Exploring continuance intention of social networking sites: An empirical study integrating social support and network externalities

Abstract

Purpose – The purpose of this paper is to discuss how to retain social networking sites (SNS) users and explore the determinants of their continuance intention through a new perspective.

Design/methodology/approach – We propose a research model by integrating network externalities and social support. Three dimensions of social support and two types of network externalities are analyzed respectively to explore the direct and indirect effects on continuance intention. Online questionnaires are adopted to collect data, and 513 valid samples are analyzed by structural equation modeling (SEM) approach.

Findings – Network externalities indirectly affect user' continuance intention through the mediation effects of social support. Among the three dimensions of social support (informational support, emotional support and network management), network management plays a more important role on continuance intention.

Research limitations/implications – The findings show that network externalities can trigger the function of social support to retain SNS users. Besides, network management is the key dimension of online social support. Some other theoretical and practical implications are also provided.

Originality/value – The study is novel in exploring users' continuance intention of SNSs by integrating social support and network externalities. Meanwhile, we also intend to compare the effect of different dimensions of social support on SNS usage and discuss their internal relationships.

Keywords Social networking sites; Social support; Network externalities; Continuance intention; SNS users; SNS providers

Paper type Research paper

1. Introduction

Social networking sites (SNSs), such as Facebook and Twitter, have become ubiquitous and well-established online social platforms in people's daily life (K.-Y. Lin & Lu, 2011; Maier, Laumer, Eckhardt, & Weitzel, 2014). Nearly every moment, a large number of people use SNSs to contact with others, express themselves, read current news, display beautiful pictures or just share daily lives. Meanwhile, the popularity of portable devices (smart phones and tablet PC) and the application of the fourth-generation mobile technologies have further accelerated this trend (Zhou, 2015). For users, SNSs have become both computer-mediated and smartphone-mediated communication systems and allowed them to log in without limitations of time and place. Essentially, SNSs are platforms based on interaction and participation(Wei, Lin, Lu, & Chuang, 2014). Thus, SNS users can be considered as the key to the success of them. In other words, long-term development of SNSs largely depends on users' continuance intention. However, Park and Lee (2010) argued that although SNSs have attracted a variety number of users, how to keep them is not easy because of the competition from new and more attractive rival SNS providers. This is because many functions and features of different SNSs now have become highly similar, and therefore fierce competitions among SNS providers will inevitably exist. Under this background, approaches of retaining users and facilitating their long-term usage are necessary to be explored. Many studies have examined this from different perspectives.

Some researchers explored this from a perspective of perceived usefulness of SNS users (Hsu, Yu, & Wu, 2013; Mouakket, 2015; Wang, Xu, & Chan, 2014; Yin, Zhu, & Cheng, 2014). Several theories and models, such as technology acceptance model (TAM), expectation–confirmation model (ECM), motivation theory and some other theories and models were adopted to discuss the variables related to usage of SNSs. Through them, these

researchers explored satisfaction, motivations, confirmation and their relationship to usefulness or ease of use, and then examined their effects on SNS usage. These studies have proposed a variety of models and empirical evidences, thereby promoting further exploring of this field and providing some theoretical and practical implications. But on the other hand, the social nature of human beings which have little relationship to services of SNSs but are still very essential to the users' continuance intention (Podoynitsyna, Song, van der Bij, & Weggeman, 2013) have not been considered seriously.

To fill this gap, some researchers focused on social psychology to examine users' continuance intention. Related theories such as attachment theory, self-regulation framework as well as uses and gratifications theory (Chaouali, 2016; Chung, Nam, & Koo, 2016; H. Lin, Fan, & Chau, 2014) were employed to propose hypotheses, and many empirical investigations were conducted to prove how continuance intention is influenced. However, most of these researches are belong to static studies, although they can reveal uses' psychological motivations when they use SNSs, but users' interaction and participation which can the considered as foundations of cannot be well reflected. Therefore, this perspective may not comprehensively reveals SNS users' behaviors.

Other studies discuss this topic from the perspective of social interaction. For example, X. Lin, Zhang, and Li (2016) argue that users' continuance intention can be affected by social support among SNS users. They developed an analytical framework to divide social support into three dimensions and examined their effects on users' commitment and SNS continuance. Besides, some researchers also tried to discuss users' continuance intention from network benefits of SNSs (Bhattacherjee & Lin, 2008; Chiu, Cheng, Huang, & Chen, 2013; K.-Y. Lin & Lu, 2011; Zhou, 2015). They believe users' attitude toward SNSs usage can be influenced by the number of participants and complementary products, because for SNS users, more benefits will be produced with convenient and frequent interactions. These studies have paid attention to interaction and participation of SNSs which are primary features of SNSs and therefore worth continuous researching. However, social support and network externalities may not work in isolation, and some inner relationships between them have never been examined. In addition, although prior studies have delineated dimensions of social support on SNSs, the effect of each dimension on users' continuance intention and the internal relationships among these dimensions also have not been analyzed.

Broadly, our aim is to explore users' continuance intention of SNSs by integrating social support and network externalities. Meanwhile, we also intend to compare the effect of different dimensions of social support on SNS usage and discuss their internal relationships. The rest of this paper is organized as follows. In section 2, we discuss the theoretical backgrounds, from which we put forward research hypothesis and present the conceptual model. Then we describe the research methodology in section 3, followed by test the mode, data analysis and results in section 4. In section 5 we discuss the implications, limitations and future suggestions from the research. Finally, we conclude the research in section 6.

