

The Effects of Relation Models on Knowledge Sharing: An Empirical Study of IS Project Team

Chiou-Mei Chen

Department of Information Management, National Sun Yat-Sen University
Department of Information Management, Tajen University

Tung-Ching Lin

Department of Information Management, National Sun Yat-Sen University

Shu-ling Chiu

Department of Information Management, National Sun Yat-Sen University

Abstract

This study suggested that the mechanism behind knowledge sharing (KS) is constructed based on the combination of the four fundamental relation models which coexist with different degree among members in the group. These four relation models of knowledge sharing are Communal Sharing (CS), Authority Ranking (AR), Equality Matching (EM), and Market Pricing (MP). Therefore this study based on four relation models to investigate how the social capital influences each relation model. Further this study also investigated the impact of each relation model on the effectiveness of knowledge sharing. 233 MIS project team members were surveyed and structural equation model analysis was conducted to test the research model. The results showed that (1) trust, identification, and norm have positive influence on the communal sharing (CS) model. (2) Obligation has positive influence on the Authority Ranking (AR) model. (3) Trust and identification have positive influence on the Equality Matching (EM) model. (4) Trust, identification, and obligation have positive influence on the Market Pricing (MP) model. We also found that trust and identification have positive influence on the effectiveness of knowledge sharing. Furthermore, CS, among the four relation models, was found to have the highest positive influence on the effectiveness of KS, followed by EM and MP sequentially, while no significant relation between AR and the effectiveness of KS was found in our observations.

Key words: Knowledge Sharing, Relation Models, Relational Dimension of Social Capital, Effectiveness of Knowledge Sharing

關係模式對於知識分享的影響— 以資訊系統專案團隊為實證研究的對象

陳秋美

中山大學資訊管理學系
大仁科技大學資訊管理學系

林東清

中山大學資訊管理學系

邱淑玲

中山大學資訊管理學系

摘要

本研究建議合理的知識分機制乃是建構在四種基本的關係模式上，此四種模式並行且程度不一的共存於群組成員的互動中，這些模式分別為社群分享(Communal Sharing)、權力等級(Authority Ranking)、對等互惠(Equality Matching)與市場價值(Market Pricing)四種關係模式，所以本研究植基於這四種基本的知識分享關係模式並進一步結合社會資本關係構面的信任(Trust)、認同(Identification)、義務(Obligation)與規範(Norm)等四要素進行探討，欲瞭解社會資本關係構面的四大要素對於四個知識分享關係模式與知識分享成效的影響，另外亦進一步探討那些知識分享關係模式可以提升資訊專案團隊中知識分享的成效。本研究採用量化的問卷調查法收集233個資訊專案成員在專案團隊中對於知識分享的相關經驗，並且採用結構方程模式分析方法對研究模式進行檢測。於社會資本關係構面元素與知識分享關係模式的關聯性探討，所得結果為：(1)信任、認同與規範對社群分享(CS)關係模式有正向的影響；(2)義務對權利等級(AR)模式有正向的影響；(3)信任與認同對於權利等級(AR)關係模式有正向的影響；(3)信任與認同對平等互惠(EM)關係模式有正向的影響；(4)信任、認同與義務元素對市場價值(MP)關係模式有正向的影響。另外，對於社會資本關係構面元素與知識分享成效關係的探討，其結果顯示信任與認同元素對於知識分享成效有顯著性的正向影響。另外，對於知識分享關係模式與知識分享成效關係的探討，其結果顯示社群分享(CS)、平等互惠(EM)與市場價值(MP)三個關係模式對於知識分享成效有正向的影響。

關鍵字：知識分享、關係模式、社會資本理論關係構面、知識分享成效

1. Introduction

In recent decades, knowledge management is becoming more and more popular. Knowledge sharing is a vital issue in the domain of knowledge management. Much of the KM literature has focused on knowledge sharing. Previous studies have been built on various perspectives, such as commitment to the group (Bij et al. 2002), expected rewards (Bock & Kim 2002), demanding from the supervisor (French & Raven 1959) and the existence of knowledge market (Constant et al. 1994). Despite these theoretical differences, empirical studies have yielded contradictory results. For example, some studies found that employing power differences may facilitate knowledge sharing (Collins 1974; Huber 1991); however, other authors reported a negative effect (Weiss 1999). Also, the effect and the role of reward on knowledge sharing have been discussed and debated (Huber 1991, Cameron & Pierce 1994). These contradictory findings of knowledge sharing were resulted from different perspectives and most of the research was dominated by only one dimension. Boer et al. (2002) proposed the relation models of knowledge sharing, suggesting that the mechanism behind knowledge sharing is based on the combination of four fundamental relation models which coexist among members in the group to a different extent. These four relation models of knowledge sharing are (1) Communal Sharing (CS), which suggests that group members automatically share their knowledge with other members for the whole community's good. (2) Authority Ranking (AR), which claims that group members are under the pressure from higher ranking members or higher ranking members want to show their generosity by sharing their knowledge. (3) Equality Matching (EM), which assumes that group members are seeking equalitarianism, so they share their knowledge as a means to pay back to others' sharing or they share their knowledge first with a belief that they will be fed back in a certain time span. (4) Market Pricing (MP), which indicates that knowledge sharing is under the exchange of monetary or equal value compensation. Thus, every phenomena of knowledge sharing could be explained with the complex structures which are yielded from various combinations of the four relation models. Moreover, previous research has shown that elements in social capital are only relevant to one relation model. For example, mutual trust motivates the altruistic behavior of knowledge sharing (Krogh 1998), thus it strengthens the effect of CS model. Individual who shares knowledge under the EM model is motivated by the expected feedback or others' reciprocity (Bock & Kim 2002). In this study, we postulated that the four relation models of knowledge sharing which coexist within the IS project team will construct an efficient mechanism of knowledge sharing, and each model is related to a different extent of all the elements in the relational dimension of social capital, including trust, identification, obligation and norm. Further, by examining the extent each relation model contribute to the effectiveness of knowledge sharing, we expect to deduce which relation model(s) should be

implemented within corresponding social capital embedded in organizational context. It can facilitate team members' interaction of knowledge sharing when they cooperate on IS projects and bring out the best effectiveness of knowledge sharing. With the relation between social capital and relation models, we hope to offer comprehensive perspectives for conducting the research of knowledge sharing and achieve a better insight of the dynamics of knowledge sharing.

The rest of this paper is structured as following: The next section develops the theoretical arguments leading to the research hypotheses in this study, including the relation models of knowledge sharing and the concept of relational dimension of social capital. In the following section, the methodology used to verify our theoretical framework and the result of the study are presented. The final section depicts the results and discussion, identifies the limitation of the study and describes its implications for both research and practice field.

