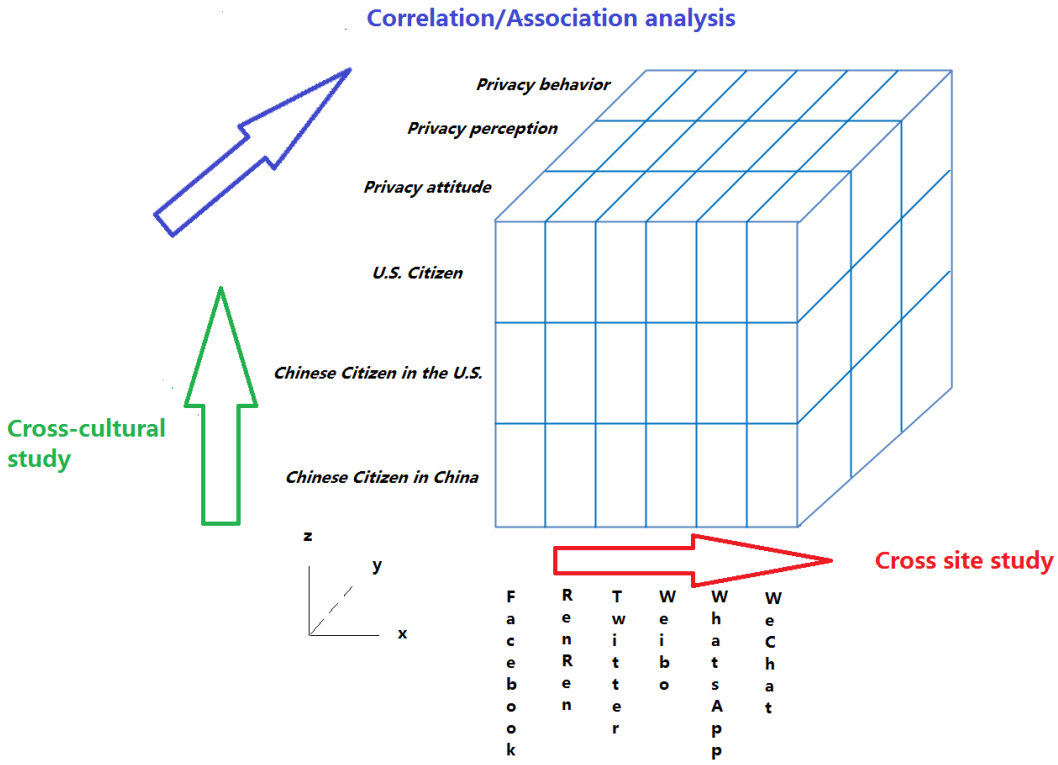


Figure 5.3 The *Cube* Model-Usage Phase

5.2 Cultural Differences in Privacy Attitude

Literature about privacy protection in social networks generally focuses on the leakage of PII (Personally Identifiable Information). The task of protecting privacy is often defined as protecting PII from unauthorized access against third parties such as government agencies, information collectors and malicious individuals. However, although PII is sensitive in general, people may have very different privacy concerns about different types of PII. Their needs of privacy protection may therefore vary greatly - some people would consider “real name” private so they want to protect it while others consider it completely public so that they are willing to share it to the public instead of being anonymous.

Considering people's different privacy attitudes would help acquire a better understanding of people's privacy needs and help fine-tune social network users' privacy protection. The study considers different cultural groups to honor the fact that social networks are often consisted of people in different cultures. Facebook as an example has only 22.6% U.S. users (Facebook Demographics & Statistics, 2014) while a vast majority of Facebook users come from various cultural settings. Understanding the cultural differences in privacy attitudes also helps social network platforms assess and preserve privacy in a fine-tuned manner.

The first research question therefore focuses on the users' privacy attitudes when using online social networks. The independent variable was cultural context. To be specific, it tries to identify whether people of different cultural background have different privacy attitudes toward different types of information, i.e. which information is considered more private and which is considered less.

The result of the study suggested that people did have different privacy attitudes toward different types of information. For example, in general people are mostly concerned about their identification number, phone number and physical address while gender and nickname/login name raise the least privacy concern. But if we take a closer look, we could see that people with different cultural background have different priorities toward the privacy concerns of information. The following table illustrates how people rank their privacy concerns toward different types of information:

Table 5.1.

Rankings of Privacy for Different Types of Information

	Privacy Rankings		
	U.S. Citizen	Chinese in the U.S.	Chinese in China
SSN/Other identification number	1	1	1
Address	2	2	2
Phone number	3	3	3
Current geolocation	4	8	7
Birthday	5	4	10
Email	6	5	12
Hometown	7	12	8
Network of friends	8	9	5
Real name	9	10	4
Age	10	6	11
School information	11	13	9
Personal photo	12	11	6
Nickname/Login name	13	14	14
Relationship status	14	7	13
Gender	15	15	15

It is clear that the top three items for each population are the same in terms of privacy concern. However, other types (marked in red) apparently do not follow the same pattern across cultural groups. “Real name” for example, ranks 4 for Chinese in China but only ranks 9 and 10 for the other two populations. Also Chinese in China seem to be less concerned about email and birthday address (ranks 12 and 10 respectively) as the other two (ranks around 5). The Chinese users in the U.S. are much more concerned about

“relationship status” as compared with the other two, while the American users seem to be more concerned about “current geolocation”.

Detailed ANOVA tests and post hoc tests were conducted and the results suggested that there exist differences between at least two groups of users in their privacy attitudes for all types of information. Yet such differences were not consistent for all information. For some types of information, American users would consider them more private than their Chinese counterparts, such as geolocation, email, birthday and login name. While for other information such as gender, American users would consider it more public.

Interestingly, the comparison between Chinese in the U.S. and Chinese in China suggested that in 14 out of 16 types of information, there exist significant differences in privacy attitudes between these two groups. For some types of information, such as real name, phone number, personal photo, physical address and identification number, the privacy attitudes of Chinese students in the U.S. are becoming similar to the U.S. citizens while significantly different from those in China. However, for other types of information such as login name and geolocation, Chinese users in both the U.S. and China do not seem to differ significantly.

The results suggested that a shift in the cultural environment may significantly change how people perceive privacy even they were born and raised in the same cultural environment.

