Master Thesis

An Empirical Investigation of Personal and Social Factors on Knowledge Sharing in China

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Abstract

Knowledge sharing is widely recognized that it can promote the competitive ability of an organization and it has been the focus of research for more than a decade. Recently, there has been a growing interest in examining the factors that support or hinder one's knowledge sharing behavior. However, still very few studies examined them from both personal and social perspective. Moreover, in comparison with other countries, relatively little work on this topic has been done in the Chinese context. In order to deepen our understanding of the personal and social factors that increase or lessen employee's knowledge sharing behavior in Chinese context, we developed a theoretical model to explain it in this study. The Theory of Reasoned Action and Social Exchange Theory are used in this study, as are the social information processing theory. Through a survey of 136 employees from five IT companies in China, we confirmed our hypothesis that attitude toward and subjective norms regarding to knowledge sharing affected individuals' intentions to share knowledge. We also found that subjective norms and anticipated reciprocal relationship had a positive effect on individuals' attitudes toward knowledge sharing while loss of knowledge power had a negative effect on individuals' attitudes toward knowledge sharing. Moreover, both identification and compliance affected subjective norms regarding to knowledge sharing. Theoretical and practical implications, as well as directions for future research, are discussed.

Chapter 1 Introduction

This chapter will provide the reader with an insight into the research area of the thesis. The chapter starts with a brief description of the importance of knowledge and knowledge sharing, followed by the goal and the theories of the research. Finally, an introduction of research context and approach are stated.

Nowadays, the knowledge becomes a key factor that can help organizations to sustain competitive advantages in unstable environments. However, knowledge resides within individuals (Nonaka & Konno, 1998) and, more specifically, in the employees who create, recognize, archive, access, and apply knowledge while carrying out their tasks. Consequently, the movement of knowledge across individual and organizational boundaries, into and from repositories, and into organizational routines and practices is ultimately dependent on employees' knowledge sharing behaviors. Knowledge sharing is critical to organizations that wish to use their knowledge as an asset to achieve competitive advantage. So the notion of knowledge sharing has attracted much attention from both researchers and practitioners.

This research seeks to deepen our understanding of the personal and social factors that increase or lessen employee's tendencies to engage in knowledge sharing behavior. Since knowledge sharing behaviors are likely to be influenced not only by personal motivations but also by contextual forces (Yoo & Torrey, 2002), we will apply a theoretical frame in which personal factors (social exchange theory) and social factors (social influence) are integrated with the Theory of Reasoned Action (TRA). The TRA has been adopted by many researchers who investigate knowledge sharing behaviors since it can be used to forecast many kinds of people's behavior (Bock & Kim, 2002;Clark & Soliman, 1999;Lin, 2007).

When considering personal factors, it has been suggested that costs and benefits are both important factors affecting knowledge sharing. In addition, rational people will consider the outcomes of an action (such as knowledge sharing) before deciding how to behave, so we will also apply Social Exchange Theory (Homans, 1961) to measure the effect of cost and benefit on attitudes towards knowledge sharing.

When considering social factors, social information is important for people within a workgroup because team members collect cues on what others do and opinion what

others think to guide their behavior. The employee's knowledge sharing behaviors with the sources of social information is a form of this pro-social behavior. And we argue that one's behavior of knowledge sharing is changed because of environmental conformity which is brought about from social pressures. For example, a workgroup with cooperative norms may invoke individual members' helping behavior (e.g., knowledge sharing). Therefore, we will also apply Social Information Processing Theory (SIP) (Salancik, 1978) to measure the social influence on subjective norms towards knowledge sharing.

This research is performed within five IT companies in China, and each company has around 50 employees. We have chosen to use a critical rationalistic research approach (Popper, 1992). In this approach, the basic task of the researcher is to discover causal relationships between phenomena in nature. The first step of the research is to develop a research model that is a falsifiable theory which consists of testable hypotheses, i.e. proposed relationships between theoretical constructs and concepts. This theoretical model will be developed using a systematic survey of the current literature. To collect the data for testing our model we have chosen to use a web-based survey. For a more detailed argumentation on the choice of the research method, we refer to Chapter 4.

This thesis is organized into six chapters including this introduction. The next chapter reviews the existing literature. Chapter 3 presents the research model and develops the research hypotheses characterizing the relationships depicted in the model. Chapter 4 describes our research methods, while Chapter 5 analysis the date and discusses the results. Finally, Chapter 6 draws conclusion and summarizes the study's contributions and their implications for research and practice, as well as directions for future research.

Chapter 2 Theoretical Background

This chapter provides a theoretical background on the major concepts that are relevant for the study. It will introduce knowledge, knowledge management and knowledge sharing in general, followed by a discussion of the theories which used in this study, included the theory of reasoned action, social exchange theory and social information processing theory.

2.1 Knowledge

Knowledge is a broad and abstract notion that has defined epistemological debate in western philosophy since the classical Greek era. In the past few years, however, there has been a growing interest in treating knowledge as a significant organizational resource. Alavi and Leidner (Alavi & Leidner, 2001) argued that knowledge is the result of cognitive processing triggered by the inflow of new stimuli. Nonaka (Nonaka , 1994) classified human knowledge into two categories: explicit knowledge and tacit knowledge. Explicit or codified knowledge refers to knowledge that is transmittable in formal, systematic language. On the other hand, tacit knowledge has a personal quality, which makes it hard to formalize and communicate. Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context. So, explicit knowledge can be transferred across individual and organizational boundaries by codification while tacit knowledge cannot be taught by reading manuals but must be learned through experience or be absorbed by means of owner's impartation with great enthusiasm. (Berman, et al. 2002)

2.2 Knowledge Management

Knowledge management has been defined as the specified process in order to manage the organizations' knowledge for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to improve organizational performance and create value (Davenport & Prusak, 1998). Basically there are two distinct knowledge management strategies: the codification strategy and personalization strategy (Hansen et al. 1999). Organizations that use a codification

knowledge management strategy focus on codifying knowledge and storing it in a knowledge management system that can be accessed by employees. When an organization uses a personalization strategy, knowledge is mostly transferred using direct person-to-person contact. The most significant use of technologies such as telephone, e-mail and corporate directories is to facilitate a personalization strategy and locating experts rather than storing knowledge. This study will focus on sharing knowledge using a codification strategy.

2.3 Knowledge Sharing

Knowledge sharing is an activity through which knowledge (i.e. information, skills, or expertise) is exchanged among people, friends, or members of a family, a community (e.g. Wikipedia) or an organization. In this study, Knowledge sharing concerns the willingness of individuals in an organization to share with others the knowledge they have acquired or created (Gibbert & Krause, 2002). The sharing could be done directly via communication or indirectly via some knowledge archive. The operative phrase here is "the willingness of individuals." And organizational knowledge largely resides within individuals. Even with the codification of knowledge, knowledge objects remain unexposed to (and hence unrecognizable by) others until the knowledge owner makes the objects available (Bock et al. 2005). In a practical sense, knowledge sharing cannot be forced but can only be encouraged and facilitated (Gibbert & Krause, 2002).

Due to the nature of the knowledge sharing mentioned above, it is no surprise that changing people's behaviors is generally considered to be the most severe challenge facing firms desiring to increase their members' knowledge sharing behaviors. But what exactly are the levers or factors likely to motivate or otherwise induce such behaviors? Szulanski (1996) suggests that motivational forces derive from one of the two bases: (1) employees' personal belief structures and (2) social structures, i.e., values, norms and accepted practices which are instrumental in shaping individuals' belief structures (DeLong & L., 2000).

2.4 Theory of Reasoned Action

In IS research, the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) stands out as the most preferred intention–behavior models for studying information

technology (IT)-related human behaviors. Theory of Reasoned Action (TRA) states: the more favorable the attitude of an individual toward a behavior, the stronger will be the intention of the individual to engage in the behavior; the greater the subjective norm, the stronger the intention of the individual to perform the behavior; and the stronger the intention of the individual to engage in a behavior, the more likely the individual will be to perform it. (Alavi & Leidner, 2001;Fishbein & Ajzen, 1975) TRA has been successfully applied in many research studies in social psychology to explain different kinds of people's behavior. It has also been used in knowledge management research (Bock & Kim, 2002). Clark and Soliman adapt the TRA in knowledge based systems valuation so as to offer business executives a means of assessing the value of KBS investments (Clark & Soliman, 1999). Lin uses the TRA to examine different motivations to explain knowledge sharing intentions and finds that knowledge self-efficacy and enjoyment in helping others are positively related to knowledge sharing attitudes and intentions (Lin, 2007). Bock et al. also found that extrinsic motivators, social–psychological forces and organizational climate factors could influence knowledge sharing intentions. (Bock et al. 2005)

2.5 Social Exchange Theory

The Communication Theory of Social Exchange is a theory based on the exchange of rewards and costs to quantify the values of outcomes from different situations for an individual. People strive to minimize costs and maximize rewards and then base the likeliness of developing a relationship with someone on the perceived possible outcomes. When these outcomes are perceived to be greater, they disclose more and develop a closer relationship with that person.

Knowledge sharing could be regarded as a kind of social exchange (Bock et al.2005) with people sharing their knowledge and skills with their colleagues and expecting, reciprocally, to receive others' knowledge in return. Much research has been undertaken on SET as a way of investigating personal behavior in knowledge sharing (e.g. (Bock et al.2005; Kankanhalli et al.2005). Since social exchange is a complicated activity, different research projects have highlighted different aspects of it. Kankanhalli et al. (Kankanhalli et al., 2005) used cost/benefit analysis according to SET to analyze incentives and inhibitory factors in knowledge sharing. Further, while Chua (Chua, 2003) emphasized reciprocity in knowledge sharing, Constant, Kiesler, and Sproull

(Constant et al.1994) emphasized self interest and context. There are also researchers who have used SET to analyze how knowledge sharing behavior can be rewarded more effectively (Bartol & Srivastava, 2002). Finally, it has been suggested that relationships and personal networks function through social exchange. (Weir & Hutchings, 2005)

2.6 Social Information Processing

The Social Information Processing (SIP) perspective proceeds from the underlying premise that individuals, as an organism, adapt attitudes, behavior, and beliefs to their social context and environmental situation (Salancik, 1978). Deutsch and Gerard (1995) distinguish two types of social influence, informational and normative social influences. The categorization of social influence and its type mapping are listed in Table 2.1. In this study, we argue that one's behavior of knowledge sharing is changed because of environmental conformity which is brought about from social pressures. For example, a workgroup with cooperative norms may invoke individual members' helping behavior (e.g., knowledge sharing).

	Internalization	**Identification**	**Compliance**
Type	Informational influence	Normative influence	Normative influence
Accepting reasons	The content of the induced behavior is intrinsically rewarding	To establish or maintain a satisfying self-defining relationship to another person or a group. Associating with the desired relationship	To achieve a favorable reaction from another person or a group.
Occurrence	The behavior is congruent with his value system.	Taking over the role of the other or taking the form of a reciprocal role relationship.	Not because of believing in content but because of expecting to gain specific rewards or approval and avoid specific punishment or disapproval by conforming.
Satisfaction due to	The content of the new behavior	The content of the new behavior	Social effect of accepting influence.

Table 2.1 Influences of social information processing (Joseph & Farn, 2008)

Chapter 3 Research model and Hypothesis

Based on theory of reasoned action, social exchange theory, social information processing and a systematic review of the literature on knowledge sharing, a model of knowledge sharing contains personal and social factors is developed. The theoretical model is summarized in Figure and Table 3.3 Definitions of constructs.
. Moreover, the definitions of the constructs are listed in Table.

3.1Methodology

A methodological review of the past literature is a crucial activity for any research (Levy & Ellis, 2006). Webster and Watson (2002) define an effective literature review as one that "creates a firm foundation for advancing knowledge. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed". When a literature review is not performed in a methodological way, it may suffer from sampling problems. Possible problems include random sampling (using the first articles found), biased sampling (using mostly articles that support the particular case) and convenience sampling (using only articles that are available in a convenient way).

