SHARING KNOWLEDGE IN VIRTUAL COMMUNITIES: FACTORS AFFECTING A MEMBER'S INTENTION TO SHARE

SHARING KNOWLEDGE IN VIRTUAL COMMUNITIES: FACTORS AFFECTING A MEMBER'S INTENTION TO SHARE

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Doctor of Philosophy

McMaster University

DOCTOR OF PHILOSOPHY (2010) McMaster University

(Business Administration) Hamilton Ontario

TITLE: Sharing Knowledge in Virtual Communities: Factors Affecting A Member's Intention to Share

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NUMBER of PAGES: xii, 218

ABSTRACT

This dissertation aims to advance empirical research in the realm of knowledge sharing in virtual communities and to help practitioners better understand the factors that inhibit (cost) or motivate (benefit) such behaviour. The impact of some costs and benefits (factors derived from social exchange theory) may be contingent upon certain social contexts or conditions (factors derived from social capital theory). To this end, two research models were developed (i.e., a main effects model and an interaction model) that integrate these two theories together. New constructs specific to the virtual community context were also incorporated. To test these models, an online survey was administered to 968 members of a large IT professional virtual community comprising millions of registered users.

Findings from a structural equation modeling analysis of this data set suggest that specific benefits and social capital factors have direct effects on an individual's intention to share knowledge, and more importantly, the impacts of some benefits are contingent upon certain social capital factors. Specifically, the impact of online score rewards on an individual's intention to share knowledge with others in the virtual community is contingent upon that person's trust in the people who are seeking knowledge from that individual. Additionally, the impact of reciprocity on an individual's intention to share knowledge is moderated by pro-sharing norms in the virtual community.

A major contribution of this dissertation is the provision of new theoretical insights that help explain how certain benefits and social capital factors affect knowledge

sharing activity in virtual communities. It is hoped that these insights will help builders and managers of knowledge-based virtual communities better promote online knowledge sharing behaviours and improve the sustainability of such communities in the future.

ACKNOWLEDGEMENTS

Over the course of the last few years this dissertation was supported by several people to whom I would like to express my gratitude.

First and foremost, this research could not have been completed without the sage guidance and persistent help of my supervisor Dr. Brian Detlor. I would like to express my sincere thanks to Dr. Detlor for his support, inspiration, input, encouragement and kindness. I have been always impressed with how much patience he had reviewing my papers, not only giving intelligent ideas and fundamental suggestions on research, but also improving my writing. Dr. Detlor is one of the kindest human beings I have ever had the privilege of knowing and working with. It is my hope that I will carry on the fine tradition when I supervise my students in the future.

Second, I would like to thank my dissertation committee members: Dr. Milena Head and Dr. Catherine Connelly. They are kind and intelligent scholars. They were influential in improving the value and rigor of this dissertation through their comments and suggestions. I am also grateful for the help I received from other professors in DeGroote School of Business. I benefited greatly from the kindness they all showed when sharing their vast experience with me.

Third, I would like to thank Mrs. Carolyn Colwell, Administrative Coordinator of the Ph.D. Program. She kindly took care of all Ph.D. students as a family. She worked very hard to help every Ph.D. student. I really appreciate her kindness.

There are many other people who supported and helped me in my Ph.D. studies. I

would like to extend my great appreciation to them.

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Chapter 1: Introduction

1.1 Research Motivation

The society in which we live today is often classified as a "knowledge society" (Drucker 1968; Bell 1973; Nonaka 1994; Stehr 1994; Hoogenboom et al. 2008). One important characteristic of a knowledge society is that people are able to obtain knowledge on the most recent of achievements in different areas of science, culture and technologies and to share this knowledge with others (Zakarevičius 2005). With recent advances in Internet technology over the last few years, online virtual communities[1] today can provide people with a convenient and efficient way to share knowledge with others, whether they are down the street or situated half-way around the world. Thus, many online virtual communities have been created to promote knowledge sharing among participants, especially when members are knowledge workers in knowledge-intensive fields. For example, Information Technology (IT) professional communities have been widely used for sharing knowledge among IT professionals; in such virtual communities, software designers, programmers, database administrators, and network architects ask/answer questions related to software programming, database, hardware, etc. Given that such communities are knowledge-intensive and are mainly used to share

[1] A virtual community refers to a group of people with common interests, goals, needs, or practices that communicate regularly in an organized way over the Internet through a common mechanism (Ridings et al. 2002). The mechanism can be a chat room, bulletin board system (BBS) or listserv email program that supports people posting and responding to questions, or the sharing of knowledge relevant to topics of interest to the community.

knowledge among members, some scholars refer to such virtual communities as knowledge-based virtual communities or knowledge communities (di Norcia 2002; McDermott 1999).

Despite the power afforded by Internet technologies, information technology alone does not appear to motivate knowledge sharing (Orlikowski 1993; Davenport, 1994, 1997; Jarvenpaa and Staples 2000). Rather, the transfer of knowledge across individuals ultimately seems to depend on people's willingness to share their knowledge (Bock et al. 2005). This leads to an interesting and important question for knowledge-based virtual communities to consider: how to encourage members to share their knowledge with others? Actually, this question is a major challenge that many knowledge-based virtual communities are facing today because there is, in principle, an imbalance between demand and supply between the number of individuals who are looking for useful advice and the number of people willing to take the time and trouble to provide that knowledge (Lampel and Bhalla 2007). This imbalance constitutes a threat to the long-term sustainability of knowledge-based virtual communities.

In the physical world, a person's willingness to share knowledge may be contingent upon how well they know others. However, knowing others well in virtual communities can be problematic because these online environments are often made up of hundreds of thousands of strangers who remain strangers. Further, sharing knowledge with others entails certain **costs** to the knowledge provider, such as the time and effort incurred for answering questions. As such, it can be very challenging to motivate people

in virtual communities to share their knowledge with strangers. Given these challenges, many online virtual communities have developed **benefits**, such as online score rewards, to motivate members to share their knowledge with others. Additionally, other benefits, such as reciprocity, online status, and social affiliation are also hoped to encourage members to engage in knowledge sharing behaviours in virtual communities.

Two broad research questions stem from this discussion. The *first* is whether such costs and benefits really do affect an individual's intention to share knowledge with others in a virtual community. The *second* is whether the impacts of costs and benefits on a person's willingness to share knowledge in a virtual community are contingent upon certain social contexts or conditions, such as trust and norms (so called social capital) in the virtual community, given that such social capital factors provide a social context for the knowledge exchange to occur. This question is important because an understanding of the contingency effects of such social capital factors may provide a deeper understanding of how to motivate members to share knowledge in knowledge-based virtual communities, and may provide some explanation why some knowledge-based virtual communities are successful at sharing knowledge while others are not.

1.2 Research Objectives

As a means to answer these broad research questions, the academic goal of this study is to gain insights not only on the factors that directly influence an individual's decision to share his or her knowledge in a virtual community, but also on the conditions that influence the impact of these factors. A set of objectives is defined to achieve the

above goal. These objectives are as follows:

1. To identify potential costs, benefits, and social capital factors that may affect knowledge sharing in virtual communities;
2. To hypothesize and test a main effects model integrating the direct effects of these factors on people's willingness to share their knowledge; and
3. To hypothesize and test an interaction model further incorporating the moderation effects of certain social capital factors on the impacts of costs and benefits.

1.3 Theoretical and Practical Significance

This study has the potential to contribute to both scholarship and practice. With respect to scholarship, this is the first study that examines how the impacts of costs and benefits on knowledge sharing in virtual communities are contingent upon social capital factors. This goes beyond simply testing the direct effects of costs, benefits, and social capital factors to testing the moderation effects of social capital factors on the influence of costs and benefits. By doing so, it is hoped that a more comprehensive and deeper understanding of knowledge sharing in virtual communities will be achieved.

In terms of practical contributions, the findings of this study will potentially yield important, practical recommendations targeted to the founders or builders of knowledge-based virtual communities that offer suggestions on how to better promote online knowledge sharing behaviours and improve the sustainability of such communities.

1.4 Outline of the Dissertation

This dissertation is organized into seven chapters. This chapter (Chapter 1) introduces the phenomenon under investigation, outlines the research motivation, highlights the research objectives, and summaries the importance of this study to both research and practice.

In order to clarify the relevant concepts and demarcate the topic and perspective of this study, Chapter 2 presents a literature review on knowledge, knowledge sharing and virtual communities. Prior studies on knowledge sharing in organizations, offline communities, and online communities are also reviewed. The challenges faced by practice in promoting and sustaining knowledge sharing activity in virtual communities are discussed as well.

Chapter 3 provides the theoretical foundation for this study and identifies the factors that affect knowledge sharing in virtual communities. Specifically, the factors are derived from social exchange and social capital theories.

Chapter 4 proposes a research model (comprising a main effects model and an interaction model) to frame the research investigation. The main effects model illustrates the direct effects of costs, benefits and social capital factors on a person's intention to share knowledge in a virtual community. The interaction model illustrates the moderation effects of certain social capital factors on the impacts of some costs and benefits. Based on these two models, research hypotheses are presented.

Chapter 5 describes the research design used in this dissertation. It begins with a

discussion of a survey instrument used for data collection and its validation using four rounds of sorting exercises (Q-sort). From there, the study's data analysis method, sampling frame, and strategy are described. The chapter ends with a description of a pilot study that pretests the measures and procedures used in full-fledged data collection and analysis.

Chapter 6 provides a thorough description of the data analysis and research results. The chapter begins with a description of the field research setting, the data collection process and the participants, followed by a preliminary analysis of the data. Then, both the main effects model and interaction model are estimated with the data collected from the field setting. Also, issues such as non-response bias and common method covariance are discussed. Additionally, the effects of control variables are examined to prove the stability of the model.

Last, Chapter 7 summarizes and concludes this dissertation. First, it provides a discussion on the study's findings in relation to the two broad research questions outlined above. Next, theoretical and practical contributions are outlined. Also, the strengths and limitations of this work are described. Lastly, future research opportunities are suggested, followed by concluding remarks.

Chapter 2: Literature Review

One challenge confronting today's knowledge society is that a lot of knowledge is not shared by the entire society, but rather resides within individual society members (Nonaka and Konno 1998). More specifically, knowledge resides in persons who create, recognize, store and apply knowledge in carrying out their study or work. Consequently, the movement of knowledge across individuals is inherently dependent upon an individual's willingness to share his or her knowledge with others. Thus, specific to this study, knowledge sharing concerns the willingness of individuals in virtual communities to transfer and disseminate their knowledge to others through the mechanisms (e.g., electronic bulletin boards) provided by virtual communities (Lee 2001; Wasko and Faraj 2005).

2.1 Basic concepts

Discussing knowledge sharing in virtual communities raises the issue: what is knowledge? This is a challenging question that has intrigued some of the world's greatest thinkers from Plato to Popper, without the emergence of a general consensus (Grant 1996a). As such, this is not an arena in which the researcher can successfully compete. Also, it is not necessary for the purpose of this thesis to engage in a debate to probe or reframe the term "knowledge" from the perspective of philosophy; such an understanding of knowledge is not a determining factor in affecting knowledge sharing behaviour in virtual communities. However, having said this, it is still useful to classify the relevant

concepts or views of the term "knowledge" as discussed in the relevant literature. To do so, a definition of knowledge will be first considered.

2.1.1 Definition of knowledge

Historically, from a philosophical perspective, knowledge is defined as "justified true belief" (Huber 1991; Nonaka 1994) that enhances an entity's capacity for effective action (Alavi and Leidner 2001). Drawing upon the work of Polanyi (1962, 1967), Nonaka (1994) explicates two dimensions of knowledge: tacit and explicit. Tacit knowledge is rooted in action, experience, and involvement in a specific context, while explicit knowledge can be articulated, codified, and communicated in symbolic form or natural language (Alavi and Leidner 2001). These two dimensions of knowledge are not dichotomous states of knowledge, but rather are mutually dependent and reinforcing qualities of knowledge. Another question that arises is, what is the difference between knowledge and information? The assumption may be that if knowledge is not something different from information, then there is nothing new or interesting about knowledge management (Fahey and Prusak 1998).

2.1.2 Data, information and knowledge

Some authors address the question of distinguishing among knowledge, information and data. A commonly held view is that data is raw numbers and facts, information is processed/interpreted data, and knowledge is authenticated/justified information (Dreske 1981; Machlup 1980; Vance 1997). Knowledge derives from

information as information derives from data (Davenport and Prusak 1998). But this hierarchy from data to knowledge is also argued to be inverse. For example, Tuomi (1999) argues that knowledge must exist before information can be formulated and before data can be measured to form information. Further, some scholars posit that information is converted to knowledge once it is processed in the mind of individuals and knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms (Alavi and Leidner 2001). However, from these views, what is key to effectively distinguishing between information and knowledge is still not clear (Alavi and Leidner 2001).

By contrast, some scholars emphasize the strong association between information and knowledge (Detlor 2001, 2002). For example, Schultze (2000) describes the close kinship between information and knowledge as a "dialectic, mutually constitutive relationship." Especially in practice, it is quite difficult to separate them unambiguously (Tuomi 1999/2000; Schulz 2003). Similarly, Kogut and Zander (1992) include both tacit "know-how" and information "know-what" in their definition of knowledge. Wikstrom and Normann (1994) also include information within the broader concept of knowledge.