Privacy is a social construct. Therefore, privacy attitude with regard to different types of information appears to vary more by social setting than cultural heritage.

The thesis then studied the correlation among general privacy attitude, behavior and perception. The first effort was to study the relationship between information disclosure and privacy attitude.

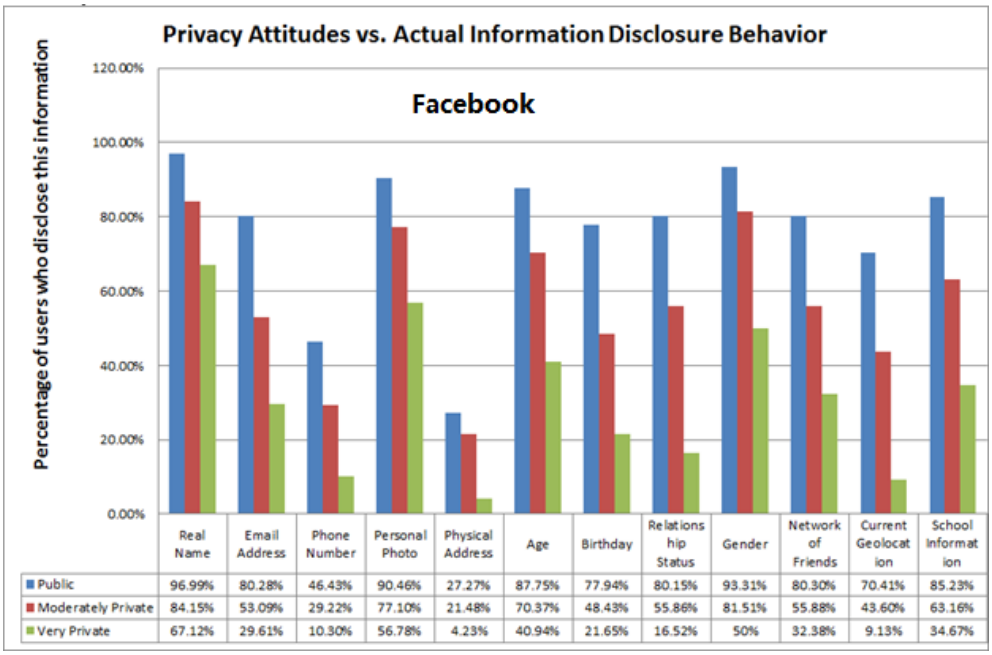
In fact, information disclosure behavior is where privacy breach potentially happens therefore has been the center of discussion of social network privacy in literatures (Tufekci 2008; Krishnamurthy 2009; Schrammel et al. 2009; Irani et al. 2011). However, the relationship between perceptions and information disclosure has remained an open problem (Zheleva et al. 2012) and the reason why social network users willingly disclose their private information have not been sufficiently investigated (Faisal & Alsumait 2011).

Surprisingly, one important factor has rarely been discussed is the general privacy attitude. It seems intuitive that people would be more willing to disclosure their information that she considers less private while more reluctant to share private information. However, as the previous literatures suggested, the information disclosure behavior was potentially affected by gender or the type of the social network (Schrammel et al. 2009). Studies also suggested that although people claimed that they concerned about privacy, their behaviors did not match. Whether there's strong association between privacy attitude and information disclosure behavior therefore, is one key issue for this thesis to explore.

To test the hypothesis that users tend to disclosure the information which they considers less private while refrain to disclose private information, respondents were asked to rate their privacy attitude toward each type of information and whether they

disclosed such information or not. A series of chi-square tests were then performed for each social network site.

The results suggested a strong positive association between privacy attitude and information disclosure behavior in also every social networks, except for WhatsApp which had a very small sample. The results show that the more private concern about a specific type of information, the less likely to disclose it. For example, the following figure illustrates the association on Facebook. It is very obvious that people who rated a type of information as "public" would be much more likely to disclose such information that those who considered it as "moderately private" or "very private".



	Real Name	Email Address	Phone Number	Personal Photo	Physical Address	Age	Birthday	Relationship Status	Gender	Network of Friends	Current Geolocation	School Information
Public	96.99%	80.28%	46.43%	90.46%	27.27%	87.75%	77.94%	80.15%	93.31%	80.30%	70.41%	85.23%
Moderately Private	84.15%	53.09%	29.22%	77.10%	21.48%	70.37%	48.43%	55.86%	81.51%	55.88%	43.60%	63.16%
Very Private	67.12%	29.61%	10.30%	56.78%	4.23%	40.94%	21.65%	16.52%	50%	32.38%	9.13%	34.67%

Figure 5.4 Privacy Attitudes vs. Actual Information Disclosure – Facebook

Such association between general privacy attitude and information disclosure behavior was robust as it was identified across multiple social network platforms – even when these sites were designed for different usages and they were targeted at different

user groups. With such an association between attitude and disclosure, it would be justifiable to investigate if changing people's privacy attitudes, through education, cultural influence, etc. would affect people's actual information disclosure behavior. If a person becomes more aware about the privacy of SSN or geolocation for example, it may be possible that she will less likely disclose such information in social networks thus reducing the probability of unexpected leakage of such information.

5.3 Cultural Differences in Privacy Perceptions and Behaviors

The second research question explores the cultural differences in privacy perceptions and behaviors. This thesis specifically studied whether there exist significant differences in social network users': 1) general privacy attitude; 2) frequency of changing privacy settings; 3) extent of reading privacy policies; 4) extent to which they trust the social network; 5) percentage of real-world friends in the friend list 6) profile preferences and 7) information disclosure behavior.

For each of the seven variables, an index was created to rate how "well" a user perceives privacy or behave in accordance with high privacy awareness. These indexes were calculated by averaging the users' survey responses across sites and mapped to a 0-10 scale. Three scores were then created to integrate these indexes to rate user privacy awareness in three dimensions: attitude, perception and behavior. These scores and indexes are listed as follows:

General Attitude Index (I) is a 0 to 10 score that rates the average concern towards 16 selected personally identifiable information. A score of 10 indicates that the

user rated every type of information as “very private” while a score of 0 indicates that the user rated each type of information as “public” Therefore, a high score means that a user was more concerned about the privacy of personally identifiable information.