2. Literature Review

2.1 Knowledge Sharing

Knowledge management is defined as systemic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more productive in their work (Alavi & Leidner 2001). Grant (1996) claimed organizational knowledge has been recognized as a valuable intangible resource that holds the key to competitive advantage. Knowledge sharing is a key component of knowledge management (Earl 2001). Bartol and Srivastava (2002) defined knowledge sharing as individual sharing organizationally relevant information, ideas, suggestions and expertise with one another. It could be seen as "the process through which one unit (e.g., group, department, or division) is affected by the experience of another" (Argote & Ingram 2000). Many practitioners and scholars have acknowledged the importance of knowledge sharing and focused on the research of different phenomena of knowledge sharing. Among these studies, individual's motivation has become a popular issue and widely discussed. Drawing on past studies, most of the motivations could be classified into three level, individual-level, such as one's desire to help others (Burgess 2005), self-interest (Constant, et al. 1994), self-esteem (Ardichvili et al. 2003); interpersonal-level, such as mutual trust (Abrams et al. 2003; Collins 2001; Krogh 1998), peer-recognition (Viehland 2005; Szulanski 1996), reciprocity norm (Burgess 2005; Weiss 1999), identification (Burgess 2005; Faraj & Wasko 2002), good citizenship (Hall 2001) and organizational-level, such as reward mechanism (Bock & Kim 2002), organizational culture (Davenport et al. 1998). Boer et al. (2002) claimed that most of studies which focus on the motivations and mechanisms of knowledge sharing were dominated

by sole perspective within every scholar's own domain, thus the various theoretical perspectives have brought a diverse approaches for explaining the emerged knowledge sharing phenomenon and that caused a great deal of fragmentary understandings, even worse, contradictory results in the research of knowledge sharing. For example, Davenport and Prusak (1998) argued that effective mechanism of knowledge sharing is based on the logic of markets, while several authors have pointed at the importance of communities (Wenger 1998; Brown & Duguid 1991). Michailova and Husted (2004) found that subordinates intentionally hoard their knowledge due to the reluctance caused by demanding of their supervisors while a pervasive belief is that knowledge sharing could be implemented with the commands of supervisors. Meanwhile, some authors have suggested that reward could stimulate knowledge sharing (Bartol & Locke 2000; Huber 1991), but others found no such positive effect of rewards on knowledge sharing (Bij et al. 2003; Constant et al. 1996). Drawing from these divergent results, Boer et al. (2002) proposed four relation models of knowledge sharing which coexist in every mechanism of knowledge sharing and intended to resolve these controversies. The four relation models are introduced in the following section.

2.2 Relation Models

Boer et al. (2002) suggested that knowledge sharing is a fundamentally social phenomenon and is practiced with reference to the relationships of the participants, thus it would be much more appropriate to explain the knowledge sharing with the perspective of their relationship. However, the relationship to which the participants refer while they interact and share knowledge is also embedded within the relationship structure which combines other social relationships between them, thus only taking sole model to explain the phenomena of knowledge sharing will result in contradictory findings. Fiske (1991) claimed that there are four fundamental relation models to which people refer to generate social action, understand and evaluate other's social behavior as well as coordinate, plan, encode and remember social behavior. Based on Fiske's perspective, Boer et al. (2002) proposed the relation models of knowledge sharing and asserted there are four fundamental models, which are communal sharing (CS), authority ranking (AR), equality matching (EM) and market pricing (MP), coexisting within the relationship structure of individuals while they share knowledge with each other. Further, they claimed that with the combination of these four relation models, it could provide comprehensive and overall interpretation for the dynamics of knowledge sharing.

1. Communal Sharing

Communal Sharing (CS) relationship is based upon a conception of some bounded group of people as equivalent and undifferentiated (Fiske 1991). This relationship primarily contains an almost pure type of altruism, so members in CS model regard other members as themselves. Therefore CS relationship usually exists in the group in which members have close

tie and intense interactions. The underlying assumption of people sharing knowledge within CS model is that someone in the group might need or ask for knowledge and the owner share their knowledge out of altruism or identification to the group and don't expect a specified favor from the recipient in return within specified time span. Knowledge is viewed as a common good belonging to the whole group members, thus group members will share and exchange their knowledge for the community interest instead of personal interest (Faraj & Wasko 2002). Boer et al. (2002) also claimed that in CS model, one of the most important manifestations is community of practice, which has been widely regarded as an effective mechanism for knowledge sharing (Carollo et al. 2003).

2. Authority Ranking

Authority ranking (AR) relationship is based on a model of the asymmetry among human, therefore people in such relationship have distinctive hierarchical ranks based on formal power, expertise or age (Fiske 1991). Knowledge is perceived as a means to display rank difference and knowledge sharing is motivated by power differences. People in higher rank would like to share knowledge with their inferiors to show their nobility and largesse and in that way they could also get authority, respect and status in return. People in lower rank would like to share their knowledge in order to pleasure and have better relationship with their superiors. Also in reality, superiors have power over their subordinates and can demand their subordinates to share knowledge with them. However, several researchers questioned the effects of organizational mandate on employees' knowledge sharing. For example, some authors believe that the disclosure of knowledge might lead to erosion of individual power (French & Raven 1959), thus employees would deliberately hoard their knowledge to maintain power or the security of their job. Therefore, in AR model, once employees are reluctant to share knowledge, the process of knowledge sharing will be hindered.

3. Equality Matching

Equality matching (EM) relationship is based on a model of even balance and one-for-one correspondence in which people keep track of how far out of balance it is (Fiske 1991). It is characterized by in-kind reciprocity and balanced exchange. Every individual in EM relationship is entitled to have the same amount as another does, so they will even things up while there is imbalance between them. The motivation of knowledge sharing in EM model is the desire for equality, thus the principle underlying knowledge sharing in EM model is based on the exchange of knowledge for something else, either economical tangibles or social relationships. Knowledge is perceived as a means of balance reciprocity. Therefore, a contribution is seen as the cost of access to future benefit, and individual may be motivated to share knowledge when he believes that such future benefits is worth the cost of contributing knowledge in the present and he will definitely get what he paid for in the future. Weiss (1999) also claimed that the mutual give-and-take of knowledge can facilitate knowledge sharing, thus the recipient in EM relationship has a

morally obligation to reciprocate something in return in certain time span to regain the equality and retain balance between them.

4. Market Pricing

Market pricing (MP) relationship is based on a model of proportionality in social relationship in which people tend to reduce all the relevant features and components under consideration to a singular value or utility metric that allows the comparison of many qualitatively and quantitatively diverse factors (Fiske 1991). Knowledge is perceived as a valuable and tradable commodity. The principle behind knowledge sharing in MP relationship is people could trade their knowledge for something they desire from the recipient or from the organization. Davenport and Prusak (1998) suggested that there exists knowledge market in which the value of knowledge could be measured and represented with some practical value such as money. Knowledge sharing in MP relationship is achievement motivated, so many companies provide a reward mechanism including monetary incentives such as bonus, stock options and salary raising and non-monetary incentives such as respect, promotion and public recognition to encourage their employees to share their knowledge. Because employees could perceive a compensation for their exchange, so they would like to share their knowledge with others to get better salary or higher position (Hall 2001).