2. Theoretical background and hypotheses

2.1 Social support

Originally, social support mainly refers to satisfying patients' psychological adjustment to their disease (Sharf, 1997; Shaw, McTavish, Hawkins, Gustafson, & Pingree, 2000). Therefore, the early definition of it is "an exchange of resources between at least two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient" (Shumaker & Brownell, 1984). It can be described as any process through which health and well-being might be promoted by social relationships (Gottlieb, 2000). This definition helps people understand the origin of social support, but it also limits social support in medical field and requires face to face interactions at a specific time. However, Fiske (2009) argued that social support always exists because human beings are social creatures and need turn to each other for emotional and informational assistance. In the context of SNSs, more open approaches for users are provided to overcome the limitations of time and physical location. Therefore, Pfeil (2009)

further defined social support as "the exchange of verbal as well as nonverbal messages in order to communicate emotional and informational messages that reduce the retriever's stress". This definition expanded the range of people who apply to social support.

In this paper, social support is regarded as an interactive supporting mode which is not only provided to those who suffer disease or illness, but also adjust to ordinary people. Nowadays, many people are willing to seek help from their online friends or search engines and share their emotion with some ones who are in the same online communities or groups with them. Useful information and light-hearted comments are the most common online social support. Moreover, compared with traditional social support, online social support usually builds relationships with casual ties and allows people to conduct anonymous interactions. Users may provide emotional or informational assistance to unfamiliar people and even establish relationships with people who have never met before (X. Lin et al., 2016). Therefore, in our research social support applies to any people rather than those in a distressing situation.

2.1.1 Dimensions of social support and their effects

Social support is regarded as a multi-dimension concept and classified depending on context and the way people use it (X. Lin et al., 2016), and prior researches have provided many patterns to classify it. Some studies classified social support from the perspective of functional support. For example, Sherbourne and Stewart (1991) divided into social support into five categories, including (1) emotional support (caring, love and empathy), (2) instrumental support (referred to by tangible support), (3) information, guidance or feedback (providing a solution to a problem), (4) appraisal support (referred to self-evaluation), (5) social companionship: leisure and recreational activities. This classification lists the details of functions about social support, and can be considered as foundation of our research. In addition, Klemm, Reppert, and Visich (1998) classified social support into several types after studying online cancer support groups, involving information giving/seeking, encouragement/support, personal experience, personal opinion, prayer, thanks, humor and miscellaneous. Although as mentioned above, classification specifically for patients cannot apply to all situations, it well displays the psychological requirements of some people who belong to online communities. Thus, it paves the path for future research of social support in the Internet Age.

X. Lin et al. (2016) identified the classifications of social support in the context of SNS. They pointed out three dimensions of support (informational support, emotional support and network management) under the theoretical framework of socio-technical theory. Our research is based on the SNS users. For them, informational support can provide suggestions, plans, or interpretation, and emotional support focuses on expressing one's concerns and hence can help to solve problems indirectly (Turban, Li, Ho, & Liang, 2011). At the same time, Boyd and Ellison (2007) pointed out that the SNS system contains both technical and social aspects to enhance users' online interaction, connection, and networking. Therefore, online social support should involve online networking maintenance. In other words, we adopt Lin's (X. Lin et al., 2016) classification to analyze social support in this paper.

Informational support

In the age of the Internet, community information (CI) portals and referral services can be considered as the origin of informational support. The Internet enables information service providers to take information and referral services online to present rich and wide-ranging community information (CI), such as such as health care, financial assistance, housing, transportation, education and childcare services as well as information on recreation programs, clubs, community events, and information about all levels of government (Day, 2007; Hider, Given, & Scifleet, 2014). However, compared with professional information service providers, informational support on SNSs are partly user-generated content and mostly belongs to spontaneous behaviors from SNS users.

For SNS users, informational support is the act of providing information to add other individuals or groups, which refers to providing recommendations, advice, or knowledge (Myrick, Holton, Himelboim, & Love, 2015; Taylor, Sherman, & Kim, 2004). Internet users are motivated by searching online for the information they need by viewing the content generated by others or asking for a specific topic or question regarding a problem(Shao, 2009). This means sharing and searching information through social networking platforms and helps each other keep up with updated news, solve problems, or make decisions. The reason why SNS users are willing to share different types of information is that such activities satisfy the social purpose of human beings, such as keeping in touch with friends and colleagues, raising the visibility of interesting things to one's social networks, seeking help and opinions and so on (D. Zhao & Rosson, 2009). Nowadays, some SNSs, such as Facebook, has often been used as a tool for information discovery. Many functions like ''Top Story'', ''Most Recent'', ''Trending'' and ''Most Shared'' help users keep up with the updated news and information (Scale, 2008). At the same time, as social platforms, interaction and participation are their prominent features. Thus, users can seek information from their friends, online friends or even strangers on SNSs anytime and anywhere through "@" function. Moreover, in recent years, SNSs have more and more been called "self-media". User-generated content can be freely posted on the SNSs. As Agarwal, Gupta, and Kraut (2008) argued, from blogs to online reviews to self-organizing encyclopedic collections of knowledge, there are few questions whose answers cannot be found on some socially constructed digital network. That is why SNSs can be considered as a window of information.

Ko, Cho, and Roberts (2005) empirically demonstrated that users who satisfy their information needs, would spend more time on websites. Some studies also revealed that when some information is sought from online social networks, people often trust it and think it valuable (Syn & Oh, 2015). That means SNS users may desire to acquire useful and enlightening information from SNSs and thereby keep using SNSs. Thus, we hypothesize that:

H1. Informational support has a positive effect on continuance intention of SNS.

Emotional support

Traditionally, emotional support is to comfort patients and occurs when caring, understanding or empathy is expressed or exchanged (Myrick et al., 2015; Taylor et al., 2004). SNSs may provide an alternative support channel for people confronting challenges by sharing emotion or sufferings online and then receiving supportive messages from friends or anonymous people. Rimé, Mesquita, Boca, and Philippot (1991) argued sharing emotions with others and expecting for encouragement and supports from friends or relatives are basic human needs and are vital for all age groups. With the increasing popularity of the mobile Internet, 4G wireless technology and smart devices, SNSs is becoming more and more important in daily communication, and seeking emotional support online has become a common case. Now a large number of people actively resort to SNSs for emotional management and regulation (Maier et al., 2014). They use text messages, pictures and videos on SNSs to express their feelings and then acquire emotional support from online support groups or users' friends and relatives.