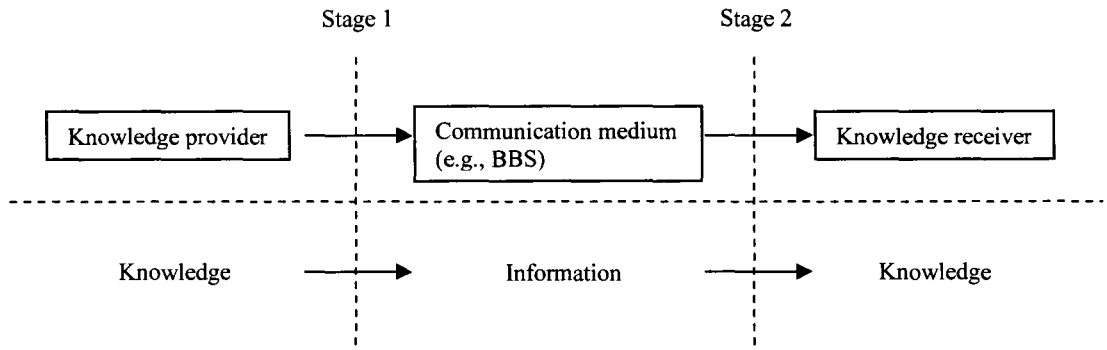
How knowledge is transmitted between knowledge providers and receivers sheds light upon the tight association between information and knowledge. As such, the next subsection of this thesis discusses the process by which knowledge is exchanged between individuals over communication channels. Specifically, the goal is to describe how knowledge is shared over electronic communication mediums – the channel found and

utilized by knowledge sharers in online communities.

2.1.3 Knowledge providers, receivers and communication mediums

Regarding knowledge sharing, two actors (entities) are involved: a knowledge provider and a knowledge receiver. A knowledge provider refers to an individual who provides or shares his or her knowledge with others, while a knowledge receiver refers to the one who receives or acquires the knowledge from the other person. Other scholars use similar terms to describe these two concepts. For example, Wasko and Faraj (2005) use the terms knowledge contributor and knowledge seeker, Chiu et al. (2006) utilize the terms knowledge contributor and knowledge receiver, Hew and Hara (2007) use the terms knowledge provider (sharer) and knowledge seeker, and Peddibhotla and Subramani (2007) utilize the terms knowledge contributor and knowledge user.

In addition to the knowledge provider and receiver, there is a communication medium through which knowledge is transferred from the provider to the receiver. Other scholars refer to this concept as a transmission channel (Gupta and Govindarajan 2000) or as a transfer mechanism (Alavi and Leidner 2001). In online communities, the communication medium can be a bulletin board system (BBS) or a chat room. Conceptualized based on prior work (Alavi and Leidner 2001; Gupta and Govindarajan 2000) and adapted to the online community context, Figure 2-1 illustrates the knowledge sharing process in which a knowledge provider, recipient and communication medium are involved. The process of knowledge sharing in virtual communities consists of two stages.



Conceptualized based on Alavi and Leidner (2001) and Gupta and Govindarajan (2000)

Figure 2-1. Process of knowledge sharing in online communities

In the first stage, the knowledge provider shares his or her knowledge by posting information on a BBS (communication medium). In this stage, the knowledge embedded in the head of the individual is converted to information (e.g., text posted on the BBS). Here, what is posted on the BBS is information. And what is provided by the knowledge provider is knowledge, not only because it is something embedded in the mind of the individual before it is converted to information, but also because it is a "justified belief" (Huber 1991; Nonaka 1994). When an individual answers another person's question based on his or her own experience and accumulated knowledge, this answer is a justified belief; that is, this individual provides an answer that he or she believes to be correct. Thus, what is shared by the individual is knowledge, although what is posted on the BBS is information.

In the second stage, the knowledge receiver reads the information posted on the BBS, and then creates his or her own knowledge. In this stage, information is converted

to knowledge that resides within the mind of the individual.

2.1.4 Knowledge sharing or information sharing

As illustrated in Figure 2-1, what is possessed in the mind of a knowledge provider and receiver is knowledge, while what is posted on a BBS is information. This raises the question: should this process be called knowledge sharing or information sharing in online communities? As mentioned above, three entities (i.e., the knowledge provider, the communication medium, and the knowledge receiver), are involved in this process. From the communication medium's (e.g., BBS's) perspective, this process can be called information sharing since what is posted and stored in the BBS is information. But from the knowledge provider's perspective, as mentioned above, what the individual provides is knowledge since it is something embedded in the head of this individual and is justified by the individual to be correct (at least the individual believes it to be so). Thus, from the knowledge provider's perspective, this process is knowledge sharing.

As mentioned earlier, this thesis is mainly concerned with the willingness of individuals to share with others the knowledge they have acquired or created. So, this study is from a knowledge provider's perspective. And thus, it is more appropriate to call this process knowledge sharing rather than information sharing. Actually, most similar studies in online communities, especially recent ones, use the phrase "knowledge sharing" (for example, Wasko and Faraj (2005), Chiu et al. (2006), Ma and Agarwal (2007), Hew and Hara (2007), and Lee et al. (2006)).

Additionally, what is posted on a BBS (e.g., the recorded discussions) is also

regarded as explicit knowledge of the virtual communities (Bieber et al., 2002). This point is consistent with the view of knowledge embedded in physical systems, such as databases (Leonard-Barton 1995; Holsapple and Joshi 2004). For example, Kankanhalli et al. (2005) regard the information input and stored in electronic knowledge repositories as knowledge. Based on this view, even from the communication medium's perspective, the sharing process mentioned above can also be called knowledge sharing.

2.2 Knowledge sharing in organizations and offline communities

As previously mentioned, we are living in a "knowledge society." One of the outcomes of living in a knowledge society is the increased awareness by individuals and organizations to harness that knowledge. As such, a new movement, coined knowledge management (KM), has been a popular area of study in recent years by those interested in leveraging knowledge, in particular by companies looking for ways to foster organizational success. Important to this paper is the fact that knowledge sharing has been identified in the KM literature to be one of the key steps in any knowledge-management initiative (Davenport and Prusak 1998; Hall and Widén-Wulff 2008; Hansen et al. 1999; Garvin 1997). How to achieve effective knowledge sharing within organizations as well as in society has been a focus of many KM research investigations (Ba et al. 2001; Hall and Widén-Wulff 2008).

As a result, most studies that concentrate on knowledge sharing are situated in organizational contexts. For example, a knowledge-based view of the firm considers the capability to use, share, and create knowledge as a source of competitive advantage for

organizations (Kogut and Zander 1992), and suggests that the primary reason for the existence of a firm is its superior ability to share and integrate multiple knowledge streams (Grant 1996a, 1996b). Further, sundry factors have been identified to influence knowledge sharing in organizational contexts, for example:

- reciprocity (in essence, "*I help you if you help me; I withhold help if you act destructively.* "(Constant et al. 1994, p.402));
- reputation[2];
- extrinsic rewards (such as monetary incentive and points toward promotion offered by organizations to reward knowledge sharing (Bock et al. 2005));
- sense of self-worth[3];
- subjective norm (refers to perceived social pressure to perform or not perform a behaviour (Ajzen 1991; Bock et al. 2005));
- amounts of work experience (Constant et al. 1994);
- absorptive capacity (refers to the ability for a recipient to recognize the value of external knowledge, assimilate it, and apply it. (Ko et al. 2005));
- source credibility (refers to the extent to which a knowledge recipient perceives a source to be trustworthy and an expert. (Ko et al. 2005)); and
- an organization's social interaction culture[4] (Connelly and Kelloway 2003).

[2] That is, people can earn respect (Constant et al 1994) and a better image (Constanct et al. 1996) from sharing knowledge with others and showing they possess valuable expertise (Ba et al. 2001)

[3] The concept of self-worth refers to individuals' degree of liking themselves based on competence, power, or efficacy regarding conduct (Gecas 1971). In the case of sharing knowledge in the organizational context, "employees see themselves as providing value to their organizations through their knowledge sharing" (Bock et al. 2005, p.91).

Despite the emphasis on the study of knowledge sharing in organizational contexts, some research has been conducted on knowledge sharing in offline (physical) communities, such as traditional communities-of-practice (CoPs). Scholars notice that significant learning arises throughout traditional CoPs (Brown and Duguid 1991, 1996), while sharing (spreading) knowledge is argued to be one important trait that characterizes such communities as a "social fabric" of learning (Wenger 1998). Some factors have been identified that are positively related to knowledge sharing, for instance:

- personal experience (Brown and Duguid 1991);
- strong tie (refers to a strong personal relationship that has "*at least two of the characteristics of intimacy, voluntariness, and multiplexity*[5]." (Wellman and Wortley 1990, p.566));
- co-location (locating people's primary offices or workstations in physical proximity to each other (Kraut et al. 1990));
- demographic similarity (Pelled 1996); and
- status similarity (Cohen and Zhou 1991).

It remains to be determined whether these factors also have influence in online virtual communities.

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[4] "In an organization with a positive social interaction culture, both management and employees socialize and interact frequently with each other, with little regard for their organizational status."(Connelly and Kelloway 2003, p.295)

[5] Multiplexity refers to an interest in being together as much as possible through interactions in multiple social contexts over a long period (Wellman and Wortley 1990, p.564) .

2.3 Knowledge sharing in virtual communities

With recent advances in Internet technologies, the concept of knowledge sharing has gone beyond organizational and physical community contexts, to a social, global and virtual context in terms of online virtual communities. Online virtual communities are believed to have provided a new and efficient way for knowledge sharing at both societal and global levels in the new era. For instance, researchers and practitioners are surprised by the speed and efficiency with which knowledge can be gathered from volunteers in Wikipedia – a system that relies on voluntary contributions and updates from a global community of users (Ma and Agarwal 2007).

In recent years, virtual communities have developed very fast and become larger and larger; some virtual communities comprise millions of registered members coming from worldwide. In order to relieve participants' potential worries of losing privacy (and thus attract more people to participate) in the community, many virtual communities have given participants more freedoms such as allowing them to use pseudonyms in the virtual community (Chen et al. 2008). Accompanied with this, however, it seems to be more challenging to promote knowledge sharing in such settings. Given that participation is open and voluntary, the population of participants is huge, and participants are strangers using pseudonyms who remain strangers, it is difficult to identify a person in such settings. Research on deindividuation[6] suggests that people would be less concerned

6 Deindividuation theory (Festinger et al. 1952) argues that an individual may feel extricated from responsibility for his or her actions simply because that person no longer has an acute awareness of the identity of self and others (individual and corporate entities) and of the social environment that provides the

about their image and less likely to behave in a socially desirable manner when they believe that the likelihood of being identified and evaluated is low in the absence of the physical body as a source of social legibility (Siegel et al. 1986). Even though this does not necessarily mean they would do evil things, the economically rational action for them is to free-ride, in other words, acquire the knowledge without contributing knowledge to the virtual community (Wasko and Faraj 200). For example, they may only ask questions without answering others' questions, or just lurk in the virtual community to search and read previous postings to get the knowledge they want.

Thus, there is in principle an imbalance between demand and supply between the number of individuals who are looking for useful advice and the number of people willing to take the time and trouble to provide that knowledge (Lampel and Bhalla 2007). This imbalance constitutes a threat to the long-term sustainability of these virtual communities.

In order to examine people's knowledge sharing behaviours in the virtual communities, some exploratory qualitative studies have been conducted by collecting and analyzing participant responses as to why they share knowledge with others (see, for example, Wasko and Faraj (2000), Lee et al. (2006), Peddibhotla and Subramani (2007), and Hew and Hara (2007)). Additionally, some quantitative studies have been done that have identified various factors affecting people's predispositions to sharing knowledge in virtual communities, such as trust (Hsu et al. 2007); reciprocity, reputation, commitment,

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context for the behaviour (Diener 1980; Hinduja 2008; Hiltz et al. 1989; Postmes 1998).

and tenure (Wasko and Faraj 2005); shared vision (Chiu et al. 2006); and perceived identity verification (Ma and Agarwal 2007).

However, with all due respect to these prior studies, the research on knowledge sharing in virtual communities can still be elaborated and extended. Given that prior quantitative studies on knowledge sharing in virtual communities (Chiu et al. 2006; Ma and Agarwal 2007; Ridings et al. 2002; Wasko and Faraj 2005) mainly focus on motivators (i.e., benefits such as reciprocity and reputation) or social capital factors (such as trust, commitment, and shared vision), there seem to be two areas that haven't been reached yet by previous quantitative studies regarding knowledge sharing in virtual communities, namely: i) costs (acting as inhibitors) of knowledge sharing, and ii) contingency effects (i.e., whether the impacts of costs and benefits are contingent upon social capital factors).

This study is aimed to address the above void by testing a complete set of costs and benefits as well as social capital factors, and more importantly, by further examining the moderation effects of certain social capital factors on the impact of costs and benefits. By doing so, this study can provide founders or builders of virtual communities a more comprehensive and deeper understanding of this phenomenon, thus helping them promote knowledge sharing more effectively, and eventually making these communities more prosperous. Extending this contribution, this study can also help to facilitate knowledge sharing, learning and knowledge accumulation in society as a whole.

To embark on such an investigation, this thesis proposes to utilize factors drawn

from social exchange and social capital theories to ground the theoretical basis for this study. Details about this theoretical foundation are presented in the next section of this thesis.

