

Strategic revival of HSM

The comparison study on employees' adoption of public and enterprise social networks

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Abstract.

BACKGROUND: The social network services (SNSs), such as Facebook, Twitter, Yammer and Slack etc., allow users to post short messages on topics ranging from personal hobbies and interests to working messages and knowledge. However, the answers to how use context and participation behavior pattern influence individual's engagement in social network services still remain vague.

OBJECTIVE: This study aims to find out the adoption mechanism in two contexts – Enterprise social network services (ESNs) and Public social network services (PSNs).

METHODS: This paper adopts the methods of literature research, questionnaire survey and statistical analysis. The research model was established by structural equation and analyzed by AMOS software.

RESULTS: Our empirical results show that the use of social network platforms is to a certain extent embedded both in the use context (public or enterprise) and in different kinds of participation modes (original participation or secondary participation). For both ESNs and PSNs, perceived playfulness is the most important adoption factor in both participations, while perceived usefulness just works for the original participation.

CONCLUSIONS: Compared with ESNs that are weighted in favor of the utilitarian-oriented perspective, PSNs are inclined to be more hedonic-oriented. The findings offer us novel insights on understanding and applying social network services.

Keywords: Social network services, PSNs, ESNs, user behavior, adoption



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1. Introduction

The social network services (SNSs), such as Facebook, Twitter, Yammer and Slack etc., allow users to post short messages on topics ranging from personal hobbies and interests to working messages and knowledge. In general, they have become well-accepted technology in daily lives and working places. These services have profoundly changed the way people acquire knowledge, share information and interact with one another on a societal scale [1].

Public social network services (PSNs) are the SNSs using social network (e.g. Facebook and Twitter) in public daily life, which are mainly used for social interaction among friends or other acquaintances [2]. Enterprise social network services (ESNs), such as Yammer and Slack, are increasingly attracting companies since they promise to offer enormous potentials to enhance organizational collaboration, innovation, and performance [3].

PSNs nowadays are almost daily partners that everyone cannot live without. According to Statista website and Facebook, two of the biggest social network sites worldwide, the number of monthly active users as of the July 2019 has reached 2.38 billion, accounting for 31.6% of the global population. Compared with PSNs, the adoption of ESNs is rather unexpected. Many companies attempting to

keep employees engaged by creating ESNs struggle to reach a wider adoption of their ESNs by their employees, but fail the expectations for participation, which is partly due to a sharp drop in interest and usage after initial enthusiasm among employees [4].

Therefore, how to maintain the enthusiasm and motivation within ESNs and encourage employees to use this service are important issues. Compared to the intensive focus on the adoption mechanism of PSNs, that of ESNs for employees seems to have attracted much less scholarly attention. Is the adoption mechanism of ESNs the same as that PSNs? If the answer is yes, then companies can borrow the experiences from PSNs to enhance employees' ESNs adoption. If the answer is no, then companies have to develop other specific strategies for employees' ESNs adoption.

The research question in this paper has both theoretical and practical implications. Theoretically speaking, the answer of this question not only provides the adoption mechanism of ESNs, but also detects how use context influences the adoption of SNSs: if the answer is yes, it means that use context has no influence on an individual's adoption of social network sites; if the answer is no, it indicates that the former has a real influence on the latter. Practically speaking, the answer can provide proper guidance to companies' ESNs adoption strategies.

This research is aiming to conduct a comparative study on user's adoption on enterprise and public social networks. To achieve this, a rational research model on the basis of the technology acceptance model is proposed, in an attempt to explain why people use the social networking tools under both enterprise and public contexts. To further explore the differences in details, employees' social network services participation behaviors are divided into original participation and secondary participation. Thus, the respective adoption mechanisms of the two different participations under two different use contexts are studied accordingly. With the exclusive data support from China Mobile, certain valuable results are generated.

2. Definitions and literature review

SNSs are evolving concept because the supporting technologies are developing continually. Boyd and Ellison define SNSs as web-based services that allow individuals to construct a public or semi-public profile within a bounded system. They articulate a list

of other users with whom they share a connection, and view and traverse their own list of connections and those made by others within the system [5]. Carr and Tayes define social media as Internet-based channels that allow users to be opportunistically interactive and selectively self-present, either in real-time or asynchronously, with both broad and narrow audiences to derive value from user-generated content and the perception of interaction with others [6]. According to Hu and Shi, a social networking site is defined as “a social aggregation that emerges from the Internet when sufficient numbers of individuals continue a public discussion for a certain amount of time, with sufficient human feeling, to form webs or connections of personal relationships in cyberspace” [7]. Yu define SNSs as the capacity to develop connections, post a profile, and give users the ability to access and interact with diverse streams of other users [8]. Erfani and Abedin define the term as networked communication platforms in which users can create profiles and content, establish connections, develop audio and video interactions with their connections, and exchange user-generated content [9]. Huang and Shih promote this notion as online services, platforms, or websites that enable the construction and reflection of social networks or social relations among individuals [10]. We can see that there are many different understandings of social media. Just as Carr and Tayes have mentioned, there is no commonly-accepted definition of what social media is, both functionally and theoretically. They hope that their definition of social media is precise enough to embody the development of technologies, and robust enough to remain applicable up to 2035. Therefore, the present study is based on Carr and Tayes' version, which is considered to be more sustainable [6].

2.1. Definition of PSNs

PSNs are platforms to build social network/ relations among people who share interests, activities, background or real-life connections [11, 12]. The classical ones include Facebook, Twitter, Myspace, Sina Weibo, WhatsApp, Instagram, Skype, Viber, China's WeChat, Japan's Line etc [13]. PSNs allow users to express themselves, connect to a social network, while develop and keep good relations with others. Compared with ESNs, PSNs are normally used by individuals on public SNSs platforms, while ESNs are just used by employees on company-boundary SNSs platforms.

2.2. Definition of ESNs

What are exactly ESNs? Ref. [14] define them as: “Web-based platforms that allow workers to (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or implicitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited and sorted by anyone else in the organization at any time of their choosing”. However, according to Carr and Tayes's notion for social media [6], our definition of ESNs is internet-based, which involves web-based applications and other applications of the internet, file transfer protocols (FTP), and media streaming to facilitate communication by circumventing the web all together.

Leonardi and his colleagues believe that there are four affordances provided by ESNs that are made distinct from other communication technologies commonly used in organizations: visibility, persistence, editability and association [15, 16]. More specifically, the new set of tools provides people an unprecedented level of visibility into the knowledge, activities, and work behaviors of others; the possibility of preserving and analyzing the traces of communicative actions over time; the ability to carefully craft a communicative act for designated audience; and the opportunity to connect with new people and information. As a result, these new technologies have been poised to greatly improve the efficiency of knowledge workers and unlock a tremendous amount of business value.

2.3. Literature review

Table 1 shows an overall of previous studies on enterprise and public social networks' user adoption. In general, it can be found that most of the current researches have only focused on PSNs rather than ESNs. Fewer academics have been using the adoption theory to test the use of SNSs in enterprises. Take a study of Yammer conducted in one Fortune 500 company as an example. An employees' ESNs behavior analysis is performed in this study, the end of which talks about the barriers to adopt ESNs, such as the noise-to-value ratio paradoxes. Sledgianowski studies the micro-blogging adoption in enterprise and discovers that perceived usefulness and privacy concerns will influence employees' usage

