

UNDERSTANDING THE EFFECT OF TIE STRENGTH ON CONTINUANCE INTENTION OF SECOND-GENERATION MOBILE INSTANT MESSAGING SERVICES

Xiuyuan Gong, School of Management, University of Science and Technology of China,
Hefei, China, gxysusan@mail.ustc.edu.cn

Matthew K.O. Lee, Department of Information Systems, City University of Hong Kong,
Hong Kong, China, matthew.lee@cityu.edu.hk

Zhiying Liu, School of Management, University of Science and Technology of China, Hefei,
China, liuzhiy@ustc.edu.cn

Abstract

Facilitated by the widespread adoption of smartphones, applications (apps) on smartphones such as WeChat and WhatsApp have seen rapid and explosive growth. These apps are generally referred to as second-generation mobile instant messaging (SMIM) services. Unlike first-generation mobile instant messaging (FMIM) services (e.g. Short Message Service), SMIM services typically support multimedia contents and are embedded within social networks, which may have a bearing on the post-adoption behaviour of users in particular. However, prior studies on the post-adoption usage of SMIM services have a limited understanding of the effects of social network. Network tie strength, as a configuration of social network, has an important impact on users in SMIM services. In order to explore the effects of social network on users' continued usage intention in SMIM services, we propose and empirically test an integrated model by identifying the antecedents such as tie strength, satisfaction, and perceived critical mass. This study contributes to existing IS post-adoption literature by understanding and capturing the role of social network (i.e. tie strength) in SMIM services. Implications for theory and practice are discussed.

Keywords: Continuance intention, social network, tie strength, second-generation mobile instant messaging.

1 INTRODUCTION

With the rapid advancement of mobile Internet and penetration of smartphones, the mode of communication in daily life has been moving from computers to mobile devices. The ubiquity of mobile communication services enables interpersonal interconnection and information accessibility on a massive scale not seen before. In recent decades, mobile instant messaging (MIM) has developed gradually from first-generation mobile instant messaging (FMIM) to second-generation mobile instant messaging (SMIM). Both of them provide real-time and point-to-point communication capability. According to the previous MIM literature (Bere 2013; Duarando et al. 2007) and the characteristics of SMIM services, we defined second-generation mobile instant messaging (SMIM) as a real-time communication tool, which works on wireless mobile devices, offers multimedia services and is embedded within a social network. Compared with FMIM (i.e., Short Message Service), SMIM services (i.e., mobile QQ, Wechat, WhatsApp, Line) have heterogeneous features. SMIM services typically support multimedia contents such as abundant facial emotion icons (Zhou & Lu 2011), user portraits and convenient voice and video chatting (Deng et al. 2010), while FMIM (e.g. SMS) only offers simple text message (Gibbs 2008). Moreover, SMIM allows users to notice the status of their friends (Meng et al. 2012), whether they are online or offline, free or busy, which helps them to conduct real-time conversation, thus stimulating interaction in social network. In other words, in addition to the basic functions of FMIM, SMIM provides user-friendly features, making them more popular and easily adapted. As reported, the number of messages sent by MIM overtook SMS in UK in 2013 (TNW 2014). Likewise, the report released by CNNIC (China Internet Network Information Center) revealed that MIM users accounted for 89.3% of China's Internet users in 2014 (CNNIC 2014b). Although the potential market for SMIM services is huge, SMIM service providers are under tremendous competitive pressure derived from other social media platforms. In January 2015, Wechat has become the most active social media platform in China. However, Wechat had only 5% active users over Sina Weibo in China market, while Twitter had 13% active users more than Line and dominated Japan market (WeAreSocial 2015).

Currently, tie strength is considered as a manifestation of relation in social science (Gilbert 2009). More specifically, tie strength is investigated from different aspects in sociological studies and found to affect many important outcome variables such as career advancement, word-of-mouth propagation, inter-group conflict (Mittal et al. 2008), or propensity to share information within good relationship (Wirtz & Chew 2002). However, few MIM studies take it into account, especially in research regarding SMIM continuance intention. Several questions in MIM post-adoption literature are still unclear. For instance, how does tie strength play a role in a SMIM service? Does it influence continuance intention directly or indirectly? Will it play a role as a promoting factor or a hindering factor? Researchers who interested in keeping users on social media platforms such as SMIMs rarely attempted to answer these questions (Deng et al. 2010). As a result, researchers start to call for papers paying attention to this essential but often missing social network factor, that is, tie strength (Kane et al. 2014). It is therefore interesting and important to study the role of tie strength in the SMIM continuance intention.