Chapter 3: Theoretical Foundation

While information systems can be used to support knowledge sharing, information systems alone do not guarantee success in knowledge sharing (Orlikowski, 1992; Davenport 1994, 1997; Cross and Baird 2000; McDermott 1999). This is because the accessibility and availability of technical solutions alone do not guarantee the use of such systems for knowledge sharing purposes. Rather, other factors, such as social issues, appear to be significant in ensuring knowledge sharing success (Ruppel and Harrington 2001; Kankanhalli et al. 2005). Knowledge is regarded as a distinctively unique resource (Kogut and Zander 1992), which can be shared by individuals through social interactions. When people share this resource with others, especially when they need to spend valuable time and effort, it is reasonable for knowledge providers to expect to receive some return in exchange. This makes social exchange theory a good candidate for explaining knowledge sharing behaviour in this study. Social exchange theory explains the social behaviour of humans in the social interaction process (Blau 1964; Homans 1958). Blau (1964, p.91) defines social exchange as "voluntary actions of individuals that are motivated by the returns they are expected to bring and typically do in fact bring from others." Homans (1958, p.606), the initiator of the theory, titles it as "social behavior as exchange" and expounds thoroughly the theory as follows: "Social behavior is an exchange of goods, material goods but also non-material ones, such as the symbols of approval or prestige. Persons that give much to others try to get much from them, and

persons that get much from others are under pressure to give much to them. This process of influence tends to work out at equilibrium to a balance in the exchanges. For a person in an exchange, what he gives may be a cost to him, just as what he gets may be a reward, and his behaviour changes less as the difference of the two, profit, tends to a maximum."

Hence, social exchange theory is best understood as a framework for explicating the movement of resources (or goods), in imperfect market conditions, between dyads or through a network via a social process (Homans 1958; Emerson 1987). Resources (either tangible or intangible ones such as knowledge) are the currency of social exchange (Kankanhalli et al. 2005).

Correspondingly, social exchange theory has been applied to prior studies on knowledge sharing in organizational contexts as well as in virtual community contexts. For example, Kankanhalli et al. (2005) applied social exchange theory in their study on the willingness of knowledge contributors to use electronic knowledge repositories in ten organizations. They found that knowledge providers expect to receive returns such as organizational rewards, as well as intrinsic benefits such as enjoyment in helping others and knowledge self-efficacy. These potential benefits can affect individuals' intentions to share their knowledge. Another study (Wasko and Faraj, 2005) partially used social exchange theory to explain people's knowledge sharing behaviour in a professional virtual community where people use their real names. They examined some elements (e.g., motivations) of social exchange theory, and found that social rewards such as reputation can act as a return (benefit) for the knowledge shared. Also, Constant et al.

(1996) found that the expectation of personal benefits could motivate individuals to share their knowledge with others in the absence of personal acquaintance or similarity. All these findings further justify using social exchange theory as a theoretical basis for the current study, and aim to further extend prior work by testing contingency effects (i.e., the conditions that influence the impact of the factors derived from social exchange theory on knowledge sharing).

One important difference between social exchanges and economic exchanges is that obligations are not clearly specified in social exchanges. In such exchanges, there is no way to assure an appropriate return for a favor. Thus, social exchange requires trusting others to discharge their obligations (Blau 1964), and requires social norms to influence participants' exchange behaviour (Nahapiet and Ghoshal 1998; Putnam 1993). Trust and norms are important aspects of social capital, which is conceptualized as a set of resources embedded within networks of social relationships (Burt 1992; Loury 1977; Tsai and Ghoshal 1998). Scholars argue that social capital provides important social contexts for social exchange (Nahapiet and Ghoshal 1998) in general, and for knowledge sharing (Kankanhalli et al. 2005) in particular. Prior studies also find that other facets of social capital, such as commitment (Wasko and Faraj 2005) and shared vision (Chiu et al. 2006) can affect knowledge sharing behaviours in virtual communities. Thus, this study uses social capital theory as a complementary theoretical basis.

The following two subsections discuss social exchange and social capital theories in the virtual community context in more detail.

3.1 Social Exchange Theory

As mentioned above, social exchange theory can be used to explain the movement of resources in the social interaction process (Homans 1958; Emerson 1987). Two facets, cost and benefit, are involved in this process. According to social exchange theory, for a person in an exchange, what the person loses may be a cost; what he or she obtains may be a benefit. "Each participant hopes to gain much at little cost" (Blau 1964, p. 114), and "an individual's social behavior changes less as the difference of the two [cost and benefit], profit, tends to a maximum" Homans (1958, p.606). In agreement with this theory, researchers have suggested that increasing the benefits and reducing the costs for contributing knowledge can help to encourage knowledge sharing behaviours (Kankanhalli et al. 2005; Markus 2001; Wasko and Faraj 2000).

3.1.1 Costs

During social exchange, costs may be incurred in the form of opportunity costs and actual loss of resources (Molm 1997). When people share their knowledge in virtual communities, they have to spend their valuable time and effort doing this. For example, the time and effort required to codify knowledge and post it on a BBS may be an important cost for knowledge sharing in virtual communities (Markus 2001). Such costs may act as opportunity costs that preclude knowledge providers from performing alternative tasks at that time and accruing the corresponding rewards (Kankanhalli et al. 2005). Additionally, knowledge providers may perceive a loss of power and unique value associated with the knowledge they share with others (Davenport and Prusak 1998; Gray

2001). If the costs are high, they will inhibit an individual's knowledge sharing behaviour.

3.1.2 Benefits

During social exchange, benefits act as motivators of human behaviour, which can be intrinsic or extrinsic in nature (Deci and Ryan 1980). Research has established intrinsic and extrinsic benefits as motivations in several domains (Vallerand 1997), including knowledge sharing (Osterloh and Frey 2000).

3.1.2.1 Intrinsic motivations (benefits)

Intrinsic motivation has previously been defined as "the doing of an activity for its inherent satisfaction rather than for some separable consequence" (Ryan and Deci 2000, p. 56). When intrinsically motivated, an individual partakes in an activity for "the fun or challenge entailed rather than because of external prods, pressures, or rewards" (Ryan and Deci 2000, p. 56). For example, by sharing knowledge with others, knowledge providers have the opportunity to help others (Ba et al. 2001; Wasko and Faraj 2000). Further, people may enjoy and derive pleasure from such acts of helping others (Baumeister 1982; Krebs 1975).

Researchers also find that knowledge self-efficacy is an important intrinsic motivation for knowledge sharing in organizational contexts (Bock and Kim 2002; Kankanhalli et al. 2005). Self-efficacy relates to the perception of people about what they can do with the skills they possess (Bandura 1986). For example, when a person faces difficulties at work (e.g., how to solve a problem in software programming), this person

asks questions by posting a message in a virtual community to seek others' help. Other people in the virtual community who have relative capability may help this person solve the problem. It is usually a challenging task to answer such a question and help this person solve the problem. Research has indicated that succeeding in a challenging task (termed an "enactive mastery[7] experience") provides the strongest information for increasing self-efficacy (Bandura, 1977b; Stadjkovic et al. 1998). The more challenging the task is, the more self-efficacy is enhanced. As Bandura (1977a, p.201) posits, "To succeed at easy tasks provides no new information for altering one's sense of self-efficacy, whereas mastery of challenging tasks conveys salient evidence of enhanced competence." Hence, people who answer others' question (especially when this question is challenging) gain confidence in their ability and acquire the benefit of increased self-efficacy (Constant et al. 1994).

Additionally, prior research finds that people communicate with others because they wish to feel a sense of belonging, which is called social affiliation (Veroff and Veroff 1980, Wiesenfield et al. 2001). The need for social affiliation has been viewed as a fundamental human motivation to communicate with other people (Baumeister and Leary 1995; Lee 2002). In a study of the 1,000 most prolific knowledge contributors to review products at an Internet store (Amazon.com), Peddibhotla and Subramani (2007) find that social affiliation is the mostly frequently (37.8%) mentioned motive for

7 Enactive mastery is defined as repeated performance accomplishments (Bandura, 1982; Gist, 1987).

contribution. Thus, it is expected that social affiliation acts as another intrinsic[8] motivation to explain people's knowledge sharing behaviour in virtual communities.

3.1.2.2 Extrinsic motivations (benefits)

Extrinsic motivation refers to "doing something because it leads to a separable outcome" (Ryan and Deci 2000, p.55). Extrinsic motivation may come from "external prods, pressures, or rewards" (Ryan and Deci 2000, p.56). For example, knowledge contributors may receive organizational rewards for their contributions (Beer and Nohria 2000; Hall 2001). However, in virtual communities, organizational rewards, such as increased pay, bonuses, job security, or career advancement, do not exist. In order to motivate members to share knowledge, some virtual communities have designed a new reward – an "online score" for a knowledge provider's contribution. After a knowledge provider answers a question posted by a knowledge seeker, a certain amount of online score may be given to the knowledge provider by the knowledge recipient. Such online scores earned by the knowledge providers are useful to these knowledge providers. When a member's online score (acquired from knowledge sharing) reaches a certain amount, this member can get certain benefits[9] from the virtual community, such as free services

8 Although social affiliation mainly serves as sources of intrinsic gratification, such as positive affect or stimulation associated with interpersonal closeness and communion (Carver and Scheier, 1992; Hill, 1987), sometimes social affiliation may be required for "reasons not related to its intrinsic rewardingness" (Hill, 1987, p.1009). For example, social affiliation can bring the opportunity of social comparison (Buss 1983, Hill, 1987), which involves the seeking of information about a self-relevant issue from others when objective criteria for evaluation are not readily available (Festinger 1954).

9 Different virtual communities have different policies for the benefits to members who have earned high scores from sharing knowledge with others.

(like personal advertisement) in the virtual community, professional certificates, or some gifts.

Also, people who answer questions posted in virtual communities may expect that their queries for knowledge will be answered by others in the future. Although knowledge providers in virtual communities have no assurance that those they are helping will directly return the favor, people do believe in reciprocity (Wasko and Faraj 2000). 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). Thus, reciprocity in virtual communities can be seen as a form of generalized social exchange (Fulk et al. 1996) where more than two people participate and reciprocal dependence is indirect, with the BBS serving as the intermediary between knowledge providers and receivers (Kankanhalli et al. 2005).

As mentioned early, Homan (1958, 606) points out that, resources in social exchange can be "material goods but also non-material ones, such as the symbols of approval or prestige." Similarly, Blau (1964) specify the non-material social rewards as approval, respect, status, etc. This suggests that one potential way an individual can benefit from sharing knowledge with others in a virtual community is the perception that sharing knowledge enhances his or her status or reputation in the virtual community. Lampel and Bhalla (2007) propose a new construct – online status seeking – to describe people's behaviour in virtual communities[10]. Correspondingly, many virtual communities

10 Wasko and Faraj (2005) use the reputation construct when studying a virtual community where

use online status rankings to motivate participants to share their knowledge. For example, Amazon.com ranks its top 10 book reviewers to highlight their knowledge contribution, and motivates them to make further contributions (Kankanhalli et al. 2005; Lampel and Bhalla 2007). Hence, online status seeking is chosen as a factor worthy of investigation in this study on knowledge sharing in virtual communities[11].

3.2 Social Capital Theory

As described earlier, social capital refers to the resources embedded within networks of human relationships (Nahapiet and Ghoshal 1998). These networks include proximate, as well as virtual, communities (Rheingold 2000).

Nahapiet and Ghoshal (1998) propose that social capital has three dimensions – structural, relational, and cognitive. The structural dimension of social capital is manifested as social interaction ties (Tsai and Ghoshal 1998). However, it seems to be difficult to develop dyadic social ties in the virtual communities where participants are strangers using pseudonyms, the population of strangers (worldwide) is so large, and participation is open, voluntary and unstable.

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people are identified. The reasons that the current study chooses the online status seeking construct are as follows. Although status seeking is closely related to reputation seeking (Washington and Zajac 2005), it is also quite different. Status seeking is based not only on trying to improve one's own position in absolute terms, but also on the relative position of others, e.g., the ranking of individuals (Lampel and Bhalla 2007). By comparison, reputation seeking has no clear rank ordering. In today's virtual communities, participants are hundreds of thousands of strangers using pseudonyms who remain strangers. This makes the relative position of others more appropriate than the absolute position in a virtual community.

[11] In the discussion above, for the sake of clarity of exposition, motivations are categorized into two groups, i.e., extrinsic motivation and intrinsic motivation. The researcher recognizes, however, these two categories are likely to be interrelated in certain ways. For example, the above-mentioned online status seeking can be not only externally oriented but also internally oriented (Lampel and Bhalla 2007).

The relational dimension (also called "relational capital") refers to the affective nature of the relationships within a collective (Nahapiet and Ghoshal 1998). Relational capital exists when members trust others within the collective (Putnam 1995b), perceive an obligation or commitment to participate in the collective (Coleman 1990; Wasko and Faraj 2005), and recognize and abide by its cooperative norms (Putnam 1995a).

The cognitive dimension is embodied in attributes like a shared code or shared paradigm that facilitates a common understanding of collective goals and proper ways of acting in a social system (Nahapiet and Ghoshal 1998). Such a common understanding is appropriable by the collectivity as a resource (Portes and Sensenbrenner, 1993). Inside a collective, a shared vision and/or a set of common values help develop this dimension of social capital, which in turn facilitates individual and group actions that benefit the whole collective (Tsai and Ghoshal 1998), such as the knowledge sharing actions in virtual communities.

Trust, norms, commitment, and shared vision, which manifest the relational and cognitive dimensions of social capital mentioned above, can improve the efficiency of coordinated action in general (Nahapiet and Ghoshal 1998; Tsai and Ghoshal 1998), and knowledge sharing in particular (Chiu et al. 2006; Kankanhalli et al. 2005; Ridings et al. 2002; Wasko and Faraj 2005). Given that these factors provide the context and conditions necessary for knowledge exchange to occur, Kankanhalli et al. (2005) also called them "contextual factors". In what follows, these factors are described in detail.