Trust Index ( ) is a 0 to 10 score that rates the extent to which that a user suspected social networking sites. A score of 0 indicates that the user completely trusted each of the social networks while a score of 10 means that the user did not trust social network sites at all.

Privacy Setting Index ( ) is a 0 to 10 score that rates how often a user changed their privacy settings. A score of 10 indicates that the user frequently changed privacy settings in all sites while a score of 0 indicates that the user never changed privacy settings in any of the sites.

Privacy Policy Index ( ) is a 0 to 10 score that rates how well a user read privacy policies. A score of 10 indicates that the user has read privacy policies in all sites while a score of 0 indicates that the user never read privacy policies in any of the sites.

Profile Preference Index ( ) is a 0 to 10 score that measures how many profiles of a user are private profiles. A score of 10 indicates that the user used private profiles in all sites while a score of 0 indicates that the user used public profiles in each of the sites.

Friend List Index (is a 0 to 10 score that measures how many people of a user‘s friend list are actual friends that she knows in real life. The higher the score is, the more proportion of the friend list was real world friends.

Information Disclosure Index (I_{Di}) is a 0 to 10 score that measures how much information that a user discloses on an average social networking site. A score of 7 for example indicates that a user on average disclosed 70% of personal information on each site.

Privacy Attitude Score ( ) is a 0 to 10 score that measures user's attitude toward the privacy of personally identifiable information. In this study, S = I.

Privacy Perception Score (S_{Pe}) is a 0 to 10 score that measure how much a user perceive privacy risks in social networks. In this study, we only have "trust" as perception variable. Therefore, $S_{Perception}$ =.

Privacy Behavior Score (S) is a 0 to 10 score that measures to what extent a user's behavior reflects high privacy awareness. A weighted summation was used to calculate the score:

$$S_{Behavior} = \frac{I_{Setting} + I_{Policy} + I_{Profile} + I_{Friend} + I_{Disclosure}}{5}$$

To study the impact of cultural background, the indices and scores of U.S. citizens, Chinese citizens in China and Chinese citizens in the U.S. were calculated respectively. The results are listed in the following tables.

Table 5.2.

Privacy Indexes for Different Cultures

	$I_{Attitude}$	I_{Trust}	$I_{Setting}$	I_{Policy}	$I_{Profile}$	I_{Friend}	$I_{Disclosure}$
Average	5.02	4.45	4.33	2.80	5.92	5.77	8.20
U.S. Citizen	5.42	5.26	4.47	3.99	6.16	5.75	8.67
Chinese in the U.S.	4.74	5.79	3.72	1.03	5.30	6.35	7.81
Chinese in China	4.90	2.18	4.83	3.47	6.33	5.17	8.14

Table 5.3.

Privacy Scores for Different Cultural Contexts

	$S_{Attitude}$	$S_{Behavior}$	$S_{Perception}$
Average	5.02	5.40	4.45
U.S. Citizen	5.42	5.81	5.26
Chinese in the U.S.	4.74	4.84	5.79
Chinese in China	4.90	5.59	2.18

Radar chart was created to illustrate the cultural differences in three dimensions: privacy perception, attitude and behavior.

Figure 5.5 Radar Chart: Privacy Scores for Different Cultural Contexts

The above figure suggested that all three populations had similar scores for privacy attitude and privacy perception, yet the Chinese users in China had apparently lower scores in privacy perception (i.e. "trust"). To further understand the results, the chart was break down into seven variables:

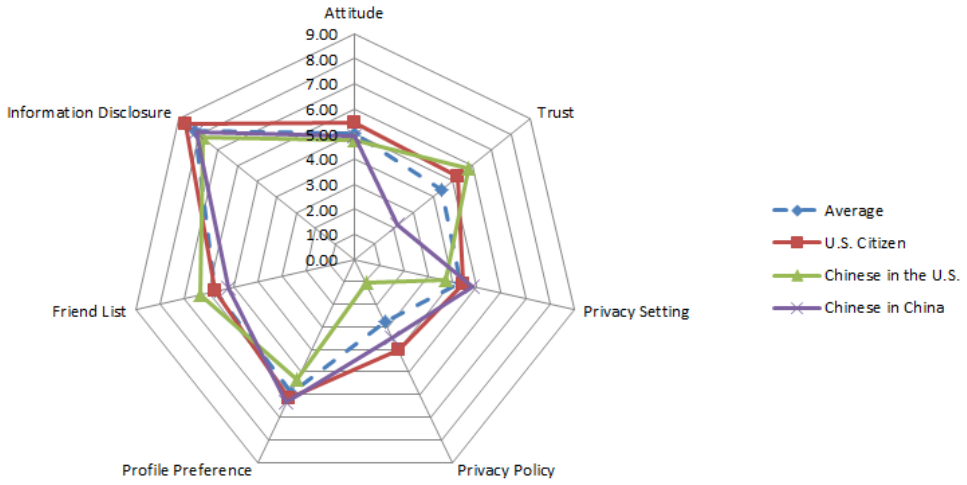


Figure 5.6 Radar Chart: Privacy Indexes for Different Cultural Contexts

The chart clearly shows that Chinese users in China were more willing to trust social networking sites according to their responses. It also suggests that Chinese in the U.S. were much more reluctant in reading privacy policies. The result also shows that

Chinese in the China were more likely to use a private profile while those in the U.S. preferred a private one.

Although Chinese users in China have a high score in information disclosure of 7.81, which indicates that they disclosed about 21.9% personal information on an average site; the U.S. citizens only disclosed about 13.3%. The Chinese users in the U.S. disclosed 18.6% which was still much worse than their American counterparts. Also interestingly, Chinese in the U.S. had more real life friends in their online friend lists than Chinese in China according to their responses.

The above findings suggested that cultural differences capture the differences in some of the privacy variables well while failing to capture the differences in others.

The study may be the first effort that tries to explore the impacts of cultural background on these privacy perception and behavior variables. Previous works have been focusing on other factors such as gender, computer expertise, personality traits, etc. For example, Tufekci (2008) found out that gender, general privacy concern and future audience play an important role in information disclosure behavior while Shrammel et al. (2009) found out that profession –student/employed also affect information disclosure behavior. Mohamed (2011) found out that how long a user uses a social network and privacy protection behaviors have influences on users' trust.