2.3 Social Capital Theory

The term “social capital” initially proposed by Jacobs (1965) in community studies, highlighting the central importance of the strong crosscutting personal relationship developed over time. Social capital theory is frequently discussed in the research of knowledge sharing, and based on the classification of Nahapiet and Ghoshal (1998), it could be classified into three dimensions: structural dimension, cognitive dimension and relational dimension. Among most of the research which studied the relationship between each dimension of social capital and knowledge sharing, the elements in relational dimension of social capital are more relevant to the practices of knowledge sharing (Bock & Kim 2002; Disterer 2001; Bosiot 1995; Nahapiet & Ghoshal 1998; Constant et al 1996; Hall 2001; Starbuck 1992; Goodman & Darr 1998; Jarvenpaa & Staples 2000). Based on the relatively robust connection of the relational dimension of social capital and knowledge sharing, this study will focus on the relational dimension.

1. The Relational Dimension of Social Capital

Based on definition of Nahapiet and Ghoshal (1998), there are four elements in the relational dimension of social capital: trust, identification, obligation and norm. They are elucidated as following sections.

(1) Trust

Mistral (1996) defined trust as the belief that the “result of somebody’s intended action

will be appropriate from our point of view” . It indicates the positive attitude that people hold toward others’ behaviors are based on their good intent and concern. Trust is a key aspect of relational capital and facilitator of collective action (Coleman 1990; Fukuyama 1995). It is essential for a long term relationship, since it enables individuals to predict the counterpart behavior and have confidence in their behavior are out of good willing. Previous research has shown that where relationships are high in trust, people are more willing to be engaged in social exchange in general and cooperative interaction in particular (Dyer & Singh 1998; Fukuyama 1995). Boisot (1995) also highlighted the importance of interpersonal trust for knowledge sharing in context of high ambiguity and uncertainty. Thus, trust has been viewed as a key factor that provides a context for cooperation (Tsai & Ghoshal 1998) and effective knowledge sharing (Adler 2001).

(2) Identification

Nahapiet and Ghoshal (1998) defined identification as the process whereby individuals see themselves as one with another person or group of people. Identification is a condition where the interests of individuals merge with the interests of the organization, resulting in the creation of an identity based on those interests (Johnson et al. 1999). Individual’ s identification to a group is a very important element in public goods research for determining why one shares more willingly or exercise restraint in public resources dilemmas than the general expect. Under conditions of strong identification, the effects of certain costs and benefits pertaining to knowledge sharing may be nullified in the face of collective outcomes (Constant et al. 1996). Burgess (2005) argued that knowledge sharing serves to benefit organizations, thus it follows that strong levels of organizational identification would be expected to increase employees’ motivation to engage in knowledge sharing activities. Hence, when there exists a strong identification within a group, members will have strong willingness to benefit the whole group instead of just themselves. Identification, therefore, acts as a resource influencing both the motivation and the anticipation of value of sharing knowledge.

(3) Obligation

Nahapiet and Ghoshal (1998) defined obligation as a commitment or duty to undertake some activity in the future. People regard obligation as a “credit slip” held by A to be redeemed by some performance (Bourdieu 1986). The notion that “there is no such thing as free lunch” provides a represent delineation of a commonly held view that exchange will bring the expectations of future obligations. Hence, obligation could be referred as a mutual reciprocity, for example, the willingness to return a favor with a favor. Hall (2001) suggested that under the sense of obligation, knowledge sharing could be motivated by recipients’ feedback due to the sense they perceived after accepting other’ s help.

(4) Norm

Coleman (1990) defined that norm is an invisible strength that control an action not by

the actor but by others. It represents a degree of consensus in the social system and constructs the setting of common standards of behavior that individuals are willing to abide by. Coleman (1988) suggested that “where a norm exists and is effective, it constitutes a powerful pressure though sometimes fragile form of social capital” . Thus, when members perceive the norm of knowledge sharing within the group, they are under the pressure to achieve expectation of the whole group. Previous studies have suggested that norms which could enhance the climate for knowledge sharing include teamwork (Starbuck 1992), collaboration and sharing (Goodman & Darr 1998; Jarvenpaa & Staples 2000), tolerance for failure (Leonard-Barton 1995) and so on. Hence, in this study we posit the norms which would facilitate knowledge sharing encompass both the pressure such as reciprocal obligation, collective expectation and the encouragement such as communal appreciation and recognition from the collective.

2.4 The Effectiveness of Knowledge Sharing

Definitions of effectiveness in respect with knowledge sharing vary widely. Previous researchers have proposed methodologies from different perspectives and levels to measure the effectiveness of knowledge management related programs. For example, Wiig (2002) proposed a methodology called Causal-Event-Chain, highlighting the comparison of expected and yielded return of the investment after implementing knowledge management activities. Edvinsson and Malone (1997) suggested examining performance from three dimensions—previous performance, current performance and future performance—to evaluate the effectiveness of the investment in knowledge management field. Besides financial evaluation, in practice, some experts argue that intangible assets should be taken into consideration while conducting the evaluation of knowledge management. For example, the prize of MAKE (Most Admired Knowledge Enterprise) proposed by Teleos company reward the enterprise with excellent knowledge management activities based on several criteria such as the organization culture, customer loyalty, innovation ability of the organization, competence to maximize the profit, benefit for shareholders, etc. Since knowledge management is an extensive program which should be implemented continuously and consistently, the evaluation or measurement issue is made more salient. Moreover, the program’s benefits for the business are usually indirect and economic returns on knowledge are hard to quantify (Hellstrom 2000), thus the measuring task appears more difficult. Due to the difficulty of evaluating the influence and financial return on knowledge sharing, some authors suggested that evaluating the performance form the level of individual is a direct way for estimating the influence after implementing. Thus the indicators including the opinion, feedback and satisfaction of the participants are required to be considered. Becerra-Fernandez and Sabherwal (2001) conducted a field study in Kennedy Space Center by assessing group member’s satisfaction with the knowledge available to them to evaluate

the effectiveness of implemented knowledge sharing activities in this organization. Because the objective of this study focus on the IS project team, which is similar to Becerra-Fernandez and Sabherwal's research unit, we adopt the indicators proposed in their study to measure the effectiveness of knowledge sharing among team members.

2.5 IS Project Team

Nowadays, it's the knowledge economic era, thus in order to response to the rapid changes in the dynamic environment more flexibly and quickly, taking advantage of IT technology to support competitive strength is required and prevalent for every enterprise, therefore IS project team plays a vital role in every organization. A project team is an organization of people dedicate to a specific purpose or objective thus projects generally involve large, expensive, unique and high risk undertakings which have to be completed by a certain date, for a certain amount of money, within some expected level of performance. Moreover, projects often last only for short time periods, thus, previous research also pointed out that project teams are faced with challenges to utilize diverse knowledge to meet the stringent requirement and fulfill ever-changing needs (Koskinen et al. 2003). Previous research showed that IS project is featured with it following characteristics: (1) it is cross functional; (2) its members bring multidisciplinary knowledge; (3) its work is characterized by time pressures (Faraj & Sambamurthy 2006; Ruuska & Vartiainen 2005), thus IS project represent knowledge work contexts, where individual team members bring specific slices of expertise to complete the task of information system (Faraj & Sambamurthy 2006). Knowledge required for completion of IS tasks is distributed across team members, thus effective ways of integrating distributed expertise is required, therefore intensive knowledge sharing is essential in IS project team.

