How Does Social Media Improve Work Efficiency? Insights from the Theory of Communication Visibility

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Completed Research Paper

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Abstract

Social media tools have been increasingly used by employees for internal communication, knowledge sharing, and problem-solving. Despite many studies on knowledge sharing in online settings, little has examined what affects employees' use of social media for work-related knowledge sharing and work efficiency. Drawing on theories of communication visibility and work motivation, this study examines the direct and indirect influence of message transparency and network translucence together with work motivations (i.e., reputation and social networking) on employees' knowledge sharing. We further hypothesize the impacts of message transparency and network translucence on work efficiency. Based on a survey of 259 employees, we find that message transparency positively influences knowledge sharing and work efficiency. Notably, message transparency weakens the impact of reputation on knowledge sharing while network translucence strengthens the effect of social networking on knowledge sharing. The practical and theoretical implications of our findings are discussed.

Keywords: Knowledge sharing; communication visibility theory; work motivation theory, message transparency; network translucence; social media; work efficiency

Introduction

Knowledge exchange is crucial in the workplace, such as improving employees' work performance (Hansen et al. 1999) and innovation (Obstfeld 2005). Employees' job performance not only depends on their own talents but also on reciprocal knowledge sharing and transparent work progress (Davison et al. 2018; Leonardi 2015). In today's increasingly digitized workplace, employees adopt social media to facilitate communication and collaboration, such as affording real-time messaging and file transmission, providing/receiving peer feedback (e.g., commenting and liking), and enabling video meetings (Bizzi 2018). Research shows that 82% of employees believe that social media is conducive to colleague relationships, and 60% agree that it facilitates decision-making processes (Tiago and Veríssimo 2014). Hence, organizations (especially those knowledge-intensive organizations) encourage their employees to publish

work-related knowledge on enterprise social media (ESM) (Rode 2016) and/or in chat groups based on popular social media platforms (e.g., Facebook Groups and WeChat Groups) (Bizzi 2018; Pi et al. 2013).

However, in a competitive work condition, employees may be reluctant to share knowledge in fear of losing their unique value (Brown and Duguid 2001) and being replaced (Huber 2001). Thus, employees tend to hoard their knowledge inherently and guardedly use the content offered by others (Hollingshead et al. 2002). This tendency can also impede knowledge sharing activities on work-related social media platforms. Researchers have explored the ways to overcome such natural barriers from several lenses. First, past research suggests that employees can be incentivized by various rewards (Katzell and Thompson 1990) to share knowledge and increase work productivity (Siemsen et al. 2007), e.g., work efficiency. Another recent stream of research on social media posits that social media makes online communication visible to all users (Leonardi 2015). Communication visibility can increase the accuracy and scope of individual metaknowledge about "*who knows what*" (termed as message transparency) and "*who knows whom*" (termed as network translucence). Such metaknowledge could potentially facilitate social media users' work collaboration and knowledge sharing (Ren et al. 2006). The use of metaknowledge in workplaces can also reduce cooperative conflicts and work duplication (Leonardi 2014). Notably, communication visibility, together with work motivations, may affect employees' knowledge sharing and work efficiency. For example, work-related knowledge sharing shows employees' images of being competent, incentivizing them to contribute more, and perform better. Thus, it could be worthwhile to explore the influences of communication visibility and work motivations on knowledge sharing and work efficiency.

Extant research has generated useful insights into the technological roles of social media use in organizations (e.g., Aral et al. 2013; McAfee 2009; Nisar et al. 2019; Schlagwein and Hu 2017) and individual motivations to share work-related knowledge (Robertson and Kee 2017; Rode 2016; Wasko and Faraj 2005). Yet, it is still unclear how the impacts of employees' work motivations would vary under the affordance by social media features. In particular, social media offers an umbrella of technologies and functions (e.g., chat groups) to achieve communication visibility (Treem and Leonardi 2013), which can lubricate knowledge transfer and acquisition (Leonardi 2015). However, studies did not theorize and empirically examine how such effects deploy in employees' work motivations for knowledge sharing. Work motivations can be fulfilled through financial rewards and social rewards.[1] Given prevalent social rewards for knowledge sharing (e.g., reputation and social networking) (e.g., Wasko and Faraj 2005), communication visibility would interact with social rewards to influence knowledge sharing since the enhanced metaknowledge may improve employee's fulfillment of particular motivations. Furthermore, the theory of communication visibility is a nascent theory mainly documented by qualitative research. Thus, it is worthwhile to know whether and how proposed mechanisms of communication visibility (i.e., message transparency and network translucence) can impact knowledge sharing and work efficiency statistically.

To address these research questions, a survey is conducted in 259 employees from various industries who are using WeChat Groups for work. WeChat is one of the most representative social media. It allows users to publish content (i.e., text, image, video, links, etc.) and send private messages to other WeChat users. Those functions help users build images and maintain relationships with others. Related to this research, WeChat provides a group chat function (WeChat Groups) whereby users can invite colleagues to join in project-specific chat groups for discussion and file transmission. Research suggests that WeChat is the most preferred work-related communication tool in China (Technode 2017). Thus, WeChat Groups is an ideal context to test our model.

Theoretical Background

The Theory of Communication Visibility

Social media makes communications among co-workers even more visible to third parties than previous technologies (Treem and Leonardi 2013). Past research indicated that organizational information could be stored, edited, and retrieved on social media (Schlagwein and Hu 2017). Social media groups, such as WeChat Groups, offer various information-sharing methods, e.g., exchanging knowledge in chat groups,

[1] In the workplace setting, financial rewards are less relevant to social media use and knowledge sharing. We focus on the impacts of social rewards.

making group calls, sharing hyperlinks, and commenting and liking co-workers' postings. Each group member can engage in all communication activities and observe all the corresponding results.