Therefore, it won't be surprised that cultural background do not play significant roles on some of these variables as there are so many other factors out there that may also affect these perceptions/behaviors. One important factor that hasn't been tested in this study is the usage of the social networks. Each social network has different functionalities and specific design in nature and people use social networks for different purposes.

Weibo and Twitter, for example are widely used as platforms for learning/broadcasting news and events, so people usually keep a public profile and they usually "follow" a lot of strangers or celebrities in order to get more interested news and events. WeChat for example, is mainly used for private messaging so that people usually have more real-life friends in their contacts and they would prefer a private profile to form a boundary so that they can selectively disclose sensitive information to their friends and non-sensitive information to the public. Facebook and RenRen were initially designed for students to find and contact with their school mates and friends. Disclosing school information and real name gives them better user experience by allowing them to be searched and contacted. Actually, Facebook and RenRen have a majority of users (above 80%) disclosed their real name in these sites while less than 20% users would disclose such information on Weibo. Therefore, the usage of each social network may strongly affect people's profile preferences, information disclosure and constituents of friend lists.

Another important potential factor is "conformity effect ". Chinese users may imitate what other cultural groups, especially American people when they started to use Facebook, Twitter and WhatsApp. Such effect can also be identified when users choose to disclose information which most people disclose. It's interesting to think about that each social network has its own culture or norm so that users conform to such culture and norms even though they come from different cultures in real world.

The third potential factor is censorship in China. Weibo, served as an important media for the public voices is under strict supervision of the government and the society. Keeping a private profile reduces the chance of getting in trouble while those students in

the U.S. have less such concern. This may explain why Chinese in the U.S. prefer public profile while Chinese in China prefer private profile.

The above factors are not exhaustive and they may affect the constituents of friend list, what type of profile to use and what information to disclose greatly. They may also have impacts on reading privacy policies and privacy settings. Subject to the usage and "conformity effect", social network users may behave and perceive similarly on the same social network thus making the cultural differences obsolete.

5.4 Privacy Attitude, Perception and Behavior in Different Sites

The third research question focused on the relationships among privacy attitude, perception and privacy behavior in different sites.

Similarly, the seven indexes and three privacy scores were calculated for each site as listed in the following table:

Table 5.4.

Privacy Indexes for Different Sites

	$I_{Attitude}$	I_{Trust}	$I_{Setting}$	I_{Policy}	$I_{Profile}$	I_{Friend}	$I_{Disclosure}$
Facebook	5.02	4.59	4.40	2.92	5.82	6.41	4.50
RenRen	4.71	3.87	4.37	2.02	5.85	6.30	4.70
Twitter	5.25	4.29	3.71	2.98	3.72	4.03	6.89
Weibo	4.87	3.37	4.36	2.32	4.16	4.31	6.47

WhatsApp	4.96	3.87	3.77	3.35	5.75	6.63	6.52
WeChat	4.83	3.11	4.65	2.15	7.14	6.64	5.76

Table 5.5.

Privacy Scores for Different Sites

	$S_{Attitude}$	$S_{Behavior}$	$S_{Perception}$
Facebook	5.02	4.81	4.59
RenRen	4.71	4.65	3.87
Twitter	5.25	4.26	4.29
Weibo	4.87	4.32	3.37

Table 5.5 (continued).

Privacy Scores for Different Sites

WhatsApp	4.96	5.20	3.87
WeChat	4.83	5.27	3.11

A series of 3-dimential radar charts were created to illustrate the differences of the six sites in privacy attitude, perception behavior. The first chart includes all six sites and similar sites were then put into single charts for comparison purpose. Again, the charts suggested that in different sites, users have different privacy perceptions.

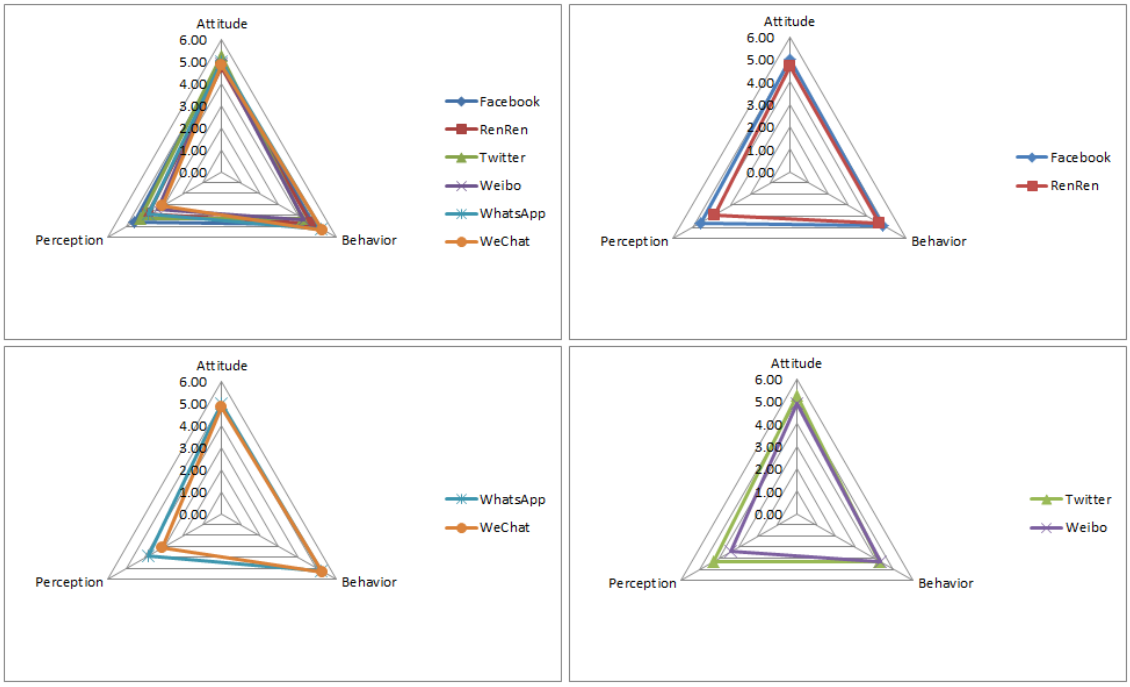


Figure 5.7 Radar Chart: Privacy Scores for Different Sites

To get a detailed look, the three dimensions are further divided into seven indexes. The next chart includes all six sites and we can clearly see how these sites differ in these variables.