Table 1
Reviews of Historical Literature on ESNs and PSNs

Authors	Research Topics		
	PSNs	ESNs	Comparison
Günther et al. (2009)		✓	
Kang et al. (2009)	✓		
Pelling & White (2009)	✓		
Zhao and Rosson (2009)		✓	
Pelling and White (2009)	✓		
Barnes and Böhringer (2009)	✓		
Zhang et al (2010)		✓	
Kwon and Wen (2010)	✓		
Ehrlich and Shami (2010)			✓
Baker and White (2010)	✓		
Barnes & Böhringer (2011)	✓		
Chang & Zhu (2011)	✓		
Maier et al. (2011)	✓		
Schöndienst & Krasnova (2011)		✓	
Lin, Chiu & Lim (2011)	✓		
Lin and Lu (2011)	✓		
Leng et al. (2011)	✓		
Engelstätter & Sarbu (2011)		✓	
Chang & Zhu (2012)	✓		
Riemer & Scifleet (2012)		✓	
Agrifoglio (2012)	✓		
Zhang and Pentina (2012)	✓		
Gao et al. (2012)	✓		
Lin et al. (2012)		✓	
Moore and McElroy (2012)	✓		
Engelstätter and Sarbu (2013)		✓	
Chiang (2013)	✓		
Pentina et al. (2013)	✓		
Pentina, Zhang, & Basmanova (2013)	✓		
Ku, Chen & Zhang (2013)	✓		
Zhu & Chang (2013)	✓		
Berger et al. (2014)		✓	
Amos & Zhang (2014)	✓		
Feng & Xie (2014)	✓		
Lin & Lu (2014)	✓		
Pentina, Basmanova & Zhang (2014)	✓		
Nikou & Bouwman (2014)	✓		
Park (2014)	✓		
Kruse & Baumöel (2016)	✓		
Ulmer & Pallud (2014)		✓	
Kügler & Smolnik (2014)		✓	
Zhou & Li (2014)	✓		
Xiong, Chen & Zhao (2014)			✓
Mark et al. (2014)		✓	
Hsu Yu & Wu (2014)	✓		
Men & Tsai (2014)		✓	

(Continued)

Table 1
(Continued)

Authors	Research Topics		
	PSNs	ESNs	Comparison
Gao & Bai (2014)	✓		
Kwon, Park & Kim (2014)	✓		
Kwon, Stefanone & Barnett (2014)	✓		
Sun et al. (2014)	✓		
Huang Hsieh & Wu (2014)	✓		
Lorenzo-Romero & Chiappa (2014)	✓		
Wu, Tao, Li, Wang & Chiu (2014)	✓		
Zhu et al. (2014)	✓		
Baran & Stock (2015)	✓		
Buettner (2015)		✓	
Pentina (2015)	✓		
Wang, Xu & Chan (2015)	✓		
Li, Lin & Wang (2015)	✓		
Chiu & Huang (2015)	✓		
Antonius, Xu, & Gao (2015)		✓	
Chen & Sharma (2015)	✓		
Maier et al. (2015)	✓		
Wong et al. (2015)	✓		
Chang, Hung, Cheng & Wu (2015)	✓		
Salahshour et al. (2015)	✓		
Yoon & Rolland (2015)	✓		
Syn & Oh (2015)	✓		
Chin, Evans & Choo (2015)		✓	
Chin, Choo & Evans (2015)		✓	
Chin, Evans, Choo & Tan (2015)		✓	
Mouakket (2015)	✓		
Bristy (2016)	✓		
Gu, Oh & Wang (2016)	✓		
Chaouali (2016)	✓		
Mäntymäki & Riemer (2016)		✓	
Zemaitaitiene et al. (2016)		✓	
Lacka & Chong (2016)		✓	
Stein, Sprenger & Rossmann (2016)		✓	
Richter et al. (2016)		✓	
Lu & Gallupe (2016)	✓		
Ng (2016)	✓		
Ifinedo (2016)	✓		
Chang, Shen & Liu (2016)	✓		
Martins et al. (2016)		✓	
Zhang, Zhao, Lu & Yang (2016)	✓		
Coelho & Duarte (2016)	✓		
Chan et al. (2016)	✓		
Jukic & Merlak (2017)		✓	
Althoff et al. (2017)	✓		
Chang, Liu & Shen (2017)	✓		
Hacker, Bernsmann & Riemer (2017)		✓	

(Continued)

Table 1
(continued)

Authors	Research Topics		
	PSNs	ESNs	Comparison
Lee & Kim (2017)	✓		
Lin, Featherman & Sarker (2017)	✓		
Lin, Wu & Kim (2017)	✓		
Hsu & Lin (2017)	✓		
Lüders & Brandtzæg (2017)	✓		
Verduyn et al. (2017)	✓		
Ameen, Almari & Isaac (2018)		✓	
Giermindl, Strich, & Fiedler (2018)		✓	
Salehan, Kim & Koo (2018)	✓		
Erfani & Abedin (2018)	✓		
Kim et al. (2018)	✓		
Dixit & Prakash (2018)	✓		
Leong et al. (2018)	✓		
Yushi et al. (2018)	✓		
Lei et al. (2018)	✓		
Kim (2018)	✓		
Aboelmaged (2018)		✓	
Weerasinghe & Hindagolla (2018)	✓		
Huang & shih (2019)	✓		
Kim, Lee & Contractor (2019)	✓		
Barnes, Pressey & Scornavacca (2019)	✓		
Zhou (2019)	✓		
Duarte & Coelho (2019)	✓		
Noguti, Singh & Waller (2019)	✓		
Mohd Suki et al. (2019)	✓		
Chin et al. (2019)		✓	
Estell & Davidson (2019)		✓	
Samad et al. (2019)	✓		
Sum	87(72.5%)	31(25.8%)	2(1.7%)
Total		120	

[17]. Engelstätter and Sarbu explore the adoption of ESNs, but their work is merely conducted on the company-level, without considering the viewpoint of individual employees. More importantly, few studies have done a comparative analysis on individual's adoption mechanism between these two social network sites [18]. Although Engelstätter and Sarbu discuss about this topic, they only have a content analysis of the 5000 public posts from 34 employees on Twitter and their ESNs, yet fail to involve adoption mechanism. Xiong compares human behaviors and motivations behind behaviors toward using enterprise and public social networks, without involving the adoption mechanism difference between the ESNs and PSNs [1]. Therefore, we believe it will

be meaningful to study why employees use ESNs at an individual level by comparing the adoption of PSNs and ESNs. Table 1 shows the summary of our literature review.

3. Hypotheses development

3.1. Perceived usefulness and perceived playfulness

The Theory of Reasoned Action (TRA) is often used in social psychology research that assumes intention as the main predictor of behavior. The theory was derived from previous research on the theory

of attitude, which led to the study of attitude and behavior. The theory posits that behavior intentions, as immediate antecedents to behavior, are a function of salient information or beliefs about the likelihood that performing a particular behavior will lead to a specific outcome.

Generally, TRA assumes that: (1) the more favorable the attitude of an individual toward a behavior, the stronger the individual's intention to engage in such behavior will be; (2) the greater the subjective norm is, the stronger the intention of the individual to perform the behavior will be; and (3) the stronger the intention of the individual to engage in a behavior, the more likely the individual will be to perform it.

TRA has been widely used in social psychology research to explain a variety of people's behaviors. Davis et al. adapt the theory into their development of the Technology Acceptance Model (TAM)[19]. TAM suggests that two factors — perceived ease of use and perceived usefulness — are two significant determinants of behavioral intention to use computer systems. Meanwhile, this notion omits subjective norm, which is also considered in TRA as a determinant of behavioral intention. TAM considers a determinant of behavioral intention and its validated measurement scales have facilitated research into IT acceptance, therefore, TAM has gained tremendous acceptance within the IS research community [20].

A lot of research effort has been devoted to the factors of the perceived usefulness and the perceived ease of use, while partial study of those factors in TAM cannot help us to thoroughly understand the mechanism of accepting certain technology and how it can be accepted by the end users, especially the process and the essence of this acceptance. Moreover, it seems that the period of TAM introduced coincides with the time when computers are only used for professional technicians rather than widely spread among general users. Thus we could raise a question: are the factors of perceived usefulness and perceived ease of use still valid to test the current technology world? Just as Padilla-Meléndez et al. has said, more intrinsic motivators such as playfulness, enjoyment and flow etc. should be taken into account together with the extrinsic motivators of perceived ease of use and perceived usefulness [21].

Although there are several alternative intrinsic motivators, playfulness has been employed as cognitive absorption [22]. Moon and Kim then adopt playfulness to explain behavioral intention to use the World Wide Web (WWW) and name it 'perceived

playfulness' [23]. They define perceived playfulness as the extent to which the individual perceives that his or her attention is focused on the interaction with the World Wide Web; is curious during the interaction; and finds the interaction intrinsically enjoyable or interesting. As a result, they show that perceived playfulness is an important factor in encouraging more people to use WWW. Lin finds perceived playfulness as an important determinant for user's continuance visiting of a web site [24]. Agrifoglio (2012) et al. investigate user continuance of using Twitter [25]. Based on TAM model, they also discover that playfulness would affect user's intention. Further, Oum and Han study the intention to participate in user-created contents services, in which the effect of perceived playfulness on intention to use is shown to be highly significant, suggesting users' need in something else: playfulness [26].