3.2.1 Trust

Trust is defined as "*the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party*" (Mayer et al. 1995, p.712). In short, trust is based on the expectation that others will behave as expected. When rules do not provide sufficient guarantees that others will behave as they are expected to, trust serves as a subjective substitute to such rules, creating the necessary atmosphere that makes engagement with others more open (Butler and Cantrell 1994). This is often the case with virtual communities. As Handy (1995, p. 44) mentions: "*virtuality ... [means] without a place as its home. Virtuality requires trust to make it work.*" The fact that participants are strangers who communicate with each other using pseudonyms via Internet, without the cues that real identity and face-to-face contact afford, requires trust for successful communication in virtual communities.

Scholars argue that trust enables and determines the nature of interpersonal relationships (Blau 1964; Gefen 2000; Jarvenpaa et al. 1998). In a trusting environment, people are more inclined to help others, while in a less trusting environment, people tend to shy away from providing help (Blau 1964; Luhmann 1979). When trust exists between individuals, they are more willing to partake in shared activity (Fukuyama 1995; Gambetta 1988b; Nahapiet and Ghoshal 1998), which is in the form of knowledge sharing in virtual communities (Ridings et al. 2002).

Generalized Trust

A trust relationship involves two specific parties: a trusting party (trustor) and a party to be trusted (trustee) (Driscoll 1978; Scott, C.L. 1980; Mayer et al. 1995). Trust may be at a personal level (Lubmann 1988) or a collective level (Ridings et al. 2002). Trust in virtual communities can be understood at the generalized (Putnam 1993), collective level (Cummings and Bromiley 1996) because an individual is typically posting to a general audience, and the individual always converses not merely with one or two other individuals. Sometimes, dozens of individuals are discussing a question in which they are interested. Scholars refer to this trust as generalized trust, which is an impersonal form of trust that does not rest with a specific individual but rests on behaviour that is generalized to a social collective (e.g., a virtual community) as a whole (Putnam 1993). With strong generalized trust, people may trust each other without having much personal knowledge about each other (Kankanhalli et al. 2005), which is exactly the case with virtual communities.

3.2.2 Pro-sharing Norms

According to Coleman (1990), a norm exists when the socially defined right to control an action is held not by the actor but by others. Thus, a norm represents a degree of consensus in the social system. Such norms may be a significant influence on exchange processes, opening up access to parties for the exchange of knowledge and ensuring the motivation to engage in such exchange (Putnam 1993; Nahapiet and Ghoshal 1998). Many studies have found that social norms can enhance the climate for

knowledge sharing. These norms include openness to conflicting views, tolerance for failure (Leonard-Barton 1995), openness to criticism (Starbuck 1992; Leonard-Barton 1995), and willingness to value and respond to diversity (Leonard-Barton 1995).

3.2.3 Commitment

Commitment is defined as the "psychological attachment" (Kiesler 1971) to a person (Coleman 1990), or to a collective (such as commitment to an organization, called organizational commitment (Mowday et al. 1979)), or even to an object (such as commitment to a brand, called brand commitment). Also, commitment can be considered as a psychological attachment to an online collective, such as an online virtual community (Wasko and Faraj 2005). Commitment is viewed as a close antecedent of behavioural loyalty (Beatty et al. 1988), and thus a person's sense of commitment is found to be closely related to certain social behaviours desired by the organization, such as knowledge sharing behaviours (Cabrera et al. 2006). In the same vein, it is very likely that members' commitment to a virtual community is related to their willingness to share knowledge in the virtual community (Wasko and Faraj 2005).

3.2.4 Shared vision

Engaging in meaningful knowledge sharing requires at least some level of understanding between parties (Nahapiet and Gohshal 1998). In an organizational context, Tsai and Ghoshal (1998, p. 467) note that a shared vision "*embodies the collective goals and aspirations of the members of an organization,*" and that organizational members

who share a vision will be more likely to become partners sharing or exchanging their resources. Prior research has shown that a common goal or shared vision of learning from each other and helping each other solve problems is associated with the knowledge contribution in a professional virtual community (Chiu et al. 2006). Recognizing that virtual communities are groups of people brought together by common interests and goals, and that participants are strangers who remain strangers, shared vision may play a more important role in virtual community settings more so than in the world where people know each other. It is likely that a shared vision of learning from each other and helping each other solve problems influences participants' knowledge sharing behaviour in virtual communities.

The following section presents the thesis' proposed research models and hypotheses.

Chapter 4: Research Model

The research model for explaining knowledge sharing in virtual communities incorporates constructs from social exchange theory and social capital theory. An initial research model is presented in Figure 4-1, in which only the main effects of these constructs are considered.

The structure of this main effects model is similar to the structure of Wasko and Faraj's (2005) theoretical model. But there are differences between the constructs of Wasko and Faraj's (2005) model and those of the main effects model in the current study. For the constructs derived from social exchange theory, Wasko and Faraj (2005) only examine two motivation factors (i.e., benefits)[12] while the current study incorporates a complete set of factors (i.e., two costs and six benefits). The reason for doing so is that this study is aimed to provide a complete picture (and thus a comprehensive understanding) of the factors affecting people's willingness to share their knowledge in virtual communities.

As for the constructs derived from social capital theory, Nahapiet and Ghoshal (1998) propose that social capital has three dimensions – structural, relational, and cognitive. The structural dimension of social capital is manifested as social interaction ties (Tsai and Ghoshal 1998). However, it seems to be difficult to develop dyadic social ties in the virtual communities where participants are strangers using pseudonyms, the

12 The reason is that the focus of Wasko and Faraj's (2005) study is on social capital theory.

population of strangers is so large (hundreds of thousands people worldwide), and participation is open, voluntary and unstable. As mentioned previously, the other two dimensions (i.e., relational and cognitive) of social capital, which are manifested as trust (Nahapiet and Ghoshal 1998; Kankanhalli et al. 2005), norms (Kankanhalli et al. 2005; Chiu et al. 2006), commitment (Wasko and Faraj 2005), and shared vision (Nahapiet and Ghoshal 1998; Chiu et al. 2006) in virtual communities, define the context for knowledge exchange in such settings. Thus, these constructs are incorporated into the research model.

As illustrated in Figure 4-1 below, based on social exchange theory (Blau 1964; Homans 1958), two categories of constructs, namely costs and benefits, are incorporated into the model as independent variables. Specifically, sharing effort, loss of knowledge power, social affiliation, enjoyment in helping, online status seeking, knowledge self-efficacy, online score reward, and reciprocity are hypothesized to impact individuals' intention to share knowledge in virtual communities. Based on social capital theory, four constructs (trust, pro-sharing norms, commitment, and shared vision) are hypothesized to influence individuals' intention to share knowledge in virtual communities. The definitions of these constructs are provided in Appendix A. Each of the independent variables is described in more detail in the following sections.

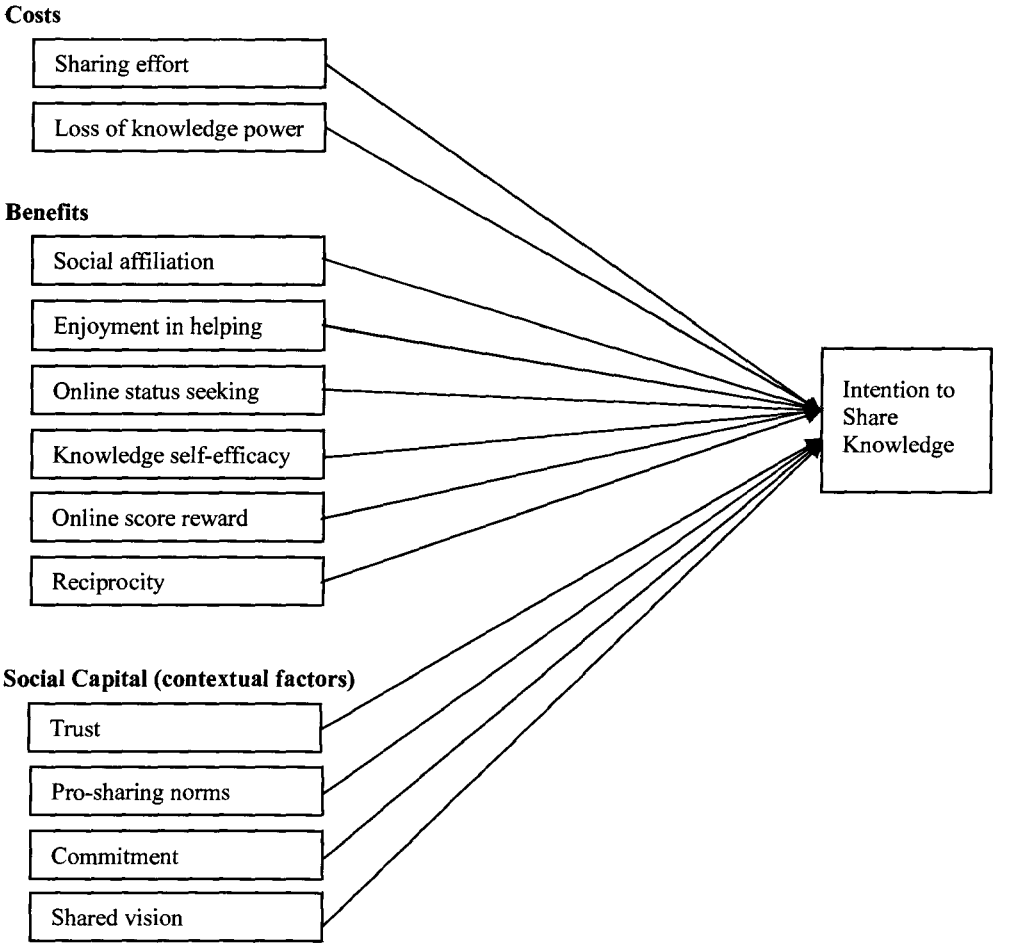

Figure 4-1. Theoretical Model (Main Effects Model)

In the theoretical model, the intention to share knowledge construct is chosen as the dependent variable. This is done for several reasons. First, this study aims to examine how the factors (i.e., costs, benefits and social capital factors) affect people's willingness to share knowledge. Intention to share knowledge is an appropriate construct to measure an individual's willingness to share knowledge, and using "intention to share knowledge"

as the dependent variable fits closely with the objective of this study.

Second, research in different streams has shown that behavioural intention is the best predictor and a good proxy for actual behaviour when the behaviour is volitional and the individual has the information to form stable behavioural intentions (Ajzen 1991; Hsieh et al. 2008; Karahanna et al. 1999; Sheppard et al. 1988). In many online virtual communities, participants are strangers and participation is open and voluntary. Nobody can force these strangers to participate or share their knowledge in such settings. Hence, knowledge sharing behaviour in these virtual communities is strictly volitional. Therefore, intention to share knowledge is believed to be a good proxy for actual knowledge sharing behaviour in virtual communities.

Some prior research on knowledge sharing tends to use "intention to share knowledge" as opposed to "actual knowledge sharing" as a dependent variable (see, for example, Bock et al. 2005). Thus, it is reasonable to assume that using "intention to share knowledge" as the dependent variable to measure an individual's willingness to share knowledge in virtual communities is feasible without compromising the objective of this study.

Last, although Wasko and Faraj (2005) used actual measures for knowledge contribution, as opposed to intention to share knowledge, these authors suggest that "*future research might also benefit from examining different dependent variables that are not based on message activity, such as perceptions...at the individual level*" (pg. 53). The dependent variable in the current study fits closely with this call for future research made

by Wasko and Faraj (2005)[13].

Since the current study uses two theories, i.e., social exchange theory and social capital theory, as its theoretical basis, it is possible that these two theories interact to affect individuals' willingness to share knowledge in virtual communities. Furthermore, social capital is argued to provide the social context and conditions for knowledge exchange (Kankanhalli et al. 2005). Thus, based on the main effects model depicted in Figure 4-1, the moderation effects of social capital on the relationship between social exchange theory and the intention to share knowledge (i.e., the moderating role of the four aspects of social capital on the relationships between some constructs pertaining to social exchange theory and individuals' intention to share knowledge) are examined. This leads to the interaction model (see Figure 4-2).

The hypotheses for the main and interaction effects are proposed and discussed in more detail below.

[13] In addition, virtual communities have developed very fast and become larger and larger in recent years; some virtual communities comprise hundreds of thousands of registered members worldwide. By contrast, the online community in Wasko and Faraj (2005, p. 43) study has only "approximately 7000" members. Furthermore, today's virtual communities have a much longer history than the online community in Wasko and Faraj's (2005) study. Given the large population and long history, the number of overall questions answered by an active member in several years (e.g., ten years) is huge; after putting all the respondents' answers together, the total number of questions answered since the date they registered may be hundreds of thousands, although some of them might not be active and only have answered a few questions. Thus, it may not be feasible to count and rate all these posting messages as Wasko and Faraj (2005) did.