From these insights, Leonardi (2014) developed the theory of communication visibility which posits that social media increases individuals' organizational metaknowledge about "who knows what" (message transparency) and "who knows whom" (network translucence). Specifically, message transparency refers to the degree to which the third-party observers can read conversation participants' messages (Leonardi 2014). In a typical workplace, communications among colleagues or co-workers are largely invisible to others except for the message sender and recipient. For example, the employee might see that two of colleagues were talking to each other or they have frequent interactions, but s/he had no idea about what content they were exchanging unless s/he went over there and eavesdropped. In contrast, with social media groups, people who are not conversation participants can also access shared messages and learn from them.

Network translucence refers to the degree that the third-party observers have an awareness of the existing of others' interpersonal relationship through observing their interactions, but do not exactly know the scope and nature of that relationship (Leonardi 2014). Although people can see others' interactions and discern who knows whom, it is hard to determine the authenticity and strength of their relationships merely based on what they have observed. For example, one employee might see that two colleagues exchanged three messages on WeChat Groups but had no idea whether the two might have private interactions. The observed messages only indicate the existence of a connection but cannot reveal its nature. Therefore, the observed network is partially transparent.

Communication visibility, which consists of message transparency and network translucence, can affect knowledge sharing and work implementation (Leonardi 2015; Ren et al. 2006). Visible communications enable employees to avoid task duplication and increase their work speed by accessing the knowledge and resource that co-workers share in chat groups (Leonardi 2014). Thus, it could improve their work efficiency. Moreover, social media groups empower group members to share workflows, activity status, problems, and even work locations with other members simultaneously and sometimes automatically, offering a communication channel that is convenient and saves employees much time and effort needed. It can also reduce misunderstandings from untimely, inaccurate, or incomplete communications among co-workers. Those visible communication benefits would encourage employees to share their knowledge in social media groups.

In addition, the enhanced metaknowledge from communication visibility might influence the ways employees use social media groups for work-related communications. Unlike associating with someone in private, employees who use social media for work-related communications and knowledge sharing would draw others' attention or initiate relationships with whom they have no personal interactions before (DiMicco et al. 2008). However, message transparency can help employees contextualize projects from past messages. They may regard such passive exposure to others' communications as a disturbance, which would negatively influence their work progress. Employees may be reluctant to engage in social media groups. Thus, an in-depth understanding of how message transparency and network translucence affect employees' knowledge sharing and work efficiency is needed.

Work Motivation and Knowledge Sharing

It is essential to understand the fundamental mechanisms motivating employees to share knowledge in social media groups and what antecedents of such behaviors are (Jin et al. 2015). Knowledge is sticky such that it is internalized in individuals and regarded as employees' private assets (Bock et al. 2005). Therefore, individuals would share what they know only when they have adequate incentives to do so.

Motivation is the reason why an individual's actions take place (Ryan and Deci 2000). It is a psychological driver affecting employees' behaviors in an organizational setting. From the perspective of individuals' effort and persistence levels, motivations can heighten ones' willingness to expend efforts and persist to achieve a goal (Lee et al. 2005). Work motivation theory has been widely used to explain employee behaviors (Siemsen et al. 2007). Research indicated that social rewards could motivate employees' organizational behaviors (Katzell and Thompson 1990; Siemsen et al. 2007). In our context of knowledge sharing, we identify two particular social rewards as important work motivations, namely the desire for reputation (Wasko and Faraj 2005) and the desire to broaden and maintain social networking (Florenthal 2015; Krasnova et al. 2017).

Reputation emerges in interpersonal interactions, referring to an image that an employee cultivates and manages (Huang et al. 2011). In the workplace, a good reputation is a critical intangible asset that employees would want to establish (Jones et al. 1997; Wasko and Faraj 2005). Employees build up their reputation through winning colleagues' and leaders' recognitions, in the way of approval, trust, dignity, and respect (Wasko and Faraj 2005). Stuebs and Sun (2010) surveyed a sample of highly reputable firms and demonstrated that a good reputation could improve job efficiency and job productivity. Thus, the importance of achieving a good reputation could drive employees to share what they regard to be beneficial for the work team on social media as this would make their expertise and roles more visible, leading others to recognize their contributions.

Another important work motivation could be social networking. Social networking refers to the width and depth of social connectedness in an organization, indicating an individual's structural position in the network (Wasko and Faraj 2005). An individual's social networking contains several elements, such as interpersonal trust, reciprocal obligation, and harmony (Davison et al. 2018). Individuals have inner needs for social networking (Ryan and Deci 2000). Employees who enjoy owning a broader social network intend to share more on social media (Toubia and Stephen 2013). Also, broader social networking can increase the reach of the intended messages or information and motivate employees who have the social network to share knowledge in social media groups. It is expected that both reputation and social networking can motivate employees to share knowledge and hence affect work efficiency. Yet, it is unclear how the two work motivations will interact with communication visibility to affect knowledge sharing and work efficiency.

Research Model and Hypotheses

Integrating the communication visibility theory and work motivation theory, we propose our research model shown in Figure 1. We develop the hypotheses in the following sections.