Since most of the social network tools emphasize very much on user experience, ease of use is an essential requirement for any SNS product to enter into market. Therefore, in this paper, we select perceived usefulness (PU) as the extrinsic motivator, and perceive playfulness (PP) as an intrinsic motivator for employees to adopt SNSs.

3.2. Employees' ESNs and PSNs' participation behavior

There are four options for individual users to take actions when using social network services. Here listed our understanding of these definitions:

- *Action to Post (AtP)*: defines the behavior that an individual uses the social network to post information content.
- *Action to Repost (AtrP)*: defines the behavior that an individual uses the social network to repost information content. This implies an action of willingness to share the same information of others.
- *Action to Follow (AtF)*: defines the behavior that an individual uses the social network to retrieve information and read through others' postings.
- *Action to Comment (AtC)*: defines the behavior that as individual read others' posting and takes the action of responding the post with meaningful feedback and suggestion.

As can be seen, the difference among the above four kinds of individual participation of social network is that users contribute their original contents in AtP, whereas they contribute secondary contents in

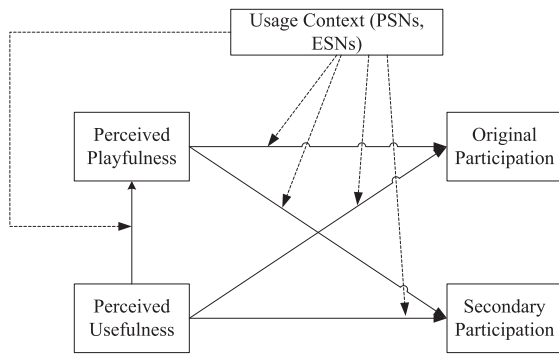


Fig. 1. Conceptual research model.

other cases. So we further classify the user's participation on social network into original participation and secondary participation.

- *Original Participation: means AtP.*
- *Secondary Participation: includes AtrP, AtF and AtC.*

3.3. Conceptual model and hypotheses

The study aims to compare the adoption mechanisms of ESNs and PSNs from companies' employees. As discussed above, we choose perceived of usefulness and perceived playfulness as two motivators, and select AtP, AtrP, AtF, and AtC as four kinds of employees' usage behaviors to ESNs and PSNs, in the hope of finding out how the public use context and organizational use context to affect employees' usage of social network services. Thus, our conceptual research model can be shown in Fig. 1.

3.4. PU and PP in the adoption of ESNs and PSNs

Prior studies have widely used the motivation theory to explain individual's behavior of accepting information technology. Deci et al. divide the motivations of underlying individual's behavior into extrinsic motivation and intrinsic motivation [27]. Extrinsic motivation refers to the commitment of an action due to its perceived helpfulness in achieving values (e.g. the performance of improvement), while intrinsic motivation refers to the engagement of an action due to an interest in the action itself, rather than external reinforcement [19].

Furthermore, from a psychological perspective, Self-Determination Theory distinguishes between different types of motivation based on the different

reasons or goals that give rise to an action. It regards intrinsic motivation as a motivation of doing something because it is inherently interesting or enjoyable. While extrinsic motivation refers to a motivation of doing something because it leads to a separable outcome. Thus, in accordance with most of the adoption models in the previous research, in this study, perceived usefulness is deemed as an extrinsic motivator while perceived playfulness an intrinsic motivator.

Since motivators always have positive influence on a person's behavior of taking actions, it is believed that when a person uses different social networks, the perceived feelings that this person would largely affect his/her perceived attitudes toward usage could lead to different behavioral actions during his/her use of social networks. Thus, the following hypotheses can be generated:

- H1: PP is positively related to employees' participation of ESNs.
- H1a: PP is positively related to employees' original participation of ESNs.
- H1b: PP is positively related to employees' secondary participation of ESNs.
- H2: PU is positively related to employees' participation of ESNs.
- H2a: PU is positively related to employees' original participation of ESNs.
- H2b: PU is positively related to employees' secondary participation of ESNs.
- H3: PP is positively related to employees' participation of PSNs.
- H3a: PP is positively related to employees' original participation of PSNs.
- H3b: PP is positively related to employees' secondary participation of PSNs.
- H4: PU is positively related to employees' participation of PSNs.
- H4a: PU is positively related to employees' original participation of PSNs.
- H4b: PU is positively related to employees' secondary participation of PSNs.

Generally, motivation is conceptualized as either intrinsic or extrinsic. The relationships between intrinsic motivators and extrinsic motivators may be complex. Deci et al suggest that extrinsic motivation for a task can be changed into intrinsic motivation, and vice versa [27]. But in the IS adoption research area, intrinsic motivators mostly impose positive influence on extrinsic motivators. In a systematic review of TAM (Technology Acceptance Model), Legris et al. generalize that in most cases of the

classical TAM model and the later extended models, intrinsic motivators have a significant and positive effect on intrinsic motivators [20]. Fagan et al. further prove that there is a positive relationship between intrinsic motivation and extrinsic motivation, and that intrinsic motivation can increase extrinsic motivation perception [28]. Thus, the following hypotheses are developed:

H5: PP is positively related to PU in employees' participation of ESNs.

H6: PP is positively related to PU in employees' participation of PSNs.

3.5. The relative influence of PP and PU in ESNs adoption

Despite a growing trend of research concerning the use of micro-blogging services like Twitter, few attempts have been made to investigate micro-blogging in a work environment. Stuart et al. conduct a content analysis and compare the messages of 34 employees posted publicly on Twitter with the ones they posted on an intra-firm micro-blogging platform [29]. They find significant differences in individuals' use of the two systems. Employees use the company-internal system mostly to engage in "Q&A" and personal, directed interaction, whereas Twitter is mostly used to share information with a larger community. Semi-structured interviews shed more light on the underlying motivation of employees in using micro-blogging. In particular, the interviewees mention the benefits of communication, such as the ability to share information in real-time and to be aware of what colleagues are working on. At the same time, employees see micro-blogging as a way to enhance their reputation.

Davis et al. interview 11 active Twitter users and build theories on interpersonal communication and social psychology to explore potential benefits micro-blogging that can bring to informal communication at work [30]. Their results hint at relational benefits such as building common ground, managing people perceptions, and creating a sense of contentedness, as well as personal benefits such as the acquisition of valuable information.

Similarly, Stuart et al. use an interpretive approach to investigate the case of a corporation use of an in-house social software development that shows close similarities to micro-blogging [29]. They find that employees see micro-blogging as a good information source and an efficient tool to stay aware of

activities in the company. On the flipside, their finding suggests that employees have concerns regarding privacy-related aspects such as the monitoring of their work.

Based on the above research, it seems that, in the working context, extrinsic motivator is more importance than intrinsic motivator for employees' adoption of ESNs, which means the effect of perceived usefulness on employees' ESNs participation is bigger than that of perceived playfulness. Thus, the following hypotheses are generated.

H7: In terms of ESNs, the influence of PU is always higher than that of PP.

H7a: In terms of employees' original participation of ESNs, the influence of PU is higher than that of PP.

H7b: In terms of employees' secondary participation of PSNs, the influence of PU is higher than that of PP.

3.6. The relative influence of PP and PU in PSNs adoption

Taking Facebook, Friendster and Myspace as their research background, Sledgianowski and Kulviwat introduce the Social Network Site Adoption model to examine the effect of perceptions of normative pressure, playfulness, critical mass, trust, usefulness, and ease of use on usage intention and actual usage of these sites [17]. They figure out that all the hypothesized determinants have a significant direct effect on intent to use, with perceived playfulness and perceived critical mass the strongest indicators. The intention to use and perceived playfulness have a significant direct effect on actual usage.

Built upon the social capital perspective, Xiao et al. provide a general social networking site experience model regarding the impact of the interaction between user-perceived competence and the user identification on user satisfaction through playfulness in the context of public social networking sites. Their research proves the mediating role of playfulness through which social network site users' competency and identification factors are transmitted and predict user satisfaction [32].