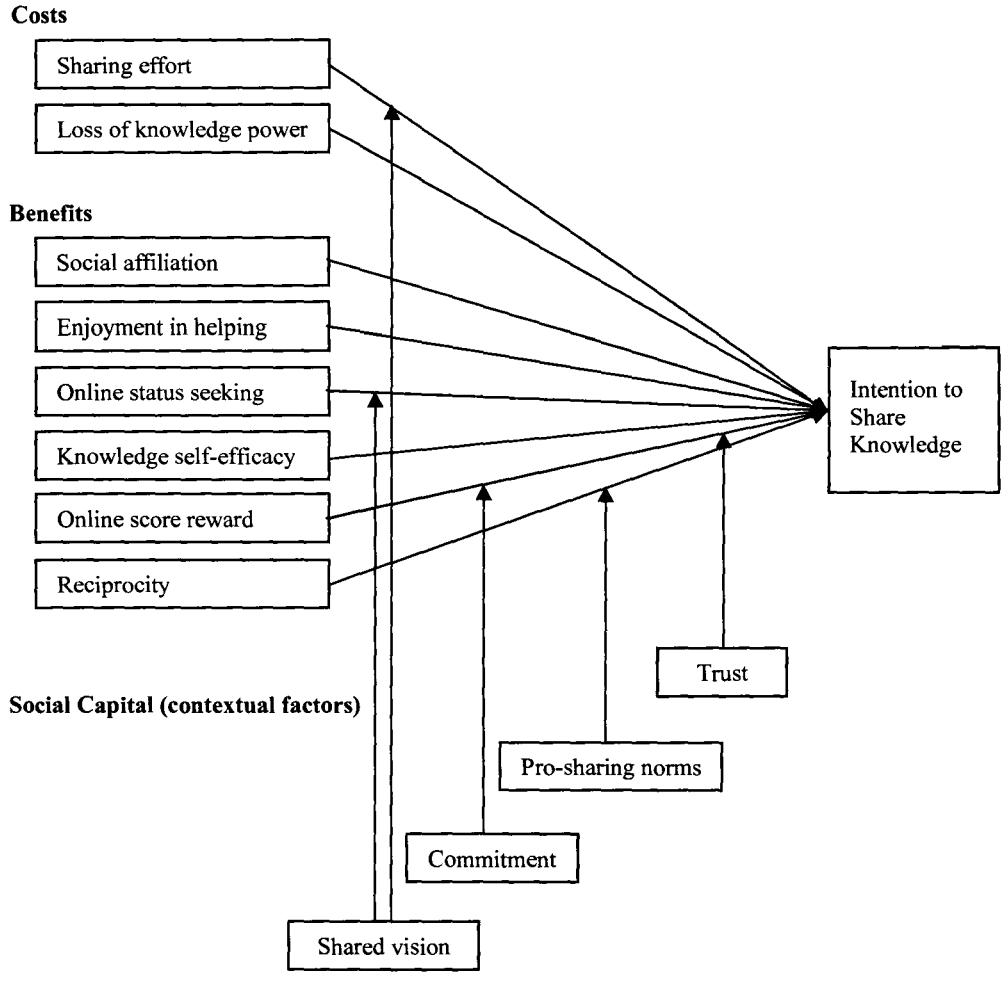

Figure 4-2. Theoretical Model (Interaction Model)

4.1 Hypotheses for main effects

In this section, the hypotheses for the main effects model are placed into three clusters: i) costs, ii) benefits, and iii) social capital.

4.1.1 Costs

As mentioned above, costs include the sharing effort (time and effort) spent on sharing knowledge, as well as the loss of knowledge power.

4.1.1.1 Sharing effort

Knowledge sharing in virtual communities primarily occurs when individuals are motivated to access the network, review the questions posted, select those they are able and willing to answer, and take the time and effort to formulate and post a response. This can entail costs to knowledge providers as an expense of time and effort (Ba et al. 2001; Markus 2001). The time required to review questions, and codify and post answers can be considered as an opportunity cost[14], because this time and effort could have been spent to obtain alternative rewards from other sources. For example, Orlikowski (1993) reported a situation where consultants avoided knowledge contribution due to high opportunity costs. These consultants were unwilling to use a knowledge management system as this would have required them to incur non-chargeable hours or give up their personal time. Additionally, after sharing knowledge, there may be additional requests for clarification from knowledge recipients, which take up more time and effort from knowledge providers (Goodman and Darr 1998).

Some prior studies (e.g., Kankanhalli et al. 2005) use the term "codification effort" to refer to the time and effort required to explicate and codify knowledge. But this

[14] Opportunity costs are rewards foregone from alternative behaviour not chosen (Kankanhalli et al. 2005; Molm 1997).

term may not reflect the dynamic interaction in a virtual community; and thus this thesis uses another term "sharing effort" to refer to the time and effort required to answer the questions in a virtual community which consists of the time and effort spent on accessing the network, reviewing the questions, choosing the question, explicating, codifying, and posting answers. The time and effort cost is argued to hinder individuals' willingness to share their knowledge. For example, in their study on knowledge contribution in electronic knowledge repositories, Kankanhalli et al. (2005) suggest that codification effort negatively affects knowledge contribution behaviour in organizational contexts. Likewise, in their qualitative study on knowledge sharing in three virtual communities, Hew and Hara (2007) find that the most common barrier to knowledge sharing reported by participants is lack of time. Thus, it is reasonable to believe that an individual's willingness to share knowledge in virtual communities may be deterred by the time and effort on answering questions. Thus, the following hypothesis is proposed:

H1: Sharing effort (time and effort required) is negatively related to an individual's intention to answer questions posted in a virtual community.

4.1.1.2 Loss of knowledge power

As shown in Francis Bacon's famous aphorism: "knowledge is power," knowledge is generally perceived as a source of power, especially in the knowledge economy (Davenport 1997; Jarvenpaa and Staples 2000). Expressed in Williamson's (1975) transaction-cost-economics terms, individuals have asset specificity when they hold detailed, useful and difficult to replace knowledge in their area of responsibility. In

other words, if this knowledge is highly particular to some individuals, their power becomes very great (Galbraith 1967). Hence, an individual's level of power may be determined, at least in part, by the level of unique, valuable knowledge he or she possesses (Gray 2001).

When an individual shares his or her unique knowledge with other people, some power will then pass on to the person or persons who receive this knowledge (Galbraith 1967) and the knowledge provider has to give up sole claim to the benefits stemming from that knowledge. To the extent that the individual no longer is the sole holder of this unique knowledge, he or she becomes more replaceable and thus less powerful (Gray 2001). Thus, it is likely that knowledge possessors may fear losing their power or value if others know what they know (Gray 2001; Thibaut and Kelley 1986). Thus, potential knowledge contributors may keep themselves out of any knowledge sharing practices if they feel that they can benefit more by hoarding their knowledge than by sharing it (Davenport and Prusak 1998).

Given that knowledge workers today become more and more associated with specific areas of expertise and responsibilities, a knowledge provider may be worried that the individual who acquires his or her knowledge will become his or her competitor, and his or her competitive advantage based on the knowledge will be threatened. This fear of losing power may be exacerbated in the virtual communities where thousands of people from every corner of the world can read the answers posted by a knowledge provider. It is the large number of potential knowledge recipients in the virtual community setting

that increases a knowledge provider's fear of losing knowledge power. Further, it is impossible for a knowledge provider to distinguish among those who in the virtual community are his or her colleagues[15], and who are in fact strangers, because members use pseudonyms. Both of these natures of virtual communities may strengthen a knowledge provider's fear of losing knowledge power. This leads to the following hypothesis:

H2: Loss of knowledge power is negatively related to an individual's intention to answer questions posted in a virtual community.

4.1.2 Benefits

The following subsections discuss the impacts of benefits, such as social affiliation, enjoyment in helping others, online status seeking, knowledge self-efficacy, online score reward and reciprocity on an individual's intention to share knowledge in virtual communities.

4.1.2.1 Social affiliation

Social affiliation is associated with an individual's desire for social contact or belongingness (Veroff and Veroff 1980), and with tendencies to receive social gratification from harmonious relationships, and from a sense of communion with others (Murray 1938; Wiesenfield et al. 2001). An important aspect of social affiliation is

[15] The competition from colleagues is direct given that an employee has power in an organization to the extent that he or she is the only one who knows about the intricacies of a particular area of responsibility (Gray 2001; Kankanhalli et al. 2005).

belongingness. The concept of belongingness is similar to the concept of membership, a dimension of "sense of virtual community" (Koh and Kim 2003); this "membership" is developed from "sense of belong," a dimension of "sense of community" (McMillan and Chavis 1986) which explains the individual's feeling of relationship to a community (Newbrough and Chavis 1986).

Need for social affiliation shows an individual's preference for being with other people (Sadowski and Cogburn 1997). Prior research has found that the need for social affiliation is a fundamental human motivation (Baumeister and Leary 1995). In a qualitative study of individual contributions to product reviews of an Internet store (Amazon.com), over a third of the reviewers indicated social affiliation as a motivation for sharing their opinions and experiences with others (Peddibhotla and Subramani 2007). Especially in online community settings, where extrinsic reward systems – if they exist – does not seem to as powerful as the reward systems (e.g., increased pay and bonuses) in organizational setting, the need of social affiliation may explain why people spend time and effort responding to questions posted by others. Thus, the following hypothesis is proposed:

H3: The need of social affiliation is positively related to an individual's intention to answer questions posted by others in a virtual community.

4.1.2.2 Enjoyment in helping

Enjoyment in helping can be derived from the concept of altruism. Altruism exists when people derive intrinsic enjoyment from helping others without expecting anything

in return (Krebs 1975; Smith 1981). Knowledge providers may be motivated by relative altruism (where self-concern plays a minor role in motivating an act) based on their desire to help others (Davenport and Prusak 1998). Additionally, individuals may share knowledge in a virtual community because they perceive that helping others with challenging problems is interesting, and because it feels good to help other people (Kollock 1999). Prior research in virtual communities suggests that individuals are motivated intrinsically to share knowledge with others because engaging in intellectual pursuits and solving problems is challenging or fun, and because they enjoy helping others (Wasko and Faraj 2000). Empirical studies find that enjoyment in helping others is positively associated with knowledge sharing both in organizational settings (Kankanhalli et al. 2005) and professional virtual communities (Wasko and Faraj 2005). Thus, it is expected that enjoyment in helping others may be correlated to an individual's willingness to share knowledge with others in virtual communities. The following hypothesis is proposed:

H4: The enjoyment in helping others is positively related to an individual's intention to answer questions posted in a virtual community.

4.1.2.3 Online status seeking

Status refers to an actor's relative standing in a group when this standing is based on prestige, honor, or deference (Berger et al. 1972; Thye 2000). Status seeking is related to activities designed to improve an individual's standing in a group, and is judged by the extent to which relevant activities bring about enhancing prestige, honor, or deference

(Lampel and Bhalla 2007). In online environments, such as virtual communities, status seeking is referred to as online status seeking.

Status seeking is pervasive in virtually all societies (Ball et al. 2001) because social status carries many benefits for those who have it (Stewart 2005). For example, high-status individuals usually are given more credit than low-status individuals in return for the same amount of effort (Merton 1968), because the propensity of others to overestimate the quality of an individual's performance will increase as the individual's status increases (Sherif 1966). Status can also be a critical factor in determining an individual's pattern of further exchange relations because high-status actors may be chosen more often than low-status actors as preferred exchange partners (Thye 2000). Additionally, individuals may seek status for psychological and emotional reasons (Lampel and Bhalla 2007). For example, they may be internally motivated, such as that occurs when status is nothing but applause from audiences (Loch et al. 2000).

In offline communities, status seeking has been reported to be a powerful motivation for knowledge sharing (Harbaugh 1998). In online environments, such as online communities, the desire for status also can motivate participants to take actions to influence their status (Liu et al. 2004), such as the action of sharing knowledge. For instance, in their study of three virtual communities, Lampel and Bhalla (2007) found that knowledge sharing (gift giving in their terminology) in online communities is strongly driven by status seeking, and that status sentiments are more likely to sustain virtual communities than other motivations such as altruism (e.g., enjoyment in helping).

Thus, it is reasonable to assume that in virtual communities, online status seeking is associated with an individual's intention to share knowledge with others. This leads to the following hypothesis:

H5: The desire of online status seeking is positively related to an individual's intention to answer questions posted in a virtual community.

4.1.2.4 Knowledge self-efficacy

Self-efficacy is defined as people's perception of their capabilities to organize and execute courses of action required to attain particular performances (Bandura 1986). It is concerned not with the skills people have, but with perception of what people can do with the skills they possess (Bandura 1986).

By extension, knowledge self-efficacy is the confidence in one's ability to provide valuable knowledge to others (Kankanhalli et al. 2005; Lu and Hsiao 2007). When individuals share expertise useful with others, they gain confidence in terms of what they can do and this brings the benefit of increased self-efficacy (Constant et al. 1994). Knowledge self-efficacy is typically manifested in the form of people's belief that their knowledge can help to solve problems in work (Constant et al. 1996), enhance work efficiency (Ba et al. 2001), or make a difference to the organization (Kollock 1999; Wasko and Faraj 2000). In organizational contexts, this belief can serve as an intrinsic motivation for knowledge providers to contribute knowledge to electronic knowledge repositories (Bock and Kim 2002; Kalman 1999; Kankanhalli et al. 2005). Individuals with higher levels of perceived expertise are more likely to provide useful advice to

others (Constant et al. 1996). Conversely, if individuals feel their expertise to be inadequate, they are less likely to share knowledge with others in virtual communities because they believe that their sharing behaviour cannot make a positive influence for other people (Wasko and Faraj 2000, 2005). Thus, it is expected that knowledge self-efficacy is associated with people's willingness to share knowledge in virtual communities. This leads to the following hypothesis:

H6: Knowledge self-efficacy is positively related an individual's intention to answer questions posted in a virtual community.

4.1.2.5 Online score reward

In the organizational context, rewards such as increased salary, bonuses, job security and career advancement are used to motivate individuals to perform desired behaviours (Bartol and Locke 2000), such as knowledge sharing behaviours (Bock et al. 2005; Kankanhalli et al. 2005; Lin 2007). Organizations have introduced sundry reward systems to encourage employees to share their knowledge. For example, Buckman Laboratories recognizes its 100 top knowledge contributors through an annual conference at a resort (Lin 2007). Moreover, several consulting companies have made knowledge sharing a basic criterion for employee performance evaluation (Davenport and Prusak 1998).