3. Research Model and Hypotheses

3.1 Research Model

Based on above literature review, this study proposed a framework by integrating the relational dimension of social capital and the relation models of knowledge sharing to explore how each element in the relational dimension of social capital influences each relation model. Further, we examined if each relation model has influence on the effectiveness of knowledge sharing. The research model of this study is presented in Figure 1.

3.2 Research Hypotheses

Social capital theory is frequently discussed in the research of knowledge sharing, and based on the classification of Nahapiet and Ghoshal (1998), it could be classified into three

dimensions: structural dimension, cognitive dimension and relational dimension. Among most of the research which study the relationship between each dimension of social capital and knowledge sharing, the elements in relational dimension of social capital are more relevant to the practices of knowledge sharing. Moreover we also consider a research model comprised of too many constructs but with small sample size would decrease the reliability of statistical analysis. So this study will focus on the relational dimension of social capital and exclude structural and cognitive dimensions, we adopt all the elements in the relational dimension to examine their relationship with the four relation models since we attempt to prove the deficiency of previous research which only concentrated on sole relation model to investigate its relationship with one or some of the elements in the relational dimension of social capital.

The relational dimension of social capital can be best understood in the current context as the asset that resides in social relationships (Walker et al. 1997) and that emerges or exists in social structures (like projects, hierarchies) through interaction between members (Adler & Kwon 2002). The relational dimension of social capital can enhance the member's cohesion within the organizational structure (Coleman 1988). Trust has been viewed as an antecedent of cooperation relationship (Gambetta 1988; Gulati 1995; Ring & Van de Ven 1994). Kramer et al. (1996), Lewicki and Bunker (1996) have found that identification with a group or collective can enhance relation and concern for collective processes and outcomes. Fairtlough (1994) ascribed considerable importance to the formal, professional, and personal obligations that develop between those involved in cooperative research and development projects. Norms can ensure that network members are willing to cooperate with each other (Coleman 1998). However, most of previous literatures based on a fragmentary perspective have not simultaneously pointed out how each element in the relational dimension of social capital affects each relation model. Therefore this study argued that even though each of these four relation models has its own dominant element. For example, in AR model, the way members interact with each other is greatly affected by the power difference among them. Also, in MP model, cost and benefit are put into consideration with first priority before conducting any behavior. However, besides these dominant factors, we argued the elements in the relational dimension of social capital coexist in each relation model to a distinct degree. Therefore this study adopted all the elements in the relational dimension to examine their relationships with the four relation models of knowledge sharing. Thus, the following hypotheses were proposed.

Hypothesis 1a : The trust has positive influence on the CS model.

Hypothesis 1b : The trust has positive influence on the AR model.

Hypothesis 1c : The trust has positive influence on the EM model.

Hypothesis 1d : The trust has positive influence on the MP model.

Hypothesis 2a : The identification has positive influence on the CS model.

Hypothesis 2b : The identification has positive influence on the AR model.

Hypothesis 2c : The identification t has positive influence on the EM model.

Hypothesis 2d : The identification has positive influence on the MP model.

Hypothesis 3a : The obligation has positive influence on the CS model.

Hypothesis 3b : The obligation has positive influence on the AR model.

Hypothesis 3c : The obligation has positive influence on the EM model.

Hypothesis 3d : The obligation has positive influence on the MP model.

Hypothesis 4a : The norm has positive influence on the CS model.

Hypothesis 4b : The norm has positive influence on the AR model.

Hypothesis 4c : The norm has positive influence on the EM model.

Hypothesis 4d : The norm has positive influence on the MP model.

The relational dimension of social capital is frequently discussed in the previous research of knowledge sharing. Mutual trust could enhance the members' willingness to share knowledge (Bock & Kim 2002; Disterer 2001) and will stimulate knowledge sharing even in the context of high ambiguity and uncertainty (Bosiot 1995); strong identification to the group will encourage members to share knowledge for the benefits of whole party even though implementing knowledge sharing requires efforts (Napapiet & Ghoshal 1998; Constant et al. 1996); obligation inspires the sense of mutual reciprocity among members, so it facilitates knowledge sharing (Hall 2001); the norms within the group, such as collective expectation, teamwork (Starbuck 1992) and collaboration (Goodman & Darr 1998; Jarvenpaa & Staples 2000), enhance the intangible strength embedded in the organization context to enforce knowledge sharing. Thus, the following hypotheses were proposed.

Hypothesis 5a : The trust has positive influence on the effectiveness of knowledge sharing.

Hypothesis 5b : The identification has positive influence on the effectiveness of knowledge sharing.

Hypothesis 5c: The obligation has positive influence on the effectiveness of knowledge sharing.

Hypothesis 5d: The norm has positive influence on the effectiveness of knowledge sharing.

Knowledge sharing is a social action conducted with reference to the relationship structure between the actors. Most of the previous studies were limited to one domain and thus produced many divergent and controversial academic results. Boer et al. (2002) claimed that the perspectives of the four relation models and its combinations could provide fundamental but comprehensive mechanisms behind knowledge sharing, and the controversies in past studies could be resolved as a result. Therefore, this study adopted the four relation models and attempted to prove the deficiency of previous research which only concentrated on one sole

relation model to investigate its relationship with the effectiveness of knowledge sharing. In other words, we argued that the mechanism of knowledge sharing among members within an IS project team is based on the four coexisting relation models. Thus, the following hypotheses were proposed.

Hypothesis 6 : The CS model has positive influence on the effectiveness of knowledge sharing.

Hypothesis 7 : The AR model has positive influence on the effectiveness of knowledge sharing.

Hypothesis 8: The EM model has positive influence on the effectiveness of knowledge sharing.

Hypothesis 9: The MP model has positive influence on the effectiveness of knowledge sharing.

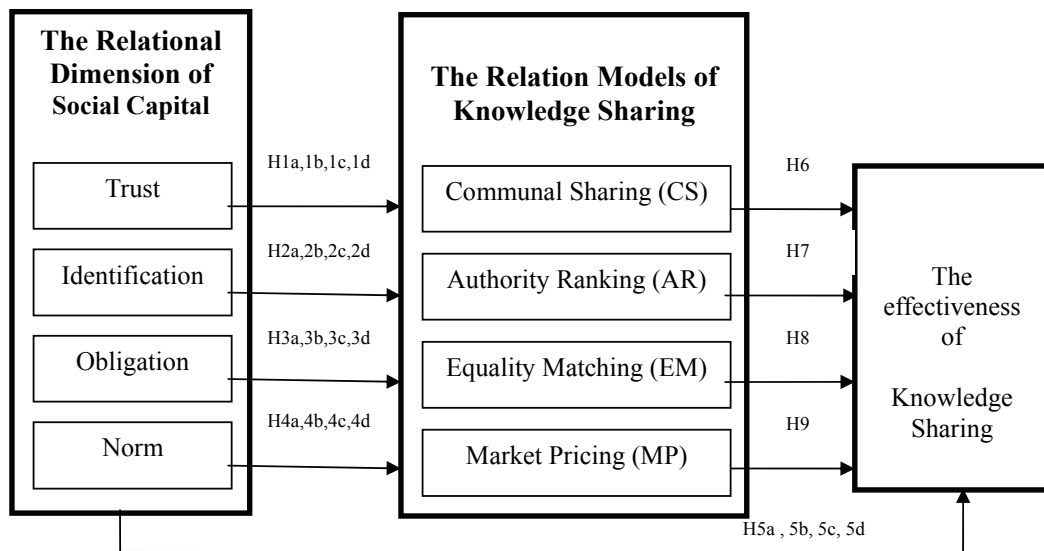


Figure 1. Research Model

4. Research Methodology and Analysis

To test the proposed research model, we adopted the survey method for data collection. All statistical tests were carried out at a 5 percent level of significance.