It seems that, compared with ESNs, in public social platforms, intrinsic motivation is more important than extrinsic motivations. Thus, the following hypotheses are produced:

H8: In terms of PSNs, the influence of PP is always higher than that of PU.

H8a: In terms of employees' original participation of PSNs, the influence of PP is higher than that of PU.

H8b: In terms of employees' secondary participation of PSNs, the influence of PP is higher than that of PU.

3.7. *Public use context versus enterprise use context*

ESNs are not simply a Facebook behind a firewall. Every enterprise has its distinct needs and nuances that require a reframing of a social network. The main tasks of ESNs are communication, information dissemination and sharing, management activities and problem solving, training and learning, and collaboration and innovation, etc. [32]. ESNs provide a new platform for informal networks to emerge and function. Studies of IBM's enterprise social networks have shown that increased use of the tool can lead to increased social capital among both new and existing relationships and workers' perceived closeness to their co-workers. Other studies have shown that blogging is an effective communication and collaboration tool within large companies to promote collaboration across departments [33, 34]. Hence, the specific functions of ESNs developed by companies are all aiming at improving firms' operation efficiency. This determines that employees' perceived usefulness should be a very important factor for companies to design their ESNs.

For PSNs, enlarging individual's social network is one of the main functions. Zhang and Pentina conduct a study of motivations and usage patterns on Weibo [4]. The authors design a list of motivations with an online survey asking respondents to rate all 40 Weibo related motivations. Afterwards, they identify the most relevant eight factors, namely: 1) professional development; 2) emotional release; 3) information seeking; 4) citizenship behavior; 5) social connection; 6) visibility; 7) self-expression; and 8) interaction with Weibo. As a result, the similar motivations to promote the use of Twitter and Weibo prove to be informational and social. And Weibo users also join the service to facilitate their professional development, fulfill emotional needs, reciprocate by helping other users with advice and information, enhance their social status, express themselves, and interact with the site and other users. More importantly, the authors find that Weibo facilitates both self-expression and interactivity, leading to more frequent contributions and longer stay on the

site. Some of the eight factors can be considered as the antecedent variables of perceived playfulness [35].

Further, Turban et al, conduct a content analysis and compare the messages of 34 employees posted publicly on Twitter with the ones they posted on an intra-company micro-blogging platform [32]. They find significant differences in individuals' use of the two systems. Employees use the company-internal system mostly to engage in "Q&A" and personal, directed interaction, whereas Twitter is mostly used to share information with a larger community.

Via the comparison, it seems that the adoption of employees' ENSs is more utilitarian oriented, while the employees' adoption of PSNs is more hedoni-oriented. Thus, we speculate that the role of perceived usefulness is stronger in ESNs than that in PSNs, while perceived playfulness is stronger in PSNs than that in ESNs. Here listed two groups of hypotheses:

H9: In terms of employees' participation, the effect of PU in ESNs is higher than that of PU in PSNs.

H9a: In terms of employees' original participation, the effect of PU in ESNs is higher than that of PU in PSNs.

H9b: In terms of employees' secondary participation, the effect of PU in ESNs is higher than that of PU in PSNs.

H10: In terms of employees' participation, the effect of PP in PSNs is higher than that of PP in ESNs.

H10a: In terms of employees' original participation, the effect of PP in PSNs is higher than that of PP in ESNs.

H10b: In terms of employees' secondary participation, the effect of PP in PSNs is higher than that of PP in ESNs.

4. Research setting

4.1. *Enterprise social network (Happy work)*

In 2010, China Mobile Beijing introduced their first Enterprise Social Network (ESN, hereafter) – Happy Work site. It is incorporated with the internal Industry and Information Technology department and maintained by IBM Corporation. The average age of employees in Beijing Mobile is about 28, with 81% of them aged under 30. Due to this reason, the design of Happy Work is oriented toward the most IT popular

trend - Social Network Site (SNS) and the easy-of-use notion. Here, the site is based on a group level, instead of an individual level.

The site is aimed to build a newly work environment towards the idea of "Team Building". It focuses on improving internal employee communication between different groups and departments, between different departments and regions, as well as bottom-top interactions. Thereby employee could experience a new way of corporate culture in a virtual corporate society.

Happy Work site is set on the background of an ancient city with some classical Chinese elements. The content includes different topics such as:

- **General Information:** Daily updated news on events or employees within organization;
- **Number 1 Team:** A specific section for top management team;
- **Discussion Teahouse:** The latest topics and discussions within or outside the company;
- **Blog Gather:** A platform where employees (incl. top managers) can share articles, which can either be their own or from external sources, either work-concerned or for life-related.
- **Post Hostel:** An online station where employees can share their work and life with their co-workers. (Similar to Twitter tweet/ Weibo post)
- **Voting Bar:** A section where teams can design the relevant issues asked across the whole organization in democracy.
- **Hero Board:** A board where team / departmental honors are posted.
- **Ask / Answer Farm:** An area where questions are frequently asked regarding the site and the system.
- **Sutra Depository:** A list of suggested books shared to every employee. Most of times employees are requested to read amount of books in certain period.
- **Lecture Hall:** A place where knowledge is shared to every employee in organization.

Furthermore, there are two special areas – Events and Employee Happy House – where employees are currently encouraged to actively participate. Events area is the places where department can post their events and attract qualify employee to join. However the events are normally mid-term or long-term that are held throughout the year, organized by administration. It should be noted that some of the events can be highly related to team performance evaluations. On

the other hand, Employee Happy House is designed for promoting employee social life, and each of its department has their own plant in the country farm. There are specific farmers taking care of their vegetables in the plant. When the harvest season comes, employees can order vegetables that grow in their own plant, ask the farm deliver to the company and pick up after work.

4.2. Public social network (Sina Weibo)

The banning of Twitter, Facebook, and YouTube in China has created an opportunity for domestic providers such as social networking sites Renren and Kaixin001, micro-blogging service Weibo, and video sharing service like Youkou. One of most successful micro-blogging services is Weibo operated by Sina Corporation – the largest Chinese-language infotainment web portal. Much like Twitter, Sina Weibo enables users to post short (140 characters or less) messages that are displayed on a user's Weibo page. A user's Weibo page is open to anyone, where followers (known as fans) can exchange private messages. However, Weibo recently enables the classification of followers for message display and the closure of friends pages.

Weibo involve games, voting, radio, music, and file sharing. It promotes interactivity and engagement by offering Weibo medals for participating in various Weibo activities, tweeting for several consecutive days, re-tweeting brand event announcements, etc. However, unlike members of SNSs, Weibo users are more oriented toward the exposure of strangers, including field experts, stars, and social celebrities, with less attention paid to the messages from friends and acquaintances. The loose social network on Weibo establishes user relationship through rich information flow. Since the launch of Weibo, many SNSs users have joined the platforms and now spend more time on Weibo than on SNSs [4].

Over the past five years, academic researchers have studied the use of social networking whereas most of them are focused on investigating (external) public social networks (PSNs, hereafter), such as Facebook and Twitter. However, few are paying attention to internal use of social networks in the organization, known as enterprise social networks (ESNs). Prior researchers on the utility of social networks have explained that, these social networks can be used for sharing information, following updated news, and directly and indirectly informing and communicating with others [36, 37]. This leads to the first research

purpose of understanding the benefits of using social networks in public, and this case concerns with the use of Sina Weibo.

On the other hand, prior researches have proven that enterprise use of social networks differ from that of (external) public social networks [33, 38]. However, studies have barely used a comparative analysis, therefore our research purpose is to investigate what differ in motivations behind of people use public social networks (e.g. Sina Weibo) and enterprise social networks (e.g. Blue Twit).

5. Research methodology

5.1. Measurement

5.1.1. Independent variables—perceived usefulness and perceived playfulness

Perceived Usefulness. Davis et al. define the perceived usefulness as a “perception that using system leads to enhanced personal performance”[30]. Later, in UTAUT model [39], the perceived usefulness has been further redefined as “perception that using system will help user attain gains in job performance”. Our research includes the study of two social network sites where we aim to discover which motivation could affect on users' attitudes of system use. Thus, we further define our understanding of the perceived usefulness as “the degree to which a person believes that using particular social network helps user enhance relevant job/learning/life performance”. Referring to the four commonly used PU measurement items [20], we develop our measurement of PU for PSNs and ESNs respectively, as shown in the Appendix.