To prevent the mentioned problems we adopted the literature search methodology as proposed by Webster and Watson (2002) :

Keyword search

Since this research is carried out within a limited timeframe, we want a purposely-biased sample: the most important or influential papers on the topic. The most influential contributions are likely to be published in the leading journals (Webster & Watson, 2002). Therefore, it makes sense to start reviewing them first. To achieve this goal, we selected the twenty-five premier IS journals as indentified by Peffers and Ya (2003) using a survey of 1129 IS researchers. The journals that were reviewed during this step are listed in Appendix A. We used the following keywords: "knowledge sharing", "knowledge contribution", "information sharing", "information contribution"

Backward search

Since IS, and knowledge management in particular, is an interdisciplinary field, it is

advisable to also review related disciplines (Webster & Watson, 2002). This is accomplished with the backward and forward search procedures. Using the articles identified in the first section, we determined the most important prior work by reviewing the references.

Forward search

Using the citation index of Scopus, we have identified other relevant works that cite the most influential papers and abstracts. We only included study's that: consider knowledge sharing between individuals in the organization, consider factors which influence knowledge sharing and consider knowledge sharing using a knowledge management system. The empirical works that we included in our literature survey are listed in Appendix B.

The results of the literature review are shown in Table 3.1, it shows the findings of the different studies on the factors that we included in our model.

NoP= virtual community of practice/electronic network of practice; Rep= repository; VC= virtual community; — = Not reported; n.a.=not applicable; 0 = No effect; D = Direct effect; Me = Mediated effect; Mo = Moderated effect; Mo2 = Moderator	Context	Responserate (Respondents)	Dependent variable	Codification effort	Anticipated extrinsic reward	Anticipated reciprocal relationship	Compliance	Loss Of Knowledge Power	Image	Internalization	Sense of self-worth	Identification
(Ardichvili, et al 2003)	NoP	n.a.			—		+		+			
(Bock et al. 2005)	Rep	51%(N=154)	Intention to share		— Me	+ Me					+D	
(Bordia et al. 2006)	Rep	46%(N=119)	KS intentions					+ D				
(Cabrer, et al, 2006)	Rep	48% (N=372)	Knowledge sharing		0	0						
(Chiu 2006)	VC	— (N=336)	Quantity of KS			+D						+ D
(Chow & Chan, 2008))	Rep	33%(N=119)	Intention to share							+D		
(Constant et al. 1994)	—	n.a.	Knowledge sharing								-D	
(Constant et al. 1996)	NoP	58%(N=263)	Usefulness of advice							+D		
(Han & Anantatmula 2007)	—	n.a.	Willingness to share					0				
(He et al., 2009)	Rep	—	Contributed to KMS usage			+D						
(Huang et al.2008)	Rep	79.5% (N=200)	Intention to share	0	+D	0			-D	+D	+D	
(Hsu & Lin, 2008)	VC	78%(N=212)	Intention to blog		0	0			+D			+D
(Lin et al. 2009)	VC	92%(N=350)	KS behavior								+D	
(Joseph & Farn, 2008)	NoP	50.22% (N=229)	Intention to share				Me			+D		+D
(Jian & Jeffres,2006)	Rep	80% (N=80)	Willingness to contribute									+ D
Kankanhalli (2005)	Rep	38%(N=150)	Repository usage	— Mo	+ D	+Mo		0		0		

	Context	Responserate (Respondents)	Dependent variable	Codification effort	Anticipated extrinsic reward	Anticipated reciprocal relationship	Compliance	Loss Of Knowledge Power	Image	Internalization	Sense of self-worth	Identification
(Kuo & Young, 2008)	VC	14.5% (N=235)	KS behavior		0						0	
(Kulkarni et al. 2006)	—	74% (N=111)	Knowledge Use		Me					D		
(Marks, et al, 2008)	—	n.a.	Knowledge sharing							D		
(Ma & Agarwal, 2007)	VC	13% / 21% (N=500/166)	Knowledge contribution									0
(Qian et al, 2008)	—	79.5%(N=200)	Intention to share	0	+Me	Me		-D	+D		+D	
(Wasko and Faraj 2005)	NoP	23% (N=173)	Volume			-D			+ D			
Yu & Chu, (2007)	VC	— (N=193)	Organizational citizenship behavior			+D			+ D			

Table 3.1: Empirical results

3.2 Hypothesis

Table 3.2 summarizes the twelve hypotheses proposed in this work and Fig.3.1 shows the overview of the research model, which integrated personal factors (social exchange theory) and social influence factors with the TRA.

The Theory of Reasoned Action (TRA) argues that the best predictor of behavior is intention and there are two antecedents of the intention to perform a behavior. One is the attitude towards the behavior; the other is the subjective norm, defined as perceived social pressure to perform or not perform a behavior (Ajzen & Fishbein, 1980) According to TRA, an individual's intention to perform a behavior is affected by his/her attitude toward the behavior and subjective norm. Applying TRA to the knowledge sharing we can expect that people may be more inclined to share their knowledge if they have positive attitudes towards the knowledge sharing behavior. If an individual feels that his colleagues expect him to share his knowledge with them, then he also has the intention to share his knowledge. This leads to the first two hypotheses:

H1: Intention of knowledge sharing has a positive impact on attitude toward knowledge sharing.

H2: Intention of knowledge sharing has a positive impact on subjective norm of knowledge sharing.

Previous researchers (Lewis et al., 2003; Venkatesh & D., 2000)) have argued that the subjective norms, through social influence process can have an important influence on attitudes. (Fulk, 1993; Schmitz & Fulk, 1991) Lewis et al. (2003) neatly summarize these arguments: This effect is manifest via the psychological pathways of internalization and identification. Via internalization, the individual incorporates the opinion of an important referent as part of her own belief structure: in essence, the referent's beliefs become one's own. Via identification, the individual seeks to believe and act in a manner similar to those possessing referent powers. Therefore, compelling messages received from important others are likely to influence one's cognition about the expected outcomes of technology use. Moreover, Lee (1990) disputes that the more individuals are motivated to conform to group norms, the more their attitudes tend to be group determined than individual-determined. Thus, it seems reasonable to posit that subjective norms regarding knowledge sharing will influence organizational members' attitudes toward knowledge sharing. This leads to the third hypothesis

H3: Attitude toward knowledge sharing has a positive impact on subjective norm of knowledge sharing.

(Kankanhalli, et al.2005) argues that knowledge sharing could be hampered if people are worried that losing of knowledge will lead to lose their individual competitive advantage since knowledge is perceived as a source of power. People enlarge their precious knowledge little by little from their working experience, even from failures and frustration. This precious knowledge enables them to exceed the performance of their colleagues, gain better pay and more opportunities in their career. Thus, potential knowledge contributors may keep themselves out of a knowledge exchange if they feel they can benefit more by hoarding their knowledge rather than by sharing it (Davenport & Prusak, 1998). Thus, we hypothesize that:

H4: Loss of knowledge power has a negative impact on attitude toward knowledge sharing.

The object of codification is to format knowledge in a certain style that makes it easier to be found and to be understood by other members in the organization (Davenport & Prusak, 1998). Codification offers a good basis for knowledge sharing. But it is uncertain whether people are willing to spend much time on codification because the benefit of doing so may not seem obvious to them compared to other tasks that could bring them greater benefit. The time required for codifying knowledge can be considered as an opportunity cost. Orlikowski(1993) reported a situation where consultants avoided knowledge contribution due to high opportunity cost. They were unwilling to use the KM system as this would have required them to incur non-chargeable hours or give up their personal time. After contributing knowledge, there may be additional requests for clarification and assistance from knowledge recipients, which take up more codification time from knowledge contributors (Goodman & Darr, 1998). So, codification was modeled as a barrier to knowledge sharing in previous research (Husted & Michailova, 2002 ;Kankanhalli et al.2005).

H5: Codification effort has a negative impact on attitude toward knowledge sharing.

Reciprocity has been highlighted as a benefit for individuals to engage in social exchange (Blau, 1964). Anticipated reciprocal relationship was suggested as an important aspect of benefit in social exchange (Chua, 2003) and it is also believed to be a critical factor in knowledge sharing: People share their knowledge with their colleagues as they develop relationships with them and anticipate receiving their knowledge in the future (Wasko & Faraj, 2000). Moreover, researchers have observed that people who regularly helped others in virtual communities seemed to receive help more quickly when they asked for it (Rheingold, 2000).Previous work also indicated that anticipated reciprocal relationships (Constant, et al. 1994)have a positive impact on attitude towards knowledge sharing (Bock, Zmud, Kim, & Lee, 2005).

H6: Anticipated reciprocal relationship has a positive impact on attitude toward knowledge sharing

According to SET, people will seek to attain maximum benefits for themselves. Thus, people will most likely to share knowledge when they perceive that incentives exceed costs. (Kelley & Thibaut, 1978). Moreover, it has been suggested that explicit monetary reward could effective motivate people to share their knowledge. (Husted & Michailova, 2002). For example, in Siemens' ShareNet project, explicit rewards were effective in motivating employees to share their knowledge (Ewing & Keenan, 2001). Similarly, the use of redemption points in Samsung Life Insurance's Knowledge Mileage Program led to an explosive growth in knowledge registration by its employees (Hyoung & Moon, 2002). Kankanahali et al (Kankanhalli, et al.2005) also argued that organizational rewards do encourage knowledge sharing, thus we propose that:

H7: Anticipated extrinsic reward has a positive impact on attitude toward knowledge sharing.

Nowadays, the importance of reputation is increasing in most organizations as traditional contracts between organizations and employees based on length of service erode (Ba et al. 2001;Davenport & Prusak, 1998). In such working environments, people need to establish their status as experts in an organization. One of the ways to establish this status is to share their professional knowledge with their colleagues (Ardichvili et al. 2006). When people share useful knowledge, it will cause them to gain colleagues' respect, enhancing their personal image in the company (Constant et al. 1994). A good reputation and personal image is believed to help people to have a better career life. Thus, we hypothesize that:

H8: Image has a positive impact on attitude toward knowledge sharing.

It has been indicated that feedback is an important facilitator of knowledge sharing, since the usefulness of the knowledge shared can enhance their feeling of self-worth. When others respond in the way that we have anticipated, we conclude that our line of thinking and behavior are correct. At the same time, role taking improves as the exchange continues (Kinch, 1973) according to the role theory, which is the cornerstone of the symbolic interactionist perspective on self-concept formation (Gecas, 1982;Kinch, 1963). This process of reflected appraisal contributes to the formation of self-worth (Gecas, 1971), which is strongly affected by sense of competence (Covington & Berry, 1976) and closely tied to effective performance (Bandura, 1978). Therefore, employees who are able to get feedback on past instances of knowledge sharing are more likely to understand how such actions have contributed to the work of others and/or to improvements in organizational performance. The understanding would allow them to increase their sense of self-worth accordingly. Similar to the concept of self-esteem, people will increase perceived control power and confidence in dealing with a task and being in control of their environment (Constant et al., 1994).

People will also be more willing to share knowledge when they find that their knowledge is meaningful to people around them (Cabrera & Cabrera, 2002). Finally, the positive relationship between the attitude towards knowledge sharing and sense of self-worth has been supported in other research (Bock et al.2005). Thus, we hypothesize that:

H9: *Sense of self-worth has a positive impact on attitude toward knowledge sharing.*

Social influence reflect social pressure from significant others to perform an important act (Bagozzi & Dholakia, 2002). In this study, we argue that general social influences (i.e., compliance, identity, and internalization) can fashion subjective norms of knowledge sharing. Internalization is occurred when an individual accepts influence because the substantial content of behavior is congruent with his values (Kelman, 1958). For example, a member who shares a common value of team will be more likely to become partners sharing and exchanging their resources(Chiu et al. 2006). Similarity of values reflects the extent to which members of an organization possess joint goals and interest, thus, the social influence of internalization may associate with knowledge contribution (Kankanhalli, et al.2005). If an individual is of internalization, the reasons that he or she attempts to share knowledge are not only because everyone is part of the collective, but also "all have a collective goal orientation" (Wasko & Faraj, 2005). If members of a group have interdependent goals, the behaviors of helping or teaching the needed skills each other will be enhanced (Janz & Prasaphanich, 2003). In light of internalization, it is not sufficient for a person to merely perceive reference group influence in order to consider the obligation to donate knowledge. Rather, the person perceives that he has duty or obligation to donate knowledge because the shared group values motive the willing of knowledge sharing (Bagozzi & Dholakia, 200;Chiu et al.2006).