4.1 Measurement and Data Collection

This study developed the items in the questionnaire either by adapting measures that had been validated by other researchers or by converting the definitions of constructs into a questionnaire format. Table 1 presents the operational definition in this study. The survey questionnaire was using seven-point scales anchored from strongly disagree to strongly disagree.

The questionnaire was pre-tested by delivering paper copies in the class of MBA courses for on-the-job graduate students in the MIS department of National Sun Yet-Sen University (NSYSU) in Taiwan, 136 out of 142 copies with valid response were returned, the returned rate is 95.79%. Factor analysis with principal components analysis and varimax rotation was employed to validate each construct's validity respectively. Nine components with eigenvalue above 1 were yielded respectively which were corresponded to three constructs: the relational dimension of social capital, the relation models of knowledge sharing and effectiveness of knowledge sharing. After omitting inadequate questions, all questions had good loadings with respect to their intended constructs and Cronbach's Alpha reliability in each construct is above .70. Table 2 shows the factor loading of each construct after dropping inadequate items. Item to total correlation analysis was conducted to test if all items are homogeneous, which is interpreted to mean that they tend to measure a common trait. All items had item-to-total correlation above .50, with the highest being .972 (see Appendix A), implying that almost all items contributed significantly.

The refined items were used to collect the research data with the format of on line questionnaire. Students graduated from MIS department in NSYSU in Taiwan were informed by email to fill out the questionnaire, and also their coworkers in the same project team were welcomed to response to the questionnaire. Totally 436 emails were sent, 233 valid responses were obtained.

Table 1 : Operation Definition of Construct

Construct	Operation definition	Reference
Relational Dimension of Social Capital		
Trust	The belief in the good intent, competence, and reliability of employees with respect to contributing and reusing knowledge.	Putnam (1993); Mishra (1996)
Identification	The perception of similarity of values, membership, and loyalty with the organization, thus individual would contribute his knowledge for the whole organization's benefit.	Johnson et al. (1999)
Obligation	The commitment or duty to undertake some activity in the future, thus one's current contribution will lead to future request for knowledge being met.	Nahapiet and Ghoshal (1998); Davenport and Prusak (1998)
Norm	The invisible strength that controls an action not by the actor but by others, thus the motivation of one's contribution is to reach the expectation of the majority.	Nahapiet and Ghoshal (1998); Coleman (1990)
Relation Models of Knowledge Sharing		
CS	A relation model which members regard others as equivalent and undifferentiated and have a strong connection thus knowledge is share out of members' altruism.	Fiske(1991); Haslam and Fiske (1999); Bore et al. (2002)
AR	A relation model in which a linear hierarchy among members is ranked and knowledge sharing is motivated by power difference.	Fiske(1991); Haslam and Fiske (1999); Bore et al. (2002)
EM	A relation model in which members treat each other with the principle of even balance and one-for-one correspondence thus knowledge sharing is motivated the desire for equality.	Fiske(1991); Haslam and Fiske (1999); Bore et al. (2002)

MP	A relation model in which members tend to reduce all the relevant features under consideration to a singular value or utility, thus knowledge is regarded as a tradable commodity and knowledge sharing is motivated by desire for better achievement.	Fiske(1991); Haslam and Fiske (1999); Bore et al. (2002)
Effectiveness of Knowledge Sharing		
Effectiveness	The group members are satisfied with the availability of knowledge to them after implementing knowledge sharing.	Becerra-Fernandez and Sabherwal (2001)

Table 2 : The Result of Factor Analysis

Items	Trust	Identification	Obligation	Norm	CS	AR	EM	MP	Effectiveness
Trust1	0.8811	0.4640	0.3030	0.4701	0.5337	0.3009	0.5659	0.3225	0.5454
Trust2	0.8852	0.4649	0.2149	0.4602	0.5497	0.1665	0.4589	0.2354	0.5121
Trust3	0.8659	0.5508	0.2405	0.4813	0.5581	0.1243	0.5133	0.2701	0.4836
Identification1	0.5468	0.8676	0.2625	0.5068	0.5438	0.2616	0.4619	0.2522	0.4841
Identification2	0.5418	0.8299	0.1501	0.5816	0.4532	0.1319	0.4235	0.2242	0.4461
Identification3	0.4972	0.8960	0.1703	0.5402	0.4693	0.1952	0.4408	0.2770	0.4757
Identification4	0.3312	0.7666	0.2594	0.3946	0.4083	0.2887	0.3470	0.2780	0.4589
Identification5	0.4648	0.8812	0.1850	0.5094	0.4966	0.1612	0.4236	0.2833	0.4864
Identification6	0.5074	0.9166	0.2520	0.5031	0.5318	0.2607	0.4648	0.3574	0.5819
Obligation1	0.0745	0.0531	0.7005	0.178	0.0618	0.2068	0.0882	0.1169	-0.0197
Obligation2	0.2694	0.1975	0.8730	0.2081	0.2349	0.2294	0.3092	0.3158	0.1854
Obligation3	0.2897	0.2894	0.8433	0.3717	0.2348	0.3019	0.2331	0.2511	0.2033
NORM1	0.5485	0.5861	0.3244	0.9370	0.5181	0.2719	0.4322	0.2105	0.4100
NORM2	0.4459	0.4868	0.2901	0.9219	0.4581	0.2428	0.3519	0.1566	0.3706
NORM3	0.5065	0.5700	0.2884	0.9525	0.5237	0.2234	0.4076	0.1539	0.4092
CS1	0.5040	0.2591	0.2321	0.3154	0.6837	0.2128	0.4873	0.3431	0.4204
CS2	0.4194	0.3157	0.1596	0.3473	0.6473	0.1313	0.3545	0.2707	0.3942
CS3	0.4860	0.4427	0.1446	0.5077	0.7358	0.1945	0.4532	0.2287	0.3748
CS4	0.4286	0.4469	0.1868	0.4605	0.6542	0.1042	0.3646	0.1764	0.3102
CS5	0.4767	0.3947	0.2014	0.2689	0.7049	0.2716	0.5727	0.3643	0.4293
CS6	0.4813	0.5408	0.1862	0.4752	0.8796	0.2237	0.4630	0.2638	0.5489
AR1	0.1649	0.1682	0.1679	0.2521	0.2767	0.6408	0.1520	0.2154	0.0948
AR2	0.0549	0.0952	0.1720	0.1570	0.1261	0.5168	0.1016	0.1738	0.0999
AR3	0.1877	0.2215	0.2974	0.2033	0.2022	0.9161	0.2287	0.3053	0.1714
EM1	0.3025	0.3493	0.1747	0.1923	0.4042	0.1412	0.6581	0.5057	0.4364
EM2	0.3635	0.3804	0.1784	0.2206	0.4913	0.1346	0.7357	0.4401	0.4756
EM3	0.5546	0.4176	0.1967	0.3450	0.5461	0.1866	0.9210	0.4226	0.5439
EM4	0.4917	0.3713	0.2849	0.3698	0.4854	0.2456	0.7718	0.4508	0.4006
EM5	0.3324	0.3838	0.2589	0.4172	0.3934	0.2113	0.5791	0.2630	0.2682
EM6	0.2248	0.3696	0.2561	0.2086	0.3640	0.1805	0.5326	0.3464	0.3110
MP1	0.2429	0.2781	0.1082	0.1480	0.3173	0.2000	0.3543	0.7681	0.3902
MP2	0.2335	0.2538	0.1893	0.1833	0.2633	0.2642	0.3214	0.6925	0.3096
MP3	0.2699	0.2566	0.2426	0.1571	0.2882	0.2863	0.3952	0.8079	0.3557
MP4	0.2542	0.2454	0.3525	0.1347	0.2854	0.3021	0.4801	0.8311	0.3232
Effectiveness1	0.4603	0.4697	0.1821	0.3706	0.4908	0.2381	0.4410	0.3295	0.7842
Effectiveness2	0.5534	0.4973	0.1677	0.4378	0.5161	0.1439	0.4851	0.2928	0.8277
Effectiveness3	0.5383	0.5027	0.1862	0.3139	0.4782	0.1276	0.5018	0.3518	0.8304
Effectiveness4	0.5324	0.4808	0.1267	0.3454	0.5091	0.1379	0.4439	0.3087	0.8062
Effectiveness5	0.5185	0.4818	0.1086	0.3634	0.5218	0.1105	0.4849	0.4152	0.8883
Effectiveness6	0.4253	0.4692	0.1721	0.2771	0.4880	0.1311	0.4897	0.4299	0.8647