Emotional support has been found to affect mood, coping strategies, personal relationships, and even physical health of the recipient (X. Lin et al., 2016; Shumaker & Brownell, 1984; Yoo et al., 2014). All of them are closely related to daily life and personal development because of the social nature of human beings. Therefore, SNS users will have motivations to log in these platforms regularly. Additionally, most SNSs providers are making greater efforts to improve their privacy protection system. Users can share their private feelings and seek emotional comfort from others without much worries behind. Therefore, we hypothesize that:

H2. Emotional support has a positive effect on continuance intention of SNS.

Network management

In this paper, network management mainly refers to maintaining and forming social ties with others. SNSs are

virtual communities that allow users to exchange resources and maintain relationships with people across the world. Current SNSs have provided a variety of channels for users to interact with others through the Internet without the limit of time and geographic distance, and people can maintain and develop their social networks in a convenient way and at a relatively low cost (X. Lin et al., 2016). For example, through the "share" function of SNSs, users can know and comment daily lives of friends on their SNS lists. They can also interact with others by using the "@" function. Moreover, nowadays most SNSs usually offer users different kinds of supporting tools, such as photo sharing and vice message to help users conduct and consolidate a wide range of social connections. Through these tools, users' requirement of social interaction can be better satisfied, and they can acquire feelings of being connected with some people or some groups (Strayhorn, 2012). It can be considered as a sense of belonging, and gradually social ties will be maintained

In a word, since SNSs have provided a variety of ways for users to keep in touch or interact with others, network management can be realized through their diverse functions and features. Boyd and Ellison (2007) argued that people are more willing to communicate with some ones who are already a part of their social network. This is because a sense of belonging has been formed. For SNS users, once a similar feeling arises, they may feel attached to SNS groups they belong to, and it will motivate them to continue using SNSs (H. Lin et al., 2014). Thus, we propose hypothesize that:

H3. Network management has a positive effect on continuance intention of SNS.

2.1.2 Relationship among these dimensions

SNSs are online social platforms, and the primary purpose of it is to help users socialize with others. For experienced SNS users, social functions of SNSs have a big impact on facilitating collaboration and interaction among platform members, and gradually users may have a feel of belonging to these platforms (Chung et al., 2016). This can be called a sense of attachment. Attachment theory originally focuses on social ties to local organizations and people who feel belong to a place (Riger & Lavrakas, 1981). It is also employed to describe some brands or products which are treated as special objects of one's connection to or differentiation from other members of society (Wallendorf & Arnould, 1988).

From the above descriptions, it is not difficult to find that attachment is similar to a sense of belonging. With the emerging of BBS, SNSs and many other online communities, attachment has become a crucial predictor of their members' behavior. It will impact on members' attitude toward participating in communication and interaction in these virtual platforms or communities. Chung et al. (2016) argued that individuals may be attached to certain SNS groups, according to their interests, to share opinions and information, and for some relation-based groups, members value social and emotional attachments to other people. This means attachment is close related to informational and emotional support of SNS users.

As discussed in 2.1.1, network management can produce a sense of belonging which is similar to a sense of attachment. Hogg (1992) argued that people who are more attached to their own group tend to participate more in the group and endeavor to help other group members more than those who are less attached to their group. Thus, they are more likely to give emotional support to friends on their SNSs and share information or knowledge with others in the same SNS communities. Hence, we propose the following two hypotheses:

H4a. Network management has a positive effect on informational support.

H4b. Network management has a positive effect on emotional support.

2.2 Network externalities

The definition of network externalities is "the value or effect that users obtain from a product or service will bring about more values to consumers with the increase of users, complementary product, or service" (Katz & Shapiro,

1985). In other words, for some products and services, benefits are related to the number of existing users and complementary goods. As the number of users and related complementary goods increases, external benefits would emerge. This will attract new users and retain original users. Direct and indirect network externalities are two basic types of network externalities summered by Katz and Shapiro (1985). Generally, the former refers to perceived network size and the later refers to perceived complementarity. Empirical results of prior researches (Bhattacherjee & Lin, 2008; K.-Y. Lin & Lu, 2011; L. Zhao & Lu, 2012) have revealed that in many situations, network externalities, especially direct network externalities cannot directly effect on users' continuance intention or loyalty. They require mediators, such as enjoyment, usefulness, and satisfaction to trigger their functions. Therefore, in this paper, indirect effects of network externalities on users' continuance intention through social support are explored. We focus on whether or not the three dimensions of social support can be considered as mediators between network externalities and continuance intention.

2.2.1 Perceived network size

Perceived network size refers to the number of participants enjoying a particular product or service (L. Zhao & Lu, 2012). As the network size becomes larger, more facilitating conditions would be provided to make the product or service more easy to use and give users more benefits (L. Zhao & Lu, 2012). The typical examples are cell phone service, online auction and online games. For them, as new participants enter these networks, existing users would gain another more choices for communicating, trading, and playing games, and thereby gain network benefits.