H10: *Internalization has a positive impact on subjective norm of knowledge sharing.*

The core principle of identification is that a person derives a part of his self-concept from the work groups and categories they belong to. Bergami and Bagozzi (2000) manifested that identification fosters loyalty and citizenship behaviors in the group setting. Wasko and Faraj (2005) also argue that commitment to a group conveys a sense of responsibility to help others within the collective on the basis of shared membership. To sum up, they construe that identity can potentially contribute more knowledge to group. The notion that group identification can affect knowledge contribution is due to a person may engage in more pro-social behavior (i.e., knowledge sharing) in order to benefit the group(Chiu et al. 2006). Thus, we hypothesize that:

H11: *Identification has a positive impact on subjective norm of knowledge sharing.*

Some previous researchers have accented that general social influences act on

knowledge contribution (Bagozzi & Dholakia, 2002; Chiu et al. 2006; Constant, et al. 1994; Janz & Prasaphanich, 2003; Kankanhalli et al. 2005; Levin & Cross, 2004; Wasko & Faraj, 2005). Similarly, some have emphasized the specific term—subjective norms of knowledge sharing (Bock, et al. 2005; Constant et al.1994;Chiu et al.2006;Kankanhalli et al. 2005;Wasko & Faraj, 2005). According to the definition of compliance, a person thinks he should share knowledge not because he concerns the benefit of work team but because he expects to gain specific approval and avoid punishment (Kelman, 1958). In other words, conforming to share knowledge is motivated by the need for approval from significant other. This social affect of accepting influence—somewhat blind obedience, leads the perception that the focal person has to share knowledge in order to be liked by others. Thus, we propose that；

H12: Compliance has a positive impact on subjective norm of knowledge sharing.

Table 3.2 List of hypotheses.

No.	Hypothesis
H1	Intention of knowledge sharing has a positive impact on attitude toward knowledge sharing.
H2	Intention of knowledge sharing has a positive impact on subjective norm of knowledge sharing.
H3	Attitude toward knowledge sharing has a positive impact on subjective norm of knowledge sharing
H4	Loss of knowledge power has a negative impact on attitude toward knowledge sharing
H5	Codification effort has a negative impact on attitude toward knowledge sharing
H6	Anticipated reciprocal relationship has a positive impact on attitude toward knowledge sharing
H7	Anticipated extrinsic reward has a positive impact on attitude toward knowledge sharing
H8	Image has a positive impact on attitude toward knowledge sharing
H9	Sense of self-worth has a positive impact on attitude toward knowledge sharing
H10	Internalization has a positive impact on subjective norm of knowledge sharing
H11	Identification has a positive impact on subjective norm of knowledge sharing
H12	Compliance has a positive impact on subjective norm of knowledge sharing
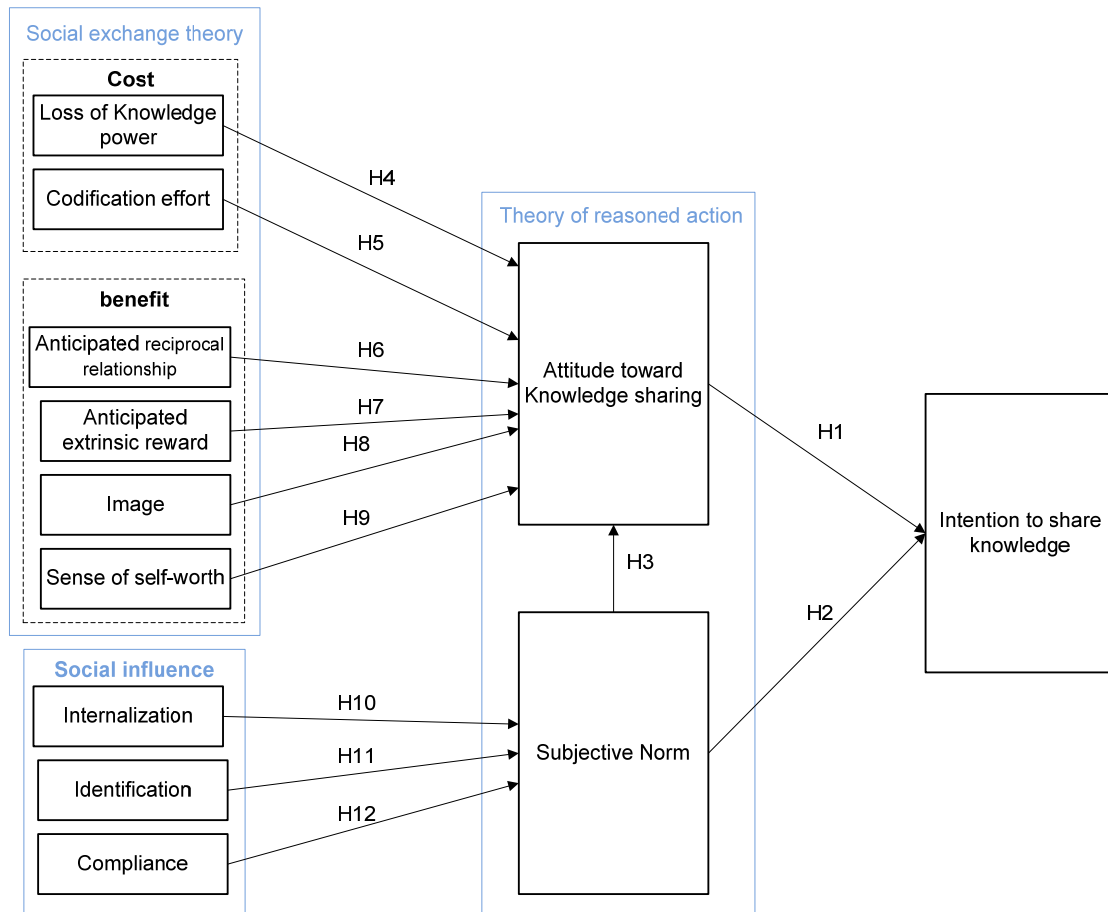
Figure 3.1: Overview of the research model

Construct	Definition	Key References
Loss of knowledge power	"The perception of power and unique value lost due to knowledge sharing"	(Gray, 2001)
Codification effort	"The time and effort required to codify and input knowledge"	(Kankanhalli et al.2005) (Markus, 2001)
Anticipated reciprocal relationships	"The degree to which one believes one can improve mutual relationships with others through one's knowledge sharing"	((Bock et al.2005); (Deluga, 1998); (Major et al.1995); (Parkhe, 1993); (Seers et al.1995); (Sparrowe & Linden, 1997)
Anticipated Extrinsic Rewards	"The degree to which one believes that one will receive extrinsic incentives for one's knowledge sharing"	(Gomez-Mejia & Balkin, 1990); (Jauch, 1976); (Koning, 1993); (Malhotra & Galletta, 1999)
Image	"The perception of increase in reputation due to knowledge sharing"	(Kankanhalli et al. 2005) (Constant et al.1996) (Kollock, 1999)
Sense of Self-Worth	"The degree of one's positive cognition based on one's feeling of personal contribution to the organization (through one's knowledge-sharing behavior)"	(Brockner, 1988); (Gardner & Pierce, 1998); (Gecas, 1989); (Schaubroeck & Merritt, 1997); (Stajkovic & F., 1998)
Internalization	"The perception of congruenting with his value due to knowledge sharing"	(Joseph & Farn, 2008)
Identification	"The perception of establishing a satisfying self-defining relationship in a group due to knowledge sharing"	(Joseph & Farn, 2008)
Compliance	"The perception of expecting to gain specific approval and avoid punishment due to knowledge sharing"	(Joseph & Farn, 2008)
Attitude toward Knowledge Sharing	"The degree of one's positive feelings about sharing one's knowledge"	(Fishbein & Ajzen, 1975)1981); (Price & Mueller, 1986); (Robinson & Shaver, 1973)
Subjective Norm	"The degree to which one believes that people who bear pressure on one's actions expect one to perform the behavior in question multiplied by the degree of one's compliance with each of one's referents"	(Fishbein & Ajzen, 1975) (Fishbein & Ajzen, 1981)
Intention to Share Knowledge	"The degree to which one believes that one will engage in knowledge sharing act"	(Constant et al.1994) (Dennis, 1996); (Feldman & March, 1981); (Fishbein & Ajzen, 1981)

Table 3.3 Definitions of constructs.

Chapter 4 Methodology

The theoretical model, which was proposed in Chapter 3, will be tested using a survey. Surveys can suffer from validity issues when not well designed. Therefore an extensive validation methodology to establish instrument validity is used. Furthermore, threats to internal validity assessed and the survey procedure is outlined.

4.1 Research design

The theoretical model in Fig. 3.1 will be tested using a survey which is an excellent tool for measuring attitudes and orientations of large populations. Survey research is one of the most important areas of measurement in applied social research. The broad area of survey research encompasses any measurement procedures that involve asking questions of respondents. Surveys can be divided into two broad categories: the questionnaire and the interview. Questionnaires are usually paper-and-pencil instruments that the respondent completes. Interviews are completed by the interviewer based on what the respondent says. Surveys also come in a wide range of forms and can be distributed using a variety of media, such as written surveys; oral surveys; electronic surveys. In this research, we will choose web-based electronic questionnaire as the method of survey because it's very convenient and economical. In a web-based survey, questionnaire can be distributed via the web link and the scores of items could be collected and recorded into the database automatically.

According to (Straub, 1989), instrument validation, internal validity (validity to the design of the research itself) and statistical conclusion validity (assessment of the mathematical relationships between variables in the research) strengthen the empirical research. It is important for researchers to recognize that valid statistical conclusion by no means ensure that a causal relationship between variable exists. It also important to realize that, in spite of the need to warranty internal validity, this validation does not test whether the research instrument is measuring what the researcher intended to measure. Measurement problems can only be resolved through instrument validation (Straub, 1989). Figure 4.3 summarizes the conclusions.
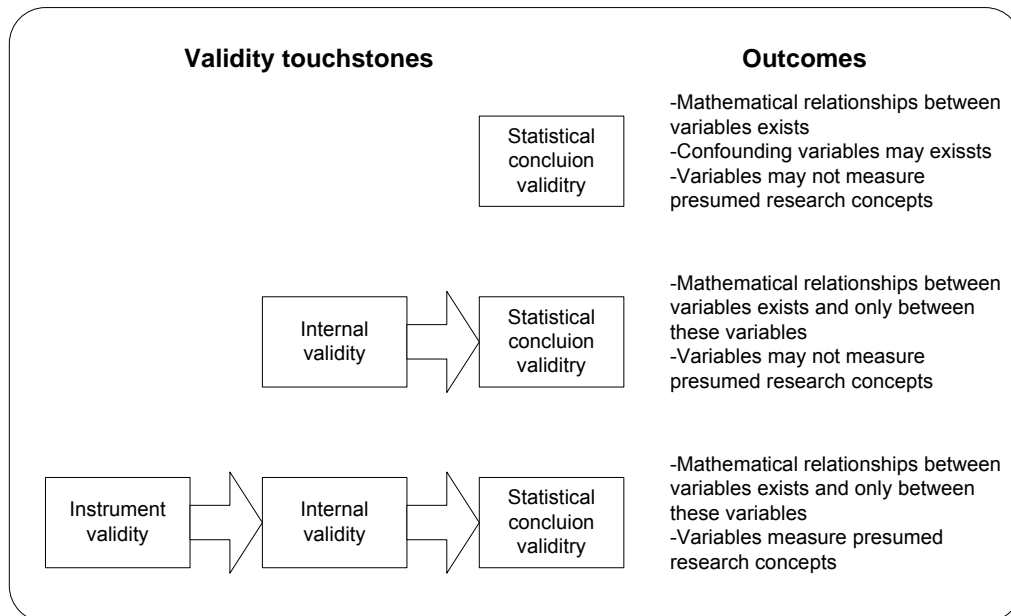
Figure 4.2 Overview of validity (Straub, 1989).