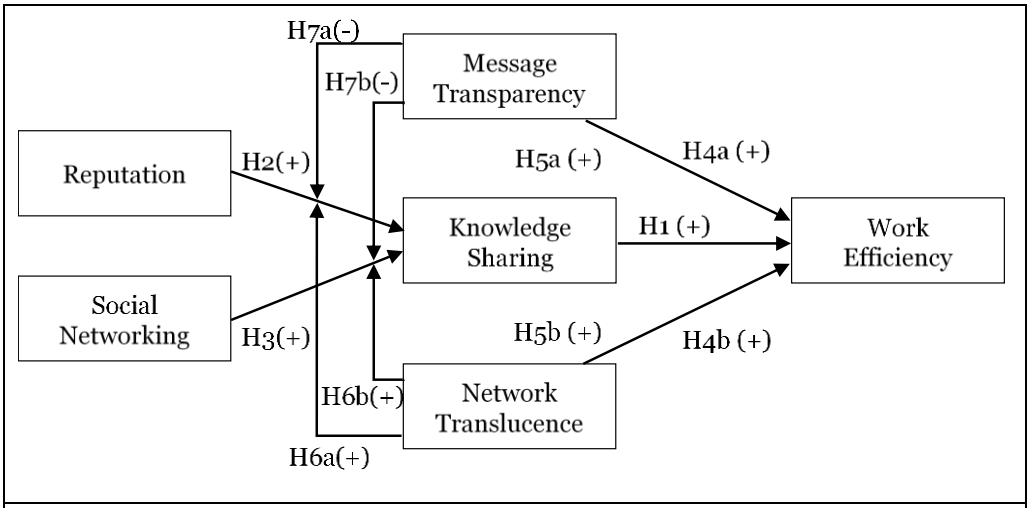

Figure 1. Research Model

Knowledge Sharing and Work Efficiency

Knowledge sharing refers to the activity of exchanging personal knowledge with other members within an organization (Ryu et al. 2003). Organizations often offer various communication channels to encourage internal communications among employees (Kline and Alex-Brown 2013). Mäntymäki and Riemer (2016) identified five goals of using social media in the workplace: problem-solving, event updates, task management, work discussion, and informal conversation. Visible work-related knowledge empowers employees to interact conveniently and avoid unnecessary waiting time and duplicated work, which supports business alignment and agility, and hence improves employees' task achievement (Leftheriotis and Giannakos 2014).

According to knowledge management literature, the effective use of enterprise resource can enhance both organization and individual's competitive advantage (Newell et al. 2003). Establishing a workgroup on

social media can gather together every single person's knowledge, expertise, and viewpoints. Prior research suggests that collective work can help overcome individual limitations, especially for subjective or innovative tasks which require employees to brainstorm (Levine and Moreland 1990). An individual might not be equipped with all task-required knowledge and skills, while a group of employees is more likely to have the complete skill set for accomplishing tasks well (Zhu et al. 2014).

Past literature indicates that knowledge sharing benefits not only knowledge seekers and free-riders but also contributors (March 1991). Helping others solve problems can stimulate the knowledge contributor to be more responsible and explore one task domain (Zhu et al. 2014). For example, knowledge stickiness makes knowledge transfer difficult, but knowledge sharing requires participants to have the ability to seek, understand, and express knowledge (Leonardi and Meyer 2015). Thus, high-output employees would continually learn to develop metaknowledge and skills, which is called "learn how to learn" (Zhu et al. 2014). This ability might help employees to improve their work productivity and efficiency over time. Thus, we hypothesize:

H1: Knowledge sharing is positively related to an employee's work efficiency.

Social Rewards

Sharing knowledge via social media seems paradoxical. Knowledge contributors might lose unique value when helping all others except themselves (Thorn and Connolly 1987). Prior literature explored this question from various lenses. One typical perspective is that as an exchange, sharing knowledge can bring contributors something in return, e.g., social rewards (respect, recognition, and status) (Wasko and Faraj 2005). Social rewards usually accrue to individuals who zealously help others and frequently participate in prosocial activities (von Hippel and von Krogh 2003). This argument suggests that employees being socially rewarded by participating in knowledge sharing will actively share more knowledge.

Reputation is an important social reward that employees are eager to have (Jones et al. 1997). Prior studies found that individuals who value reputation will respond more positively to others' questions (Kankanhalli et al. 2005; Wasko and Faraj 2005). In the workplace, employees are motivated to give their advice and knowledge to others if they want a prestigious image among or respect from colleagues and leaders (Constant et al. 1994). Thus, we expect that employees will behave more actively in work-related activities, such as sharing knowledge, if they place a higher value on their reputation.

H2: Reputation is positively related to an employee's knowledge sharing.

Besides reputation, employees may also expect to build or expand their own social networking. Past literature suggests that social networking is predictable for individual behaviors (i.e., knowledge sharing) (Burt 2009). One stream of research indicates that a larger social network allows a broader reach of a message to network members. Individuals tend to enjoy owning a large social network and the feeling of influencing members in their network (Toubia and Stephen 2013). This will motivate individuals to share more in order to build and expand the social network. Another line of research suggests that employees who are centrally embedded in a social network are more likely to develop the sense of cooperation and comply with team goals (Siemsen et al. 2007; Wasko and Faraj 2005). They are more likely to share knowledge. Both lines of literature concur that employees who value social networking are more likely to share knowledge. Thus, we hypothesize:

H3: Social networking is positively related to an employee's knowledge sharing.

Communication Visibility, Knowledge Sharing, and Work Efficiency

Communication visibility affects work efficiency through metaknowledge enhancement and redundancy avoidance. Social media technologies afford communication visibility, which allows individuals to acquire metaknowledge (Leonardi 2014). Accurate organizational metaknowledge, being increased through message transparency and network translucence, is helpful for employees to make full use of available knowledge into recombinant innovation and work duplication reduction (Leonardi 2014).