In this study, we explore the motivators (i.e., tie strength, satisfaction and perceived critical mass) of SMIM continuance intention, and highlight the role of tie strength. Moreover, we take SMIM continuance intention as our dependent variable. We use intention rather than actual usage as dependent variable because it is difficult to measure the actual behavior and intention is regarded as a good prediction of actual behavior (Ajzen 1991).

In the following sections, we first address the relevant literature and theoretical background of this study, pointing out the missing social feature (i.e., tie strength) in SMIM literature. Then, we illustrate the research model and hypotheses. Thereafter, we describe our research methodology and present the results obtained. Finally, we conclude with a discussion on the implications and limitations of this study.

2 THEORETICAL BACKGROUND

Compared with traditional instant messaging tool, social applications involving SMIM applications, not only provide fundamental communication functions, but also support services such as information sharing, payment or other financial services, thereby enhancing users' continuance intention and enabling the continuous growth of users (CNNIC 2014a).

However, within loyalty studies in the mobile context (Shin et al. 2010; Zhao et al. 2012; Zhou 2013), a large proportion of them seek for IM or SMIM adoption (Ke & Li 2009), SMIM participation for teaching and learning (Bere 2013), information security concern in a SMIM service for healthcare (Børnes et al. 2007). Scholars rarely focus on exploring the SMIM retention.

Within continuance intention studies in IM or SNS contexts (Chang & Zhu 2012; Lou 2005; Ou et al. 2014), we can notice that social factors (e.g., swift guanxi, perceived critical mass, social capital, relationship commitment) add enlightened insights into continuance intention studies, which supplying fresh blood into the existing understanding, thus opening a new scenario to the development of continuance intention research. However, within the limited post-adoption studies of SMIM services (Deng et al. 2010; Zhou & Lu 2011), it is difficult to find one that incorporates social network features such as tie strength into consideration.

The scarcity of studies in post-adoption of SMIM services may results in the discrepancy between the rapid growth of SMIM in reality and the delay of theoretical support in research. To fill in this gap, we aim at exploring the continuance intention of SMIM users. Specially, we focus on the important role of tie strength between users in SMIM services, along with the potential influence of perceived critical mass on SMIM services.

2.1 Satisfaction

Depend on previous studies (Chang and Zhu 2012; Oliver 1999), satisfaction was considered as a crucial factor in determining the survival of a SMIM service, and became the essential determinant of users' continuance intention. In line with this point, this study considered satisfaction as the determinant that strongly influences continuance intention of SMIM users.

However, as Oliver (1999) pointed out, satisfaction can just tell part of the story. A SMIM service provides many functions for users to communication. However, users' satisfaction of a service may not result in their continuous usage of a service. In this regard, this study takes tie strength into account. Tie strength, combined with satisfaction, is likely to have an impact in determining the sustained usage intention of SMIM users.

Consistent with social capital literature (Hsiao & Chiou 2012b), tie strength is a manifestation of structural social capital. We draw upon social capital theory, and provide explanations for continuance intention formation of SMIM users from the tie strength perspective.

2.2 Tie Strength as Social Capital

Social capital theory posits that a structural attribute can create valuable outcomes, and it exists in relationships among actors (Hsiao & Chiou 2012b). Tie strength, as a structural feature of social capital in sociological studies (Lee & Kim 2011), is widely recognized to be affective in maintaining relationships, seeking or diffusing information (Chiu 2006; Wang et al. 2009; Woisetschläger et al. 2011). Additionally, scholars have noticed and claimed for the studies referring to tie strength and its influence that affects users' behavior in social media platforms (Kane et al. 2014).

Tie strength was initially proposed by Granovetter (1973) in the paper “The Strength of Weak ties”. It was primarily regarded as a combination of the time, the emotional intensity, the intimacy relationship and reciprocal services that form a tie (Gilbert & Karahalios 2009). Granovetter (1973) classified two types of ties, namely, strong tie and weak tie. Strong ties are the persons who you trust, such as kinships and good friends. Weak ties include acquaintances and strangers. Research showed that the strong ties are good at seeking social support (Schaefer et al. 1981), while weak tie seems to be a useful channel to access to novel information (Gilbert & Karahalios 2009).