4.2 Statistical conclusion validity

For a discussion of the statistical conclusion validity we refer to the next Chapter in particular.

4.3 Internal validity

In order to reduce the threats of internal validity, we systematically reviewed the literature and identified multiple variables that might be alternative explanations for knowledge contribution in the model. However, since we choose to use the survey as the research method, it is impossible to completely eliminate the risk of alternative explanations. Another important threat to internal validity is the non-responder bias. Therefore, we use the procedure of Armstrong and Overton (1977) to asses the non-responder bias.

Another concern is the common method variance which is an important threat to internal validity in general and to surveys that collect the responses in a single setting in particular.(Podsakoff et al. 2003) When the same method is used to measure the correlations between variables, common method variance may occur(Podsakoff et al. 2003;Schwarzet al. 2008)). The best measure to minimize common method variance is to collect the data of the independent and dependent variables in two steps (Podsakoff et al. 2003). In other words, we need to conduct two surveys for each participant. In order to do that, participants' anonymity has to be compromised to link the data of the first and second survey. Moreover, it will be difficult to get a high response rate for the second survey since the participants are quite busy and have limited time for the survey.

Therefore, we decide to collect the data in one single step. As a remedy, the scales are designed under the guidelines of item and questionnaire design of Podsakoff et al. (2003) to reduce common method variance.

4.4 Instrument validity

According to Straub (1989), instrument validation consists of 3 fundamental sections, which are *Content Validity* (representation of the full content of a definition in a measure), *Construct Validity* (measurement for multiple indicators), and *Reliability* (evaluation of measurement accuracy).

In order to improve instrument validity, we chose to use several steps. Firstly, a pre-test is used to assess the reliability and other procedures of the survey. After this pre-test a larger pilot-test is used to technically asses construct validity and reliability. These steps are summarized in Table 4.1.

Phase			Content validity	Construct validity	Reliability
1	Pretest	Qualitative			X
2	Pilot Test	Cronbach alphas Factor analysis		X	X
3	Full-Scale Survey	Cronbach alphas Factor analysis		X	X

Table 4.1: Assessment of instrument validity

4.5 Operationalization the constructs

The survey items are provided in Appendix D and E, all of which are adapted to the context of research from pre-existing and validated scales.

Like all surveys that use the same method for the same method for collecting data of the dependent variable and the independent variables, common method variance is an important threat to the internal validity of this survey. The items of the survey are designed to reduce the possible common method variance. It is known that, amongst others, the item characteristics and the context of the items influences the common method variance (Podsakoff et al., 2003). Sources of common method variance that can be influenced by item wording and design include ambiguous or complex items, format of the scales and choice of anchors, reverse coded items, item priming effects and item embedness.

Loss of Knowledge Power (LOKP) is operationalized using four items that are adapted from Kankanhalli et al (2005). These items ask about losing unique value, power, knowledge that makes one stand out with respect to others and knowledge that

no one else has in the organization. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree"

Anticipated Reciprocal Relationships (ARRE) is measured using five items that are adapted from Bock et al. (2005).These items ask about amongst others whether the respondent expects that knowledge sharing would strengthen the ties, draw smooth cooperation and expands the scope of the association with the members of the network. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree"

Anticipated Extrinsic Reward (AERE)) is measured using two items that are adapted from Bock et al. (2005). These items ask about whether they will receive monetary rewards or additional points for promotion in return for my knowledge sharing. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Codification effort (CEFF) is measured by three items that are adapted and selected from Kankanhalli et al. (2005). The original construct consisted of five items, but the analysis of   Kankanhalli et al. (2005) showed that two items did not load together on the factor analysis. The questions asked the respondents whether they think that they do not have the time, it is too laborious and the effort for knowledge sharing is high. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree"

Image (IMAG) is operationalized using five items that are adapted from Kankanhalli et al.(2005). The items ask whether the respondents think that sharing knowledge improves image, status and earns respects. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Sense of self-worth (SOSW*)* is measured using five items that are adapted from Bock et al. (2005). The items ask whether the participations think that sharing knowledge helps others, creates new business opportunities, improve work processes, increases productivity and helpes organization achieve its performance objectives. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Attitude toward Knowledge Sharing(ATKS) is measured using five items that are adapted from Bock et al. (2005). The items ask whether the participations think that sharing knowledge is good, harmful, enjoyable experience, valuable or wise move. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Internalization (INTE*)* is operationalized using four items that are adapted from Netemeyer et al..   (1997).The items ask about the participations' attitudes of reward for their effort, stress and work. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Identification (IDEN) is operationalized using three items that are adapted from

Bagozzi and Dholakia. (2002). The responders are asked whether they feel their self-image overlaps with the group and whether they feel a sense of belonging to the group. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Compliance (COMP) is operationalized using two items that are adapted from Algesheimer er al. (2005). The responders are asked whether they feel that they must share knowledge in order to be accepted and whether sharing knowledge is influenced by how other members want they to behave. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Subjective Norms (SUNO) is measured using two items that are adapted from Bock et al, (2005). The responders are asked whether they think that sharing knowledge is influenced by their boss or colleagues. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

Intention to Share Knowledge (ITSK) is measured using three items that are adapted from Ryu et al. (2003). The items ask about the intentions to share knowledge of the participations. The items were measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree".

For a better readability, the constructs are abbreviated in some tables. Table 4.2 provides an overview of the abbreviations used throughout the text.

Table 4.2: List of abbreviations.

Construct Name	Abbreviation
Anticipated extrinsic reward	AERE
Anticipated reciprocal relationship	ARRE
Attitude toward Knowledge Sharing	ATKS
Codification effort	CEFF
Compliance	COMP
Loss Of Knowledge Power	LOKP
Image	IMAG
Internalization	INTE
Identification	IDEN
Intention to share knowledge	ITSK
Sense of self-worth	SOSW
Subjective Norms	SUNO

4.6 Pre-test

In the pretest, the draft instrument was subjected to a qualitative testing of all validities. This phase was designed to facilitate revision, leading to an instrument that could be formally validated. (Straub, 1989). We will use the pretest to test the reliability of the draft version of the questionnaire and identify the ambiguously worded questions. There will be ten participants in this pretest. They will be asked to complete the survey and after they finished the survey, the participants will be asked to evaluate the questionnaire item-by-item basis.

Because the misinterpretation of questions would result in a measurement error, variations in the answers were examined in particular. After five participants completed the pre-testing, we modified the survey according to their feedback and the procedure was repeated again using five other participants. Additionally we measured the time required to complete the survey. We found that participants took approximately between 12 and 16 minutes to complete the survey.

4.7 Pilot test

To further validate the instrument, a small pilot survey of randomly selected participants will be carried out. Judging from 20 returned questionnaires, the pilot test once again confirmed that measurement problems in the instrument will be not seriously disabling. The instrument will firstly be tested for reliability using Cronbach alphas and composite reliability (Fornell consistency); both indicators are listed in Table 4.4. A commonly used rule of the thumb indicates that both coefficients should be above .70 to show good internal consistency.

	Composite Reliability	Cronbachs Alpha
Anticipated extrinsic reward	0.94	0.88
Anticipated reciprocal relationship	0.93	0.91
Attitude toward Knowledge Sharing	0.78	0.54
Codification effort	0.89	0.86
Compliance	0.78	0.61
Loss Of Knowledge Power	0.91	0.88
Image	0.92	0.89
Internalization	0.76	0.72
Identification	0.97	0.95
Intention to share knowledge	0.89	0.81
Sense of self-worth	0.94	0.92
Subjective Norms	0.86	0.67

Table 4.4: Test of the instrument reliability.

4.8 Sampling

Five Chinese IT companies were selected as the survey population. Each companies has about 20-50 employees. There are 202 employees are invited via emails in advanced to assure their willingness to take part in the study. Completed questionnaires were received from 145 members of the companies, rendering total response rate of 71.7%. From the 145 dropped some arbitrary answers judging from reversed items. Finally, 136(67.3%) valid questionnaires were offered for data analysis. This is a good response rat.

To stimulate response we used the tailored design method (Dillman, 2000). To estimate non-response bias we compared known values on the gender, age and tenure demographics of the whole population with the reported values of the sample as discussed by Armstrong and Overton (1977). Table 4.5 summarizes the demographic characteristics of the respondents and the complete population.

Table 0.5: Sample and population demographics

		Organizations		Survey	
Sex	Male	173	85.7%	108	74.5%
	Female	49	24.3%	38	25.5%
Age	18-25	24	11.8%	20	13.8%
	26-35	80	39.6%	62	42.7%
	36-45	63	31.2%	31	21.4%
	46-55	25	12.4%	16	11.0%
	>55	10	5.0%	6	4.1%
		202		145	

4.9 Survey Implementation

For the implementation of the survey we will adopt the Tailored design method (Dillman, 2000). Using this method, surveys will show to be able to reach a highly response rates.

The first contact will be a pre-notice e-mail. The pre-notice provides a positive and well-timed notice that the respondent will receive a request to help by participating in the survey. It has been shown that sending a pre-notice average improves the response rate with about 5 percent points (Dillman, 2000). The pre-notice was send by the manager of the companies and states shortly that the respondents are about to receive a survey, what the survey is about, what is the usefulness of the survey is and concludes with a short thank-you message.

Two or three days after the pre-notice, an e-mail that contains the cover letter and a link to the questionnaire will be send. To differentiate between the first and the second

message, this message will be send by the author. The cover letter starts with the request for help and then subsequently explains why you received the questionnaire, what the usefulness of the survey is, how confidentiality is safeguarded and a statement that the author is willing to answer requests and concludes with a short thank you message.

About one week after the questionnaire was distributed; a short thank you message /reminder will be e-mailed by the manager of the network. This message is a short e-mail from the manager that includes a statement that the questionnaire was send to the respondent last week and asks whether the respondent can fill in the survey before the deadline that will be in three days.

On the morning of the day before the deadline, a last reminder will be send by the author. This reminder has a priority flag to indicate the urgency. The letter includes the following main points: feedback that we did not heard from the respondent yet, a message that others have responded, a statement of the importance of their response and a final paragraph that says that filling out the questionnaire is voluntary, but important.

Chapter 5 Data analysis and results

This chapter presents the results from the partial least squares analysis. An overview of the statistical technique is presented, followed by the analysis of measurement model and the structural model.

5.1 Statistical technique

The general structural equation modeling (SEM) can be decomposed into two sub-models: a measurement model and a structural model. The measurement model defines relations between the observed and unobserved variables. In other words, it provides the link between scores on a measuring instrument (i.e., the observed indicator variables) and the underlying constructs they are designed to measure (i.e., the unobserved indicator variables). In contrast, the structural model defines relations among the unobserved variables. Accordingly, it specifies the manner by which particular latent variables directly or indirectly influence changes in the values of certain other latent variables in the model. Being a components-based structural equations modeling technique, partial least squares (PLS) is similar to regression, but simultaneously models the structural model (theoretical relationships among latent variables) and measurement model (relationships between a latent variable and its indicators).

The PLS procedure has been gaining interest and use among IS researchers in recent years (Compeau & Higgins, 1995; Aubert, Rivard and Paltry 1994; Chin and Gopal 1995) because of its ability to model latent constructs under conditions of nonnormality and small to medium sample sizes. Besides, the PLS technique is supported for both confirmatory exploratory research (Gefen et al. 2000) and it is is better suited for exploratory research. Because PLS does not require normally distributed data and it is better suited for more exploratory contexts, we have chosen to use PLS technique to show statistical conclusion validity. We have used SmartPLS version 2.0.M3 to perform the analysis (Ringle et al. 2005). To test for significance we used the bootstrapping resampling procedure.