Perceived Playfulness. Computer playfulness has been defined as “the degree of cognitive spontaneity in microcomputer interactions”. Here, for SNSs use, we define perceived playfulness as the degree of cognitive spontaneity in SNS interactions. In Moon and Kim's study, three dimensions of perceived playfulness are described as: concentration (the extent to which a user perceives that his or her attention is focused), curiosity (the extent to which the user is inquisitive about the interaction), and enjoyment (the extent to which the user finds the interaction fun or interesting) [23]. In this study, we also classify perceived playfulness into three dimensions: the extent to which the individual 1) perceives that his or her attention is focused on the interaction with the SNSs; 2) is curious during the interaction; and 3)

finds the interaction intrinsically enjoyable or interesting. Referring to the measurement of perceived playfulness (PP) provided by Moon and Kim, the measurement items of for PSNs and ESNs are generated respectively, as shown in the Appendix.

5.1.2. Dependent variables—employees' SNSs participation

To measure employees' SNSs participation, we have asked employees in the survey to self-report their use frequency of PSNs and ESNs, as shown in the Appendix 3.

5.2. Survey design and sampling

Our research is aimed to investigate the motivation behind each user's behaviors, therefore, we follow the approaches of most relevant studies and conducted a survey among staff users in Beijing Mobile. We design sampling quota by gender, age, and occupation in accordance with the demographics of this target population. We measure perceived attitudes and participation behaviors on a five point Likert scale (1 = strongly disagree, while 5 = strongly agree). All items measurement are mixed up and re-categorized into different topics of questions. The research instrument is developed on the basis of prior studies in the west. For the convenience of our Chinese sample group, the English questionnaire is translated into Chinese. We conducted 15 in-depth interviews with random samples in China Mobile to ensure the face validity of the measures. For details, please see the Appendix 3.

Invitation to participate for online survey is spread through Labor Union within Beijing Mobile, and posted on internal Survey System. The Labor Union post an announcement to ask each department to fill out the survey (the quota sampling is requested by the research team beforehand). The duration is about one month. After that, the Labor Union collects the survey results and sends them to the research team.

5.3. Construct reliability and validity

5.3.1. Construct reliability

To test the reliability of these variables, we adopt confirmatory factor analysis (CFA) to assess the scale properties of the measurement model. The CFA results indicate that the four measures about perceived playfulness can be merged into a single one, with the Cronbach's Alphas coefficient (0.841 in

Table 2-a

Reliability, means and standard deviations of research variables in ESNs

Variable	CA	AVE
Perceived playfulness	0.841	0.762
Perceived usefulness	0.947	0.811
Action to post	0.857	0.778
Action to repost	0.905	0.842
Action to follow	0.937	0.801
Action to comment	0.915	0.798

Note: CA = Cronbach's alpha; AVE = average variance extracted.

Table 2-b

Reliability, means and standard deviations of research variables in PSNs

Variable	CA	AVE
Perceived playfulness	0.817	0.737
Perceived usefulness	0.883	0.701
Action to post	0.855	0.779
Action to repost	0.931	0.879
Action to follow	0.934	0.795
Action to comment	0.899	0.768

Note: CA = Cronbach's alpha; AVE = average variance extracted.

ESNs and 0.817 in PSNs, see Table 2-a) being sufficiently high to allow further analysis. Similarly, the measures of perceived usefulness, action to post, action to repost, action to follow and action to comment converge can all be merged into a single factor with Cronbach's Alpha values of 0.7, 0.92, and 0.84, respectively (see Table 2-b). In addition, average variance extracted (AVE) values for the constructs also exceed the cut-off point of 0.5, indicating that the constructs have captured a sufficiently high level of variance [40].

5.3.2. Convergent and discriminant validity

We assess convergent validity by examining the factor loadings through the exploratory factor analysis. The criteria for an acceptable level of convergent validity are: 1) individual item loadings greater than 0.5, and 2) cumulative variance contribution greater than 40%. The results of all item loadings are reported in Table 3-a, which support the dimensionality of the constructs. One additional guideline for discriminant validity is that the square root of AVE for each construct should be greater than the correlation values of the construct with other constructs [40]. As reported in Table 3-b, all constructs across the samples meet

Table 3-a

Factor loading analysis for the variables in ESNs

Variable	Items	Factor loading	Overall explanation degree
Perceived playfulness	PP1_a	0.809	76.176%
	PP2_a	0.905	
	PP3_a	0.901	
Perceived usefulness	PU1_a	0.914	82.313%
	PU2_a	0.930	
	PU3_a	0.926	
	PU4_a	0.913	
	PU5_a	0.851	
Action to post	AtP1_a	0.883	77.846%
	AtP2_a	0.925	
	AtP3_a	0.840	
Action to repost	AtRp1_a	0.878	84.174%
	AtRp2_a	0.931	
	AtRp3_a	0.944	
Action to follow	AtF1_a	0.865	80.085%
	AtF2_a	0.895	
	AtF3_a	0.906	
	AtF4_a	0.922	
	AtF5_a	0.888	
Action to comment	AtC1_a	0.867	79.788%
	AtC2_a	0.912	
	AtC3_a	0.927	
	AtC4_a	0.865	

with the guideline. Therefore, the discriminant validity criterion is also satisfied.

5.4. Common method bias

Self-reported data collection and logical constructs of items lead naturally to variance in the measurement method [41]. Whereas this variance is commonly acknowledged, very few papers actually address it, despite the popularity of self-report survey method [42].

Given the measurement of perceived playfulness, perceived usefulness, action to post, action to repost, action to follow and action to comment with information gathered from the same respondents, the issue of common method variance must be addressed. We conduct a Harmon single-factor test, which reveal that the common method variance unlikely to be a concern. Table 4 shows the results of the adjustments, with zero-order correlations below the diagonal and adjusted correlations above it. Our results do not show a substantial bias due to common method variance.

Table 3-b
Factor loading analysis for the variables in PSNs

Variable	Items	Factor loading	Overall explanation degree
Perceived playfulness	PP1_b	0.797	73.655%
	PP2_b	0.914	
	PP3_b	0.861	
Perceived usefulness	PU1_b	0.813	70.232%
	PU2_b	0.838	
	PU3_b	0.865	
	PU4_b	0.874	
	PU5_b	0.794	
Action to post	AtP1_b	0.876	77.579%
	AtP2_b	0.919	
	AtP3_b	0.852	
Action to repost	AtRp1_b	0.916	87.883%
	AtRp2_b	0.941	
	AtRp3_b	0.956	
Action to follow	AtF1_b	0.863	79.476%
	AtF2_b	0.914	
	AtF3_b	0.873	
	AtF4_b	0.935	
	AtF5_b	0.871	
Action to comment	AtC1_b	0.874	76.821%
	AtC2_b	0.897	
	AtC3_b	0.895	
	AtC4_b	0.837	

All relevant correlations remain significant after the correction.

6. Empirical results

6.1. Assessment of model fit

To test the model's effectiveness, we apply it to the ESNs context and the PSNs context, respectively. Tests are performed using the AMOS 17.0 software. For the chi-square is very sensitive to the sample size, item numbers and factor numbers in the model, as well as other fit indices, such as goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), root mean square of approximation (RMSEA), and Comparative Fit Index (CFI) are used to assess overall model fit. These results are reported in Table 5. In general, all these results suggest that our model fits the data well (See Table 5).

6.2. Hypotheses testing

We use structural equations to analyze the relations between perceived playfulness, perceived usefulness and their impacts on employees' participation,

Table 4-a
Results of discriminant validity and construction of correlations in ESNs

	1	2	3	4	5	6
Perceived playfulness	0.82	0.57*	0.17*	0.38*	0.42*	0.12*
Perceived usefulness	0.57*	0.99	0.20*	0.40*	0.63*	0.15
Action to post	0.17*	0.17*	0.94	0.29*	0.16	0.09*
Action to repost	0.41*	0.41*	0.35*	0.92	0.35*	0.13
Action to follow	0.45*	0.68*	0.16	0.31*	0.89	0.10*
Action to comment	0.09*	0.14	0.15*	0.10	0.10*	0.90

Table 4-b
Results of discriminant validity and construction of correlations in PSNs

	1	2	3	4	5	6
Perceived playfulness	0.88	0.56*	0.17*	0.38*	0.44*	0.39*
Perceived usefulness	0.56*	0.99	0.20*	0.40*	0.63*	0.34
Action to post	0.17*	0.17*	0.93	0.29*	0.16	0.33*
Action to repost	0.43*	0.41*	0.35*	0.94	0.35*	0.32
Action to follow	0.42*	0.68*	0.16	0.31*	0.95	0.31*
Action to comment	0.37*	0.35	0.33*	0.30	0.30*	0.89

Note: Square roots of AVEs are presented on the diagonal. Construct correlations are below the diagonal. Construct correlations corrected for common method bias are above the diagonal. *Marks the significance levels. In summary, the measures of the proposed constructs achieve high reliability as well as convergent and discriminant validity.