Prior studies used tie strength to characterize the closeness and interaction frequency of relationship (Levin & Cross 2004), the relation intensity or overlap (Steffes & Burgee 2009), duration of relations between contacts (Perry-Smith 2014), or the potency of bond (Mittal et al. 2008). More specifically, some researchers use terms such as social interaction tie (Chiu et al. 2006; Hsiao & Chiou 2012a), social interaction (Ng 2013) illustrate the similar meaning of tie strength, but they are not exactly the same. The aforementioned terms focus on the interaction functions of ties, while tie strength has additional meanings. Tie strength is a relational property representing by different types of social relations (e.g., acquaintances or friends), which can exist inherently without interpersonal interaction. Especially in Chinese culture, social ties are often regarded as “guanxi”, representing relations necessitated in organizational development (Xin & Pearce 1996) or interpersonal communication in daily life (Ou et al. 2014). As people are more willing to share their value, tastes and interests with others that social circle tightly overlap with them (Gilbert 2012), it is reasonable for us to suppose that if strong ties exist in a SMIM service, the existing users of the service are likely to reluctant to move away.

As discussion above, we take tie strength as a key factor that influences users to continue using a SMIM service. In addition to the social influence from ties in SMIM services, social influence derived from perceived critical mass should also be noticed.

2.3 Perceived Critical Mass

Perceived critical mass refers to the degree of a user in a service beliefs that many people he or she communicates with also use the same service and tend to continue using it in the future (Ku et al. 2013). The perception of critical mass is firstly used to describe the IM adoption (Craig et al. 2007), and is found to be important to adoption decisions (Shen et al. 2013). It is subsequently extended to the continuance intention studies of social networking sites or virtual communities (Chen et al. 2012; Deng et al. 2013; Ku et al. 2013).

SMIM applications can not only play a role as online medium (e.g. provide functions of creating or transmitting information and knowledge), but also offer services as online platforms (e.g. support users to participate, collaborate with other users, and improve their relationship within the group). SMIMs users, especially youngsters, may be more easily influenced by perceived critical mass. In other words, the more friends of user perceived to use the same SMIM service, the more possibility that users can connect with more friends, maintaining or extending their social circle, maximizing the utility of the service. Consistent with this logic, we propose that perceived critical mass plays a role in affecting continuance intention of SMIM users.

3 RESEARCH MODEL AND HYPOTHESES

According to the theoretical background and the specific context of SMIM services, we propose an integrated model of continuance intention of SMIM users. The research model is depicted in Figure 1.

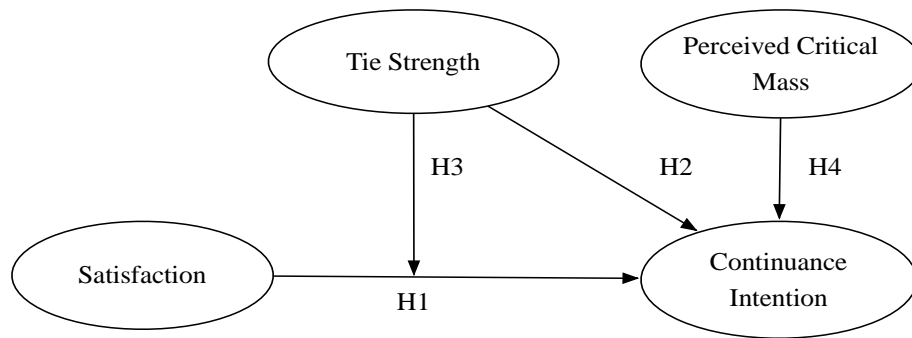


Figure 1. The Research Model

3.1 Satisfaction and Continuance Intention

Continued usage is imperative for long-term sustainability (Ku et al. 2013). As a primary motivator of customers' retention, customer satisfaction had been studied in marketing area for a long time (Anderson & Sullivan 1993; Fornell 1992). In IS discipline, scholars have given evidence that satisfaction is an effective motivator of customers' continuance intention (Bhattacharjee 2001). In SMIM context, SMIM services make efforts to provide multiple functions that enable users to communicate with peers freely and access to diverse resources conveniently. For instance, by sending messages or making voice records through SMIM services, consumers can have a real-time chat with friends without special and temporal boundaries. As satisfaction depends on users' past usage experience of the product or service (Fang et al. 2014), the convenience provided by SMIM services is likely to fulfill users' requirements to great extent, and enhance users' perception of satisfaction towards the SMIM service, thus increasing users' intention to continued using it in the future. Hence, we propose that a SMIM user's continuance intention is determined by users' satisfaction about their prior usage experience of the SMIM service.