However, in an online virtual community, where strangers come from all over the world and use pseudonyms to communicate with each other, the above-mentioned organizational rewards such as increased salary, bonuses, job security, and career

advancement do not exist. Having the same purpose as organizational rewards, an innovative reward – an online score – has been designed in some online virtual communities to motivate members to perform desired behaviours, specifically knowledge sharing behaviours in knowledge-based virtual communities. When an individual (a knowledge seeker and also a potential knowledge recipient) is posting a question in the virtual community, this individual may also indicate the amount of online score that is promised by this individual to reward the person who will answer this question. After an individual (a potential knowledge provider) answers this question, a certain amount (maybe none, a portion, or all) of online score is given to the knowledge provider by the knowledge recipient[16]. The amount of the online score given to a particular knowledge provider is decided by the knowledge recipient based on evaluating the quality of the answer this knowledge provider provides. Such online scores earned by the knowledge providers are useful to these knowledge providers. For example, when a member's online score (earned from sharing knowledge with others) reaches a certain amount, this member can get some free services (like personal advertisement) in the virtual community, or some real certificates proving one's expertise[17], or high privilege in the community, or some gifts provided by the virtual community. Different virtual

[16] The knowledge recipient is obliged to give the knowledge provider a certain amount of online score after the knowledge provider answers the question. The online score is used as a reward for the knowledge sharing behaviour. If the knowledge recipient fails to do so, he or she will engender loss of credit, i.e., others may not trust him or her again, and thus it may be difficult for him or her to seek others' help in the future. This is consistent with social exchange theory, which views the exchange relationship between specific actors as "actions contingent on rewarding reactions from others" (Blau, 1964, p.91).

17 For example, an IT professional virtual community nominates the members who have earned high scores from sharing knowledge with others for the MVP (Microsoft Most Valuable Professional) certificate. Such certificates will be helpful and useful to the holders in job hunting.

communities have different policies for the benefits to members who have earned high scores from sharing knowledge with others.

There is one difference between an organizational reward and an online score reward. While an organizational reward is given by an organization (namely by the managers on behalf of an organization), an online score reward is given by a knowledge recipient. This is not only because the online virtual community is self-governed by the members themselves, but also because only the knowledge recipient can assess the quality of the answers.

Further, for each member, the online score is a limited resource, and the limited nature of an online score can prevent individuals from asking whatever questions they want (in other words, it can prevent them from squandering the right of requesting knowledge from others in the virtual community). Conversely, if an online score is not a limited resource, the knowledge recipient may give as high as a score as he or she can to the knowledge provider; if so, the value of the online score will decrease. If the value of the online score is too low, the online score may not motivate knowledge providers to share their knowledge (in terms of answering the questions posted by others) in the virtual community. Therefore, in sum, it is the best strategy if the online score is a limited resource for each member and the score is given by the knowledge recipient based on an evaluation of the quality of the answers received.

Prior studies have shown that organizational rewards can be used to motivate employees to share their knowledge (Cabrera et al. 2006; Kankanhalli et al 2005). As

mentioned above, the online score reward is designed to have a similar influence as organizational rewards, i.e., to motivate members in the virtual community to share their knowledge with others. Thus, it is likely that online score rewards have a similar effect as organizational rewards do, and thus have a positive influence on a member's intention to share knowledge with others. This leads to the following hypothesis:

H7: Online score reward is positively related to an individual's intention to answer questions posted by others in a virtual community.

4.1.2.6 Reciprocity

Reciprocity has been identified as a benefit for individuals to engage in social exchange (Blau 1964). The principle of reciprocal benefit is manifested as "*You do something nice to me and I will do something nice to you*" (Boulding 1962, p.103). In social exchanges, individuals act on the basis of their interests as expressly linked with the welfare of others involved in the exchanges (di Norcia 2002). If someone fails to reciprocate, this will engender loss of credit and may eventually result in exclusion from future exchanges (Blau 1964).

In this study, reciprocity refers to the expectation knowledge providers have that their current knowledge contributions will lead to their own future knowledge requests being met (Kankanhalli et al. 2005). That is, knowledge providers spend time and effort sharing their valuable knowledge with others in virtual communities, and expect that this expense will be reciprocated in the future. In contrast to direct reciprocity where individuals expect returned favors from those who they have specifically helped out in

the past, knowledge sharing effort in virtual communities may be reciprocated by someone else, i.e., in a form of generalized reciprocity (Putnam 1993; Petkova and Gupta 2005). Researchers observe that individuals who always help other people in virtual communities seem to receive help more quickly when they ask for it themselves (Rheingold 2000). Prior research suggests that individuals who share knowledge in virtual communities do believe in reciprocity (Wasko and Faraj 2000). Empirical studies also demonstrate that reciprocity is positively associated with knowledge sharing both in organizational contexts (Kankanhalli et al. 2005) and in virtual communities (Wasko and Faraj 2005; Chiu et al. 2006). It is likely that reciprocity is related to an individual's willingness to share knowledge with others in virtual communities. Hence, the following hypothesis is proposed.

H8: Reciprocity is positively related to an individual's intention to answer questions posted in a virtual community.

4.1.3 Social capital

As described earlier, some important facets of social capital, such as trust, pro-sharing norms, commitment, and shared vision may influence individuals' intention to share their knowledge in virtual communities.

4.1.3.1 Trust

Trust is the belief that the intended action of others would be appropriate from the trustor's point of view. Trust indicates the willingness of people to be vulnerable to

others due to beliefs in their good intent and concern, competence, and integrity (Mayer et al. 1995). In the context of the current study, trust refers to the belief in the good intent, competence, and integrity of participants with respect to sharing and reusing knowledge through virtual communities. Although trust is multidimensional (Butler 1991; Mayer et al. 1995), the proposed study treats trust as a single variable rather than as multi-variables composed of various trusting beliefs or factors. As several scholars point out, combining trusting beliefs into a single construct is a parsimonious approach to studying trust if the research objective does not entail a detailed understanding of trust signals (Hassanein and Head 2007; Schlosser et al. 2006).

Bradach and Eccles (1989, p. 104) claim that "*trust is a type of expectation that alleviates the fear that one's exchange partner will act opportunistically.*" When two parties begin to trust each other, they become more willing to share their resources without worrying that they will be taken advantage of by the other party. Nonaka (1994) indicated that trust is important in teams and organizations for creating an atmosphere for knowledge sharing. Trust is recognized as being "*at the heart of knowledge exchange*" (Davenport and Prusak 1998, p. 35). High levels of trust are keys to effective communication (Dodgson 1993) as trust "*improves the quality of dialogue and discussions ... [which,] facilitates the sharing of ... knowledge*" (Ichijo et al. 2000, p.200). Studies suggest that trust – an important attribute of offline communities – can also emerge in virtual communities despite the nature of online interaction (Chevalier and Mayzlin 2003; Dellarocas 2004; Senecal and Nantel 2003).

Generalized trust

In the virtual community environment, trust develops between an individual and the group of strangers that forms the community (Ridings et al. 2002). Here, trust is generalized (Putnam 1993) at a collective level (Cummings and Bromiley 1996) because everybody in the community can read the answers posted by knowledge providers. This study examines trust at a collective level, which is generalized trust as identified by Putnam (1993). Kankanhalli et al. (2005) suggest that generalized trust can facilitate knowledge sharing before people have much personal knowledge about each other. In an organizational context, generalized trust has been viewed as a key factor that influences knowledge sharing behaviour (Adler 2001; Kankanhalli et al. 2005). Chiu et al. (2006) also find the trust plays an important role in affecting knowledge sharing behaviour in virtual communities. Thus, the following hypothesis is proposed:

H9: An individual's trust in other members in general in a virtual community is positively related to his or her intention to answer questions posted in this virtual community.

4.1.3.2 Pro-sharing norms

Norms foster a shared understanding of what is expected of oneself and of others, and provide a non-personal, systematic explanation of resulting behaviours. Norms are generally thought to be a source of guidance for individuals who face complex or potentially controversial choices (Hackman 2002). Coleman (1988) suggests that when a norm exists and is effective, it can constitute a powerful form of social capital. Bock et al. (2005) find that a norm is positively associated with an individual's intention to share

knowledge in organizational contexts. Kankanhalli et al. (2005) suggest that pro-sharing norms can affect knowledge contributions to electronic knowledge repositories in organizations. Pro-sharing norms that have been found to improve the climate for knowledge sharing are: openness to conflicting views, tolerance for failure (Leonard-Barton 1995), openness to criticism (Starbuck 1992; Leonard-Barton 1995), and willingness to value and respond to diversity (Leonard-Barton 1995). Since a norm represents a degree of consensus in a social system (Coleman 1990), and virtual communities constitute a special social group where it is difficult to develop dyadic relationships directly, it is reasonable to expect that norms will affect how knowledge is shared in virtual communities. This leads to the following hypothesis.

H10: The pro-social norms an individual perceives will be positively related to his or her intention to answer questions posted in a virtual community.

4.1.3.3 Commitment

Commitment is defined as the "psychological attachment" (Kiesler 1971), representing a duty or obligation to undertake some activity in the future and arising from frequent interaction (Coleman 1990; Nahapiet and Gohshal 1998). Commitment is often described as direct expectations developed within particular personal relationships. Also, commitment can accrue to a collective, such as employees' commitment to their employing organizations, so called organizational commitment[18] (Mowday 1998;

[18] Porter defined organizational commitment in terms of "the overall strength of an individual's

Mowday et al. 1979). Given this description, it is reasonable to expect that such commitment may also exist between members of a virtual community and the virtual community with whom they are involved (Wasko and Faraj 2005).

Prior studies find that sense of commitment or obligation can affect an individual's willingness to share knowledge with others in a collective (for example, organizational settings and virtual community settings). Organizational research shows that individuals who show greater commitment to their organizations are more likely to engage in knowledge sharing activities (Cabrera et al. 2006). For example, one study of an organizational electronic network finds that individuals who post valuable advice are motivated by a sense of obligation to the organization (Constant et al. 1996). Another study on extra-organizational electronic networks suggests that individuals participate in networks due to a perceived moral obligation to pay back the network and the profession as a whole (Wasko and Faraj 2000). In the context of professional virtual communities, Wasko and Faraj (2005) suggest that members who feel a strong sense of commitment to the community are more likely to consider it an obligation to assist other members and share knowledge with them. Hence, the following hypothesis is proposed:

H11: An individual's sense of commitment to a virtual community is positively related to his or her intention to answer questions posted in this virtual community.

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identification with and involvement in an organization" (Mowday 1998, p.389).

4.1.3.4 Shared vision

Shared vision (e.g., shared goals and values) binds the members of human networks and communities together, and makes cooperative action possible (Cohen and Prusak 2001). When members of a group have the same perceptions about how to interact with one another, they can avoid possible misunderstandings in their communications and have more opportunities to exchange their knowledge and resources freely (Tsai and Ghoshal 1998). The common goals or interests they share in the virtual community can help them see the potential value of their own knowledge sharing behaviours. Several studies have shown that a shared vision (or a similar construct like goal congruence) may hold together a loosely coupled system and promote the integration of an entire organization (e.g., Orton and Weick 1990). In a virtual community context, shared vision has also been found to affect knowledge sharing behaviour (Chiu et al. 2006). Thus, it is reasonable to view shared vision as a bonding mechanism that helps individuals in a virtual community to share knowledge resources. Hence, it is likely that shared vision is positively associated with an individual's willingness to share knowledge in virtual communities. Hence, the following hypothesis is proposed:

H12: An individual's perception of a shared vision with others in a virtual community is positively related to his or her intention to answer questions posted in this community.

The following section discusses the moderation effects of social capital on the relationship between factors pertaining to social exchange theory and an individual's intention to share knowledge.

4.2 Hypotheses for interaction effects

Within the information systems (IS) discipline, many studies have examined the interaction effects created by moderating variables, often under the general umbrella of contingency theory (McKeen et al. 1994; Weill and Olson 1989). These studies examine the conditions and contexts under which particular theoretical relationships may vary (Chin et al. 2003). Similar expressions are used to refer to interaction effects; for example, moderators, multiplicative terms, moderation effects, or interaction terms. Furthermore, defining moderators are viewed as a way to elaborate on or extend the findings of prior studies (Marcoulides and Saunders 2006).

Detecting and estimating interaction effects are important to IS research in general, and to the current study in particular. Scholars suggest that the impact of costs and benefits on knowledge sharing (e.g., the use of electronic knowledge repositories) is likely to be contingent upon certain social contexts or conditions (Constant et al. 1996; Goodman and Darr 1998; Jarvenpaa and Staples 2000; Orlikowski 1993). For example, Kankanhalli et al. (2005) find that social capital provides the context and conditions necessary for knowledge exchange to occur.

With respect to the current study, the aspects of social capital (e.g., trust, pro-sharing norms, commitment, and shared vision) provide the context and conditions for knowledge sharing in virtual communities, and thus it is likely that these aspects provide conditions for the relationship between the factors pertaining to social exchange theory and an individual's willingness to share his or her knowledge. Hence, the current study

hypothesizes and tests the moderating effects of four aspects of social capital (trust, pro-sharing norms, commitment, and shared vision) on the relationships between some constructs derived from social exchange theory (e.g., online score reward, reciprocity, sharing effort, and online status seeking) and an individual's intention to share knowledge. However, the effects of the intrinsic benefits are not expected to be contingent upon social capital factors. As Kankanhalli et al. (2005) point out, these intrinsic benefits are sought after as ends by themselves, and thus social capital factors do not play a significant role in influencing the value of the intrinsic benefits to knowledge providers in virtual communities.