4.2 Analyses and Results

Tables 3 provide respondent profile statistics. T-Test and ANOVA were employed to verify if the difference of respondents' background information will affect respondents' perception of the effectiveness of knowledge sharing. To verify the effects of the gender difference on the effectiveness of knowledge sharing, T-test was conducted. We get a conclusion that male respondents have more positive perception of the effectiveness of knowledge sharing than female respondents. Other data, including working experience, age, participant duration, participant number, time, and position, in respondents' profile were conducted with ANOVA to examine if respondents with different profile would have different perception of the effectiveness of knowledge sharing. Participant number, respondents' participant duration and position were verified resulting undifferentiated perception of the effectiveness, while respondents' age and working experience would affect their perception of effectiveness of knowledge sharing. Most respondents in every layer of age had undifferentiated perception, except the respondents above 60-year-old had significantly worse perception of the effectiveness. Also, most respondents within each layer of work experience had undifferentiated perception, while respondents with 16-20-years working experience had more positive response than respondents with above 20-years working experience.

Table 3 : Profile of Sample

(a) Industry Type					
Industry	#of response	Percent	Industry	#of response	Percent
Manufacturing	50	21.4	Transportation	4	1.7
Financial	16	6.8	Information	75	32.1
Public Section	4	1.7	Service	29	12.4
Retail	2	0.8	Pharmaceutical	3	1.2
Government	32	13.7	Others	18	7.7
(b) Demographic Information of Respondents					
Age	#of response	Percent	Education	#of response	Percent
21~29	75	32.18	junior high school	1	0.42
30~39	109	46.78	senior high school	2	0.85
40~49	39	16.73	college(2 years)	15	6.43
50~59	7	3.0	college (4 years)	120	51.50
60~	3	1.2	graduate school	95	40.77
Gender	#of response	Percent	Work Experience (year)	#of response	Percent
Male	170	72.9	< 1	49	21.0
Female	63	27	1~5	91	39.0
			6~10	37	15.87
			11~15	28	12.01
			16~20	17	7.29

Participant Duration (Month)	#of response	Percent	Number of Participant	#of response	Percent
~3	57	24.46	~ 5	104	44.63
3~6	42	18.02	6~10	75	32.18
7~12	48	20.60	11~15	28	12.01
13~24	35	15.02	16~20	7	3.0
25~	53	22.74	21~25	2	0.85
			26~	16	6.86

Position	#of response	Percent	Position	#of response	Percent
programmer	62	26.6	division manager	18	7.72
data processor	20	8.58	network administrator	20	8.58
project manager	50	21.4	database administrator	21	9.01
system analyst	29	12.4	Others	13	5.57

1. Reliability Analysis, Convergent and Discriminant Validity

Partial least squares (PLS) analysis was used to analyze the survey data (Chin and Frye 1995). The first step is to assess the convergent validity of the constructs by examining the average variance extracted (AVE). The AVE attempts to measure the amount of variance that a latent variable component captures from its indicators relative to the amount due to measurement error. AVE values should be greater than the generally recognized .50 cut-off, indicating that the majority of the variance is accounted for by the construct. In addition, individual survey items that make up a theoretical construct must be assessed for inter-item reliability. In PLS, the internal consistency of a given block of indicators can be calculated using the composite reliability (ICR) developed by Werts, Linn, and Joreskog (1973). Acceptable values of an ICR for perceptual measures should exceed .70 for exploratory research (Fornell and Larcker, 1981) and interpreted like a Cronbach's coefficient. All ICR and AVE values meet the recommended threshold values. Table 4 summarizes the measurement model results.

Additionally, discriminant validity indicates the extent to which a given construct is different from other constructs. The measures of the constructs should be distinct and the indicators should load on the appropriate construct. One criterion for adequate discriminant validity is that the construct should share more variance with its measures than with other constructs in the model (Barclay et al. 1995). Table 4 demonstrates the constructs' strong discriminant validity. A commonly accepted criterion for construct discriminant validity is that the average variance shared between a construct and its measures should be greater than the variance shared between the construct and other constructs in the model (Barclay et al. 1995). The diagonal elements are the square roots of the average variance extracted; the off-diagonal elements are the inter-construct correlations. Good discriminant validity is demonstrated because all the diagonal elements are greater than corresponding off-diagonal elements (Barclay et al. 1995).