To account for the deleterious effects of measurement error, PLS uses a product indicator approach. The variables are now viewed as latent variables (i.e., constructs) that cannot be measured directly. Instead, multiple indicators for these latent variables need to be obtained. Each indicator is influenced by both the underlying latent variable and error. Product indicators reflecting the latent interaction variables are then created. Each set of indicators reflecting their underlying construct (i.e., latent variable) are then submitted to the PLS algorithm for estimation which resulting in a more accurate

assessment of the underlying latent variable loadings and their relationships. Because PLS is a components-based structural equation modeling technique, it is similar to regression, however it simultaneously models the structural paths (i.e., theoretical relationships between latent variables) and measurement paths (i.e., relationships among a latent variable and its indicators). Instead of assuming equal weights for all indicators of a scale, the PLS algorithm varies each indicators' weight to how much it contributes to the composite score of the latent variable. This leads to that indicators with weaker relationships to the latent construct are given lower weightings. From this viewpoint, PLS is preferable to techniques such as regression which assume error free measurement (Wold, 1989).

5.2 Measurement model

The first step in PLS is to establish the reliability and validity of the measurement model. In PLS, the composite reliability is preferred over using Cronbach alphas, due to its assumption of equal weightings of items; a better estimate can be gained using the composite reliability formula (Chin, 1998). However, to be on the safe side we will assess both coefficients. According to commonly used heuristics, both coefficients should be above 0.70 (Gefen et al., 2000).As shown in Table 5.1, our composite reliability values range from 0.83 to 0.91.

Construct	Items	Mean	Std. Dev.	Range	Cronbach alpha	Composite reliability
Anticipated extrinsic reward	2	3.01	.76	1-5	.74	.88
Anticipated reciprocal relationship	5	3.90	.63	1-5	.86	.90
Attitude toward Knowledge Sharing	5	3.80	.51	1-5	.86	.91
Codification effort	4	3.46	.74	1-5	.85	.87
Compliance	2	3.32	.64	1-5	.61	.84
Loss Of Knowledge Power	4	2.60	.96	1-5	.87	.91
Image	5	3.63	.60	1-5	.84	.89
Internalization	4	3.25	.52	1-5	.78	.85
Identification	3	3.50	.68	1-5	.82	.89
Intention to share knowledge	3	3.73	.50	1-5	.68	.83
Sense of self-worth	5	3.59	.55	1-5	.82	.87
Subjective Norms	2	3.63	.54	1-5	.78	.90

Table 5.1: Descriptive statistics and reliability

To asses construct validity we discuss both convergent and discriminant validity.

Convergent validity can be shown by examining the average variance extracted (AVE). The AVE tries to measure the amount of variance captured by a construct by calculating the ratio of the amount of the variance captured by the construct and the measurement variance. For the AVE by a measure, a score of 0.50 indicates acceptability (Fornell & Larcker, 1981). Table 5.2 shows that the AVE by our measures range from 0.58 to 0.82, which are above the acceptability value.

	AVE	AERE	ARRE	ATKS	CEFF	COMP	LOKP	IMAG	INTE	IDEN	ITSK	SOSW	SUNO
AERE	.79	.89											
ARRE	.65	.22	.80										
ATKS	.66	.25	.62	.81									
CEFF	.63	.06	.14	.16	.78								
COMP	.72	.26	.27	.21	-.11	.85							
LOKP	.72	.14	-.22	-.34	.10	.01	.85						
IMAG	.61	.43	.57	.52	.31	.24	-.22	.78					
INTE	.59	.27	.21	.25	.16	.29	.12	.39	.77				
IDEN	.73	.30	.39	.34	.23	.15	.00	.45	.30	.86			
ITSK	.61	.30	.43	.58	.07	.36	-.22	.39	.34	.28	.78		
SOSW	.58	.32	.53	.50	.26	.14	-.15	.58	.45	.45	.55	.76	
SUNO	.82	.37	.43	.56	.15	.26	-.22	.41	.22	.28	.46	.39	.91

Note: AERE: Anticipated extrinsic reward; ARRE: Anticipated reciprocal relationship; ATKS: Attitude toward Knowledge Sharing; CEFF: Codification effort; COMP: Compliance; LOKP: Loss of Knowledge Power; IMAG: Image; INTE: Internalization; IDEN: Identification; ITSK: Intention to share knowledge; SOSW: Sense of self-worth; SUNO: Subjective Norms.
*The shaded numbers in the diagonal row are square roots of the average variance extracted.
Table 5.2: Constructs correlations, convergent validity and discriminant validity

Discriminant validity refers to the extent to which a particular construct is different from other constructs. One criterion of discriminant validity is that a construct should share more variance with its measures than with all other constructs. Following Tsang (2002), we measured the square root of the AVE for each construct to assess discriminant validity (see Table 5.2). These square roots were greater than the correlations between constructs, which confirms discriminant validity. Another method to judge discriminant and convergent validity is to assess the factor loadings of the indicators using a principal components factor analysis (Chin, 1998). Each indicator should load more on the construct than on any other factor. The factor loadings and cross loadings are shown in Appendix F. Examination of these loadings shows sufficient discriminant and convergent validity.

5.3 Common method variance

As explained before, common method bias is an important threat to the internal validity. Common method variance occurs when the same method is used to measure the correlations between variables (Podsakoff et al., 2003). Next to the procedural remedies related to question design that were used, we also took a statistical approach to check whether common method variance is likely to deteriorate the results. Podsakoff et al. (2003) recommends that the ad-hoc approach should be taken when the dependent and independent variables cannot be obtained from distinct sources, not measured in different contexts and the source of the common method variance cannot be obtained. Using this approach indicators are allowed to load on theoretical constructs, as well as on a common method latent variable. Every indicator is determined by its substantive construct and the method factor.

Figure 5.1

Fig 5.1 shows an example of this structural equation model where A is an independent variable and B a dependent variable. Indicators are represented by a1,..,b2. However, PLS does not allow an indicator to be defined by two latent variables. Therefore, we used the conversion strategy as described in Liang, Saraf, Hu, and Xue (2007) to test this model using PLS.

We followed the statistical approach described by Liang et al. (2007) to assess common method bias using PLS. As noted by Liang et al. "if the method factor loadings are insignificant and the indicators' substantive variances are substantially greater than their method variances, we can conclude that common method bias is unlikely to be a serious concern." Appendix G shows each construct, the indicators for each construct, the substantive factor loading, the substantive factor loading squared, the method factor loading, and the method factor loading squared. The results revealed that only 8 (out of 44) of the method factor loadings were statistically significant, and the average explained variance of the indicators is .68, while the average variance explained by the method factor is .006. The ratio of the substantive variance to the method variance is around 113:1. Therefore we conclude that method variance is unlikely to be a major concern for this study.
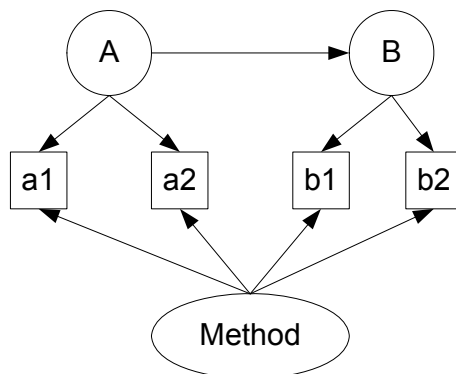
Figure 5.1: Model with a method factor

5.4 Structural model

After examining the measurement model, we tested the proposed hypotheses with PLS. we conducted a test of significance for all paths using 500 iterations of the bootstrap re-sampling procedure and a two-tailed T-test. The betas in PLS, can be read in a manner very similar to multiple regression, i.e. the standardized coefficients designate the relative strength of the statistical relationships. The results of the analysis are shown in Figure 5.2 and summarized in Table 5.4. The results provides evidence for 7 of the 12 hypotheses a significance level of $p < .1$ and 7 of the 12 hypotheses are confirmed at a significance level of $p <.05$. We found no support for the other five hypotheses.

We will now discuss the results in the following sequence: standard TRA constructs ((Hypotheses 1, 2, and 3), the antecedents of cost and benefit to attitude towards knowledge sharing (Hypotheses 4, 5.6,7,8 and 9), and the antecedents of social factors to intention to share knowledge (Hypotheses 10, 11, And12).

The path between the attitude toward knowledge (H1) and subjective norms (H2), and intention to share knowledge were positive and significant. Both hypotheses 1 and 2 are supported, as they have been in many previous studies which apply TRA to explain behavioral intentions. In line with our expectations the path between subjective norms and attitude toward knowledge (H3) is also supported, adding credence to the argument that subjective norms can influence intentions both directly and indirectly (through attitudes), especially within cultural contexts characterized by strong group orientation, such as is the case with Chinese organizations.

Considering cost first, loss of knowledge power (H4) had a significant negative relationship with attitude towards knowledge sharing while codification effort (H5) had no significant relationship with attitude. This suggested that H4 was supported but H5 was not. With respect to benefit, H7, H8 and H9 are all not supported which suggests that anticipated extrinsic reward, image and sense of self-worth had no significant relationship with attitude towards knowledge sharing. However, we found a significant relationship between anticipated reciprocal relationship and attitudes, that is to say, H6 is supported.

Finally, regarding social influence, hypothesis 10 proposed that internalization would be positively related to subjective norms. Our data shows no significance of this path, meaning that H10 is not supported. We also proposed direct links between identification (H11) and compliance (H12), and subjective norms. We see than both paths are positive and significant.

	Hypothesis	β	T Statistic	
H1	Attitude toward Knowledge→ Intention to share knowledge	.47	5.60	***
H2	Subjective Norms → Intention to share knowledge	.20	3.24	**
H3	Subjective Norms → Attitude toward Knowledge Sharing	.28	2.31	*
H4	Loss Of Knowledge Power→ Attitude toward Knowledge Sharing	-.18	2.61	**
H5	Codification effort →Attitude toward Knowledge	.02	.21	
H6	Anticipated reciprocal relationship →Attitude toward Knowledge	.31	3.76	***
H7	Anticipated extrinsic reward →Attitude toward Knowledge	-.00	.03	
H8	Image →Attitude toward Knowledge	.16	1.53	
H9	Sense of self-worth →Attitude toward Knowledge	.10	1.41	
H10	Internalization → Subjective Norms	.05	.51	
H11	Identification → Subjective Norms	.23	2.36	*
H12	Compliance → Subjective Norms	.21	2.17	*

Table 5.3: PLS results.
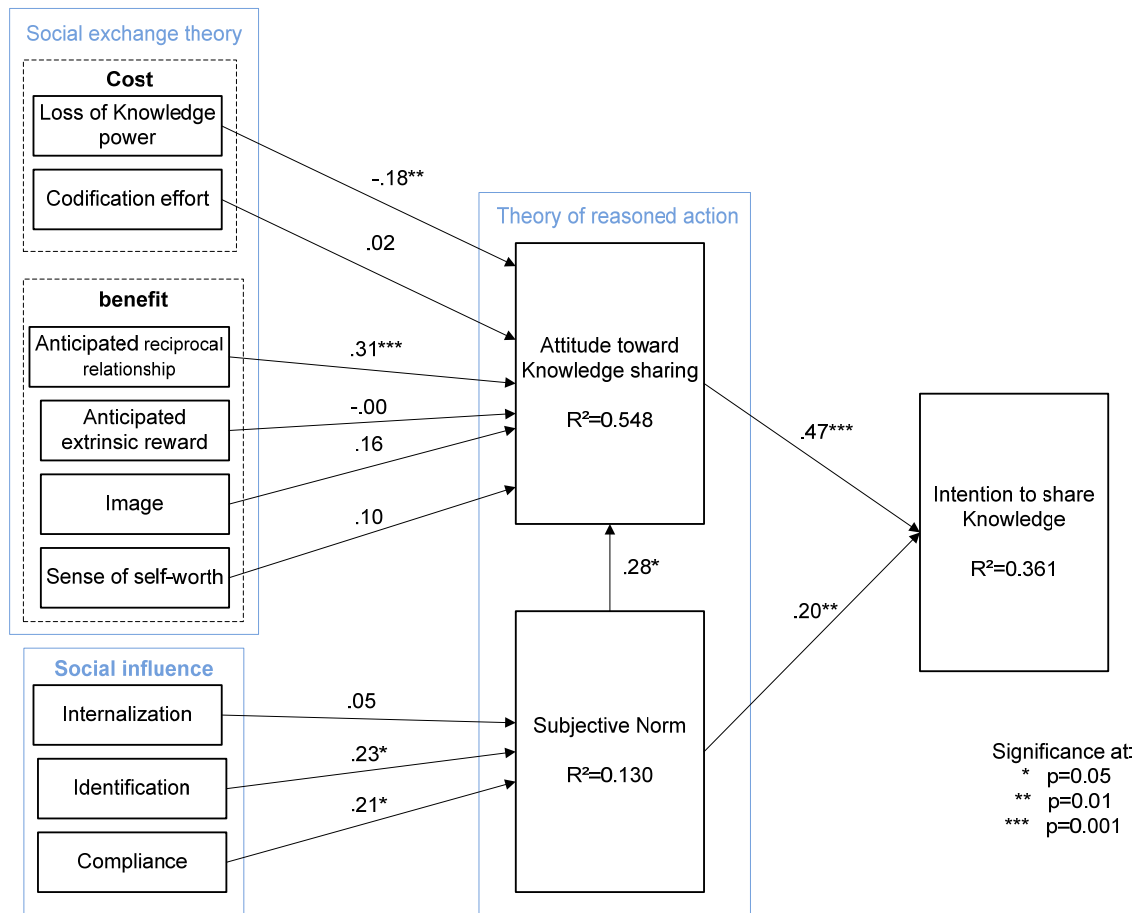
Figure 5.4: PLS results.