H1: Users' continuance intention of a SMIM service is positively related to their satisfaction with the service.

3.2 Tie Strength in SMIM Services

A report of CNNIC (2014b) reveals that SMIM services (e.g., Wechat and QQ) have more strong ties than Microblogs (e.g., Sina Weibo). In the contact list of SMIM users in China, more than 80% connections are friends and classmates, more than 75% connections are relatives. However, papers rarely focused on investigating the role of strong tie, most of them pay much attention on weak tie instead (Levin & Cross 2004; Seibert et al. 2001). We consider that strong ties exist when a user has intimate relationship or frequent interaction with other users in the same SMIM service.

Tie strength is a cost-effective way for knowledge sharing and resource acquisition (Chiu 2006; Wang et al. 2009), and can act as a switching barrier that prevents users from moving away (Chiu et al. 2006). In this regard, we propose that strong relationship among users has a great impact on users' continued usage intention.

Conceptual and empirical studies have investigated the nonlinear and complex features of relationship between satisfaction and relationship length, and this relationship can be moderated by other factors including age and gender (Woisetschlager et al. 2011). Wirtz and Chew (2002) have taken the interaction between tie strength and satisfaction into consideration in marketing literature. They found satisfied consumers made different reactions to friends with different degree of tie strength. However,

the question regarding to how does strong tie influence the role of satisfaction on continuance intention in SMIM services is still unclear. Here, we also propose that strong tie will moderate the power of satisfaction on continuance intention. When strong ties exist, the influence of satisfaction on continuance intention decreases.

H2: Users' continuance intention of a SMIM service is positively related to strong ties in the service.

H3: Strong ties negatively influence the relationship between users' satisfaction and continuance intention in a SMIM service.

3.3 Perceived Critical Mass in SMIM Services

Perceived critical mass, which based on actual critical mass, have been discussed as an important factor that influences the adoption and diffusion of interactive communication innovation for a long time (Van Slyke et al. 2007). Among the discussions, researchers hold different arguments. For instance, Ku et al. (2013) exclaimed that perceived critical mass have direct impact on users' continuance intention, while Mäntymäki and Salo (2011) argued that perceived network externalities exert an indirect effect on continuance usage intention through perceived enjoyment and usefulness.

In China, a variety of SMIM services emerge in the market (e.g., Wechat, QQ, WhatsApp, LaiWang), supplying many alternative services and enabling users to switch away without financial costs. We expect that perceived critical mass of users is crucial for users' adoption and continued usage decision in SMIM setting. Perceived critical mass plays the role of switching cost that prevents users from leaving the existing SMIM service, when users realize that many people around them use the same service as well. Therefore, we propose:

H4: Users' continuance intention of a SMIM service is positively related to their perceived critical mass about the service.

4 METHODOLOGY

As one of the early and popular SMIM services in China, Wechat is chose as a suitable research object of this study. Wechat has successfully occupied a large market proportion in China since 2011 (iResearch 2013). In particular, a great proportion of users in Wechat derive from existing users in tencent QQ, which is famous for its intensive social network. In other words, socialization of Wechat becomes the dominant factor in motivating people to use Wechat (CNNIC 2014b).

In this study, we conduct survey with the following reasons. Survey has better generalizability comparing with other empirical research methods (e.g., experiment or case study). Besides, survey is convenient to access to representative samples. It also has the ability to gather data in a natural setting without manipulate independents, thus becoming more approachable to reality.

4.1 Measurement Development

We adapted measurement from the existing literature, with corresponding modifications that depend on specific context. Based on Ho et al. (2003) and Mittal et al. (2008), we measured tie strength in SMIM services with five items. Following Van Slyke et al. (2007), we used items to measure perceived critical mass, thus evaluating the influence derived from people that users communicated with. Items of satisfaction were adapted from scales of Bhattacharjee (2001), and items of continuance intention were adapted from Bhattacharjee (2001) and Ku et al. (2013). After items had been adapted from previous scales, we improved content validity of the measurement by inviting

experts to discuss together and inviting PHD students to do double translation. Finally, we formed the initial questionnaires. All the items were measured on a seven-point Likert scale, and were anchored from strongly disagree to strongly degree (see in Appendix).