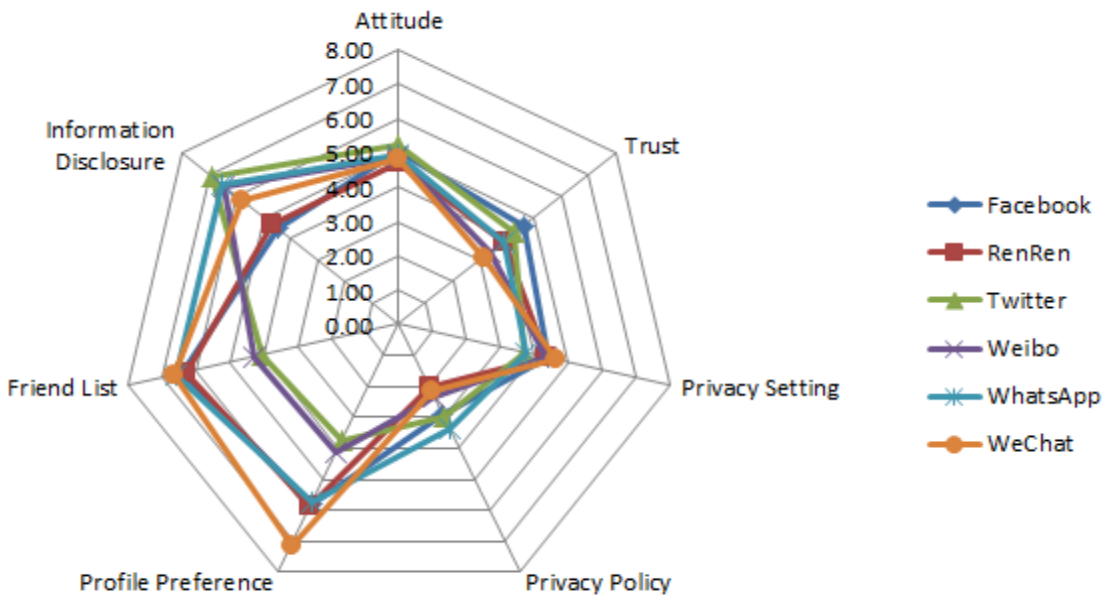


Figure 5.8 Radar Chart: Privacy Indexes for Different Sites 1

For information disclosure, Facebook and RenRen users seem to have a much worse score than the other four sites. It's not surprising because both sites were used to exhibit oneself and to make new friends, which encourage users to disclose much personal information.

For friend list, two similar sites, Twitter and Weibo has a significantly lower percentage of real life friends in users' friend lists. It's intuitively true because these two sites enable users to follow and being followed by strangers without bilateral agreement. On other sites, users generally have to agree/accept friend requests before they become online friends.

For privacy policy, three Chinese sites, WeChat, RenRen and Weibo had much fewer users that were willing to read privacy policies.

For profile preference, Twitter user and Weibo users tend to prefer public profiles while more users on the other sites reported that they used private profiles. WeChat, especially, has a very high score of profile preference. One explanation would be that Twitter and Weibo's default profile was public while WeChat's was private and users might simply won't bother to change the default setting. Also, as discovered above, Twitter and Weibo users did not disclose much information on these sites. Therefore, they might be less concerned about profile management. WeChat on the other hand was used for private messaging so that users were more reluctantly to make their profile public in fear of sensitive messages may be leaked to strangers.

One interesting finding is that some of the differences capture in the seven variables seemed to be attributed to the differences of the "type" or "usage" of the social network such as profile preference, friend list and information disclosure as discussed above. While other differences, such as differences in reading privacy policy seem more likely to be linked to the fact that whether the sites are Chinese sites or American sites.

This study did a simple effort to study this issue by splitting the six sites into 1) different types of same "nationality" 2) similar sites of different "nationality"