Chapter 6 Discussions and Conclusions

This chapter summarizes analytical findings and draws conclusions. The contribution to theory, the implications for practice and limitations and further research are discussed.

6.1 Conclusions

Our research goal is to investigate personal and social factors which affect the intention to share knowledge. Firstly, we investigated individual factors, such as benefit and cost of knowledge sharing. Secondly, we combined these individual factors with the TRA research model so as to predict their impact on the intention to share knowledge. Thirdly, we introduced social factors and found that social information processing shape knowledge sharing intention through the perspective of TRA.

Our findings show that loss of knowledge power is an important factor which has a negative effect on the attitude towards knowledge sharing. This suggests that many employees have realized that knowledge power is critical and are unwilling to share their experience and core knowledge with others. This finding is in consistence with Li & Scullion (2007) It shows that the belief "knowledge is power" tends to make Chinese people "hoard knowledge rather than share it".

We also found that there is no significant relationship between codification effort and attitude toward knowledge sharing.Kankanhalli et al. (2005) also found no direct effect for codification effort, but they found that the relationship between codification effort and knowledge contribution was only salient when generalized trust is weak. Moreover，Huang et al. (2008) also found that "codify effort" was no significant relationship with attitude to share knowledge. We then confirmed from our survey population (We asked some respondents from original volunteer population) that the main reason why "codify effort" does not negatively affect the attitude towards the willingness to share knowledge is that codifying knowledge is already a formal requirement of their supervisors and managers. They also confirmed that, although such knowledge codification takes time and effort, the employees would usually undertake these actions in obedience to this requirement. Some respondents said: "most of the time, our document of experience can help new employees to avoid making mistakes and enhance their working efficiency." Other employees also told that they would withhold knowledge that they did not want to share openly, since the knowledge that could be shared is tacit, which is inclined to be ignored. Given this additional information, we could see that codification effort is much easier to overcome as long as the managers demand it, since most employees choose to obey and think the effort required to share knowledge is not a serious barrier.

Regarding to benefit factors, we found that anticipated reciprocal relationship has a significant effect on the attitude to share knowledge while anticipated extrinsic reward, image and sense of self worth do not. In other words, individuals contribute more knowledge when they expect to develop reciprocal relationships. This finding is identical with research in face-to-face settings and social exchange theory, where it is consistently found that reciprocity is essential for sustaining social exchange relationships. That is to say an individual's attitude toward knowledge sharing is driven primarily by anticipated reciprocal relationships .This finding is also confirmed by Bock et al. (2005). However, this finding contradicts other literature such as Wasko and Faraj (2005) and Huang et al.(2008). Wasko and Faraj (2005) found that the volume of contributions in a electronic network of law professionals was negatively related to anticipated reciprocal benefits. Huang et al (2008) found that there is no relationship between anticipated reciprocal relationships and attitude to knowledge sharing.They also stated that sharing knowledge is mainly conducted so as to enable more effective working, not for relationship maintenance. There are some possible explanations for this contradiction. Firstly, in our research, the responses are from small companies. One of the respondent's replies is instructive here: "we work in a small company, everyone knows each other. Sharing knowledge can help to maintain a good relationship with persons." Secondly, Chinese culture is another explanation that employees like to take anticipated reciprocal relationship into account when they tend to share their knowledge. Chinese People typically have a high guanxi orientation, where guanxi is regarded as a basic element of the web of personal relationship (Buckley et al., 2006).

In accordance with the TRA, attitude is found to have a positive and significant effect on knowledge sharing intention. Moreover, subjective norm is likely to affect knowledge sharing intention directly and indirectly through attitude. The application of the TRA to the knowledge sharing context has been tested in previous research, with attitude, subjective norm and knowledge sharing intention found to be significant (Bock et al 2005; Ryu et al.2003).

Finally, from a social influence perspective, we found that identification and compliance have significant effect on subjective norm while internalization does not. This finding is consistent with the results of Kankanhalli et al. (2005) that identification toward workgroup is helpful for knowledge contribution. Moreover, Joseph and Farn (2008)also find that identification and compliance are determinates of subjective norms of knowledge sharing. But they also show that internalization can shape the knowledge sharing from subject norm, which reverses our finding. One of the respondent's replies is instructive here: "It is not clear what is the value and common principle of our company and workgroup, and I do not think that the goal and vision of company links with my personal value system."

6.2 Implications

6.2.1 Implications for the theory

From a theoretical perspective, our study contributes to the literature in several ways. First, our study combined SET, TRA and SIP to investigate knowledge sharing intentions in the Chinese context. We classified antecedents of attitudes into costs and benefits, and analyzed the subjective norm of sharing by the general processes of social influences. This offers a more clear and intensive vision. Secondly, this study examined how social information processing shapes knowledge sharing intention through the subject norm. Thirdly, this study identifies both personal and social factors which can influence the knowledge sharing intentions. It not only identifies personal factor that improve knowledge sharing such as anticipated reciprocal relationship, but also find that loss of knowledge power is a negative personal factor of knowledge sharing. Moreover, in the term of social factors, we found that identification and compliance can improve the knowledge sharing intentions through social norms. Finally, the research shows that the TRA also can explain knowledge sharing intentions very well in the Chinese context since the effect of attitude and subject norms are both significant.

6.2.2 Implications for practice

Based on what we found, we offer some suggestions to management about how to promote employees to share knowledge within organizations. Firstly, since the loss of knowledge power has such a significantly negative relationship with attitude(H4), managers should pay more attentions to this point. We suggest that managers should communicate more with their employees and find out how to compensate their loss if the knowledge is shared. What is critical here is the understanding that the knowledge "lost" by the individual is of great value to the whole organization. What is more, managers could also endeavor to cultivate employees' high commitment towards the organization so as to encourage employees them to contribute their knowledge as a form of organizational citizenship behavior. Secondly, based on our finding that anticipated reciprocal reward has no effect on attitude to share knowledge (H7), we suggest that practicing managers should not stress rewords as a primary motivator and they should rely on non-material rewards to motivate knowledge sharing. Thirdly, since the anticipated reciprocal relationship has a great effect on attitude (H6), management can emphasize effort to nurture the targeted social relationships and interpersonal interactions of employees before launching knowledge sharing initiatives. Managers should endeavor to foster a work context characterized by high level of organizational citizenship which can nurture the mutual social exchange relationships that are

apparently important in driving knowledge sharing intentions. Last but not least, identification toward workgroup is help for knowledge contribution in organization (H11). Therefore, managers should encourage employees to share their social lives and opinions or comments by rewarding top 10 employees. The more information and comments posted and discussed, the more people will to share their knowledge. This will, in turn, establish a stronger sense of identification among employees. Moreover, since compliance also has a significant effect on knowledge sharing (H12), managers should pay more attention on reward and punishment system which related to employees' knowledge sharing behavior.

6.3 Limitations and future research

Our study also has some limitations. First of all, many scholars have noticed that knowledge types, namely tacit and explicit knowledge, are different from each other in many ways, including characteristics, hoarding, distribution, and so on(Alavi & Leidner, 2001; Bordia et al., 2006; Constant et al., 1994; Grover & Davenport, 2001; Hansen et al., 1999; Zander & Kogut, 1995). However, in this research, we did not consider knowledge type when employee shared their knowledge since they shared both types of knowledge in daily life and it is difficult to separate them. This is an area for future research to consider, i.e., how knowledge type intervene the effects on sharing behavior. Secondly, in our study, we chose several Chinese companies as the sample, but we did not take the Chinese culture factors into consideration, which may have important impacts on the propensity to share knowledge in the Chinese context. Future research could explore the interaction of Chinese culture factors and knowledge sharing more deeply. Thirdly, our sample populations are from small IT companies, The following two important points can be drawn from the review of KM literature in the small business setting: (1) small businesses generally lack a proper understanding of KM – mostly in terms of key concepts; and (2) small businesses have been slow in adopting formal and systematic KM practices – it does not feature highly as an important agenda in most of them. Last, but definitely not least, our research has considered knowledge sharing that occurs between colleagues at the same level, but knowledge sharing between supervisors and subordinates is also important and worthy of attention.

Given these limitations, we encourage research on knowledge types intervene the effects on knowledge sharing and the difference knowledge sharing behavior between tacit and explicit knowledge. More research could also be done to investigate to discover how Chinese culture affects knowledge sharing and what the difference of knowledge sharing behavior is between Chinese employees and the employee of western country such as The Netherlands. Furthermore, it would be interesting to probe more deeply on knowledge sharing between supervisors and subordinates.

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Appendix

Appendix A: Top 25 IS Journals

Top 25 IS Journals (Peffers & Ya, 2003)

Communications of the ACM

MIS Quarterly Management Information Systems

Information Systems Research

Harvard Business Review

Decision Science

Journal of Management Information Systems

Management Science

European Journal of Information Systems

Information and Management

Decision Support Systems

Academy of Management Journal

Academy of Management Review

Database

Administrative Science Quarterly

ACM Computing Surveys

Sloan Management Review

ACM Transactions on Database Systems

Computer

California Management Review

Organization Science

Information Systems Journal

IEEE Transactions on Software Engineering

IEEE Transactions on Knowledge and Data Engineering

Appendix B: Questionnaire

This questionnaire uses the five-point Likert scale ranging from "strongly disagree" to "strongly agree"

1 Strongly Disagree

2 Disagree

3 Neutral

4 Agree

5 Strongly Agree

Loss of knowledge power:

1. Sharing my knowledge makes me lose my unique value in the organization.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

2. Sharing my knowledge makes me lose my power base in the organization.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

3. Sharing my knowledge makes me lose my knowledge that makes me stand out with respect to others.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

4. Sharing my knowledge makes me lose my knowledge that no one else has.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

Codification effort:

I do not have the time to codify my knowledge.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

It is laborious to codify my knowledge.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

The effort is high for me to codify my knowledge.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

I am worried that if I share my knowledge, I will have to spend additional time answering follow up questions.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

Anticipated reciprocal relationships:

1. My knowledge sharing would strengthen the ties between existing members in the organization and myself.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

2. My knowledge sharing would get me well acquainted with new members in the organization.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

3. My knowledge sharing would expand the scope of my association with other members in the organization.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

4. My knowledge sharing would draw smooth cooperation from outstanding members in the future.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

5. My knowledge sharing would create strong relationships with members who have common interests in the organization.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

Anticipated extrinsic rewards:

1. I will receive monetary rewards in return for my knowledge sharing.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

2. I will receive additional points for promotion in return for my knowledge sharing.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

Image:

1. Sharing my knowledge improves my image within the organization.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

2. People in the organization who share their knowledge have more prestige than those who do not.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

3. Sharing my knowledge improves others recognition of me.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

4. When I share my knowledge, the people I work with respect me.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

5. When I share my knowledge, my superiors praise me.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

Sense of self-worth:

1. My knowledge sharing would help other members in the organization solve problems.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

2. My knowledge sharing would create new business opportunities for the organization.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

3. My knowledge sharing would improve work processes in the organization.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