4.2 Data Collection

In the data collection process, we firstly conducted a pilot study with 20 questionnaires in China. The result indicated that the reliability and validity of questionnaires are acceptable. Thereafter, the feedbacks of the pilot study were received to further modify the questionnaires. In the main survey, questionnaires were posted online and an invitation message with a URL was sent to survey respondents randomly. Moreover, a lottery was used as a kind of incentive to motivate the respondents.

We randomly collected 300 online responses. Within these responses, a response was deleted due to its inconsistency answers of the same construct. Finally, we had 299 usable responses. Among these responses, we have 52% female respondents and 48% male respondents. Most respondents are aged 25-30 (49 %), and 81% respondents have bachelor degree. More than half respondents (53%) have used Wechat for one to two years since it released in January 2011. Especially, 57% respondents used Wechat about one to five times a day and 39% espondents used Wechat even more than five times a day. What is more, 59% respondents use Wechat about one to three hours a day.

To examine common method bias (CMB), we performed the Harman's single-factor test (Podsakoff et al. 2003). Common method bias exists when (1) a single factor emerges from the exploratory factor analysis or (2) one general factor could accounts for the majority of the covariance of the variables (Podsakoff et al. 2003, p. 889). The unrotated principal components factor analysis indicates 30.22 percent of the total variance, suggesting the lack of common method bias.

5 DATA ANALYSIS

The data analysis process consists two stages, including examination of the measurement model and structural model. We used partial least squares (PLS) to test them respectively. PLS is good at analyzing complex but relative small samples (Barclay et al., 1995). Moreover, it does not require the multivariate normality distributions of data, thus enabling us to examine structural model and measurement model simultaneously (Van Slyke et al., 2007). In addition, SPSS is used to replenish the results.

5.1 Measurement Model

The results of the measurement model were described in Table 1, representing composite reliability (CR), average variance extracted (AVE), loadings, means and standard deviations. In Table 2, Cronbach's alpha ranged from 0.73 to 0.82, indicating a acceptable internal consistent reliability (Fang et al. 2014).

The convergent validity represents that whether the construct relates to other constructs that it should relate to. According to Fornell and Larcker (1981), it is established if (1) the average variance extracted (AVE) of every constructs exceeds 0.5 and (2) the standardized factor loading of each construct is higher than 0.7 and (3) composite reliability is higher than 0.8. Table 1 shows that the convergent validity met the requirements. The loadings of two items were below 0.7, but we kept them because they were higher than 0.6 (Bagozzi & Yi 1988; Zhang et al. 2009).

Constructs	Item	Loading	T-value	Mean	Standard Deviation
Continuance Intention (CR=0.88; AVE=0.65)	CI1	0.83	42.62	6.51	0.64
	CI2	0.84	40.03	6.38	0.68
	CI3	0.83	29.43	6.42	0.70
	CI4	0.71	9.95	5.63	0.66
Satisfaction (CR=0.85; AVE=0.59)	SAT1	0.79	24.02	6.08	0.72
	SAT2	0.80	28.83	5.98	0.73
	SAT3	0.71	17.85	5.92	0.83
	SAT4	0.77	20.59	5.99	0.81
Tie Strength (CR=0.84; AVE=0.52)	TS1	0.75	21.02	5.72	0.83
	TS2	0.75	21.76	5.59	0.89
	TS3	0.65	13.06	5.89	0.87
	TS4	0.70	13.72	5.55	0.93
	TS5	0.74	19.75	5.68	0.96
Perceived Critical Mass (CR=0.83; AVE=0.56)	PCM1	0.78	21.40	6.24	0.71
	PCM2	0.75	22.27	6.11	0.75
	PCM3	0.69	9.27	6.21	0.80
	PCM4	0.76	17.71	6.12	0.73

Table 1. Psychometric properties of measures

Discriminant validity shows that whether the construct relates to other constructs that it should not relate to. It is acceptable when the square root of the AVE of a construct is higher than correlations between it and other constructs (Anderson & Gerbing 1988; Fornell & Larcker 1981), and the largest correlation between constructs is lower than recommended 0.71 (Fang et al. 2014). The result indicated the good discriminant validity of the constructs (see in Table 2).