Message transparency allows employees to learn from others' messages vicariously and create a shared memory of each co-worker's expertise. As a result, they can turn to the right person promptly when relevant problems occur (Leonardi 2015). Being able to observe others' activities and work history, employees

enhance their metaknowledge about who is professional in one specific realm (Kane et al. 2014). This plays a critical role in their knowledge management and task achievement (Subramaniam et al. 2013). Thus, we expect:

H4a: Message transparency is positively related to an employee's work efficiency.

In addition, network translucence enables observers to develop a cognitive structure about co-workers' social networks within an organization. Informants from Leonardi (2014) admitted that social media allows them to be aware that "who knows whom" and "who knows who knows whom," which could help them acquire an introduction or endorsement to someone they did not know previously. The understanding of others' social networks will ease knowledge transfer (Leonardi and Meyer 2015) and can offer knowledge seekers more favors outside their current social circles and improve work efficiency. Thus, we expect:

H4b: Network translucence is positively related to an employee's work efficiency.

Communication visibility could affect knowledge sharing (Leonardi and Meyer 2015). First, from the perspective of transactive memory, employees share work-related knowledge on internal communication platforms, which builds up a transactive memory system (Ren et al. 2006). Any employee can encode, store, edit, and retrieve knowledge from the transactive memory system for job-related tasks. Such a shared transactive memory will help employees to understand what they can contribute to projects. Second, employees' behaviors on this system are visible to all members owing to the message transparency and network translucence mechanisms afforded by social media groups. Any pro-organizational behaviors will be amplified and broadcasted to anyone in the chat group. In addition, communication visibility smoothens workflow and work adjustment. A broadcast message enables employees to reach anyone in the chat group. Thus, people can observe the whole work course and understand what happened. Therefore, employees might choose to share knowledge in a condition of high message transparency and network translucence. Thus, we expect:

H5a: Message transparency is positively related to an employee's knowledge sharing.

H5b: Network translucence is positively related to an employee's knowledge sharing.

Communication visibility can visualize an employee's effort and capacity and provide the chance of building a social network with like-minded or related employees. According to work motivation theory (Katzell and Thompson 1990), such features can arouse the importance of work motivation on employees' pro-organizational behaviors.

We posit that the strength of impacts might be contingent on the communication visibility mechanisms afforded by social media. Specifically, network translucence enables employees to have a more precise identification of co-workers' interpersonal relationships with one another through the use of social media (Leonardi 2015). In this case, knowledge providers can obtain a higher gratification from social rewards (i.e., reputation and social networking). On the one hand, communication visibility can amplify the competence of knowledge providers by showing who they have helped and the potential gratification and endorsement from knowledge seekers in the future. This will increase the utility of a good reputation.

Moreover, observers' social cognition about "who knows whom" and "who knows who knows whom" helps to expand their reach to the network of the sharing employees (Treem and Leonardi 2013). This may arouse the importance of such social rewards. Notably, the increasingly translucent social networks among co-workers can reduce observers' uncertainty on ambient awareness (Leonardi 2015). Observers will have more confidence in sharing useful knowledge in exchange for social rewards that they value. Therefore, employees who desire for social rewards (i.e., reputation and social networking) are more likely to share knowledge on social media affording a more translucent network than less. Thus, we expect:

H6: The effect of (a) reputation and (b) social networking on an employee's knowledge sharing will be stronger when the employee perceives the network translucence to be high as opposed to low.

In contrast, we argue that message transparency may weaken the effect of perceived social rewards on knowledge sharing. Past research (Higgins 1998) suggests that individual behavior is motivated by two basic self-regulation systems, promotion- and prevention-focused self-regulation (Keller et al. 2015). Promotion-focused self-regulation articulates an individual's motivation to reach gains, while prevention-focused explains the motivation to avoid loss. People with different types of self-regulation behaves differently. For example, Acharya et al. (2016) found that managerial employees, already enjoying greater

social rewards, are usually self-insured and risk-averse. In general, employees who are reputable and in a high status tend to pursue personal achievement and protect what they already have, rather than investing much time and effort in sharing for earning additional social rewards. A high level of message transparency indicates that an employee's postings may be under scrutiny by a group of observers larger than expected. This might be disruptive for their work.

Moreover, an overly transparent communication environment might lead employees to be more cautious in self-presenting and avoid knowledge sharing. Message transparency allows employees to discern others' job responsibility and expertise, which will straightly facilitate their conversations but might also circuitously reduce their enthusiasm for sharing. Let's imagine the context of someone seeking for suggestions in a chat group. Observers might believe that more knowledgeable people would respond with a better idea and solution. In order to protect their reputation, reputable employees may hesitate to share knowledge to avoid giving incorrect or immature advice, which might damage their reputation within an organization. Also, some employees post overloaded, unconvincing, or superfluous information in chat groups (Pozin 2014). Each piece of message discriminately exposes to group members, which will make work-related communication less effective. As a result, message transparency may bring more pressure and extra work for finding useful knowledge. Concluding the above arguments, message transparency might weaken the positive effect of social rewards on knowledge sharing behavior. Specifically, we hypothesize:

H7: The effect of (a) reputation and (b) social networking on an employee's knowledge sharing will be weaker when the employee perceives the message transparency to be high as opposed to low.

Research Methodology

We employed a survey methodology to collect data for examining our research hypotheses. We select this methodology for its advantage in generalizing results (Bryman 2016).