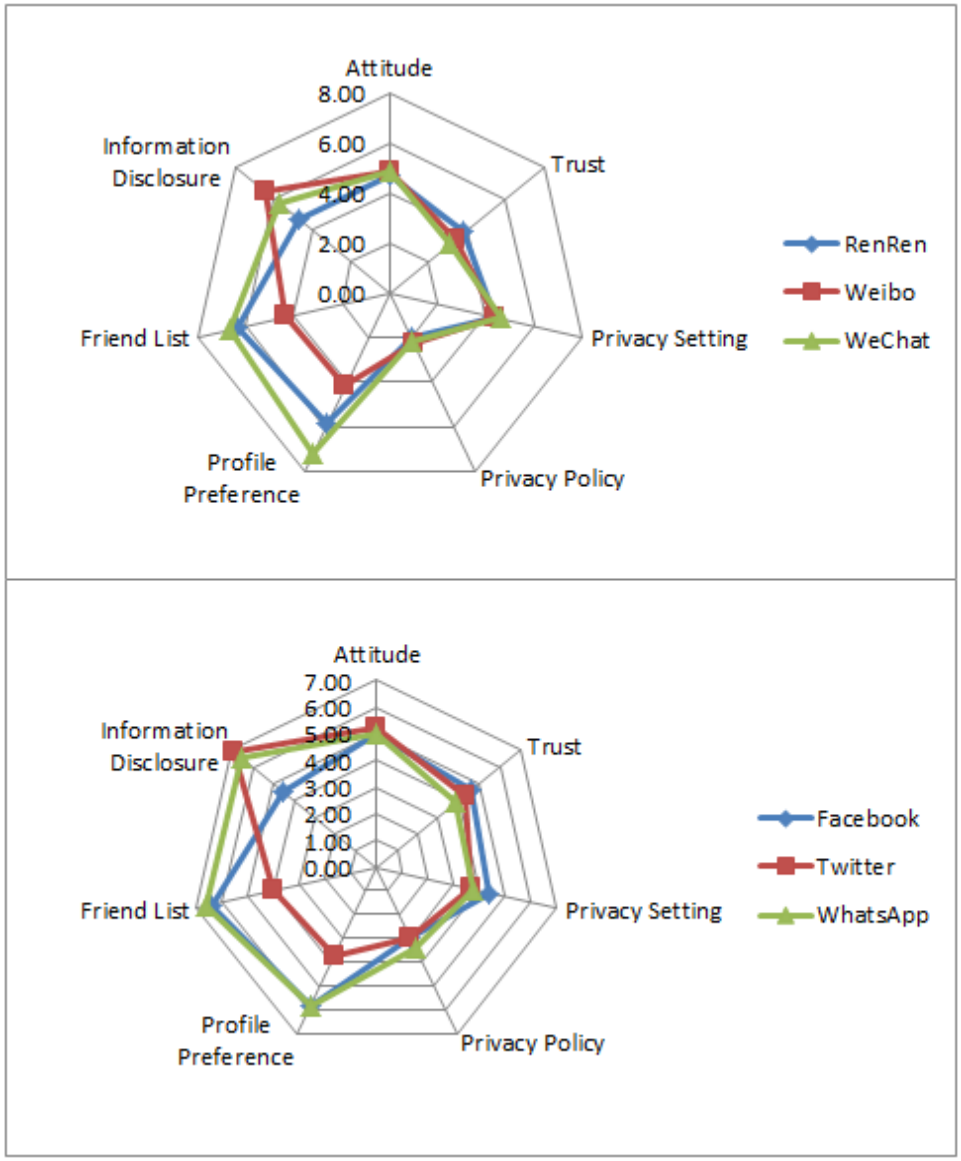


Figure 5.9 Radar Chart: Privacy Indexes for Different Sites 2

The first set of radar charts clearly suggests that the difference of usage/type of social networks capture the differences of friend list, profile preference, and information disclosure well. In the three American sites, Facebook and WhatsApp users had significantly higher scores than Twitter users in profile preference and friend list while Twitter and WhatsApp users performed better in information disclosure as compared to

Facebook users. The results hold for three Chinese sites and they follow the same pattern. RenRen and WeChat users had significantly higher scores than Weibo users in profile preference and friend list while Weibo and WeChat users performed better in information disclosure as compared to RenRen users.

Such pattern can be better identified by comparing similar sites. The following figures suggested that similar sites generally have similar scores in information disclosure, attitude, privacy setting, friend list and profile preference (except for WeChat and WhatsApp where we only have a small sample of 106 WhatsApp users).

However, there were mismatches. Three Chinese sites have consistent lower score in trust and privacy policy. Such results actually match the fact the Chinese users were less willing to read privacy policies and more willing to trust social networking sites as compared to U.S. citizens.

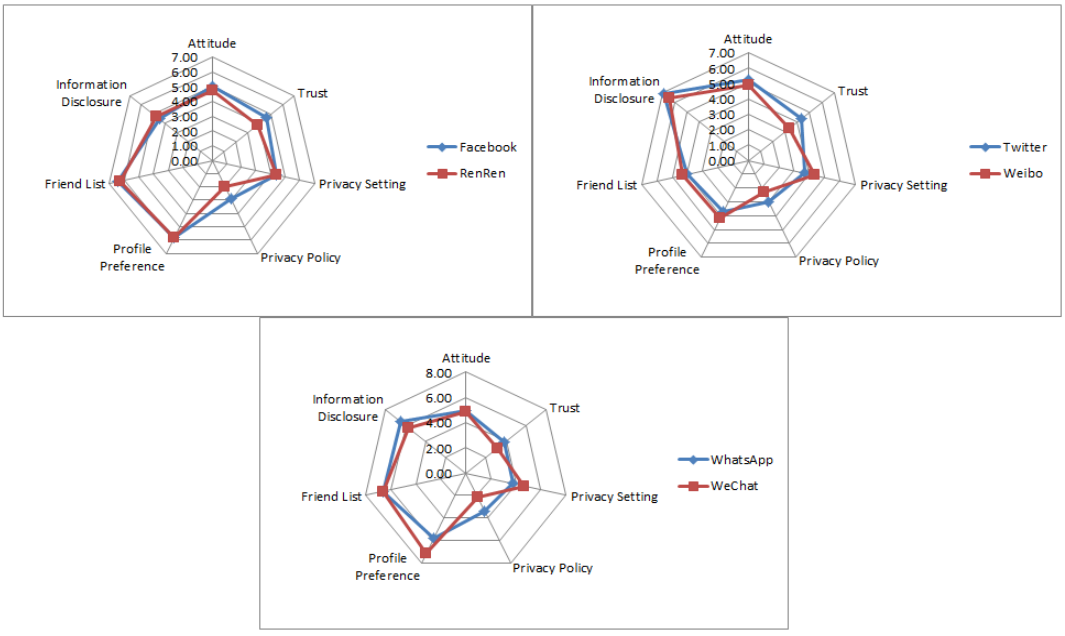


Figure 5.10 Radar Chart: Privacy Indexes for Different Sites 3

The results suggest that the differences of social network sites do have significant impacts on several behavior and perception variables and similar sites generally have similar patterns in these variables. However, as sites were consisted of different groups of people. In this case, the three Chinese sites were consisted of Chinese users while the three American sites were consisted of a combination of U.S. citizens and Chinese users in the U.S. So such differences of social networks may also be partially attributed to the differences of users' cultural background.

It might be an interesting topic to study whether it is the innate characteristic or usage of the site or it is the mindsets of users themselves that contributed to the differences in privacy attitudes, behavior or perception the most.

To further understand the relationships among privacy perceptions and behaviors. The study tested the correlations among the other five variables using Person's r and Spearman's rho:

Cohen's guideline was leveraged to interpret the correlation results. According to him, r=0.5 represents a "large" correlation coefficient in social science, r=0.3 implies medium correlation and r=0.1 implies small correlation (Cohen, 1988).

On the three American sites, we found consistent medium positive correlation between privacy setting and privacy policies – the more people are willing to read privacy policies, the more frequently they tend to modify their privacy settings. On Facebook and Twitter, we also found significant negative correlation between trust and profile preference – the more trust, the more likely to use a public profile. On WeChat, we found medium positive correlation between privacy policy and profile preference –

the more people are willing to read privacy policies, the more likely they would use a private profile.

On the three Chinese sites, consistent medium positive correlation between privacy setting and privacy policies were also identified. Yet other interesting correlations were not found.