In what follows, the above-mentioned interaction effects are discussed in detail.

4.2.1 Online score reward and trust

As described early, when an individual (a potential knowledge recipient) is posting a question in a BBS, this individual may also indicate the amount of online score that will be awarded to the knowledge provider who answers this question. After an individual answers this question, a certain amount (maybe none, a portion, or all) of the online score previously promised is given to this individual by the knowledge recipient. The amount of the online score given to a particular knowledge provider is decided by the knowledge recipient based on an evaluation of the quality of the answer the knowledge provider gave. Thus, a knowledge recipient may not give any online score to a particular knowledge provider if the knowledge recipient is not satisfied with the answer the knowledge provider gave. Or, the knowledge recipient may give a particular

knowledge provider only a portion of the online score promised because the knowledge recipient is not fully satisfied with the answer. Further, as mentioned early, online scores are limited resources for each member. Thus, it is possible that some knowledge recipients may have the intention or disposition to refuse to give any score or to give a lesser score than deserved. As such, from a knowledge provider's perspective, the knowledge provider is taking a risk when providing an answer since there may be no score reward or a reduced reward[19] for doing so.

Even if the knowledge recipient is a good person without any immoral intent, there are always some disagreements between the knowledge provider and the knowledge recipient regarding the quality of the knowledge and how much score is deserved. Thus, if the knowledge provider expects to receive an online score when answering a question posted by a knowledge seeker, the knowledge provider may have to trust the knowledge seeker, and this trust implies a general belief in the potential knowledge recipient's good intent, integrity, as well as competence to understand the answer and thus be able to assess its quality fairly (Mayer el al. 1995). Hence, the impact of an online score on an individual's intention to share his or her knowledge is contingent upon (i.e., moderated by) how much he or she trusts knowledge seekers.

As mentioned earlier, trust in virtual communities is generalized (Putnam 1993) at a collective level (Cummings and Bromiley 1996). This is not only because everybody in

[19] This can happen because the exchange (between the knowledge and online score) does not occur simultaneously, i.e., the knowledge provider offers his or her knowledge (answers) first and the knowledge recipient gives an online score to the knowledge provider later.

the community can read the answers posted by knowledge providers, but also because participants are strangers using pseudonyms, the population of strangers is so large (hundreds of thousands people worldwide), and participation is open and a member can easily change one's identity (pseudonym). If a person (who loses credit) changes his or her identity (pseudonym) by registering in the virtual community again, nobody knows he or she is the previous untrustworthy person. Hence, it seems to be difficult for a knowledge provider's trust to rest with a specific individual; instead, this trust rests on behaviour that is generalized to a social collective (e.g., a virtual community) as a whole (Putnam 1993). Given this, the impact of the online score reward on a knowledge provider's intention to answer the questions posted in a virtual community is contingent upon (i.e., moderated by) how much he or she trust the knowledge seekers in general in this virtual community. In essence, the less a knowledge provider trusts the knowledge seekers in general in the virtual community, the weaker the impact of the online score reward on this person's intention to answer questions posted in the virtual community. Hence, the following hypothesis is proposed:

H13: The impact of the online score reward on an individual's intention to answer questions posted in a virtual community is moderated by the individual's trust in the knowledge seekers in general in the virtual community in such a way that this relationship will be weaker under conditions of weak trust and be stronger under conditions of strong trust.

4.2.2 Reciprocity and pro-sharing norms

As mentioned early, when people spend time and effort sharing their knowledge with others in a virtual community, they expect to receive reciprocal benefits (Connolly and Thorn 1990; Davenport and Prusak 1998). Prior studies have found that reciprocity is positively associated with knowledge sharing (Wasko and Faraj 2005; Chiu et al. 2006). However, this relationship may be contingent upon pro-sharing norms in the virtual community. When perceived pro-sharing norms are strong (i.e., potential knowledge providers feel that people are open to conflicting views, failure (Leonard-Barton 1995), and criticism (Starbuck 1992; Leonard-Barton 1995), and willing to value and respond to diverse answers (Leonard-Barton 1995)), potential knowledge providers are more inclined to share their knowledge without the need for extrinsic benefits (Nahapiet and Ghoshal 1998), such as reciprocity. In such a climate, potential knowledge providers are likely to share their knowledge even in the absence of reciprocity benefits. Conversely, when pro-sharing norms are perceived to be weak, reciprocity may be a salient motivator for knowledge sharing.

In a study on knowledge contributions made to electronic knowledge repositories in ten organizations, Kankanhalli et al. (2005) find that the impact of reciprocity on knowledge contribution is moderated by pro-sharing norms in the organizations, such that the positive relation between reciprocity and knowledge contribution is stronger under conditions of weaker pro-sharing norms. It is reasonable to assume that this effect also exists in the context of virtual communities. Thus, the following hypothesis is proposed:

H14: The positive relationship between reciprocity and an individual's intention to share knowledge in a virtual community is moderated by pro-sharing norms in such a way that this relationship will be stronger under conditions of weak pro-sharing norms and be weaker under conditions of strong pro-sharing norms.

4.2.3 Online score reward and commitment

As mentioned previously, online score rewards, which are designed to motivate members to share their knowledge with others in a virtual community, may be positively related to a member's intention to share his or her knowledge. However, this relationship may be contingent upon a member's commitment to the virtual community. When sense of commitment or obligation is strong, the member has a psychological attachment (Kiesler 1971) to the virtual community, and thus is concerned about the development and fate of this virtual community. Specifically, people who feel a strong sense of commitment to a virtual community would consider it an obligation to assist other members and share knowledge with them (Wasko and Faraj 2005). In such situations, sense of obligation tends to dominate over certain benefits. Thus, under conditions of strong commitment, potential knowledge providers may not require an online score reward to motivate them. Even when online score rewards are absent, people may still answer questions posted by others in the virtual community. Conversely, weak commitment can make online score rewards a salient motivator for knowledge providers.

In the organizational context, Kankanhalli et al. (2005) suggest that the relationship between organizational rewards and knowledge contribution is moderated by

an employee's identification with his or her organization. Identification, defined as "a perception of oneness with a group of persons" (Ashforth and Mael 1989, p.20), has much overlap (or "apparent redundancy") with commitment (Ashforth et al. 2008, p.333), which is defined as the "psychological attachment" (Kiesler 1971) to a group. As Ashforth and Mael (1989, p. 23) noticed, "Some theorists equate identification with commitment, while others view the former as a component of the latter (see Wiener, 1982)"[20]. Given the moderating effect of identification in Kankanhalli et al. (2005) and much overlap between identification and commitment, it is likely that the impact of online score rewards on an individual's intention to share knowledge is moderated by that individual's commitment to the virtual community. This leads to the following hypothesis:

H15: The impact of online score reward on an individual's intention to answer questions posted in a virtual community is moderated by his or her commitment to this community in such a way that this relationship will be stronger under conditions of weak commitment and be weaker under conditions of strong commitment.

4.2.4 Knowledge sharing effort and shared vision

When people share their knowledge with others, they have to spend time and effort. As previously hypothesized (see H1), sharing effort may have a negative impact on an individual's intention to share his or her knowledge with others in a virtual community. But this relationship may be contingent upon shared vision (e.g., shared

20 For example, Mowday et al. (1979, p.226) define organizational commitment as "the relative strength of an individual's identification with and involvement in a particular organization."

goals and values). The common goals, value or interests participants share in a virtual community can help members see the importance and potential value of their knowledge sharing behaviours in the virtual community (Chiu et al. 2006). When individuals feel that they have a shared vision with other members, collective goals and interests may dominate certain costs and benefits since collective interests merge with an individual's own interests. In such situations (i.e., a strong shared vision prevails), knowledge providers may not be concerned too much about the time and effort needed for sharing knowledge in virtual communities. Conversely, when they feel the shared vision is weak, sharing effort may become a deterrent to for individuals to share their knowledge in virtual communities. Thus, the following hypothesis is proposed:

H16: The negative relationship between sharing effort and an individual's intention to answer questions posted in a virtual community is moderated by shared vision in such a way that this negative relationship will be stronger under conditions of weak shared vision and be weaker under conditions of strong shared vision.

4.2.5 Online status seeking and shared vision

As discussed earlier, sharing knowledge with others may bring a knowledge provider higher status, like enhanced prestige, honor, or deference (Lampel and Bhalla 2007). Thus, online status seeking may be positively related to an individual's intention to answer questions posted in an online virtual community. However, the relationship between online status seeking and an individual's intention to share knowledge may be contingent upon whether this individual feels that he or she has a shared vision with other

members. When people perceive that they have the common goals, value or interests, they will be more likely to become partners sharing or exchanging their resources (Tsai and Ghoshal 1998). Thus, individuals who feel they have a shared vision with others may not require extrinsic benefits such as online status in order to share knowledge with others in the virtual community. Under such conditions, potential knowledge providers are likely to share their knowledge with others even if the benefit of improved online status is absent. Conversely, weak shared vision can make online status seeking a salient motivator for knowledge sharing in the virtual community. Thus, the following hypothesis is proposed:

H17: The positive relationship between online status seeking and an individual's intention to answer questions posted in a virtual community is moderated by shared vision is such a way that this positive relationship will be stronger under conditions of weak shared vision and be weaker under conditions of strong shared vision.

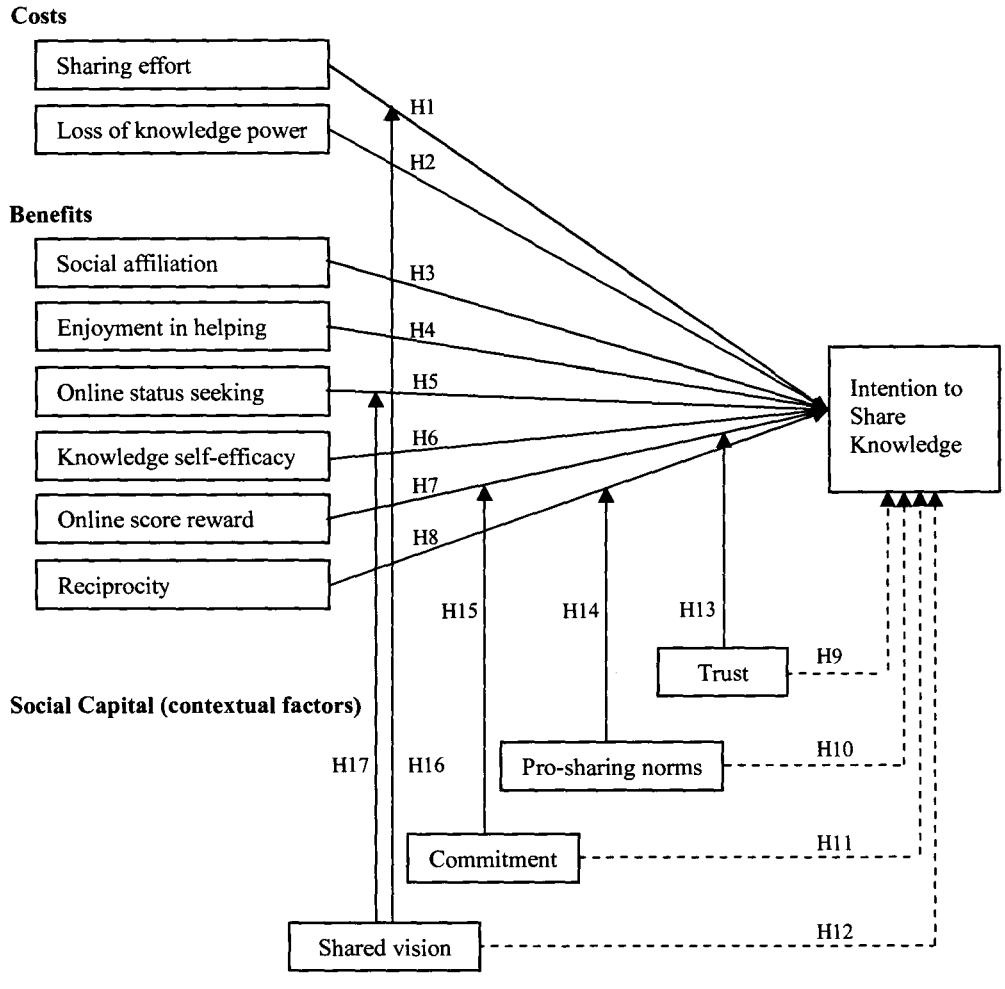


Figure 4-3. Theoretical Model (Interaction Model with Hypotheses)

So far, the hypotheses for both main and interaction effects[21] have been

[21] For determining the strength of an interaction effect, the standard approach involves comparing the difference between squared multiple correlation (R^2) for the main effects model and the interaction model (Chin et al. 2003). The main effects model consists of the measures that will be ultimately used to estimate the interaction effect; and the interaction model contains the same main effects variables plus the interaction terms. For this study in particular, while the theoretical model illustrated in Figure 4-2 is main effects model, the model in Figure 4-3 is the interaction model.

proposed[22]. Figure 4-3 shows the theoretical model with the labels of these hypotheses added. Since the direct effects of the moderating variables on the dependent variables need not show up in the theoretical model with interaction effects, four dashed lines are added to indicate the main effects of moderating variable on the intention to share knowledge.