4. My knowledge sharing would increase productivity in the organization.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

5. My knowledge sharing would help the organization achieve its performance objectives.

○ 1   ○ 2   ○ 3   ○ 4   ○ 5

Attitude toward Knowledge Sharing:

1. Sharing my knowledge with other organizational members is good.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

2. Sharing my knowledge with other organizational members is harmful.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

3. Sharing my knowledge with other organizational members is an enjoyable experience.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

4. Sharing my knowledge with other organizational members is valuable to me.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

5. Sharing my knowledge with other organizational members is a wise move.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

Internalization:

I was fairly rewarded considering the responsibilities I have.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

I was fairly rewarded for the amount of effort I put forth.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

I was fairly rewarded for the stresses and strain of my job.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

I was fairly rewarded for the work I have done well.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

Identification:

1. Cognitive social identity:

I feel my self-image overlaps with the identity of the group I work with.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

2. Affective social identity:

I feel I am attached and belong to the group I work with.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

3. Evaluative social identity:

I feel I am an important and valuable member of the group I work with.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

Compliance:

1. In order to be accepted, I feel like I must Sharing my knowledge with others as other members expect me to share.

◯ 1　　◯ 2　　◯ 3　　◯ 4　　◯ 5

2. Sharing my knowledge with other organizational members is often influenced by how other members want me to behave.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

Subjective norms :

1. My boss thinks that 1 should share my knowledge with other members in the organization.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

2. My colleagues think 1 should share my knowledge with other members in the organization.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

Intention to share knowledge:

1. I will make an effort to share knowledge with my colleagues.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

2. I intend to share knowledge with my colleagues when they ask.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

3. I will share knowledge with my colleagues.

◯ 1   ◯ 2   ◯ 3   ◯ 4   ◯ 5

AppendixC: Studies Included in the Review

Authors	Main Results	Theory	Methodology	Context	Journal
(Ardichvili, & Wentling, 2003)	Employees hesitate to contribute out of fear of criticism, or of misleading the community members	-	Case study	Community of practice	Journal of Knowledge Management
(Bock et al. 2005)	Subjective norms and organizational climate affect individuals' intentions to share knowledge. Reciprocal relationships affect individuals' attitudes toward knowledge sharing Sense of self-worth and organizational climate affect subjective norms	Theory of reasoned action	Survey	Repository	MIS Quarterly: Management Information Systems
(Bordia et al. 2006)	Evaluation apprehension is negatively associated with knowledge sharing intentions and perceived benefit was only positively associated with knowledge sharing intentions Evaluation apprehension is higher and knowledge sharing lower in the repository context compared to interpersonal context	Social exchange theory	Survey	Repository and interpersonal	European Journal of Work and Organizational Psychology
(Cabrera et	Self-efficacy, openness to experience, perceived support		- Survey	Repository	International

al.2006)	from colleagues and supervisors and, to a lesser extent, organizational commitment, job autonomy, perceptions about the availability and quality of knowledge management systems, and perceptions of rewards associated with sharing knowledge, significantly predicted self-reports of participation in knowledge exchange				Journal of Human Resource Management
(Chiu 2006)	"Social interaction ties, norm op reciprocity, identification and a shared vision are significant predictors"	Social Cognitive Theory Social Capital Theory	Survey	Virtual community	Decision Support Systems
(Chow & Chan,2008)	"Social network and shared goals significantly contributed to a person's volition to share knowledge, and directly contributed to the perceived social pressure of the organization. The social trust has however showed no direct effect on the attitude and subjective norm of sharing knowledge."	Social Capital Theory Theory of reasoned action	Survey	Repository	Information and Management
(Constant et al. 1994)	"A greater self interest reduces support of sharing, but that a belief in organizational ownership of work encourages and mediates attitudes favoring sharing."	Interdependence theory Social Exchange Theory	Experiment	-	Information Systems Research
(Constant et	"Organizational citizenship behavior and the desire to	Weak ties and	Case study:	Community	Organization

al. 1996)	benefit the organization are the major motivations for helping behavior"	prosocial motivations	Survey and observational data	of practice	Science
(Han & Anantatmula 2007)	"Availability and usability of technology, leadership support and motivating structures were shown to have influences on knowledge sharing. The study also revealed that employees' willingness to share knowledge was not affected by their concerns about the loss of power or job insecurity."	-	Caste study and survey	Repository	VINE
(He et al.2009)	"Hard elements, such as IT, only play a part of the role in KM initiatives: social relationship embedded in human beings is the key factor affecting knowledge sharing behaviors in a KM initiative." "social relationship could establish positive attitudes toward knowledge sharing and therefore stimulate KMS usage."	Social capital theory	Caste study and interviews		Information and Management
(Huang et al.2008)	"Image, sense of self worth and anticipated extrinsic reward have a significant effect on attitude while anticipated reciprocal relationships do not." "Attitude has a medium to large effect on the intention to share knowledge while cultural factors have a large effect." "Face and guanxi orientation both exert a significant effect	Social exchange theory Theory of reasoned action	Survey	Repository	Asia Pacific Journal of Management

	on the intention to share knowledge."				
(Hsu & Lin,2008)	"The results indicated that ease of use and enjoyment, and knowledge sharing (altruism and reputation) were positively related to attitude toward blogging," "Social factors (community identification) and attitude toward blogging significantly influenced a blog participant's intention to continue to use blogs"	Theory of reasoned action	Survey	Virtual community	Information and Management
(Lin et al.2008)	"Trust significantly influences knowledge sharing self-efficacy, perceived relative advantage and perceived compatibility, which in turn positively affect knowledge sharing behavior" "The norm of reciprocity does not significantly affect knowledge sharing behavior"	Social capital theory	Survey	Professional virtual community	Computers in Human Behavior
(Joseph,2008)	"Compliance takes no effect on intention of tacit knowledge sharing " "Group shared value affects attitude through subjective norms in tacit context"	Theory of reasoned action	Survey	Repository	Lecture Notes in Computer Science
(Jian & Jeffres 2006)	"The utilitarian,, normative and collaborative experience dimensions provide an additive model to explain the willingness to contribute."	-	Survey	Repository	Communication Research
(Kankanhalli	"Knowledge self-efficacy and enjoyment in helping others	Social exchange	Survey	Repository	MIS Quarterly:

2005)	"significantly impact EKR usage" "Extrinsic benefits (impact EKR usage contingent on particular contextual factors whereas the effects of intrinsic benefits on EKR usage are not moderated by contextual factors." "The loss of knowledge power and image do not appear to impact EKR usage"	theory Social capital theory			Management Information Systems
(Kulkarni et al. 2006)	"Organizational support factors of leadership commitment, supervisor and coworker support, as well as incentives, directly or indirectly supported shared knowledge quality and knowledge use." "In addition to knowledge management systems quality, firms must pay careful attention to championing and goal setting as well as designing adequate reward systems for the ultimate success of these efforts."	Delone and Mclean model of IS succes	Survey	-	Journal of Management Information Systems
(Kuo & Young,2008)	"Self-efficacy is the only variable that exhibits predictive power, although its power is rather limited."	Theory of Reasoned Action Theory of Planned Behavior	longitudinal, two-phased study	Virtual community	Information Systems Research
(Marks et al. 2008)	"Knowledge sharing s can be encouraged by management's reminders of the importance of the goal, as well as	-	Experiment	-	Organization Studies

	reminders about rivals." "It is also important to hire personnel with prosocial traits."				
(Ma & Agarwal 2007)	"Perceived identity verification is strongly linked to member satisfaction and knowledge contribution."	Self-presentation theory	Survey	Virtual community	Human Relations
(Wasko & Faraj 2005)	"People contribute their knowledge when they perceive that it enhances their professional reputations, when they have the experience to share, and when they are structurally embedded in the network. Surprisingly, contributions occur without regard to expectations of reciprocity from others or high levels of commitment to the network."	Social capital theory	Survey	Network of practice	MIS Quarterly: Management Information Systems
(Yang & Farn,2009)	"Tacit knowledge sharing intention can be induced by affect-based trust. But shared value is negatively related to tacit knowledge sharing intention" "Internal control has a positive effect on tacit knowledge sharing intention, but the relationship between internal control and tacit knowledge sharing behaviour could not be confirmed" "External control positively moderates the relationship between tacit knowledge sharing intention and behaviour."	Social capital theory Perceived behavioral control	Survey		International Journal of Information Management
(Yu & Chu	"Effective leader–member exchange relationships, the	Organizational	Survey	Virtual	Information and

| 2007) | attractiveness of the group to individuals, and affection similarity are important in establishing a virtual environment within which voluntary contributions can be promoted effectively." | citenship behaviour Leader-member exchange | | community | Management |

Appendix D: Survey instruments (English)

Construct	ID	Items
Anticipated extrinsic rewards	AERE1	I will receive monetary rewards in return for my knowledge sharing.
	AERE2	I will receive additional points for promotion in return for my knowledge sharing
Anticipated Reciprocal Relationships	ARRE1	My knowledge sharing would strengthen the ties between existing members in the organization and myself.
	ARRE2	My knowledge sharing would get me well acquainted with new members in the organization.
	ARRE3	My knowledge sharing would expand the scope of my association with other members in the organization.
	ARRE4	My knowledge sharing would draw smooth cooperation from outstanding members in the future.
	ARRE5	My knowledge sharing would create strong relationships with members who have common interests in the organization.
Attitude toward Knowledge Sharing	ATKS1	Sharing my knowledge with other organizational members is good.
	ATKS2	Sharing my knowledge with other organizational members is harmful.
	ATKS3	Sharing my knowledge with other organizational members is an enjoyable experience.
	ATKS4	Sharing my knowledge with other organizational members is valuable to me.
	ATKS5	Sharing my knowledge with other organizational members is a wise move。
Codification effort	CEFF1	I do not have the time to codify my knowledge.
	CEFF2	It is laborious to codify my knowledge
	CEFF3	The effort is high for me to codify my knowledge.
	CEFF4	I am worried that if I share my knowledge, I will have to spend additional time answering follow up questions.
Compliance	COMP1	In order to be accepted, I feel like I must Sharing my knowledge with

		others as other members expect me to share
	COMP2	Sharing my knowledge with other organizational members is often influenced by how other members want me to behave
Loss Of Knowledge Power	LOKP 1	Sharing my knowledge makes me lose my unique value in the organization.
	LOKP2	Sharing my knowledge makes me lose my power base in the organization.
	LOKP3	Sharing my knowledge makes me lose my knowledge that makes me stand out with respect to others.
	LOKP4	Sharing my knowledge makes me lose my knowledge that no one else has
Image	IMAG1	Sharing my knowledge improves my image within the organization.
	IMAG2	People in the organization who share their knowledge have more prestige than those who do not.
	IMAG3	Sharing my knowledge improves others recognition of me.
	IMAG4	When I share my knowledge, the people I work with respect me.
	IMAG5	When I share my knowledge, my superiors praise me.
Internalization	INTE1	I was fairly rewarded considering the responsibilities I have
	INTE2	I was fairly rewarded for the amount of effort I put forth.
	INTE3	I was fairly rewarded for the stresses and strain of my job.
	INTE4	I was fairly rewarded for the work I have done well.
Identification	IDEN1	I feel my self-image overlaps with the identity of the group I work with.
	IDEN2	I feel I am attached and belong to the group I work with.
	IDEN3	I feel I am an important and valuable member of the group I work with.
Intention to share knowledge	ITSK1	I will make an effort to share knowledge with my colleagues.
	ITSK2	I intend to share knowledge with my colleagues when they ask.

	ITSK3	I will share knowledge with my colleagues.
Sense of self-worth	SOSW1	My knowledge sharing would help other members in the organization solve problems
	SOSW2	My knowledge sharing would create new business opportunities for the organization.
	SOSW3	My knowledge sharing would improve work processes in the organization.
	SOSW4	My knowledge sharing would increase productivity in the organization.
	SOSW5	My knowledge sharing would increase productivity in the organization.
Subjective Norms	SUNO1	My boss thinks that 1 should share my knowledge with other members in the organization.
	SUNO2	My colleagues think 1 should share my knowledge with other members in the organization.