Table 5
Evaluation indicators of the model

Indicators	Reference value	References	AtP	AtrP	AtF	AtC
GFI	>0.9	Hooper et al.	0.943	0.958	0.934	0.952
AGFI	>0.9		0.804	0.928	0.900	0.923
CFI	>0.9		0.973	0.983	0.973	0.980
RMSEA	<0.08		0.056	0.045	0.052	0.045

according to the theoretical conceptual model in Fig. 1. The AMOS 17.0 software is used.

Table 6 presents the analysis of the relationships among different variables in the conceptual models. The three models are quite consistent: all the relations are significant ($p < .001$), except for those between perceived usefulness and employees' secondary participation of PSNs.

Based on this observation, we modify the model as shown in Fig. 2.

After the modified model in Fig. 2 is analyzed, we present the path coefficients in the structural equation models in Table 7.

6.2.1. Perceived playfulness and perceived usefulness is positively related to employees' participation of ESNs (H1, H2)

On the one hand, the path coefficients in ESNs model—PP to AtP: .372, PP to AtrP: .572, PP to AtF: .754, PP to AtC: .497 (see the third row in Table 7)—show that the relationship between perceived playfulness and employees' original participation and secondary participation is significantly positive. On the other hand, the data analysis of

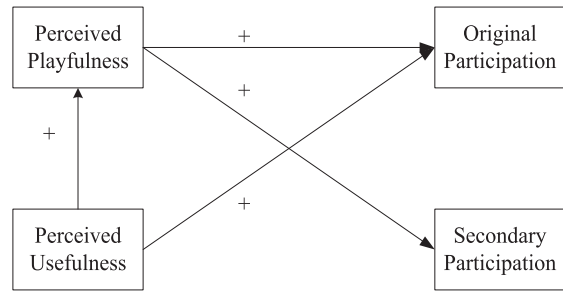


Fig. 2. Modified Conceptual Research Model.

the path coefficients in ESNs model—PU to AtP: .432, PU to AtrP: -.020, PU to AtF: -.059, PU to AtC: .133 (see the third row in Table 7)—shows that the relationship between perceived usefulness and employees' original participation is significantly positive, but the relationship between perceived usefulness and employees' secondary participation is slightly (but not significantly) negative. Therefore, we can conclude that in ESNs, perceived playfulness is positively related to employees' participation, while perceived usefulness is only positively related to employees' original participation, without significant correlation to employees' secondary participation.

6.2.2. Perceived playfulness and perceived usefulness is positively related to employees' participation of PSNs (H3, H4)

On the one hand, the path coefficients in PSNs model—PP to AtP: .443, PP to AtrP: .621, PP to AtF: .687, PP to AtC: .506 (see the fourth row in Table 7)—show that the relationship between

Table 6
Correlation analysis of the variables in the conceptual model

Hypothesis	Relations between variables	Correlation	P value		Significance
			ESNS	PSNS	
H1a/H3a	PP and AtP	Positive	***	***	Significant
H2a/H4a	PU and AtP	Positive	***	***	Significant
H1b/H3b	PP and AtrP	Positive	***	***	Significant
	PP and AtF	Positive	***	***	Significant
	PP and AtC	Positive	***	***	Significant
H2b/H4b	PU and AtrP	Positive	.886	.092	Not significant
	PU and AtF	Positive	.644	.866	Not significant
	PU and AtC	Positive	.315	***	Not significant
H5/H6	PP and PU	Positive	***	***	Significant

Table 7
Path coefficient for the two contexts

Participation	Hypothesis	Path	Correlation	ESNs Model	PSNs Model	Significance
Original participation	H1a/H3a	PP → AtP	Positive	.372	.443	Significant
	H2a/H4a	PU → AtP	Positive	.432	.329	Significant
Secondary participation	H1b/H3b	PP → AtrP	Positive	.572	.621	Significant
		PP → AtF	Positive	.754	.687	Significant
		PP → AtC	Positive	.497	.506	Significant
	H2b/H4b	PU → AtrP	Positive	-.020	.081	Not significant
		PU → AtF	Positive	-.059	.008	Not significant
		PU → AtC	Positive	.133	.230	Not significant
	H5/H6	PU → PP	Positive	.910	.525	Significant

perceived usefulness and employees' original participation and secondary participation is significantly positive. On the other hand, the data analysis of the path coefficients in PSNs model—PU to AtP: .329, PU to AtrP: .081, PU to AtF: .008, PU to AtC: .230 (see the fourth row in Table 7)—shows that the relationship between perceived usefulness and employees' original participation is significantly positive, but the relationship between perceived usefulness and employees' secondary participation is slightly (but not significantly) positive. Therefore, we can conclude that in PSNs, perceived playfulness is positively related to employees' participation, while perceived usefulness is only positively related to employees' original participation, without significant correlation to employees' secondary participation.

6.2.3. Perceived playfulness is positively related to perceived usefulness in employees' participation of PSNs (H5, H6)

The path coefficients of the relationship from perceived usefulness to perceived playfulness in ESNs model: .910, PSNs model: .525, General model: .706 (see the last line in Table 7)—show that the relationship between perceived usefulness to perceived playfulness is significantly positive. It is supported that perceived playfulness is positively related to perceived usefulness in employees' participation of ESNs and PSNs. H5 and H6 are confirmed.

6.2.4. In terms of ESNs, the influence of PU is always higher than that of PP. (H7)

In ESNs model, on the one hand, the path coefficients of original participation—PP to AtP: .372, PU to AtP: .432 (see the third row in Table 7)—show that in terms of employees' original participation,

the influence of perceived usefulness is higher than that of perceived playfulness. On the other hand, the data analysis of the path coefficients of secondary participation—PP to AtrP: .572, PU to AtrP: -.020 (not significant); PP to AtF: .754, PU to AtF: -.059 (not significant); PP to AtC: .497, PU to AtC: .133 (not significant) (see the third row in Table 7)—shows that the influence of perceived usefulness is not higher than that of perceived playfulness. Therefore, it can be concluded that in terms of ESNs, the influence of PU is not always higher than that of PP. H7.

6.2.5. In terms of PSNs, the influence of PP is always higher than that of PU. (H8)

In PSNs model, on the one hand, the path coefficients of original participation—PP to AtP: .443, PU to AtP: .329 (see the fourth row in Table 7)—show that the influence of perceived playfulness is higher than that of perceived usefulness. On the other hand, the data analysis of the path coefficients of secondary participation—PP to AtrP: .621, PU to AtrP: .081 (not significant); PP to AtF: .687, PU to AtF: .008 (not significant); PP to AtC: .506, PU to AtC: .230 (see the fourth row in Table 7)—shows that the influence of perceived playfulness is higher than that of perceived usefulness. Therefore, it can be concluded that in terms of PSNs, the influence of PP is confirmed to be always higher than that of PU. H8.