Table 4 : Correlation of Constructs, Composite Reliability, Square Root of AVE Values and Cronbach's α

	ICR	Cronbach's α	1	2	3	4	5	6	7	8	9
1 Trust	.909	.848	.877								
2 Identification	.945	.928	.693**	.861							
3 Obligation	.849	.747	.348**	.321**	.809						
4 Norm	.956	.940	.708**	.722**	.446**	.937					
5 CS	.866	.827	.691**	.615**	.349**	.697**	.722				
6 AR	.744	.701	.169**	.187*	.308**	.247**	.337**	.711			
7 EM	.856	.822	.492**	.448**	.227**	.354**	.611**	.229**	.712		
8 MP	.858	.802	.271**	.256**	.425**	.275**	.390**	.354**	.445**	.777	
9 Effectiveness	.932	.919	.705**	.715**	.275**	.633**	.571**	.193**	.567**	.327**	.834

Notes: *= $p < 0.05$, **= $p < 0.01$, ***= $p < 0.001$ (two tailed significance)

2. Hypothesis Testing

To examine the specific hypotheses, we addressed the t-statistics for the standardized path coefficients and calculated p-values based on a two-tail test with a significance level of 0.05. Table 5 presents the results of hypothesis testing.

Table 5 : Results of Hypothesis Testing

	Hypotheses	T value	Results
H 1a	The trust has positive influence on the CS model.	4.3035***	Supported
H 1b	The trust has positive influence on the AR model.	0.6986	Not supported
H 1c	The trust has positive influence on the EM model.	4.7374***	Supported
H 1d	The trust has positive influence on the MP model.	2.3479*	Supported
H 2a	The identification has positive influence on the CS model.	2.4337*	Supported
H 2b	The identification has positive influence on the AR model.	1.4079	Not supported
H 2c	The identification has positive influence on the EM model.	2.3824*	Supported
H 2d	The identification has positive influence on the MP model.	2.5418*	Supported
H 3a	The obligation has positive influence on the CS model.	0.3934	Not supported
H 3b	The obligation has positive influence on the AR model.	2.7898**	Supported
H 3c	The obligation has positive influence on the EM model.	1.6526	Not supported
H 3d	The obligation has positive influence on the MP model.	2.4536*	Supported
H 4a	The norm has positive influence on the CS model.	1.9726*	supported
H 4b	The norm has positive influence on the AR model.	0.993	Not supported
H 4c	The norm has positive influence on the EM model.	0.8127	Not supported
H 4d	The norm has positive influence on the MP model.	-1.5314	Not supported
H 5a	The trust has positive influence on the effectiveness of knowledge sharing.	5.4989***	Supported

	Hypotheses	T value	Results
H 5b	The identification has positive influence on the effectiveness of knowledge sharing.	4.1577***	Supported
H 5c	The obligation has positive influence on the effectiveness of knowledge sharing.	-1.2596	Not supported
H 5d	The norm has positive influence on the effectiveness of knowledge sharing.	0.3486	Not Supported
H 6	The CS model has positive influence on the effectiveness of knowledge sharing.	4.1286***	Supported
H 7	The AR model has positive influence on the effectiveness of knowledge sharing.	-1.1313	Not supported
H 8	The EM model has positive influence on the effectiveness of knowledge sharing.	3.222**	Supported
H 9	The MP model has positive influence on the effectiveness of knowledge sharing.	2.3032*	Supported

5. Discussion and Implications

5.1 Results and Discussion

Based on the results of analysis, the relationship between each element in the relational dimension of social capital and each relation model showed that (1) trust ($\beta=0.388^{***}$), identification ($\beta=0.235^*$) and norm ($\beta=0.184^*$) have positive influence on the communal sharing (CS) model. (2) Obligation ($\beta=0.233^{**}$) has positive influence on the authority ranking (AR) model. (3) Trust ($\beta=0.413^{***}$), identification ($\beta=0.213^*$) have positive influence on the equality matching (EM) model. (4) Trust ($\beta=0.183^*$), identification ($\beta=0.239^*$) and obligation ($\beta=0.233^*$) have positive influence on the market pricing (MP) model. That is to say, the elements of trust and identification are equally important for enhancing the interactive structure of CS, EM, and MP models. Obligation ranks in second place of contribution to enhance the AR and MP models. Norm is only related to CS model. In addition, the results of the relationship between each element in the relational dimension of social capital and the effectiveness of knowledge sharing showed that trust ($\beta=0.492^{***}$) and identification ($\beta=0.337^{***}$) have positive influence on the effectiveness of knowledge sharing. This implies trust and identification are more important factors that can enhance knowledge sharing. This is also consistent with the conclusion of previous research that trust (Adler 2001; Tsai & Ghoshal 1998; Bosiot 1995), identification (Burgess 2005; Constant et al. 1996) will facilitate the effectiveness of knowledge sharing. It was found that obligation ($\beta=-0.08$) and norm ($\beta=0.023$) have no significant relationship with the effectiveness in this study. This may be attributed to the fact that knowledge sharing is voluntary, and obligation and norm have not enough strength to motivate people to do it in the IS project team.

Furthermore, the results of the relationship between relation models and the effectiveness of knowledge sharing showed that the three relation models, CS ($\beta=.392^{***}$), EM ($\beta=.245^{**}$) and MP ($\beta=.186^*$), simultaneously have positively significant relationship with the effectiveness of knowledge sharing to a certain extent respectively, indicating that all these three relation models contribute a certain proportion of significance to the effectiveness. CS, which is mostly related to the effectiveness among the relation models, accounts for the largest effect. The result is consistent with the finding of previous studies that while a fashion of sharing knowledge arises among the group in which members give what they can and freely take what they need from the pooled resources, such as community of practice, an ideal mechanism of knowledge sharing is constructed and the optimal effectiveness is expectable (Ardichvili et al. 2003; Faraj & Wasko 2002). EM, which ranks second in the contribution to the effectiveness of knowledge sharing according to our observations, suggests that group members regard each other as coworkers or peers and are motivated to share knowledge with expectation of future beneficiaries. This finding is also supported by previous research (Schultz 2001; Weiss 1999). MP is also positively related to effectiveness, suggesting some members regards knowledge as their own assets with great value for trading, according with the theory of social exchange that cost and benefit would be identified while conducting knowledge sharing (Kankanhalli et al. 2005). Contrary to our hypothesis 7, AR has no significant relationship with the effectiveness. One explanation is that in the process of knowledge sharing, both tacit and explicit knowledge will be shared. However, tacit knowledge, embedded within every individual, requires more time and efforts to transfer among the members. Thus, if team manager implement AR model to enforce members to share knowledge with others, members will be unsatisfied. From the above discussions, we could conclude that the mechanism behind knowledge sharing based on the four relation models is constituted with a distinctive degree of each one. Moreover, except AR model, the impact of each model on the effectiveness of knowledge sharing depends on the constitution.

5.2 Implications of Theory

This study integrated the relational dimension of social capital, the relation models and the effectiveness of knowledge sharing to present a framework which has not been fully understood in previous research. In the past, most research proposed that social capital is important for social relation and organizational structure, and discussed them based on general perspectives or a fragmentary dimension. Thus, in this research, we explored all the elements in the relational dimension of social capital coexist within every relation model. Moreover, we proposed that the four relation models are involved within the execution of IS project team simultaneously with different degree. These implies that both of the relational dimension of social capital theory and the relation models are fundamental components embedded within the context that affects

the mechanism of knowledge sharing among the IS project team. The results of this study are consistent with the perspectives from Boer et al. (2002). Firstly, the four relation models coexist within the mechanism of knowledge sharing. Secondly, the research mechanism of knowledge sharing among group members should be based on the combination of the four coexisting relation models to avoid the fragmentary or controversial findings. Moreover the results of this study are also consistent with previous study that the relational dimension of social capital are salient determinants of knowledge sharing within the group (Kankanhalli 2005; Wasko & Faraj 2000; Nahapiet & Ghoshal 1998; Constant et al. 1994). Besides, our assumptions that every element in the relational dimension of social capital is involved in the execution of each relation models are also supposed, except norm which has relatively weak effects. These results suggest that future research should take a close look at the dynamic correlation between the relational dimension of social capital and the relation model, further advance an integral perspective for the mechanism of knowledge sharing.