Appendix E: Survey instruments (Chinese)

Construct	ID	Items
Anticipated extrinsic rewards	AERE1	共享我的知识我会得到金钱回报
	AERE2	共享我的知识会提高我晋升的机会
Anticipated Reciprocal Relationships	ARRE1	共享我的知识会增进我跟公司中现有同事的关系
	ARRE2	共享我的知识会让我跟公司新同事很快熟起来
	ARRE3	共享我的知识会让我跟公司中同事的联系更广泛
	ARRE4	共享我的知识会增加我跟杰出同事合作的机会
	ARRE5	共享我的知识会让我建立起跟与我有共同志向的同事的紧密关系.
Attitude toward Knowledge Sharing	ATKS1	与同事共享我的知识是好的
	ATKS2	与同事共享我的知识是有害的
	ATKS3	与同事共享我的知识是愉快的
	ATKS4	与同事共享我的知识是有价值的
	ATKS5	与同事共享我的知识是一个明智的选择
Codification effort	CEFF1	我没有时间把我的知识写成文字
	CEFF2	把我的知识写成文字是一种体力活
	CEFF3	把我的知识写成文字我需要花很多时间.
	CEFF4	我担心如果我共享我的知识,接着我就得花额外的时间回答相应的问题
Compliance	COMP1	为了融入团队,我觉得我必须共享我的知识,因为这是同事希望我做的
	COMP2	与同事共享我的知识往往受同事对我的期望所影响.
Loss Of Knowledge Power	LOKP 1	与他人共享我的知识会让我失去在公司中的独特地位.
	LOKP2	共享我的知识会让我失去在公司中的权力基础
	LOKP3	共享我的知识会让我失去让我有别于他人的那部分知识
	LOKP4	共享我的知识会让我失去只有我有的那部分知识
Image	IMAG1	共享我的知识会提高我在公司的形象
	IMAG2	在公司中共享知识的人有更好的声望
	IMAG3	共享我的知识增加同事对我的认可
	IMAG4	当我共享我的知识,同事们会更尊重我
	IMAG5	共享我的知识,上司会表扬我

Internalization	INTE1	相应于我的职责,我的回报是很不错的
	INTE2	相比我付出的努力,我的回报是很不错的
	INTE3	相比我承受的压力,我的回报是很不错的
	INTE4	对于我出色完成的工作,我得到了很好的回报
Identification	IDEN1	我觉得我的自我形象跟我的团队形象很吻合.
	IDEN2	我在我的团队很有归属感.
	IDEN3	我觉得我是团队里重要而且有价值的成员
Intention to share knowledge	ITSK1	我会为与同事共享知识付出努力.
	ITSK2	如果同事要求了,我会共享我的知识
	ITSK3	我会与同事共享知识.
Sense of self-worth	SOSW1	共享我的知识会帮助同事们解决问题
	SOSW2	共享我的知识会给公司带来新的商机
	SOSW3	共享我的知识会改善公司的工作流程
	SOSW4	共享我的知识会提高公司的产出
	SOSW5	共享我的知识会帮助公司实现预期目标
Subjective Norms	SUNO1	我的上司认为我应该跟他人共享我的知识.
	SUNO2	我的同事认为我应该跟他人共享我的知识

Appendix F: Factor analysis

	AERE	ARRE	ATKS	CEFF	COMP	IDEN	IMAG	INTE	ITSK	LOKP	SOSW	SUNO
AERE1	0.89	0.04	0.16	0.06	0.12	0.19	0.28	0.30	0.22	0.21	0.26	0.34
AERE2	0.89	0.29	0.26	0.08	0.31	0.32	0.47	0.22	0.30	0.08	0.32	0.33
ARRE1	0.12	0.86	0.52	0.25	0.19	0.40	0.57	0.20	0.30	-0.12	0.42	0.28
ARRE2	0.12	0.80	0.48	0.14	0.20	0.31	0.52	0.20	0.37	-0.03	0.49	0.38
ARRE3	0.19	0.87	0.51	0.09	0.28	0.28	0.46	0.14	0.36	-0.12	0.45	0.33
ARRE4	0.24	0.73	0.54	-0.04	0.36	0.34	0.36	0.20	0.49	-0.32	0.39	0.39
ARRE5	0.08	0.76	0.43	-0.06	0.01	0.18	0.33	0.06	0.20	-0.32	0.36	0.34
ATKS1	0.18	0.51	0.85	0.11	0.17	0.32	0.53	0.27	0.51	-0.30	0.44	0.52
ATKS2	0.17	0.41	0.71	0.12	0.12	0.14	0.37	0.07	0.36	-0.22	0.31	0.42
ATKS3	0.15	0.46	0.84	0.12	0.11	0.21	0.34	0.23	0.47	-0.24	0.39	0.42
ATKS4	0.14	0.61	0.87	0.12	0.11	0.21	0.34	0.23	0.47	-0.24	0.39	0.42
ATKS5	0.33	0.49	0.77	0.10	0.13	0.38	0.41	0.16	0.50	-0.30	0.46	0.44
CEFF1	0.14	0.12	0.11	0.85	-0.10	0.29	0.27	0.20	0.05	0.20	0.25	0.14
CEFF2	-0.01	0.10	0.14	0.85	-0.06	0.15	0.27	0.11	0.09	0.10	0.19	0.09
CEFF3	0.04	0.12	0.12	0.87	-0.14	0.23	0.27	0.11	0.03	0.03	0.23	0.15
CEFF4	0.10	-0.02	-0.04	0.75	-0.14	0.18	0.14	0.21	-0.02	0.25	0.15	-0.02
COMP1	0.18	0.28	0.24	-0.21	0.85	0.17	0.20	0.26	0.38	-0.04	0.14	0.23
COMP2	0.23	0.16	0.11	-0.01	0.85	0.08	0.22	0.23	0.23	0.06	0.11	0.21
IDEN1	0.25	0.29	0.26	0.28	0.12	0.86	0.46	0.37	0.19	0.11	0.38	0.22
IDEN2	0.29	0.27	0.27	0.21	0.12	0.88	0.36	0.41	0.25	-0.05	0.38	0.24
IDEN3	0.18	0.41	0.34	0.16	0.14	0.83	0.33	0.44	0.27	-0.01	0.40	0.26
IMAG1	0.34	0.46	0.40	0.17	0.25	0.36	0.77	0.37	0.25	-0.14	0.43	0.34
IMAG2	0.32	0.37	0.35	0.28	0.19	0.22	0.79	0.31	0.32	-0.07	0.46	0.33
IMAG3	0.22	0.55	0.47	0.20	0.09	0.42	0.83	0.28	0.28	0.00	0.48	0.25
IMAG4	0.27	0.46	0.46	0.23	0.16	0.40	0.80	0.34	0.41	0.39	0.50	0.34
IMAG5	0.53	0.33	0.30	0.25	0.29	0.33	0.70	0.24	0.25	0.13	0.36	0.38
INTE1	0.22	0.21	0.21	0.21	0.20	0.39	0.33	0.79	0.28	0.06	0.42	0.22
INTE2	0.25	0.20	0.18	0.24	0.28	0.33	0.40	0.79	0.23	0.17	0.34	0.11
INTE3	0.19	0.11	0.23	0.06	0.22	0.37	0.27	0.77	0.19	0.05	0.32	0.18
INTE4	0.25	0.08	0.07	0.07	0.20	0.38	0.22	0.76	0.28	0.24	0.24	0.08
ITSK1	0.34	0.36	0.46	-0.09	0.33	0.24	0.28	0.21	0.83	-0.23	0.38	0.43
ITSK2	0.14	0.38	0.47	0.16	0.24	0.18	0.42	0.29	0.78	-0.06	0.47	0.34
ITSK3	0.20	0.25	0.42	0.05	0.27	0.24	0.20	0.24	0.73	-0.20	0.45	0.29
LOKP1	0.11	-0.21	-0.30	0.16	0.02	-0.07	-0.06	0.08	-0.16	0.87	-0.07	-0.20
LOKP2	0.18	-0.20	-0.33	0.11	0.02	-0.04	-0.04	0.18	-0.26	0.82	-0.17	-0.17
LOKP3	0.08	-0.14	-0.27	0.13	0.02	0.05	-0.03	0.08	-0.16	0.84	-0.13	-0.19
LOKP4	0.18	-0.18	-0.19	0.17	-0.04	0.12	0.01	0.23	-0.13	0.86	-0.09	-0.20

SOSW1	0.11	0.50	0.48	0.30	0.00	0.36	0.51	0.34	0.41	-0.17	0.77	0.28
SOSW2	0.31	0.36	0.33	0.00	0.19	0.28	0.26	0.26	0.38	-0.24	0.73	0.39
SOSW3	0.28	0.39	0.35	0.21	0.12	0.42	0.42	0.32	0.41	-0.06	0.78	0.31
SOSW4	0.24	0.38	0.35	0.28	0.09	0.32	0.56	0.34	0.43	0.04	0.79	0.19
SOSW5	0.33	0.36	0.35	0.14	0.18	0.36	0.42	0.36	0.49	-0.09	0.74	0.32
SUNO1	0.34	0.38	0.54	0.10	0.29	0.19	0.38	0.20	0.41	-0.27	0.29	0.91
SUNO2	0.35	0.39	0.47	0.11	0.18	0.32	0.37	0.16	0.43	-0.13	0.41	0.91

Appendix G: Common method bias analysis

Indicator	Substantive loading (R1)		R1^2	Method Loading (R2)		R2^2
AERE1	0.937	**	0.878	-0.106	**	0.011
AERE2	0.847	**	0.717	0.104	**	0.011
ARRE1	0.833	**	0.694	0.029		0.001
ARRE2	0.728	**	0.530	0.090		0.008
ARRE3	0.921	**	0.848	-0.066		0.004
ARRE4	0.801	**	0.642	0.169	**	0.029
ARRE5	0.931	**	0.867	-0.218	**	0.048
ATKS1	0.746	**	0.557	0.126	**	0.016
ATKS2	0.784	**	0.615	-0.095		0.009
ATKS3	0.954	**	0.910	-0.139	**	0.019
ATKS4	0.842	**	0.709	0.034		0.001
ATKS5	0.728	**	0.530	0.056		0.003
CEFF1	0.830	**	0.689	0.052		0.003
CEFF2	0.848	**	0.719	0.012		0.000
CEFF3	0.861	**	0.741	0.026		0.001
CEFF4	0.778	**	0.605	-0.104	*	0.011
COMP1	0.832	**	0.692	0.043		0.002
COMP2	0.861	**	0.741	-0.043		0.002
LOKP 1	0.869	**	0.755	-0.020		0.000
LOKP2	0.805	**	0.648	-0.052		0.003
LOKP3	0.845	**	0.714	0.002		0.000
LOKP4	0.871	**	0.759	0.069		0.005
IMAG1	0.734	**	0.539	0.044		0.002
IMAG2	0.881	**	0.776	-0.109	**	0.012
IMAG3	0.823	**	0.677	0.010		0.000
IMAG4	0.800	**	0.640	0.000		0.000
IMAG5	0.744	**	0.554	-0.052		0.003
INTE1	0.743	**	0.552	0.084		0.007
INTE2	0.769	**	0.591	0.040		0.002
INTE3	0.773	**	0.598	-0.013		0.000
INTE4	0.818	**	0.669	-0.117	**	0.014
IDEN1	0.869	**	0.755	-0.017		0.000
IDEN2	0.904	**	0.817	-0.043		0.002
IDEN3	0.794	**	0.630	0.063	*	0.004
ITSK1	0.870	**	0.757	-0.053		0.003
ITSK2	0.723	**	0.523	0.085		0.007
ITSK3	0.751	**	0.564	-0.031		0.001
SOSW1	0.858	**	0.736	0.147	**	0.022
SOSW2	0.730	**	0.533	0.000		0.000
SOSW3	0.811	**	0.658	-0.034		0.001
SOSW4	0.815	**	0.664	-0.030		0.001

SOSW5	0.714 **	0.510	0.033	0.001
SUNO1	0.913 **	0.834	-0.009	0.000
SUNO2	0.899 **	0.808	0.009	0.000
Average	0.854	0.680	-0.000	0.006