Operationalization of Constructs

Table 1 shows the construct definitions, and Table 2 shows the construct measurement. Where available, constructs definition and measurement items were adapted from prior research. Elsewhere, we developed new items for message transparency and network translucence based on a review of prior communication visibility literature. Given that items for measuring the constructs were adapted from various research or developed for our research, all items were subjected to a two-stage conceptual validation (Moore and Benbasat 1991). Four graduate students engaged in the first stage (unstructured sorting) and another four participated in the second stage (structured sorting) as sorters. Results from the unstructured sorting stage showed 89% of the agreement rate. We reworded five items and removed two items as suggested. In the second stage, all sorters classify all items into targeted categories correctly. Finally, 22 items were consolidated into the instrument for survey administration.

Table 1. Construct Definitions

Construct	Definition
Knowledge Sharing (KSH)	The degree to which one engages in the knowledge sharing activity on WeChat Groups for work purpose (Bock et al. 2005).
Work Efficiency (WEF)	The perception of individuals' performance on job-related tasks in the level of quantity and quality (Janssen and Van Yperen 2004).
Reputation (REP)	The perceived importance of individuals' image or status within an organization (Wasko and Faraj 2005).
Social Networking (SNE)	The perceived importance of social connectedness with others within an organization (Chiu et al. 2006).
Message Transparency (MTR)	The awareness of knowing "who knows what" (Leonardi 2014).
Network Translucence (NTR)	The awareness of knowing "who knows whom" (Leonardi 2014).

Table 2. Operationalization of Constructs		
How much do you agree with the following statement? (strongly disagree 1 to strongly agree 7)		
Construct	**Item Code and wording**	**Source**
Knowledge Sharing	KSH1: I share work progress and official documents with others via WeChat Groups	Adapted from Choi et al. (2010)
	KSH2: I give suggestions and ideas to members who have problems involving work via WeChat Groups	
	KSH3: I share experience or know-how from work with others via WeChat Groups	
Work Efficiency	WEF1: WeChat Groups helps me advance the state of task by avoiding replicated work	Adapted from Janssen and Van Yperen (2004)
	WEF2: I finish my tasks fast with the help of WeChat Groups	
	WEF3: The knowledge sharing on WeChat Groups helps me save time or effort spending on my tasks	
Reputation	REP1: It is important to earn respect from others by participating in WeChat Groups for work	Adapted from Kankanhalli et al. (2005) and Wasko and Faraj (2005)
	REP2: I value my status in WeChat Groups for work	
	REP3: It is important to improve reputation in WeChat Groups for work	
	REP4: Members who participate in WeChat Groups for work want to have more prestige than those who do not	
Social Networking	SNE1: It is important to maintain close social relationships with co-workers via WeChat Groups	Adapted from Chiu et al. (2006)
	SNE2: It is important to bond with co-workers via WeChat Groups	
	SNE3: It is important to contact co-workers via WeChat Groups	
	SNE4: I value the personal contact with co-workers via WeChat Groups	
Message Transparency	MTR1: WeChat Groups enables me to access the chat history of other colleagues	Developed based on Leonardi (2014)
	MTR2: WeChat Groups enables me to receive documents that other members transfer in the chat group or Moments	
	MTR3: WeChat Groups enables me to read the messages delivered by other members in the chat group or Moments in detail	
	MTR4: WeChat Groups enables me to obtain the files other members shared in the chat group or Moments	
Network Translucence	NTR1: WeChat Groups enables me to know the connections of other team members through such as the @, comment, and like functions	
	NTR2: WeChat Groups enables me to have the perception of other team members' interpersonal relationships	
	NTR3: WeChat Groups enables me to identify the group members someone might know through their communications	
	NTR4: WeChat Groups for work enables me to know who has a close work relationship with another team member	

Survey Administration

We carried out an anonymous online survey in WeChat. We first translated our questionnaire into Chinese in case of misunderstanding. We invited three New Zealand Ph.D. students whose mother tongue is Chinese

to check the coherence and consistency of translation. Two Chinese students helped test the time to complete the survey. We used the snowball sampling method. The survey URL was first sent to the authors' WeChat friends who are working in various companies, and those friends then forwarded the URL to their friends and colleagues. We used a binary question to screen respondents, i.e., "*If you have at least one WeChat chat group for work purposes*." Only respondents who answered "Yes" to this question proceeded to the survey questions. Each WeChat account is permitted to access the survey only once.

The survey was conducted over a period of one week. 313 employees responded to this survey. To ensure the validity of responses, we deleted all responses, which were finished less than 1.5 minutes. Finally, 259 valid responses remained, yielding a validity rate of 82.7%. Descriptive statistics of our respondents (see Table 3) show that most of them are post-90s (12.4%), the 80s (71.4%), and the 70s (13.1%) generations. 89.2% of respondents achieved bachelor and above degrees. Over half (57.5%) of them are ordinary employees. The number of chat group members looks evenly distributed.

Table 3. Demographics of Respondents

Demographic Variables		Count	%	Demographic Variables		Count	%
Gender	Male	116	44.8	Position	Ordinary employee	149	57.5
	Female	143	55.2		Group Leader	38	14.7
Age	<18	0	0		Manager	25	9.7
	18~25	32	12.4		Senior or Executive Director	34	13.1
	26~35	185	71.4		Undisclosed	13	5.0
	36~45	34	13.1	Number of the chat group members	<10	35	13.9
	>45	8	3.1		11~20	44	17.0
Education	Diploma or below	28	10.8		21~50	61	23.6
	Bachelors	139	49.8		51~100	49	18.9
	Masters	93	35.9		101~200	26	10.0
	Ph.D.	9	3.5		201~500	43	16.6
Work experience	<= 3 years	87	33.6				
	4~6 years	99	38.2				
	7~9 years	14	5.4				
	>9 years	59	22.8				

Data Analysis and Results

Partial Least Squares (PLS) was employed to analyze the survey data and test the hypotheses and the proposed model (Jöreskog and Wold 1982). We used Smart PLS 3.0 software to perform the data analysis and Partial Least Squares Structural Equation Modelling (PLS-SEM) to test our model.