6.2.6. The difference of the effect of perceived attitude between ESNs and PSNs. (H9, H10)

To test the moderating effect of use context (i.e. the H9 and H10), we establish a multi-group structure equation model (Multi-Group SEM). The objective of multi-group simultaneous path analysis is to determine whether the path coefficients between perceived

Table 8
Multi-group invariance test (assuming model unconstrained to be correct)

Model		df	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho-2
Measurement weights	AtP	8	69.603	.000	.008	.008	.003	.003
	AtrP	8	67.330	.000	.007	.007	.006	.006
	AtF	10	66.388	.000	.006	.006	.003	.003
	AtC	9	62.987	.000	.006	.006	.005	.005

Table 9
The results for multi-group SEM

Hypothesis	Path			Significance							
				χ^2/df	GFI	CFI	RMSEA	df	$\Delta\chi^2$	P	Significance
H9a	PU	→	AtP	5.541	.953	.976	.069	6	34.957	.000	Significant
H9b	PU	→	AtrP	3.910	.968	.986	.055	6	38.706	.000	Significant
	PU	→	AtF	4.962	.936	.972	.064	7	21.362	.003	Significant
	PU	→	AtC	3.658	.959	.982	.053	6	18.902	.004	Significant
H10a	PP	→	AtP	6.256	.968	.973	.074	4	19.114	.001	Significant
H10b	PP	→	AtrP	61.489	.979	.988	.054	4	13.485	.009	Significant
	PP	→	AtF	4.993	.952	.974	.065	6	15.643	.016	Significant
	PP	→	AtC	3.555	.974	.984	.052	5	13.328	.020	Significant

attitudes and the employees' participations are equal across different use contexts.

For H9 and H10, the sample is divided into two subgroups according to the context. We first constrain the paths to be invariant across the two contexts and then freely estimate these paths. If the chi-square change between the above constrained and unconstrained multi-group SEM is statistically significant, it means the path loadings in different industries are significantly changed. That is, context type is a significant moderator to the relationships between perceived attitudes and employees' participations.

For the unconstrained multi-group analysis, we suppose that the corresponding path coefficients from perceived attitudes to employees' participations in the two sample models (the ESNs model and the PSNs model) are statistically equivalent. Then we do a multi-group invariance test using the software AMOS 17.0. Table 8 shows that $\Delta\chi = 69.603, 67.330, 66.388, 62.987$, which is non-significant at the level of $p < .05$. That is to say, the study does not pass the multi-group invariance test. In other words, there are significant difference between the ESNs model and the PSNs model.

Table 9 shows the results of Multi-group SEM analysis. As can be seen, for H9a, the chi-square change

($\times 2$ with 4df) is 19.114, which is significant at the .05 level, so H9a is supported. That is, the relationship between perceived usefulness and employees' original participation differs between ESNs and PSNs. H9b is tested using the same method. We divide the data into two subgroups, Chi-square change ($\times 2$ with 6 df) of AtrP is 38.706, Chi-square change ($\times 2$ with 7 df) of AtF is 21.362, and Chi-square change ($\times 2$ with 6 df) of AtC is 18.902, which are significant at .05 level, so H9b is supported. Other hypothesis, H10a and H10b are tested by using the same method. Here, H10a is supported where the Chi-square change ($\times 2$ with 4 df) is 19.114 and the P -value is .001 which is significant at .05 level; H10b is supported where the Chi-square change ($\times 2$ with 4 df) of AtrP is 13.485, Chi-square change ($\times 2$ with 6 df) of AtF is 13.485, Chi-square change ($\times 2$ with 5 df) of AtC is 13.485, and the P -value is .009, .016 and .020, respectively. Therefore, all the relationships between perceived playfulness and employees' participation differ between ESNs and PSNs, which means use context has a significantly moderating effect in this study.

6.2.6.1. In terms of employees' participation, the effect of PU in ESNs is higher than that of PU in PSNs. (H9). On the one hand, in terms of the

effect of perceived usefulness on employees' original participation, the path coefficients —ESNS model: .432, PSNs model: .329 (see the third line in Table 7)—show that the effect of perceived usefulness in ESNS is higher than that in PSNs. On the other hand, in terms of the effect of perceived usefulness on employees' secondary participation, the data analysis of the path coefficients are significant in all (see the seventh-ninth lines in Table 7)—showing that it is unable to compare the effect of PU in ESNS and that in PSNs. Therefore, it can be concluded that in terms of employees' original participation, the effect of PU in ESNS is higher than that of PU in PSNs. H9 is therefore supported.

6.2.6.2. In terms of employees' participation, the effect of PP in PSNs is higher than that of PP in ESNS. (H10). On the one hand, in terms of the effect of perceived playfulness on employees' original participation, the path coefficients —ESNS model: .327, PSNs model: .443 (see the second line in Table 7)—show that the effect of perceived playfulness in PSNs is higher than that in ESNS. On the other hand, in terms of the effect of perceived playfulness on employees' secondary participation, the data analysis of the path coefficients - ESNS model: .572 (AtrP), .754 (AtF), .497 (AtC); PSNs model: .621(AtrP), .687(AtF), .506(AtC) (see the fourth-sixth lines in Table 7)—shows that the effect of perceived playfulness in PSNs is higher than that in ESNS except for the action to follow. Therefore, it can be concluded that in terms of employees' original participation, the effect of PP in PSNs is higher than that of PP in ESNS. H10 is partly confirmed.

7. General discussion and conclusion

7.1. Theoretical implications

In the introduction section, we raise the question that we want to address in our research: "Is the adoption mechanism of ESNS the same as that of PSNs?" After the entire data analysis, we are now in a position to answer it. The hypothesis test results are present in the Table 10.

The answer is partly yes and partly no. As for the general adoption mechanisms, PSNs and ESNS are almost the same. However, as for the relative roles of PP and PU in PSNs and ESNS, there are obvious differences. These similarities and differences construct the main theoretical implications of this study.

Firstly, our study discovers that the general adoption mechanisms of PSNs and ESNS for both employees' original participation and secondary participation are nearly the same: the original participation is a both utilitarian-oriented and recreational-oriented adoption, while the secondary SNS participation is a recreational-oriented adoption. Our study shows that both perceived usefulness and perceived playfulness are all the factors to influence employees' original PSNs and ESNS participation. However, for employees' secondary PSNs and ESNS participation, only perceived playfulness is the influencing factor. According to the classification, we can deduce that employees' original participation for PSNs and ESNS are dual-purpose (utilitarian-oriented and recreational-oriented) IT behavior, while the usefully perceived playfulness and the uselessly perceived usefulness in the employees' secondary participation of PSNs and ESNS indicate that the secondary SNS participation

Table 10
Hypothesis test results

Hypothetical Content	Results
H1: PP is positively related to employees' participation of ESNS.	Support
H2: PU is positively related to employees' participation of ESNS.	Support
H3: PP is positively related to employees' participation of PSNs.	Support
H4: PU is positively related to employees' participation of PSNs.	Partly support
H5: PP is positively related to PU in employees' participation of ESNS.	Support
H6: PP is positively related to PU in employees' participation of PSNs.	Support
H7: In terms of ESNS, the influence of PU is always higher than that of PP.	Partly support
H8: In terms of PSNs, the influence of PP is always higher than that of PU.	Partly support
H9: In terms of employees' participation, the effect of PU in ESNS is higher than that of PU in PSNs.	Support
H10: In terms of employees' participation, the effect of PP in PSNs is higher than that of PP in ESNS.	Support

is a recreational-oriented IT behavior. Individual's original SNS participation is dual-purpose and secondary SNS participation is recreational-oriented. This conclusion is suitable for both PSNs and ESNs. This is a very unique research finding of our study. Previously, people take it for granted that PSNs is recreational-oriented until Xu et al. find that utilitarian gratifications and hedonic gratifications together become the important factors for individual's PSNs usage [43]. However during their work, user's different SNS activities are dealt with as a whole although they measure the general SNS usage from posting, viewing, sharing, replying and playing etc. Therefore, we can see that our work deepens Xu et al.'s study, and further detects which PSNs activities are utilitarian-oriented and which ones are recreational-oriented. As for ESNs, people are also likely to simply think that ESNs is a utilitarian-oriented adoption. At this point, our study firstly proves that the adoption of ESNs is also both utilitarian-oriented and recreational-oriented [44–46].

Secondly, although the general adoption mechanism of PSNs and ESNs is the same, the relative influences of PP and PU in the adoption of PSNs and ESNs are different. Our study finds that the influence of PP in PSNs is bigger than that of PU in PSNs, indicating that although the adoption of PSNs is found to be dual-purpose, it actually prefers recreational-oriented adoption to utilitarian-oriented adoption. As for ESNs, our study indicates that for individual's original ESNs participation, the influence of PU is higher than that of PP, while the direction of the relationship is opposite to individual's secondary ESNs participation. The results for ESNs mean that although individual's first original participation is dual-purpose, it is more inclined to be utilitarian-oriented. To generalize, our findings show that the individual's adoption of PSNs is more inclined to be recreational-oriented in individual's original participation while individual's adoption of ESNs is more inclined to be utilitarian-oriented, although both of them are proved to be dual-purpose. If our research results about the similar adoption mechanism between PSNs and ESNs are not in conformity with people's common experience, here, the different roles of PP and PU in the adoption processes of PSNs and ESNs are in line with people's common experience [47–49].