Constructs	Crobach's Alpha	CI	SAT	TS	PCM
Continuance Intention (CI)	0.82	0.80			
Satisfaction (SAT)	0.77	0.53	0.77		
Tie Strength (TS)	0.78	0.39	0.57	0.72	
Perceived Critical Mass (PCM)	0.73	0.58	0.57	0.46	0.75

Table 2. Reliability, construct correlation, and the Square Root of AVE

Note: Diagonal elements represent square roots of AVE.

5.2 Structural Model

The structural equation model (SEM) technique was utilized to examine the structural model, which is assessed by testing the hypothesized relationships (Cheung & Lee 2012).

The results were presented in Figure 2, including the variance explained (R^2 value) for the dependent variable, standardized path coefficients, path significances. The variance explained for continuance intention ($R^2 = 41.7\%$) demonstrated the explanatory power of users' continuance intention in this model. The path significances reveal significant relationships between variables, albeit to different

degree. In addition, path coefficients can also provide evidences for analyzing relationships between variables.

Overall, three hypotheses were supported. As expected, satisfaction had a significant impact on users' continuance intention (H1), while perceived critical mass significantly affected users' continuance intention (H4). More importantly, tie strength significantly moderated relationship between users' satisfaction and their retention intention of a SMIM service (H3). When strong tie exists, the effect of satisfaction on continuance intention decreases. However, the main effect of tie strength on continuance intention directly was not significant ($\beta = 0.039$, $t = 0.722$). Thus, H2 was not supported.

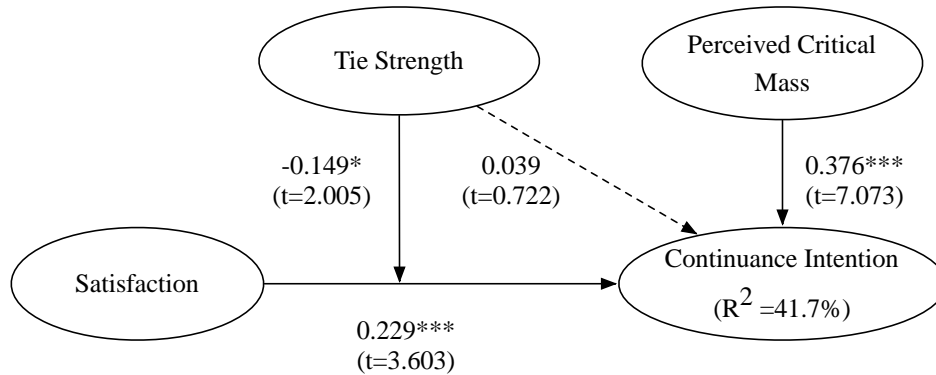


Figure 2. The Results of Research Model

Note: Path significances: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$.

6 DISCUSSION

The purpose of this study was to explore motivators of the continuance intention of SMIM users. The results revealed that tie strength, satisfaction and perceived critical mass were significant motivators in facilitating continuance intention of SMIM users. According to previous intention-behavior association studies (Davis 1989), these motivators are also important to study the actual continued usage behavior in SMIM services.

This study contributes to the research by considering a missing social network factor (i.e., tie strength) in the SMIM context. By investigating the post-adoption research of SMIM services from the tie strength perspective, the results reflected some characteristics caused by study setting and unexpected outcomes that may be inconsistent with prior research. The results of this study have both implications for theory and practice.

6.1 Implications for Theory

Social network effects are often ignored because many researches pay much attention on satisfaction in continued mobile engagement intention research (Kim et al. 2013). In SMIM setting, however, most of users keep using SMIM services for maintaining contacts with their friends. We highlighted the role of tie strength as a moderating factor in influencing continuance intention of SMIM services, and gave evidences for its significant impact on users' retention. This study takes seldom-researched social network configuration factor (i.e. tie strength) into consideration, which enhances more comprehensive understanding on SMIM studies.

Surprisingly, the H2 is unsupported. Tie strength does not directly affect continuance intention, which is inconsistent with the finding in contractual service setting (Woisetschläger et al. 2011). One possible explanation is the special context in this study. The context of SMIM services is different

from the context of contractual services. Contractual service setting including mobile telecommunication strongly emphasizes on relationships between users on their contact list. In SMIM services, however, tie strength is not the only essential determinant of SMIM continuance. It does not have a direct impact on continuance intention, while other antecedents involving satisfaction of functions or perceived critical mass strongly affect the sustainable usage of SMIM services.