The correlations were then broken down into different cultural groups. Here the study only focused on Facebook, RenRen, Weibo and WeChat which had a balanced sample size for each population and a large total size. WhatsApp only has a total sample size of 106 and Twitter has a very imbalanced sample as discussed before.

The results suggested that on all of these 4 sites, Chinese users in the U.S. did not show significant correlation between privacy setting and privacy policy while the other two groups – Chinese in China and U.S. citizens did. The previous tests already identified that Chinese users in the U.S. are significantly "more reluctant" to change privacy settings and to read privacy policies than the other two groups. It would be an interesting topic that needs further investigation of why such "mismatch" happens.

In fact, according to the results, only privacy settings and reading privacy policies had consistent medium correlation in social networks while others only had small or non-significant correlations. No strong correlation ($r>0.5$) were identified between any of the variables. The interpretation is that these variables could not accurately predict each other – although they may be statistically correlated with significance. The study challenges the assumption that people who distrust the social network would necessarily be more willing to read privacy policies, or would she change privacy settings more frequently, add fewer strangers into their friend lists or keep a private profile than those who trust. One

implication is that a simple correlation could not perfectly capture the relationships among these variables. The intuition that these perception/behavior variables are correlated with each other is that they all seemed to capture the privacy awareness of users. However, as discussed above, these variables are also subject to the potential influences of other factors that may not even related much to privacy, such as usage, personality traits and conformity effects.

The consistent medium correlation among privacy settings and reading privacy policies implies that they may be good indicators of users' privacy awareness, and by using concise/transparent privacy policies so that people are more willing to read, the more possible that a user would change their privacy settings frequently. This finding is important because privacy settings have been the major mechanism for end-users to manage their privacy and previous research has shown that such mechanism failed to protect privacy due to the fact that users simply do not bother to or are not adept at the fine-grained privacy settings. This result justified the effort in making privacy settings more useful by promoting reading privacy policies.

5.5 Conclusion and Future Work

This study found out that 1) People have different privacy concerns toward different types of information 2) Cultural differences are indeed an important factor in social network users' privacy perceptions and behaviors. 3) Privacy attitudes generally imply information disclosure behavior, users are generally more willing to disclose the information that he/she considers public than those which he/she considers more private. People perceive privacy differently, so that they disclose things differently. 4) The

differences of social networking sites also have impacts on the differences of user privacy perception and behavior 5) No strong correlations were found among trust, profile preference and other privacy perception/behavior variables. How people behave and perceive may be a complicated problem that could not be modelled by simple correlation. However, changing privacy settings and reading privacy policies were significantly correlated in all social networks.

The relationship between users' privacy perception and behavior remains an open yet complicated problem. Previous work has put much effort into investigating factors that may affect information disclosure such as gender, age, computer expertise, etc. (Tufekci 2008; Krishnamurthy 2009; Schrammel et al. 2009; Irani et al. 2011). Following their lines of inquiry, this thesis looked into another variable – privacy attitude that was rarely discussed and found out that there was significant association between privacy attitude and information disclosure behavior. The next step is to integrate other variables such as gender, social network usage, etc. into the cube in order to achieve a more sophisticated model.

Many previous literature treated different types of PII as equals without distinguishing their different levels of sensitivity. It measured information disclosure by simply counting how many different types of information were disclosed (Schrammel et al. 2009; Irani et al. 2011). This thesis found out different types of information may have different "weights" of privacy which varies person by person. A more precise measurement of information disclosure index or privacy attitude index could then be introduced based on the findings of the thesis, in order to better capture a user's privacy awareness as part of future work.

In the future, multiple regression analysis and mediation analysis will be applied to study the relationship among multiple variables. The current results only covered pairwise correlation and might not able to capture complex relationships among multiple variables.

One innate limitation of the research is that the design of the survey questions tried to capture common characteristics of different sites. Therefore, the data would neglect many distinct features of each site. For example, Facebook and Weibo have very different profile management mechanism. Facebook allows very fine-grained profile setting that people could customize their own white lists or blacklists. Weibo, on the other hand has only "public" or "private" options. Therefore, in this study we only let users to choose whether they use a private profile or public profile. In the future, distinct features of each site and their impact on users' perceptions and behaviors will also be investigated. For example, would a more fine-grained profile setting make people less bother to use? Would a more fine-grained profile setting make people trust the site more?

Another area for future research is how to change people's privacy attitudes or what are the factors that affect people's privacy attitudes. Since the study found out that privacy attitudes guides information disclosure. Studying factors that influences privacy attitudes may potentially make social network users more wisely disclosing their information.

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APPENDICES

Appendix A Survey Questions

Informed Consent Form

Introduction

This survey is part of our research study about privacy protection in Social Networks. Your response would help us better understand students' behavior patterns and privacy concerns when using different online social networking services.

Procedures

The questionnaire consists of 10 questions and will take approximately 3-5 minutes to complete. This questionnaire will be conducted with an online Qualtrics-created survey.

Risks/Discomforts

Risks are minimal for involvement in this study. We consider the possibility that participants may feel unconfortable or have privacy concerns about the questions. We encourage them not to answer such questions or quit the survey upon such conditions.

Confidentiality

The response will be totally anonymous and confidential. No connection between you and your answer could be linked. All questionnaires will be concealed, and no one other than then primary investigator and assistant researchers will have access to them. The data collected will be stored in the HIPPA-compliant, Qualtrics-secure database until it has been deleted by the primary investigator.

Compensation

There is no direct compensation.However, hopefully, this survey would also raise participants' privacy awareness on social networking sites.

Participation

Participation in this research study is completely voluntary. You have the right to withdraw at any time or refuse to participate entirely.

I am above 18 and I have read, understood the above consent form and desire of my own free will to participate in this study.

- ❍ Yes
- ❍ No

The survey has a total number of 10 questions which may take 3-5 mins to complete. We really appreciate your participation!

Lao Tzu —"The journey of a thousand miles begins with a single step."

Q1: Are you a _ ?

- ❍ U.S. citizen
- ❍ Chinese citizen living in the U.S.
- ❍ Chinese citizen living in China
- ❍ None of the above

Q2: How many social networking services (Facebook, Twitter, LinkedIn, Youtube, Tumblr, tc.) are you actively using?