Instrument Validation

Results of exploratory factor analysis are shown in Table 4. We identified six factors with eigenvalues greater than 1.0. When compared across factors, all items loaded highest onto corresponding constructs, indicating convergent validity. Together, all six factors explained 76.61% of the total variance. As for confirmatory factor analysis (see Table 5), we tested the content validity and convergent validity. Convergent validity was assessed with three indicators: Cronbach's α (CA), Composite Reliability (CR) and Average Variance Extracted (AVE). Table 5 shows that CA and CR are greater than 0.7 and AVE is greater than 0.5, suggesting a decent convergent validity.

Table 4. Exploratory Factor Analysis Results

	KSH	WEF	REP	SNE	MTR	NTR
KSH1	0.67	0.34	0.13	0.05	0.13	-0.03
KSH2	0.78	0.31	0.13	0.13	0.17	-0.03
KSH3	0.80	0.17	0.25	0.19	0.11	0.20
WEF1	0.28	0.75	0.12	0.15	0.25	0.00
WEF2	0.27	0.82	0.23	0.14	0.17	0.11
WEF3	0.22	0.83	0.18	0.28	0.11	0.15
REP1	0.13	0.15	0.84	0.22	0.19	0.07
REP2	0.19	0.18	0.87	0.21	0.11	0.17
REP3	0.21	0.20	0.86	0.16	0.12	0.16
REP4	0.18	0.13	0.82	0.15	0.12	0.16
SNE1	0.18	0.21	0.27	0.73	0.31	0.20
SNE2	0.18	0.20	0.21	0.83	0.28	0.08
SNE3	0.14	0.22	0.23	0.83	0.23	0.19
SNE4	0.17	0.19	0.21	0.63	0.10	0.38
MTR1	0.17	0.13	0.08	0.22	0.81	0.25
MTR2	0.17	0.15	0.19	0.23	0.80	0.25
MTR3	0.09	0.16	0.21	0.13	0.74	0.26
MTR4	0.11	0.19	0.10	0.19	0.82	0.16
NTR1	0.03	0.24	0.12	0.23	0.30	0.68
NTR2	0.11	0.12	0.16	0.13	0.10	0.88
NTR3	0.07	0.03	0.11	0.15	0.27	0.87
NTR4	0.08	0.06	0.13	0.12	0.23	0.87

Table 5. Results of Convergent Validity Testing

Construct	CA	CR	AVE
KSH	0.851	0.900	0.694
WEF	0.917	0.942	0.802
REP	0.942	0.958	0.851
SNE	0.913	0.939	0.796
MTR	0.912	0.938	0.791
NTR	0.916	0.941	0.800

Discriminant validity reflects the extent to which factors are significant and unrelated to other constructs. It can be verified by the square root of each factor's AVE when it is higher than the value of its correlations with others, and structure loadings are higher on the corresponding structures than on others. We assessed by evaluating the indicator-factor loadings and AVEs with inter-construct correlations (Straub et al. 2004). Results in Table 6 show that all correlation coefficient is less than 0.6, and the square root of AVE for each construct (diagonal terms) are larger than inter-construct correlations (off-diagonal terms). Also, variance inflation factors (VIFs) were less than 3, suggesting that multi-collinearity is not a problem. Hence, we have established the construct discriminant validity.

Table 6. Correlations

	1	2	3	4	5	6	7	8	9	10	12	13
1. Gender	—											
2. Age	-0.16	—										
3. Edu.	0.12	0.10	—									
4. W.exp	-0.20	0.69	-0.24	—								
5. Pos.	-0.12	0.38	-0.10	0.48	—							
6. Num.	-0.01	0.13	-0.10	0.09	0.06	—						
7. KSH	-0.04	0.17	-0.08	0.16	0.24	0.00	0.84					
8. WEF	0.00	0.04	-0.06	0.07	0.12	-0.10	0.59	0.90				
9. REP	-0.04	-0.05	-0.07	-0.02	0.14	0.02	0.51	0.48	0.92			
10. SNE	0.07	0.00	-0.07	0.02	0.05	-0.09	0.50	0.57	0.56	0.89		
11. MTR	0.24	-0.04	0.05	-0.05	0.05	-0.08	0.42	0.49	0.43	0.59	0.89	
12. NTR	0.09	-0.04	-0.11	0.02	0.08	-0.03	0.34	0.39	0.39	0.51	0.55	0.90

Note: Diagonal elements are the squared root of AVE of each construct

Hypothesis Testing

We employed a PLS analysis to test all hypotheses. The constructs were added in hierarchical steps of control variables first, and then main effects, followed by interaction terms, as suggested in prior studies (Dawson and Richter 2006; Jaccard and Turrisi 2003). Table 7 shows that the path coefficients and explained variances for the proposed model. Results show that *knowledge sharing* (H1), and *message transparency* (H4a) positively affect *work efficiency*. The results also indicate that *reputation* (H2), *social networking* (H3), and *message transparency* (H5a) significantly impact *knowledge sharing*. However, we did not find significant effects of *network translucence* on *knowledge sharing* and *work efficiency*, i.e., H4b and H5b were not supported. Furthermore, results show that *network translucence* significantly enhances the relationship between *social networking* and *knowledge sharing* (H6b) but has no moderating effect on *reputation* (H6a). Thus, H6b was supported, and H6a was not. *Message transparency* negatively moderates the effect of *reputation* on *knowledge sharing* (H7a) but does not moderate the effect of *social networking* on *knowledge sharing* (H7b). Thus, H7a was supported while H7b was not.