In the context of SNS, Lin and Lu (2011) suggested that a large number of SNS members would enhance the utility of sharing information and interacting with others. That is because SNSs are online social platforms and can be regarded as a mechanism involving functions of chatting, discussing, question consulting, information sharing and relationship management. Belonging to large social groups on SNSs means more chances to meet colleagues, schoolmates, friends, and relatives in a virtual world and keep social interaction with them in an easy way without the limits of time and space. At the same time, through these guys' social ties, users may build up new social networks with others. Besides, SNS users who belong to a large social groups means the ability to coordinate collective efforts in order to seek and acquire such information (Butler, 2001). This is because diverse social ties and functions of SNSs (such as "share") will provide users more opportunities to access to updated information which they are interested in, and it will be easier for them to find a member who knows the answer of someone's question. Additionally, SNSs allow users to be more open and honest about potentially embarrassing or private topics with anonymous communication (Yoo et al., 2014). The increasing number of SNS users means a more convenient approach to acquire caring or understanding from online friends or even strangers, and then acquire emotional support. Hence, the following three hypotheses are proposed:

H5a. Perceived network size has a positive effect on informational support.

H5b. Perceived network size has a positive effect on network management.

H5c. Perceived network size has a positive effect on emotional support.

2.2.2 Perceived complementarity

Perceived complementarity refers to an increased sense of benefits from a product or service which can be felt because of the improvement of related complementary products (K.-Y. Lin & Lu, 2011). For perceived complementarity, benefits are acquired not because of the increasing number of existing participants, but from the compatibility of some functions supported by complementary goods and services. These services can promote users' perceived utility and satisfaction because they help users take advantage of various services via a single platform (Zhou & Lu, 2011). As the development of new communication technologies, SNSs are providing more supporting

tools for users to exchange information and maintain social connection through many computer-mediated communication settings (IJsselsteijn, Baren, & Lanen, 2003), which include photo and video sharing, voice messages, posting links on their profiles and even small social games. These tools greatly enrich social interactions of users and help users seek and acquire information more effectively. Meanwhile, with the updated hardware performance and the popularity of mobile devices (smart phones), SNS users can experience these supporting tools anywhere and anytime (X. Lin et al., 2016). In addition, due to the emotion of human beings are always complex, sometimes text message is not sufficient to fully express the feelings of people. With the support of multimedia tools and other creative methods of communication, SNS providers will be able to facilitate users to better express their true feelings and seek emotional support. In a word, the complementary services of SNS stimulate more desire and convenience for participants to update information and comments, maintain their social relations, and provide emotional support for others. Hence, the following hypotheses are proposed:

H6a. Perceived complementarity has a positive effect on informational support.

H6b. Perceived complementarity has a positive effect on network management support.

H6c. Perceived complementarity has a positive effect on emotional support.

In summary, Fig.1 presents our research model and the hypothesized relationships of this study based on the theory of network externalities and social support. It hypothesizes that perceived network size and perceived complementarity would affect the social support of SNS users, which include three dimensions: informational support, emotional support, and social network management. Network externalities have indirect effects on SNS usage through three dimensions of social support. They work as mediators and have significant effects on the continuance intention respectively.

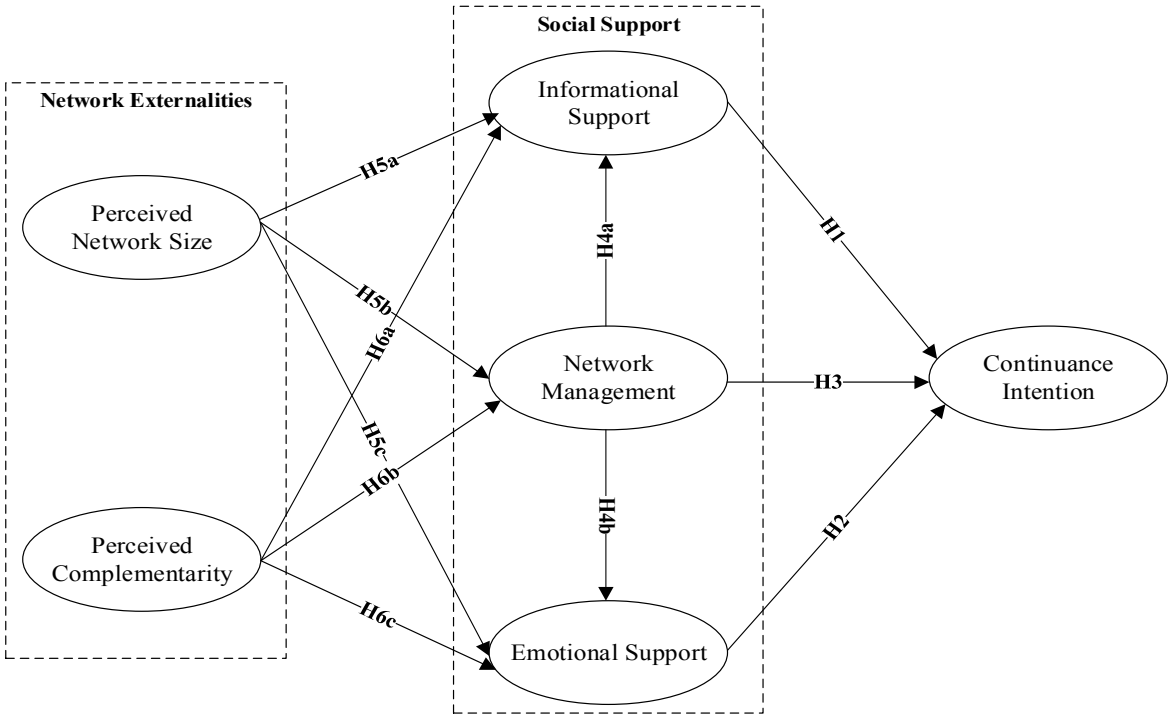


Fig.1. Research model

3. Methodology

3.1 Sample and data collection

To test the research model and all hypotheses, the samples of our research were selected from students, teachers, and officials who are SNS users in a comprehensive university located in an eastern province in China PR. We chose these respondents is because the development path of Facebook have proved that students and faculty members are more likely to try new methods of communication, such as SNSs (Kirkpatrick, 2011). We cooperated with the student union of this university and requested them to promote this survey. Besides, a questionnaire website was utilized to display our questionnaire and collect data (https://www.wenjuan.com/). Under the help of student union, we can distribute the hyperlink of online questionnaire to the official micro-blogging and BBS of this university. Respondents were requested to answer all questions based on their usage experience of SNSs. In order to avoid replications, we checked IP address of every respondent when online questionnaires were received. To encourage participation, 10% of them were random selected to reward an album of campus postcards.