- ❍ 0
- ❍ 1
- ❍ 2-4
- ❍ 5 or more

Q3: In general, please rate the privacy level of the following personal information when you use the Internet:

	public(little privacy concern)	moderate privacy concern	very private
Real Name	❍	❍	❍
Email address	❍	❍	❍
Phone number	❍	❍	❍
Physical address	❍	❍	❍
Age/ Birth year	❍	❍	❍
Exact birthdate	❍	❍	❍
Relationship Status	❍	❍	❍
Gender	❍	❍	❍
Personal photo	❍	❍	❍
Login name/Nick name	❍	❍	❍
SSN or other identification number	❍	❍	❍
Hometown/ Birthplace	❍	❍	❍
Network of friends	❍	❍	❍

(eg. friend list or contact list)			
School information	❍	❍	❍
Employer information	❍	❍	❍
Current geolocation	❍	❍	❍

Q4: Are you a member of the following social networking services? (check all that apply)

- ❑ Facebook
- ❑ Twitter
- ❑ WhatsApp
- ❑ RenRen(人人网)
- ❑ Weibo(新浪微博)
- ❑ WeChat(微信)
- ❑ None of the above

Q5: How often do you change your privacy settings?

	Never	Seldom - Once a year or less	Sometimes - Several times a year	Often - Monthly or weekly
Facebook	❍	❍	❍	❍
Twitter	❍	❍	❍	❍
WhatsApp	❍	❍	❍	❍
RenRen	❍	❍	❍	❍
Weibo	❍	❍	❍	❍
WeChat	❍	❍	❍	❍

Q6: Have you ever read the Privacy Policies for each site?

	No	Yes, but not carefully	Yes, I've read them carefully
Facebook	❍	❍	❍
Twitter	❍	❍	❍
WhatsApp	❍	❍	❍
RenRen	❍	❍	❍
Weibo	❍	❍	❍
WeChat	❍	❍	❍

Q7: What type of profile are you currently using?

	Public- every one can see my profile	Private - only specific group of people can see my profile
Facebook	❍	❍
Twitter	❍	❍
WhatsApp	❍	❍
RenRen	❍	❍
Weibo	❍	❍
WeChat	❍	❍

Q8: How much do you trust each of your online social network?

	I trust it won't misuse my private information	I'm suspicious that it may misuse my private information	I don't trust it at all
Facebook	❍	❍	❍
Twitter	❍	❍	❍
WhatsApp	❍	❍	❍
RenRen	❍	❍	❍
Weibo	❍	❍	❍
WeChat	❍	❍	❍

Only 2 questions left, we are almost there, be patient!

Q9: What information would you share on each of these online social networks? (check all that apply)

	Facebook	Twitter	WhatsApp	RenRen	Weibo	WeChat
Real name	❑	❑	❑	❑	❑	❑
Email address	❑	❑	❑	❑	❑	❑
Phone number	❑	❑	❑	❑	❑	❑
Physical address	❑	❑	❑	❑	❑	❑
Age/ Birth year	❑	❑	❑	❑	❑	❑
Exact Birthdate	❑	❑	❑	❑	❑	❑
Relationship Status	❑	❑	❑	❑	❑	❑
Gender	❑	❑	❑	❑	❑	❑
Personal photo	❑	❑	❑	❑	❑	❑
Network of friends (eg.	❑	❑	❑	❑	❑	❑

friend list or contact list)						
School information	❑	❑	❑	❑	❑	❑
Employer information	❑	❑	❑	❑	❑	❑
Current geolocation	❑	❑	❑	❑	❑	❑

Q10 : Roughly estimate the percentage of your online friends who are people you actually know in real world (friends/relatives/collegues/classmates etc.) in the following social network.

		10-40%	40%-60%	60-90%	>90%
Facebook	❍	❍	❍	❍	❍
Twitter	❍	❍	❍	❍	❍
WhatsApp	❍	❍	❍	❍	❍
RenRen	❍	❍	❍	❍	❍
Weibo	❍	❍	❍	❍	❍
WeChat	❍	❍	❍	❍	❍

Appendix B IRB Protocal

PURDUE
UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	MELISSA DARK KNOY 467A
From:	JEANNIE DICLEMENTI, Chair Social Science IRB
Date:	01/27/2014
Committee Action:	**Exemption Granted**
IRB Action Date:	01/24/2014
IRB Protocol #:	1401014403
Study Title:	Studying User Behavior and Privacy Attitude in Online Social Networks

The Institutional Review Board (IRB) has reviewed the above-referenced study application and has determined that it meets the criteria for exemption under 45 CFR 46.101(b)(2) .

If you wish to make changes to this study, please refer to our guidance "**Minor Changes Not Requiring Review**" located on our website at http://www.irb.purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms page of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

Below is a list of best practices that we request you use when conducting your research. The list contains both general items as well as those specific to the different exemption categories.

General

- To recruit from Purdue University classrooms, the instructor and all others associated with conduct of the course (e.g., teaching assistants) must not be present during announcement of the research opportunity or any recruitment activity. This may be accomplished by announcing, in advance, that class will either start later than usual or end earlier than usual so this activity may occur. It should be emphasized that attendance at the announcement and recruitment are voluntary and the student's attendance and enrollment decision will not be shared with those administering the course.
- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.
- When conducting human subjects research at a non-Purdue college/university, investigators are urged to contact that institution's IRB to determine requirements for conducting research at that institution.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without

Figure B.1 Original IRB Protocal

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	DARK, MELISSA JANE
From:	DICLEMENTI, JEANNIE D, Chair Social Science IRB
Date:	03 / 18 / 2014
Committee Action:	Amended Exemption Granted
Action Date:	03 / 17 / 2014
Protocol Number:	1401014403
Study Title:	Studying User Behavior and Privacy Attitude in Online Social Networks

The Institutional Review Board (IRB) has reviewed the above-referenced amended project and has determined that it remains exempt.

If you wish to make changes to this study, please refer to our guidance"**Minor Changes Not Requiring Review**" located on our website at http://www.irb/purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms pages of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

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General

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- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.
- When conducting human subjects research at a non-Purdue college/university, investigators are urged to contact that institution's IRB to determine requirements for conducting research at that institution.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit

Figure B.2 IRB Approval of Amendment