Table 7. Hypothesis Test

Variables	DV = Work Efficiency		DV= Knowledge Sharing		
Control	Model 1	Model 2	Model 1	Model 2	Model 3
Gender	0.02 (0.07)	-0.06 (0.05)	0.01 (0.01)	-0.04 (0.05)	-0.04 (0.05)
Age	0.01 (0.09)	-0.04 (0.08)	0.1 (0.08)	0.14* (0.07)	0.14* (0.07)
Edu.	-0.07 (0.07)	-0.02 (0.06)	-0.08 (0.06)	-0.04 (0.05)	-0.03 (0.05)
W.exp	0.02 (0.09)	0.04 (0.07)	-0.02 (0.08)	0.00 (0.07)	-0.00 (0.07)
Pos.	0.11* (0.06)	-0.02 (0.05)	0.20** (0.06)	0.12* (0.05)	0.12* (0.05)
Num.	-0.12* (0.07)	-0.08+ (0.05)	-0.03 (0.06)	0.00 (0.05)	0.00 (0.05)
KSH		0.46*** (0.07)			
MTR		0.26** (0.08)		0.16* (0.09)	0.13* (0.09)
NTR		0.09 (0.07)		0.02 (0.07)	0.02 (0.07)
REP				0.29*** (0.08)	0.31*** (0.08)

SNE				0.23** (0.10)	0.28** (0.10)
*MTR * REP*					-0.17* (0.10)
*MTR * SNE*					0.02 (0.10)
*NTR * REP*					0.04 (0.08)
*NTR * SNE*					0.14* (0.09)
R^2	0.030	0.439	0.073	0.390	0.421
ΔR^2		0.409		0.319	0.031
Note: One-tailed test, * p<0.05, **p<0.01, *** p<0.001					

To further interpret the interaction effects, we employed moderation plots and threshold analysis. The relations between IVs and DV at high and low levels of one of the moderators can be plotted separately (Jaccard and Turrisi 2003). These plots specify the interaction effect and the direction of variation. For H6b, Figure 2a illustrates the interaction effect of SNE and NTR on knowledge sharing. This indicates that the effect of social networking on knowledge sharing is stronger for those who perceive a high than a low level of network translucence. In other words, network translucence strengthens the relationship between social networking and knowledge sharing. Thus, H6b was supported.

For H7a, Figure 2b shows the interaction effect of REP and MTR on knowledge sharing. It indicates that the effect of message transparency on knowledge sharing is stronger under a low level of perceived reputation than a high level. However, as for employees who achieve a rather high reputation from using WeChat Groups for work, knowledge sharing is higher with a lower level of message transparency. In other words, message transparency attenuates the effect of reputation on knowledge sharing. Thus, H7a was supported.

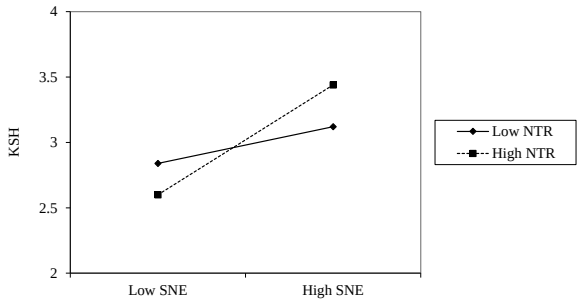

Figure 2a. Interaction Effect of NTR on the Relationship between SNE and KSH

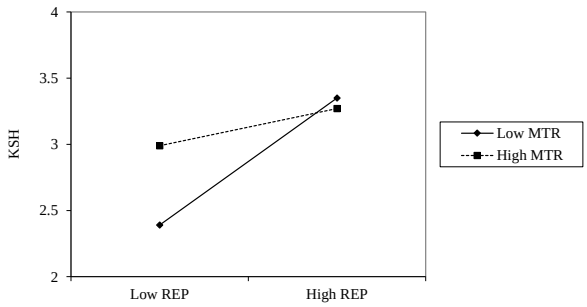

Figure 2b. Interaction Effect of MTR on the Relationship between REP and KSH

Discussion and Implications

Discussions of Findings

There are several important findings from our study. A salient result is that knowledge sharing and communication visibility in terms of message transparency and network translucence are key determinants of employees' work efficiency. Thus, knowledge and accurate metaknowledge can improve work efficiency. Our results confirm that individuals' expectation of social rewards (reputation and social networking) significantly impact their knowledge sharing behavior. Another notable finding is related to the differential roles of the two mechanisms of communication visibility on knowledge sharing. Specifically, only message transparency has a positive effect on knowledge sharing and work efficiency. Thus, message transparency rather than network translucence affects employees' knowledge sharing behavior. There could be three reasons for this result. First, members in a chat group are colleagues or co-workers whose task responsibilities are mostly known exante, even if there is no social media to present expertise. However, *message transparency* helps them understand others' skills better. Second, even without social media

groups, employees within an organization usually know about each other. The metaknowledge about who knows whom, from *network translucence*, cannot add significant value to employees. Third, the inner nature of co-workers' networks is less transparent than their messages. Thus, even though network translucence increased observers' organizational metaknowledge, such enhanced metaknowledge may reduce their concern substantially.