We also sought for the role of perceived critical mass on continuance intention of SMIM users. The results showed that perceived critical mass is a strong power in influencing continuance intention of users. Especially, it played a role as a switching cost or the norm that prevented users from easily moving to a new SMIM service from an incumbent one. In other words, when SMIM users perceive that people they communicate with use the service as well, they will keep using the service.

6.2 Implications for Practice

This study provides several suggestions for practitioners. Therefore, SMIM service providers are able to foresee opportunities and make use of social media for their purpose.

SMIM service providers should notice that users' satisfaction is not enough to keep users maintaining relationship with a specific SMIM service. Many SMIM applications provide similar services in different forms, resulting in the increasing possibilities for users' withdrawal. Even they are not dissatisfied with the service, they may move away because of its low switching costs.

Moreover, we emphasized the important role of tie strength on users' retention intention. For instance, SMIM service providers can implement strategies that enhance tie strength between existing users. What is more, SMIM designers could improve social media designs or working mechanisms such as information prioritized selection, information delivery, privacy protection and friend recommendation system.

Finally, perceived critical mass can have a positive outcome on customer relationship management. Advertisement or positive word of mouth can be used to establish the popular image of a specific SMIM service, in order to increase their user base. Service providers can also provide additional services freely to users for a period of time. When they have the good experience with the SMIM service, they may continue using it or even introduce friends to join together.

6.3 Limitations and Future Research

This study has several limitations. Firstly, we found that tie strength had a moderating effect on continuance intention but it was really weak. Although this finding is consistent with prior social tie research (Woisetschl äger et al. 2011), we call for further exploration regarding this issue. Besides, the direct effect of tie strength on continuance intention is not significant in this study. Further research could investigate the effect of tie strength in different contexts and wider scopes.

On the other hand, our study focused on the consumers' behavioral intention rather than actual behavior in SMIM services. The results cannot be directly used for the studies of actual continuance behavior, but behavioral intention is found to be affective in predicting actual behavior and is accepted by previous studies.

At last, this study only investigated three motivators of continuance intention, and other motivators need to be investigated. Especially, additional variables such as personality, privacy concern, or trust may also affect the continuance intention. Future study can incorporate these factors into research.

In spite of these limitations, this study is still beneficial for both research and the practice. It attempts to simultaneously examine the effect of satisfaction, tie strength and perceived critical mass on continuance intention of SMIM usage. In particular, tie strength is emphasized on this study because

its important role in SMIM users' usage decision. Consequently, the results offer new perspectives for explaining users' continuance intention of SMIM services.

6.4 Conclusion

Although tie strength has been investigated in many aspects in sociological literature, it is seldom taken into consideration in information systems research. This study shows how does tie strength moderately affect relationship between satisfaction and continuance intention in SMIM services. While second-generation mobile instant messaging services develop rapidly, continuance usage of users becomes a great concern for service providers. Tie strength, one of the essential social structural features, plays a important role in understanding the behavioral intention of users in SMIM environment. Specially, strong tie plays a role of switching cost and prevents dissatisfied users from switching away.

APPENDIX

Construct	Item No.	Measurement	Reference
Continuance Intention (CI)	CI1	I intend to continue using Wechat	(Bhattacharjee 2001; Ku et al. 2013)
	CI2	I plan to keep using Wechat	
	CI3	I expect to continue using Wechat	
	CI4	If I could, I would like to discontinue my use of Wechat (reverse coded).	
Satisfaction (SAT)	SAT1	I am satisfied with my Wechat use	(Bhattacharjee 2001)
	SAT2	I am pleased when I use Wechat	
	SAT3	I am contented about using Wechat	
	SAT4	I am absolutely delighted when using Wechat.	
Tie Strength (TS)	TS1	I am close to persons in Wechat	(Ho et al. 2003; Mittal et al. 2008)
	TS2	I have strong ties with persons in Wechat	
	TS3	I am familiar with persons in Wechat	
	TS4	I understand the persons in Wechat well	
	TS5	I have frequent contacts with persons in Wechat.	
Perceived Critical Mass (PCM)	PCM1	Many people that I communicate with use Wechat.	(Van Slyke 2007)
	PCM2	The people that I communicate with will continue to use Wechat in the future.	
	PCM3	The people that I communicate with using Wechat will continue to use Wechat in the future.	
	PCM4	Of the people that I communicate with regularly, many use Wechat.	

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