Data were gathered from March to April, 2016. In order to make sure all data were collected from experienced SNS users, we request participants to choose how long they have used SNSs*. 550 respondents who have become SNS users for more than 3 months were invited to participate in our next stage survey, and a total of 538 responses were received from them. After removing incomplete responses, 513 valid responses remained. Among them 47.4% were males and 52.6% were females. The largest age group was 20-29 years, accounting for 58.1%, and most people spend 31-60 minutes on SNS per day, accounting for 60.8%. Table 1 shows the detailed sample demographics.

Table 1

Sample demographics.

Measure	Item	Frequency	Percentage (%)
Gender			
	Male	243	47.4
	Female	270	52.6
Age			
	Less than 20	31	6.0
	20-29	298	58.1
	30-39	121	23.6
	40-49	40	7.8
	More than 50	23	4.5
Time spent on SNSs (per day)			
	Less than 30 min	33	6.5
	31-60 min	312	60.8
	1-2 h	127	24.8
	More than 2 h	41	7.9

3.2. Measurement development

To design a questionnaire, we adapted measurement items from previous literatures pertaining to the six constructs of perceived network size, perceived complementarity, informational support, emotional support, network

*Participants were requested choose from the following five options in the first part of our questionnaire:
A. Never; B. Less than 3 months; C. 3 months-6 months; D. 6 months-12 months; E. More than 1 year

management, and continuance intention. We adopted three measurement items for each construct, and all items were measured with a seven-point Likert scales ranging from ‘‘strongly disagree’’ (1) to ‘‘strongly agree’’ (7). The items for perceived network size and perceived complementarity were adapted from K.-Y. Lin and Lu (2011). The items for emotional support and network support were adapted from X. Lin et al. (2016). Informational support items were adapted from (Leung & Zhang, 2016). The items for continuance intention were adapted from Hsu et al. (2013) and H. Lin et al. (2014)

We translated all measurement items into Chinese and employed “SNSs (such as Weibo)” to replace Facebook, Twitter, or mobile Facebook among original measurement items. That is because firstly, for some political reasons, people in China PR cannot log in Facebook, Twitter and some other foreign SNSs. One of the most popular SNSs is Weibo (http://weibo.com/). Secondly, the research object of this paper is to discuss SNSs in general rather than a specific SNS, and the functions of Weibo are similar to the most SNSs, so it can represent them. Thirdly, “SNSs (such as Weibo)” can also help respondents clearly understand what SNS is and thus avoid misunderstanding. Therefore we believe it can be considered as an appropriate description for this survey. A pilot study with 20 students and 4 IS scholars was adopted to access the logical consistency and ease of understanding of the questionnaire. The appendix of this paper lists all items.

4. Data analysis and results

A two-step approach for data analysis was used in this paper (Anderson & Gerbing, 1988). It tests the measurement model and structural relationship among the latent constructs.

4.1 Tests of the measurement model

We used confirmatory factor analyses (CFA) to assess the measurement model via AMOS 21.0. For a good model fit, $\chi 2/d.f$ should be less than 3.0 (Bollen, 1989). The goodness of fit index (GFI) should be more than 0.90 (Scott, 1995). The adjust goodness of fit index (AGFI) should be more than 0.80 (Scott, 1995). The normed fit index (NFI) is required more than 0.90 (Bentler & Bonett, 1980). The comparative fit index (CFI) is required more than 0.9 (Bagozzi & Yi, 1988). The root mean square error of approximation (RMSEA) less than 0.08 (Bagozzi & Yi, 1988). Table 2 reveals that all fit indices exceed the recommended value based on these established criteria. It proves an adequate fit to the collected data.

Table 2

Fit indices for the measurement models.

Fit Indices	Recommended value	Measurement model
$\chi 2/d.f$	≤3.0	2.32
GIF	≥0.90	0.95
AGIF	≥0.80	0.92
NFI	≥0.90	0.92
CFI	≥0.90	0.95
RMSEMA	≤0.08	0.05

We used Cronbach’s α and composite reliability to assess the internal consistency of this model. As shown in Table 3, the Cronbach’s α of each construct is more than 0.70, meeting the accepted level recommended by Hinkin (1998). The composite reliabilities of all constructs exceed 0.70, meeting the suggested threshold (Nunnally & Bernstein, 1994). It indicates good reliability and stability for the measurement items of each construct.

Convergent validity was checked with three standards. First, each item loaded significantly on its respective construct, and none of the loadings were below the cutoff value of 0.60 (Hair, Tatham, Anderson, & Black, 2008).

Second, composite reliabilities (CR) for each construct should be larger than 0.7 (Bagozzi & Yi, 1988). Last, the average variance extracted (AVE) should be above 0.5 (Bagozzi & Yi, 1988). Table 3 shows the indicator factor loadings of all items of the measuring mode are greater than 0.60. The value of CR for all constructs ranges from 0.70 to 0.80. The AVE for each construct exceeds 0.50.