Further, there exist interaction effects between communication visibility and social rewards on knowledge sharing. In accord with H6b and H7a, *message transparency* weakens the positive relationship between *reputation* and *knowledge sharing*, while *network translucence* strengthens the relationship between *social networking* and *knowledge sharing*. However, *message transparency* did not moderate the effect of *social networking* on *knowledge sharing*, and *network translucence* did not moderate the effect of *social networking*. These insignificant effects could be because that the interaction effects have been diluted by the main effects. Furthermore, it is possible that message transparency can afford the visibility of employees' task performance while network translucence can afford the disclosure of social interactions and hidden connections. Therefore, employees' reputation was likely to be related with the visibility of past performance (*message transparency*), while the effects of social networking were likely to be changed in view of cues for employees' socialization (*network translucence*).

Limitations and Future Research

This research should be interpreted in light of its limitations. First, we collected the data from one popular social media (i.e., WeChat). Results might not be feasible for all companies. Furthermore, some survey respondents indicated that they utilize both ESM (e.g., DingTalk[2]) and WeChat Groups together. They use the former to share formal and confidential documents, while the latter to perform routine work communications. Thus, it would be meaningful to test the robustness of the results by replicating this proposed model across ESM. Second, we conducted this study with respondents from China. Findings should be carefully interpreted when being generalized to countries with different economic status, culture, and IT infrastructure. Third, a new perspective is needed to start the use of social media for work purposes. For example, although respondents answered all questions in the working context, employees' social networking improved through WeChat may still include non-work relationships. Thus, future research may consider the impacts of formal and informal social networking. Additionally, people are using social media dynamically for its echo chamber effect (Barberá et al. 2015), which might also be enhanced by communication visibility. It would be worthwhile to investigate how communication visibility influences employees' proper use of social media and behavioral dynamics.

Implications for Research

Our research contributes to the literature in several ways. First, this study contributes to the communication visibility theory by empirically validating the hypothesized relationships between communication visibility and knowledge sharing and work efficiency, and extends the theory by exploring new relationships. Leonardi et al. (2013) identified the affordance of ESM on facilitating communicative activities within organizations, and then Leonardi (2014) suggested that social media affords communication visibility through two interrelated mechanisms: message transparency and network translucence. Leonardi (2015) found that the two types of communication visibility improved observers' metaknowledge accuracy, which might increase their innovation. This study takes a further step by theorizing the direct and interactive impacts of message transparency and network translucence on knowledge sharing and work efficiency. Furthermore, with a dominance of conceptual research on this theory, our study contributes by empirically validating such effects. Our study extends the theory of communication visibility by only finding the direct impacts of message transparency on knowledge sharing and work efficiency.

Second, this study advances the theory of communication visibility by identifying contingent moderation effects of message transparency and network translucence on knowledge sharing. In particular, we find that network translucence enhance the positive relationship between social networking and knowledge sharing, but message transparency attenuates the positive relationship between reputation and knowledge sharing.

[2] https://www.dingtalk.com/

Such differential moderation effects improve our understanding of this theory and pave the way for further research to validate this theory in various other contexts.

Third, our results add to the organizational knowledge management literature, which suggests that employees' social rewards have a significant influence on knowledge sharing behavior (Rode 2016). Specifically, we identified two work motivations that influence employees' knowledge sharing. We studied the impact of perceived importance of reputation and social networking on employees' activities of sharing work-related knowledge and demonstrated their strong influence. Our research indicated that good reputation and social networking significantly drive employees to share more knowledge in social media groups.

Implications for Practice

From a pragmatic perspective, our study provides insights to developers that popular social media should not be limited to perfect the function of recreation or sociability but also work-related functions. Results demonstrated that it is meaningful to design more functions to strengthen message transparency and network translucence, which will improve work efficiency directly and indirectly. Even though network translucence cannot motivate employees to share knowledge with co-workers or to assist people, it performs well in enhancing the effect of social networking on knowledge sharing.

Second, our research indicates that employees use social media, e.g., WeChat Groups, differently. Results illustrated that reputation and social networking are powerful motivations for employees to share knowledge. Moreover, the effective use of WeChat Groups is also beneficial for work efficiency due to its communication visibility features, especially message transparency. WeChat Groups empower employees to discern "who knows what" and "who knows whom" which helps create metaknowledge and avoid redundancy in work. Assessing two sets of moderation effects, we find that reputable employees are less motivated to share knowledge via WeChat Groups under a high level of message transparency. Thus, organizations and the platform should consider more about their requirements to motivate them to share. In addition, employees can make use of the network translucence mechanism of WeChat Groups to help them share knowledge for broadening social networking.

Conclusion

This study is motivated by the fact that a considerable number of employees are using social media for work, while limited studies have explored the influence of popular social media (e.g., WeChat) use on knowledge sharing and work efficiency. Nascent social media related theories and functionalities are interesting but lack empirical examination. To fill this gap, this research built a theoretical model based on the communication visibility theory and work motivation theory to assess how social rewards and communication visibility would encourage employees to share knowledge, how communication visibility mechanisms influence their work efficiency, as well as how communication visibility mechanisms interact with social rewards to affect knowledge sharing. Our research findings indicated that social rewards (reputation and social networking) and message transparency motivate employees to share knowledge via social media groups, and message transparency can improve work efficiency to an extent. Findings also illustrated that message transparency and perceived importance of reputation interact to attenuate knowledge sharing, but network translucence and social networking interact to increase knowledge sharing. These findings not only enlighten future research on social media use for work but also inform practitioners on how to design and implement social media for work communications to promote knowledge sharing and work efficiency.

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