Thirdly, although PP and PU are both the influencing factors for individual's ESNs and PSNs original participation, and as PP is the only influencing factor for individual's ESNs and PSNs secondary participa-

tion, the comparative power is different. The role of PU in the original participation of ESNs is stronger than PU in that of PSNs, and the role of PP in PSNs is stronger than PP in that of ESNs for both original and almost all secondary participations. This means that PP is the most important factor affecting the behavior of individual's PSNs adoption. This conclusion is supported by other related work. For example, the study of Ref. [50] shows that enjoyment is the most influential factor in people's continued use of PSNs. Lin et al. find that appraisal factors (pleasure, awareness, connectedness, and system quality) are strong determinants of emotional reaction on PSNs continuance intention. Compared to PSNs, PU has higher influence in ESNs adoption [51].

7.2. Managerial implications

Our research has implications for companies' ESNs development. First, ESNs are not just for work. They are also for fun. Although most people resist that ESNs can bring values to companies, there are also some difference voices concerning the time wasted, juggling multiple personas, personal views affecting career progression and crossing organizational hierarchy, etc. of ESNs. Our research gives clues of disagreement of these voices. Our study shows that PP has positive relationship with PU, and employees' adoption of ESNs is dual-purpose for original participation and recreational-oriented for secondary participation. This indicates when designing an internal social network, companies can take these both PU and PP into account, especially on system playfulness. From this implication, we believe the design of Happy Work Site in China Mobile has indeed provided a good example. Secondly, different employees' ESNs participations have different roles. Companies should make some intensive policies to encourage all kinds of employees' ESNs participation. The more utilitarian-oriented original employees' participation may lead to higher working productivity, while the more recreational-oriented secondary employees' participation may increase the connections between employees, and may reduce the employees' turnover. Thirdly, companies should also carefully manage ESNs to balance the utilitarian function and recreation function to harvest their best of benefits. Although we pretest the forbidding opinions on ESNs, and also support that PP is much important for employees' adoption of ESNs, we still suggest companies to balance the utilitarian functions and recreation functions of ESNs since too

many recreation functions will let ESNs not ESNs, but more and more like PSNs, and make companies aim of ESNs further away.

Our research also has implications for PSNs development. First, PSNs are not just for fun, especially for people's original participation. In particular at this moment, PSNs have developed to very high level, so we suggest the providers of PSNs strengthen the utilitarian functions of their platforms to attract more and more users to generate contents. Second, PSNs are mostly for fun. When the providers want to add more and more utilitarian functions to PSNs, they should never forget that the biggest value of PSNs for users is to enjoy happiness. Too many utilitarian functions to PSNs maybe make the platforms lose fun, and drive users away. Third, the providers of PSNs should also balance the utilitarian function and the recreation function to get the largest number of users, and enhance the activities of users. The providers of PSNs should give more weight to recreation functions than utilitarian functions, and make utilitarian functions full of fun if possible.

7.3. Limitations and future research directions

Although our study provides meaningful implications to both enterprises and public social networks, it has a few inherent limitations.

Our study is a first empirical study on the comparison of ESNs and PSNs adoption mechanism based on the data from China Mobile. Concerning the characteristics of China Mobile, a state-owned big telecommunication operator, despite of the strong support given by the data to our empirical study, they also bring limitations to our study. Our conclusion may not be suitable for other companies different from China Mobile, such as the ones in West cultures, the ones with small size or middle size, the ones not in IT industry, etc.

Our study just uses micro-blogging services to be one example of SNS. Both Happy Work and Weibo are micro-blogging services. We do not use other SNS formats, such as Blogging service, Forum etc. to test our research results. Thus, we cannot make sure whether the research conclusions are still fit in other SNS formats.

In summary, future research is suggested to investigate the difference of using social networks between Eastern and Western countries, between big companies and small or middle size companies, between IT industry and non IT industries.

Finally, considering the purpose and functionality of establishing ESNs, it is suggested that later scholars can combine both organizational behaviors and leadership theories for developing a relevant research model to investigate how ESNs can be adopted by different companies.

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Appendix

Measurement items

ESNs		
Constructs	Items	Item wording
Perceived playfulness	PP1_a	When using Happy Work Site, I do not realize the elapse of time.
	PP2_a	I feel the contents of Happy Work Site are very attractive to me.
	PP3_a	Happy Work Site provides me with a lot of enjoyment.
Perceived usefulness	PU1_a	Happy Work Site enables me to accomplish my work more quickly.
	PU2_a	Happy Work Site would enhance my work effectiveness.
	PU3_a	Happy Work Site enables me to solve my life troubles quickly.
	PU4_a	Happy Work Site would enhance my life effectiveness.
	PU5_a	Overall, I think Happy Work Site brings benefits to our work.
Action to post	AtP1_a	I express my thought on Happy Work Site.
	AtP2_a	I show my opinion to other colleagues on Happy Work Site.
	AtP3_a	I share my knowledge and information to other colleagues on Happy Work Site.
Action to repost	AtRp1_a	When I read and agree with a post, I repost to other colleagues on Happy Work Site.
	AtRp2_a	When I see useful information (work related) and am willing to share with other colleagues on Happy Work Site, I repost.
	AtRp3_a	When I see useful information (life related) and am willing to share with other colleagues on Happy Work Site, I repost.
Action to follow	AtF1_a	I keep myself updated about company information through the Happy Work Site.
	AtF2_a	I check the postings of my team and department on Happy Work Site.
	AtF3_a	I check the postings of other teams and departments on Happy Work Site.
	AtF4_a	I follow the information related to my life on Happy Work Site.
	AtF5_a	I follow the information related to my work on Happy Work Site.
Action to comment	AtC1_a	I take an active part in the discussion of hot topics on Happy Work Site.
	AtC2_a	I comment on my team and colleagues' postings.
	AtC3_a	I comment on other team and colleagues' postings.
	AtC4_a	I provide useful content on Happy Work Site.

^a All items measured on a five-scale ranging from 1 = “strongly disagree” to 5 = “strongly agree”.

PSNs		
Constructs	Items	Item wording
Perceived playfulness	PP1_b	When using Weibo, I do not realize the elapse of time.
	PP2_b	I feel the contents of Weibo are very attractive to me.
	PP3_b	Weibo provides me with a lot of enjoyment.
Perceived usefulness	PU1_b	Weibo enables me to accomplish my work more quickly.
	PU2_b	Weibo would enhance my work effectiveness.
	PU3_b	Weibo enables me to solve my life troubles quickly.
	PU4_b	Weibo would enhance my life effectiveness.
	PU5_b	Overall, I think Weibo brings benefits to our work.
Action to post	AtP1_b	I express my thought on Weibo public.
	AtP2_b	I show my opinion to others on Weibo.
	AtP3_b	I share my knowledge and information to others on Weibo.
Action to repost	AtRp1_b	When I read and agree with a post, I repost to other colleagues on Weibo.
	AtRp2_b	When I see useful information (work related) and am willing to share with other colleagues on Weibo, I repost.
	AtRp3_b	When I see useful information (life related) and am willing to share with other colleagues on Weibo, I repost.
Action to follow	AtF1_b	I keep myself updated about social information through Weibo.
	AtF2_b	I check the postings of my friends on Weibo.
	AtF3_b	I check the postings of others on Weibo.
	AtF4_b	I follow the information related to my life on Weibo.
	AtF5_b	I follow the information related to my work on Weibo.
Action to comment	AtC1_b	I take an active part in the discussion of hot topics on Weibo.
	AtC2_b	I comment on my following group (people, celebrities or company)'s postings on Weibo.
	AtC3_b	I comment on other (not in my following group) people/events posted on Weibo.
	AtC4_b	I provide useful content on Weibo.

a All items measured on a five-scale ranging from 1 = "strongly disagree" to 5 = "strongly agree".