Table 3

Statistics of construct items

`	Items	Loadings	t-Statistics	CR[a]	AVE[b]	Alpha[c]
Perceived network size	PNS1	0.74		0.76	0.52	0.76
	PNS2	0.72	13.87			
	PNS3	0.70	12.65			
Perceived complementarity	PC1	0.80		0.79	0.56	0.79
	PC2	0.74	15.82			
	PC3	0.71	14.26			
Emotional support	ES1	0.77		0.80	0.57	0.79
	ES2	0.78	15.25			
	ES3	0.71	13.94			
Informational support	IS1	0.74		0.80	0.57	0.80
	IS2	0.81	15.30			
	IS3	0.71	14.15			
Network management	NS1	0.76		0.77	0.52	0.76
	NS2	0.70	13.31			
	NS3	0.71	13.04			
Continuance intension	CI1	0.72		0.77	0.52	0.77
	CI2	0.71	13.71			
	CI3	0.74	12.85			

Note: [a] Composite reliability; [b] Average variance extracted; [c] Cronbach's alpha

One method to check the discriminant validity of a measurement model was suggested by Fornell and Larcker (1981). It requires comparing the square root of the AVE for every construct with the correlations between that and other constructs. The square roots of AVE should exceed the all correlations between that construct and other constructs. In Table 4, the diagonal elements are the square roots of AVE for the constructs. It shows that all square roots of AVE are larger than any correlations between that construct and the other constructs. Therefore, discriminant validity in our research was established.

In addition, structural model for collinearity also be examined. We employed Variance inflation factors (VIF) to evaluate the degree of multicollinearity. A regression analysis was conducted by modeling continuance intention as the dependent variable and the other five variables as the independent variables. The resulting VIF values range from 1.26 to 1.55, which are well below the suggested threshold of 3.3 (Diamantopoulos & Siguaw, 2006). Therefore, multicollinearity is not a problem in the data of this research.

Table 4

Discriminant validity

Construct	PC	PNS	NMS	IS	ES	CI
PC	**0.75**					
PNS	0.63	**0.72**				

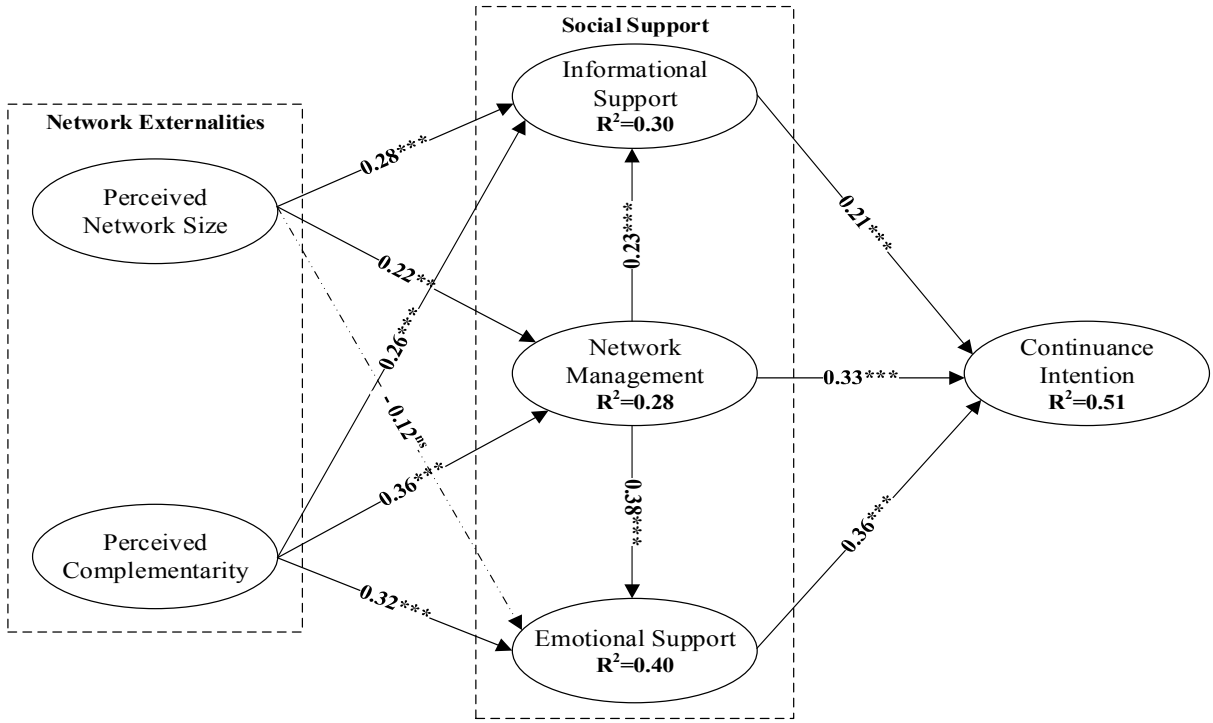
NM	0.50	0.45	**0.72**			
IS	0.55	0.54	0.48	**0.75**		
ES	0.44	0.26	0.49	0.29	**0.75**	
CI	0.44	0.35	0.61	0.47	0.58	**0.72**

Notes: PC: perceived complementarity, PNS: perceived network size; NMS: network manage support; IS: informational support; ES: emotional support, CI: continuance intention.

4.2 Tests of the structural model

We tested the structural model by using AMOS 21.0. The model-fit indices had proved that the structural model is of a good model fit ($\chi 2$/d.f=2.32, GFI=0.95, AGFI=0.92, NFI=0.92, CFI=0.95, RMSEA=0.05). Then we examined the structural paths and variance explained (R^2). Fig 2 shows the standardized path coefficients, path significances, and R square by each path. The significance of all of the paths has been assessed via 1000 bootstrap runs. The model explains 51% of the variance in continuance intention. In addition, the explained variance of informational support, emotional support, and network management support is 40%, 30% and 28% respectively.