5.3 Implications for Practice

In practice, many managers tend to emphasize on certain relation model in the hope of maximizing organizational performance. However, among the interaction of employees, various kinds of relationship are developed, affecting their attitudes while executing tasks at work. Thus, to promote knowledge sharing among group members, managers should acknowledge the complex relationships which coexist among the employees and employ the four fundamental relation models to implement an extensive and efficient mechanism. Also within the group or project team, social capital in relational dimension, derived from the process of social interaction, play a critical role while implementing the relation models of knowledge sharing. Based on the results of this study, we propose some advices as for what combination of relation models should be employed and which social capital in relational dimension should be emphasized in the practice of knowledge sharing among IT related project teams. The results also show that, these relation models, CS, EM and MP, have significantly positive effects on the effectiveness of knowledge sharing. Therefore, managers should employ the mechanism comprised of them to expedite the practice of knowledge sharing. Meanwhile, CS, among these relation models, should be prioritized before EM and MP. Further, beyond the execution of these relation models, relational dimension of social capital should be emphasized. That is to say that managers should establish a climate, in which group members have intense trust between each other, strong identification to the group, mutual obligation to reciprocate others' contribution, and the norms of sharing knowledge, to encourage employees to share knowledge. Moreover, the results also show that obligation, in the relational dimension of social capital, has positive effect on the exertion of the two relation model, MP and AR, while AR has no signification relationship with the effectiveness of knowledge sharing. This finding implies that

even though obligation, residing within the organization or group, is beneficial for the exertion of AR model, it isn't recommended to implement AR model among the group or project teams in which intensive and extensive practice of knowledge sharing is required.

5.4 Limitations and Future Studies

This study adopted a convenient sampling scheme and selected employees who graduated from the MIS department in NYSU in Taiwan as the main source of research data, so generalizability might be limited. In the future, using different samples to verify this framework is necessary. Besides, the survey method employed in this study was cross-sectional, so the longitudinal circumstances caused by time might not been well explored. Scholar interested in this area can further concentrate on the effect of time to investigate the shift and transform of the combination of relation models through a long term observation. Moreover, there are still many factors that may influence the relational models or effectiveness of knowledge sharing in a project team. However, if our research model comprised of too many constructs but only used a small sample size, the reliability of statistical analysis would be reduced. Therefore, we focused on two fundamental theories and excluded other related factors to enhance the reliability of this study. It is suggested that future research could incorporate other related variables, such as group climate, project characteristics, knowledge attributes, task independence, reward, and so on, to construct a more elaborate framework for related studies in the field of knowledge sharing.

5.5 Conclusion

This study extended and integrated previous theories in social capital (Nahapiet & Ghoshal 1998; Cosntant et al. 1994) and relation models (Boer et al. 2002; Fiske 1991) to develop a theoretical framework for empirical research. The results revealed how the relational dimension of social capital influence the relation models, the effectiveness of knowledge sharing, and the impact of each relation model on the effectiveness of knowledge sharing. According to our findings, trust and identification are equally important to the improvement of interactive relationships for CS, EM, and MP models. Obligation ranks second in its contribution to the interactive relationship. It is correlated with AR and MP models. Norm is correlated with only CS model. Besides trust, identification, CS, EM and MP have significantly positive influence on the effectiveness of knowledge sharing. It is suggested that these components could be employed in the IS project team to promote the effectiveness of knowledge sharing. These findings will be useful both in academic and in practice to advance the research of knowledge sharing by cultivating social capital embedded in organization. Moreover, we also hope this study can motivate researchers to advance more elaborate framework in the field of knowledge sharing.

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Appendix A Retained Items and Item to Total Correlation

Question item	Item to total correlation
Relational Dimension of Social Capital	
Trust	
1 You will cooperate and help each other to accomplish the job.	.837**
2 You rely on and respect your coworker even if (s)he is not a close friend of you.	.865**
3 You rely on other members while making critical decisions at work.	.828**
Identification	
4 You feel proud to work in this project team.	.900**
5 When making a decision, you will consider the result that may be caused to the group.	.877**
6 You will make more efforts than expected.	.923**
7 You will mention the company you work in while introducing yourself.	.783**
8 You will regard the problems your group encountered as yours.	.908**
9 You are very happy to work in this group.	.917**
Obligation	
10 You expect reciprocity from the one who had accepted your help before.	.848**
11 You believe the one you had helped before will reciprocate in the future.	.880**
12 Mutual benefit is the principle you abide by while interacting with other members.	.858**
Norm	
13 You follow principle of consensus and rules among the group to interact with others.	.970**
14 Every member's behavior is required to meet the expectation of the group.	.959**
15 Consensus, rules, and values among the group are highly emphasized.	.972**
The relation models of Knowledge Sharing	
CS	
16 If any of you needs something, others give it without expecting anything in return.	.760**
17 Many important things you use belong to the whole group instead of any specific member in this group.	.821**
18 Responsibilities are shared jointly in this group, without being assigned to any specific member.	.729**
19 You feel a moral obligation to feel kind and compassionate to each other.	.870**
20 You make decisions by consensus.	.855**
21 In this group, everyone regards others as himself and treats each other equally.	.633**
22 You feel you are one member belong to the group.	.799**

AR		
23	Every member is ranked according to his position.	.665**
24	Members in higher rank sometimes turn over jobs to others and isn't necessary to pay back.	.680**
25	In some respects, one of you is entitled to more than others, and should be treated with special respect.	.824**
EM		
26	Job is equally split up in this group.	.830**
27	Resources are divided up into shares equally in this group.	.894**
28	Every member in this group has even chances.	.911**
29	Every member regards others as peers, fellow workers and copartners.	.905**
30	Every member has a right to equal treatment.	.846**
MP		
31	You divide things up according to how much each of you has paid or contributed.	.634**
32	What you get from others is directly proportional to how much you give to them.	.802**
33	You have a right and are entitled to a fair rate of return for what you have devoted to this interaction.	.838**
34	Your interaction is strictly rational: you calculate what your payoffs are, and act accordingly.	.728**
Effectiveness of Knowledge Sharing		
35	You are satisfied with the availability of knowledge for your tasks.	.824**
36	The available knowledge improves your effectiveness in performing your tasks.	.831**
37	You are satisfied with knowledge sharing in this group.	.903**
38	You are satisfied with knowledge sharing among individual in this group.	.888**
39	The current mechanism of knowledge sharing improves overall effectiveness in this group.	.881**
40	You are satisfied with the current mechanism of knowledge sharing.	.887**