Three dimensions of social support including informational support, emotional support, and network management support have positive impacts on the continuance intention (H1: β=0.21, $p<0.001$; H2: β=0.36, $p<0.001$; H3: β=0.33, $p<0.001$), thus H1, H2 and H3 are supported. Among three dimensions, network management support has positive impacts on informational support and emotional support respectively (H4a: β=0.23, $p<0.001$; H4b: β=0.38, $p<0.001$), thus H4a and H4b are supported. In addition, perceived network size has positive and significant effects on network management support and informational support (H5a: β=0.28, $p<0.001$; H5b: β=0.22, $p<0.01$). Therefore, H5a and H5b are supported. However, H5c is not supported, because perceived network size is not positively related to emotional support (H5c: β= -0.12, p=0.133). Last, perceived complementarity has direct positive effects on informational support, network management, and emotional support (H6a: β=0.26, $p<0.001$; H6b: β=0.36, $p<0.001$; H6c: β=0.32, $p<0.001$). Thus, H6a, H6b and H6c are supported. Generally, the results of this study support all the hypotheses, except for H5c.



*** p < 0.05, ** p < 0.01, *** p < 0.001, ns = not significant.**

Fig.2. Structural model results

4.3 Testing mediation effects

We also tested the mediator role of the three dimension of social support by observing their confidence intervals. However, the bootstrap procedure of Amos 21.0 can only provide total indirect effects and confidence intervals in the output file. In order to test specific indirect effects and their confidence intervals, we resorted to Program PRODCLIN (MacKinnon & Fritz, 2007).This program can provide the results of specific indirect effects. In other words, we adopt bootstrap procedure (1000 bootstrap samples) and PRODCLIN to test total indirect effects and specific indirect effects respectively. As shown in Table 5, all the 95 % CI of the indirect effects do not overlap with zero, except for PN→ES→CI (-0.122, 0.016). That means perceived network size does not have a significant effect on continuance intention through emotional support (mediator), but the mediation effects of other mediators in paths all exist. This result further confirms the previous hypotheses.

Table 5

Confidence intervals for mediation effects (Unstandardized estimates).

Model pathways	95% CI		Estimated effect
	Lower bonds	Upper bonds	（Unstandardized）
Total indirect effects from PNS to CI	**0.015**	**0.302**	**0.155**
PNS→IS→CI	0.022	0.134	0.069
PNS→NS→CI	0.024	0.172	0.088
PNS→ES→CI	-0.122	0.016	-0.052^{ns}
PNS→NS→IS→CI			0.013

	PNS→NS→IS	0.013	0.131	
	NS→IS→CI	0.011	0.087	
PNS→NS→ES→CI				0.037
	PNS→NS→ES	0.036	0.223	
	NS→ES→CI	0.059	0.204	
Total indirect effects from PC to CI		**0.241**	**0.468**	**0.340**
PC→IS→CI		0.013	0.107	0.051
PC→NS→CI		0.049	0.202	0.114
PC→ES→CI		0.045	0.198	0.111
PC→NS→IS→CI				0.016
	PC→NS→IS	0.028	0.148	
	NS→IS→CI	0.011	0.087	
PC→NS→ES→CI				0.048
	PC→NS→ES	0.069	0.277	
	NS→ES→CI	0.059	0.204	

Notes: PC: perceived complementarity, PNS: perceived network size; NMS: network manage support; IS: informational support; ES: emotional support, CI: continuance intention

5. Discussion

Through theoretical analysis and empirical tests, we propose a theoretical model to examine how network externalities influence social support and subsequently affect the continuance intention. The findings of our research provide theoretical and practical implications for future researches.

5.1 Theoretical implications

First, our research contributes to the SNS usage literature and reveals the users' continuance intention by integrating social support and network externalities. Although prior researchers have respectively explored the impact of social support and network externalities on the continuance intention of SNSs, such as X. Lin et al. (2016) and Chiu et al. (2013). This paper extends these studies by indicating that the two factors can work together to promote users' continuance intention. At the same time, the relationship between network externalities and social support are also been discussed. Fig.2 and Tab.5 indicate that through our structural model, effects from PNS (perceived network size) to CI (continuance intention) and from PC (perceived complementarity) to CI (continuance intention) are all significant. It prove that three dimensions of social support can works as mediators and triggered by network externalities to affect SNS usage. From this perspective, our study shows a new understanding of how network externalities impact on users' continuance intention. From now on, user's behaviors related to "stickiness" of SNSs can be explained from a new perspective on the context of SNSs.

Second, our research proves that among three dimensions of social support, network management is the most important dimension for SNS usage. As Fig.2 displays, social support has a positive effect on continuance intention. This is consistent with the research of X. Lin et al. (2016). Meanwhile, our results further indicate that network management has the biggest effect on users' continuance intention (0.33+0.23×0.21+0.38×0.36), because it not only directly affects users' continuance intention (0.33), but also has positive effects on informational support and emotional support of social support and finally indirectly affects users' decision (0.23×0.21+0.38×0.36). Actually, network management is firstly classified as a dimension of social support by X. Lin et al. (2016) and has not been analyzed deeply. Previous study has shown that forming and maintaining online relationships are two important factors for social support exchange (Eastin & LaRose, 2005). Therefore, it is also reasonable in theory to treat

network management as a key function of social support under the background of SNSs.

Third, structural model indicates that perceived complementarity plays a more important role in SNS usage than perceived network size. As Tab.5 shows perceived complementarity has a stronger indirect significant effect on the continuance intention (unstandardized estimated effect is 0.34) than perceived network size (unstandardized estimated effect is 0.155). This result is consistent with previous researches (Chiu et al., 2013; K.-Y. Lin & Lu, 2011). However, more surprisingly, as shown in Fig. 2, perceived network size does not have a significant effect on emotional support (β= -0.12, p=0.133). For these two results, one possible explanation is the so called "social overload" on SNSs. It is used to describe a situation when an individual confronts too many social support requests from other individuals in his social network (Maier et al., 2014). As SNSs have become ubiquitous in daily life, social support from friends or relatives may exceed what an individual is comfortable in offering. This will cause a negative consequence for social support providing, especially emotional support (Ellison, Steinfield, & Lampe, 2007) and then weaken user's continuance intention. The other possible explanation is the privacy concern of SNS users. Zhou (2015) argued that when users have great privacy concern, they feel lack of control and cannot expect a positive utility and enjoyment associated with using SNSs. In other words, without a relatively safe and private environment, more SNS users means more risk of information leakage. Therefore, the benefit of direct network externalities (perceived network size) for social support and continuance intention will be weakened.

5.2 Practical implications

First, this research gives a new direction for SNS providers to consider how to retain SNS users and strengthen the stickiness of users. Social support, as delineated by informational support, emotional support and network management, has a significant effect on the continuance intention of SNS users. In our research model, it is triggered by two types of network externalities. But on the other hand, as Fig.2 shows, the effect of perceived complementarity on social support (0.26+0.36+0.32) is larger than perceived network size (0.28+0.22), and even the perceived network size is not positively related to emotional support (β= -0.12, p=0.133). Meanwhile, as discussed above, among social supports, network management is the most important factor for retaining existing users. Therefore, SNS providers should pay attention to design more compatible and novel supporting tools and services to satisfy users' need of network management and then retain SNS users. "Friends recommendation" and embedded social games are two successful trying. Such functions help individuals to contact with people they know but have not built relationships on SNSs and reinforce existing relationships at the same time.

Second, our results suggest that SNS providers and users should avoid social overload together. SNSs are social platforms which may suffer social overload. This places SNS providers in a dilemma. For one thing, SNS providers require a large number of active users to form social support, and then these support will contribute to continuance intention. For another, too many active users might cause social overloaded. As mentioned above, social overload can have psychological consequences and produce resistant behaviors of SNS usage. To avoid this dilemma, some Chinese SNS providers have begun to explore. For example, one SNS named MOMO tries to rate their users according to their behaviors. Someone who is always reported by other users for his inappropriate behaviors, such as harassment and sending advertising messages may get low rating scores, and then he will be not qualified to add contacts with others. Therefore, SNS providers can try to offer a filter system to shield advertising messages and restrict unnecessary social connections for their users, especially for those who have inappropriate behaviors before. For SNS users, they should also try to avoid addicting to SNSs, and strengthen offline relationships with friends.

Third, our findings suggest that SNS providers are required to pay more attention to privacy protection of their users. As discussed in the third part of 5.1, privacy concern of SNS users may have negative effects on emotional support and then on users' continuance intention. Now SNSs have attracted a large number of users and are still trying to expand user groups by using existing social ties. Under this background, some ones who are not familiar with each other and even strangers may easily become "friends" on SNS lists. Thus, inadequate measures of

privacy protection will result in a high risk of personal information and data. Because of this, SNS providers are required to make detailed privacy policies and develop relatively perfect functions of privacy protection to mitigate users' privacy concern (Xu, Dinev, Smith, & Hart, 2011). "Friend Confirmation" and "Blocked List" are two successful attempts. These measures will ease users' concern on privacy, and under the carefully-designed protection, SNS users will be more willing to share their private feelings or emotions with their friends on SNS list. In other words, with well-designed privacy protection, perceived network size may have a bigger and positive effect on social support (especially emotional support).

5.3 Limitations and suggestions for future research

Although we made every effort to this research, some limitations still exist. First, we employed college students and faculty members as the research samples. They may not represent SNS users in general. Further studies should attempt to inquire different types of SNS users, and classify them based on vocation, income, education and gender. Then compare the result of them respectively. Second, results of our research might have been influenced by self-selection bias, because the respondents we surveyed are all experienced SNS users. However, people who rarely use SNSs or have already stopped using them might have different effects on perceived network size, perceived complementarity, informational support, emotional support, and network management. Therefore, the results of this research require to be considered as only explaining the continuance intention of current active SNS users. Third, this paper directly used the dimensions of online social support delineated by previous study. While the three dimensions can present the features of social support in the context of SNSs to some extent, the classification of online social support is dependent on many factors, such as the way people seek or require it. Further research could try to conduct a more detailed classification by combining some other social capital to examine their effects on SNS continuance. Additionally, more explicitly examining about the relationship between social support and some extrinsic and intrinsic factors, such as usefulness and enjoyment are required, because these factors are also mediators between network externalities and continuance intention. A combination of these factors and social support may have a new impact on users' continuance intention.

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Appendix: Measurement items

Perceived network size (PNZ)

PN1: I think a good number of people use SNSs (such as Weibo).

PN2: I think most people are using SNSs.

PN3: I think there will still be many people joining SNSs.

Perceived complementarity (PC)

PC1: A wide range of applications is available on SNSs.

PC2: A wide range of supporting tools is available on SNSs (e.g., photo sharing, message sharing, video sharing).

PC3: A wide range of friend-finding tools is available on SNSs.

Emotional support (ES)

ES1: When faced with difficulties, some people on SNSs listened to me talk about my private feelings.

ES2: When faced with difficulties, some people on SNSs comforted and encouraged me.

ES3: When faced with difficulties, some people on SNSs are on my side with me.

Informational support (IS)
IS1: SNSs allow me to find out what is going on in society.
IS2: SNSs allow me to understand events that are happening.
IS3: SNSs allow me to broaden my knowledge base.

Network management (NM)
NM1: I have frequent communication with others on SNSs.
NM2: I know some other people on SNSs on a personal level.
NM3: I maintain close social relationships with others on SNSs.

Continuance intention (CI)
CI1: I intend to continue using SNSs.
CI2: I intend to use SNSs as much as possible.
CI3: I will recommend my friends to use SNSs.