4.3 Demographics

When gathering research data on human subjects, the collection of detailed demographic information on those same subjects can enable the potential comparison of collected research data to known populations, previous studies, and theories (Campion1993). Thus, the following demographic information of subjects participating in this project will be collected in the field research setting: gender, age, education, tenure in the virtual community, and length of work experience. Given that the demographic information related variables (i.e., gender, age, education, tenure in the virtual community, and length of work experience) may influence an individual's intention to share knowledge in virtual communities, these variables act as control variables in this study. The effects of these control variables will be tested later in the final data analysis to find out whether theoretical models are independent of these control variables.

The next section of this thesis discusses the study's research design.

[22] It may be suspected that some variable directly affects another variable, and thus the latter mediates the relationship between the former and the intention to share knowledge. In order to keep things parsimonious, the research model only includes interaction effects, which is the focus of this research. The mediating effects could be investigated in future research.

Chapter 5: Research Design

The quality of quantitative, empirical research depends on at least three factors: i) whether the theoretical foundation is solid; ii) whether the sample can represent the population; and iii) and whether the measurement is valid and reliable. The theoretical foundation of this study has been discussed in the previous sections of this thesis. This chapter addresses the issue of measurement design, while the next chapter discusses the field research setting (i.e., sample selection) in detail.

In a nutshell, the research design involves the administration a Web-based survey instrument to real-life end-users of a virtual community site. The survey polls end-users on their perceptions and opinions regarding knowledge sharing practices in this community. The survey instrument is derived from the study's theoretical model, and utilizes questions from other validated research instruments used in prior research studies, with some new items developed specific to the virtual community context. Four rounds of item sorting exercises (with two rounds in English and two rounds in Chinese[23]) confirm the instrument's conceptual validation. A pilot test confirms the reliability and appropriateness of this research instrument on a small but representative sample. Other research issues such as the data analysis method, sampling frame and strategy are also discussed.

[23] The reason that two rounds of sorting exercises are in Chinese is that the final data would be collected from an IT professional online virtual community in China.

5.1 Instrument design and validation

Technically, the process of measurement or operationalization involves "rules for assigning numbers to objects to represent quantities of attributes" (Nunnally 1978, p. 2). Furthermore, the rigor with which these rules are specified may determine whether a construct has been captured appropriately by the measures developed by the researcher (Churchill 1979). As Nunnally (1978, p. 258) points out, "*rather than test the validity of measures after they have been constructed, one should ensure the validity by the plan and procedures for construction.*" If the measures are invalid at the outset, the subsequent statistical result, whether it is significant or not, does not make sense (Jacoby 1978). Churchill (1979) uses the phrase GIGO – garbage in, garbage out – to refer to the routine of research with poor measures. Unfortunately, the inadequate measurement of constructs is identified as one of the major causes for some mixed and inconclusive outcomes in IS research (Moore and Benbasat 1991).

To enhance validity and reliability, the constructs in this study are measured using questions adapted from scales used and tested in prior studies, where available (Stone 1978). Since there are not many studies on knowledge sharing in virtual communities, some of the questions come from other contexts, such as organizations and offline communities. These questions are adapted for the context of virtual communities. Additionally, some new questions (i.e., items) are developed based on a review of the previous knowledge management, information systems, and other related literatures, as

well as on the opinions of experts[24]. For example, a new construct (i.e., online score reward) with five items was informed by the opinions of experts and then developed based on a construct from an organizational context (i.e., organizational rewards) and further fine-tuned to fit a virtual community context. This study follows particular prescribed procedures to design measurements in order to ensure the validity and reliability of these constructs, because the quality of measures depends on the procedures that are used to develop the measures and evidence supporting their "goodness" (Churchill 1979).

Several articles referenced in recent IS studies provide rigorous procedures and guidelines for developing valid measurement instruments, such as Moore and Benbasat (1991), Churchill (1979), and Straub (1989). The current study mainly follows Moore and Benbasat's (1991) procedure while consulting Churchill's (1979) procedure, Davis' (1989) technique, Straub's (1989) guidelines and Kankanhalli et al.'s (2005) study. Overall, this study utilizes the following procedures to enhance the validity and reliability of the measures used in study:

(1) operationalization of constructs (i.e., defining constructs and generating items for the constructs);

(2) conceptual validation (i.e., scale development where items are sorted and the

[24] Two groups of experts were involved in this study. At the beginning of this study, a few experts who were experienced in sharing knowledge with others in virtual communities were asked to suggest the factors affecting knowledge sharing in virtual communities. These people comprised the first group of experts. Later, in the stage of sorting exercises, the people who formed the four subgroups of sorters were also experts in the field. These sorters comprised the second group of experts.

correspondence between items and constructs is assessed);

(3) pilot testing (i.e., the collection of data from a similar population, pre-testing and further refinement of the instrument); and

(4) measurement model testing (i.e., testing the measurement model using the formal data collected from the field setting).

As Fowler (2001) mentions, measurement design has two components: i) deciding what to measure, and ii) designing and testing items that will be good measures. The above-mentioned four steps belong to these two components. The following three sections of this thesis describe the first three steps in more detail. Details about measurement model testing (the fourth step) are provided in the next chapter – data analysis and results.

5.1.1 Operationalization of constructs

To operationalize constructs, researchers are advised to begin by formulating definitions of constructs (i.e., latent variables) and preparing items (i.e., observed variables) to fit the constructs' definitions (Anastasi 1986).

5.1.1.1 Construct definition

As Fowler (2001) describes, a prerequisite to designing a good survey instrument is deciding what is to be measured. In other words, the researcher should exactly delineate what is included in the definition of a construct and what is excluded, i.e., specify the domain of the constructs (Churchill 1979). The formal definitions of the

constructs used in this study are provided in a table in Appendix A. These definitions are adapted from (or developed based on) prior research. The references for each definition are also provided in the table.

5.1.1.2 Item creation

As mentioned above, most questions that measure the study's constructs are adopted from past literature and adapted for the context of this study, (i.e., virtual communities); questions relating to several constructs (including the new construct – online score reward) are developed based on a review of the relevant literature as well as the opinions of experts. Moore and Benbasat (1991) refer to this stage as item creation, i.e., creating pools of items by identifying items from existing scales, and by creating additional items that seem to fit the definitions of the constructs. Similarly, Churchill (1979) calls this step "item-generation" with the objective of capturing the domain as specified in the previous step. Additionally, some items with slightly different nuances of meaning are included because this can provide a better foundation for the eventual measure (Churchill 1979).

Another issue relating to item generation is the appropriate number of items (i.e., indicators in the terminology of statistical technique) for each construct. First, single item constructs are not appropriate because no single item can provide a perfect representation of a construct, just as no single word can be used to examine the differences in an individual's spelling abilities (Churchill 1979). A multi-item approach can reduce any extraneous influences of individual items, allowing idiosyncrasies to be cancelled out by

other items to yield a more reliable and valid measure (Davis 1989), because even seemingly identical statements may produce quite different answers (Churchill 1979). Also, more items with slightly different shades of meaning can provide more room for further item elimination. According to reliability theory, the greater the number of indicators used to measure a construct, the more reliable and valid the subsequent analyses will be (Carmines and Zeller 1979). Most of the structural equation modeling literature suggests that three indicators should be a minimum when developing scales and not an average (Bollen 1989). When the number of indicators is small and reliability is lower, measurement error will be more problematic (Chin et al. 2003).

Furthermore, this study intends to test interaction effects, which require larger indicator levels than direct effects because product indicators are multiplicatively less reliable than their respective indicators (Chin et al. 2003). Increasing the number of indicators when analyzing moderators is as important as gathering more data (Chin et al. 2003).

From the respondent's perspective, however, a larger number of items is not always better because more questions mean more time and effort required to answer the questionnaire. In such cases, the length of the instrument may tax a respondent's concentration and result in inaccuracies in measurement (Ives et al. 1983; Straub 1989). Therefore, after balancing the benefits and negative effects, no less than three indicators are assigned to each construct.

Based on this, 56 questions were developed for this study's data collection

instrument, each of which was measured using seven-point Likert scales anchored from "strongly disagree" to "strongly agree." These questions were adopted, adapted, or developed from prior research instruments. Given that online score reward is a brand new construct, a detailed description of how of the items for this construct were developed now follows.

This new construct (online score reward) was developed based on Kankanhalli et al.'s (2005) "organizational rewards" construct. As described in the definition of the online score reward construct found in Appendix A, the focus of this construct is on the "importance" of the online score incentives perceived by an individual. This focus on "importance" is consistent with Kankanhalli et al.'s (2005) definition of the organizational reward construct. Kankanhalli et al. (2005, p.123) define "organizational reward" as "The importance of economic incentives provided for knowledge contribution to EKR [electronic knowledge repositories] (Ba et al 2001; Hall 2001)". The four items used and validated[25] in Kankanhalli et al (2005, p.141) are shown in Table 5-1 below.

[25] Originally, Kankanhalli et al. (2005, p.141) provided five items for this construct. They omitted one to achieve adequate reliability (Cronbach's alpha) of this construct.

Table 5-1. Items for the organizational reward construct in Kankanhalli et al. (2005)

Construct	Item Wording and Code	Source
Organizational Reward	It is important to be promoted when I share my knowledge through EKRs.	Developed based on Hargadon (1998)
	It is important to get a higher salary when I share my knowledge through EKRs.	Developed based on Hall (2001)
	It is important to get a higher bonus when I share my knowledge through EKRs.	Developed based on Hall (2001)
	It is important to get more job security when I share my knowledge through EKRs.	Developed based on Davenport and Prusak (1998)

In the context of online communities, in order to get an online score, an individual gives away (i.e., shares) his or her knowledge (which is an important resource); that is, this individual uses one resource (i.e., knowledge) in exchange for a reward (i.e., an online score). Here, the assumption is that the online score is important to this individual, either for external or internal (psychological) reasons[26]. Otherwise, this individual would not pay the price for that incentive or reward (i.e., give away his or her valuable resource – knowledge). Thus, the perceived importance of an online score incentive is the focus of this construct.

In order to ensure validity and reliability of a construct, multiple items should be

[26] An example of the external reasons is that when a member's online score (acquired from knowledge sharing) reaches a certain amount, this member can get benefits from the virtual community, such as free services (like personal advertisement) in the virtual community, professional certificates, high privilege in the community, or some gifts. An example of the internal reasons is the psychological feeling, i.e., the online score really shows the knowledge receiver's gratitude to the knowledge provider (i.e., recognizing the knowledge provider's contribution) given that the online score is a limited resource.

used (Carmines and Zeller 1979; Davis 1989). For the "online score reward" construct, five items were used to measure the perceived importance of an online score incentive, either directly or indirectly reflecting whether the online score was important to the respondent, or whether the respondent needed or wanted an online score incentive. The items for the online score reward construct are provided in Table 5-2 below. Some items' wording differs only slightly from others. As Churchill (1979, p. 68) mentioned, "The researcher probably would want to include items with slightly different shades of meaning because the original list will be refined to produce the final measure. Experienced researchers can attest that seemingly identical statements produce widely different answers. By incorporating slightly differently nuances of meaning in statements in the item pool, the researcher provides a better foundation for the eventual measure." This is also consistent with what Davis (1989) did when he was creating the item pool for the Technology Acceptance Model (TAM) in his study.

Table 5-2. Items for the online score reward construct

Construct	Item Wording and Code	Source
Online Score Reward	It is important for me to get a score or credit of points (i.e., online score) as a reward when I share my knowledge with others through answering their questions in <name of the virtual community>. (SR1)	Adapted from Kankanhalli et al. (2005)
	I really hope to get a score or credit of points (i.e., online score) as a reward, when I share my knowledge with others in <name of the virtual community>. (SR2)	Developed based on Kankanhalli et al. (2005)
	The online score reward mechanism in <name of the virtual community> motivates me to answer the questions posted by others in this virtual community. (SR3)	Developed based on Kankanhalli et al. (2005)
	The higher the online score in reward for answering a question posted by others is in this virtual community, the more likely I would answer that question. (SR4)	Developed based on Kankanhalli et al. (2005)
	In order to get a score or credit of points (i.e., online score) as a reward, I answer the questions posted by others in this virtual community. (SR5)	Developed based on Kankanhalli et al. (2005)

5.1.2 Conceptual validation (scale development)

Given that the items for measuring the constructs are adapted from various sources or developed for this study, all of the items were subjected to a four-stage conceptual validation (sorting) exercise (Kankanhalli et al. 2005). Moore and Benbasat (1991) refer to this step as scale development. The first objective of this step is to identify any particular questions that may be ambiguous, because survey questions should mean

the same thing to all respondents (Fowler 2001). If one of the questions is ambiguous and respondents have to guess its meaning, this guessing will tend to lower the alpha coefficient (Churchill 1979). The second objective of this step is to assess construct validity. Additionally, after the sorting exercises are carried out, the opinions of experts (in this case, the sorters) are collected by asking the sorters a few open-ended questions.

The first two rounds of sorting exercises were based on the English version of the questionnaire, while the other two rounds were based on the Chinese version of the questionnaire. The four rounds were as follows:

sort 1: unstructured sorting exercises in English;

sort 2: structured sorting exercises in English;

sort 3: unstructured sorting exercises in Chinese; and

sort 4: structured sorting exercises in Chinese.

The detailed procedures and results of these four rounds of sort are described below.

5.1.2.1 Sort 1: Unstructured sorting exercises in English

Unstructured sorting means that the sorters are not given the names and definitions of the constructs, and thus can sort the questions freely. Davis (1989) refers to this procedure as categorization. The sorters are asked to provide their own label for each category which eventually makes up a construct. If the number of categories created by different sorters, the labels assigned to the categories, and the questions included in them, are consistent, then constructs based on these categories demonstrate convergent and

discriminant validity (Moore and Benbasat 1991). The detailed procedures for the first sort (i.e., unstructured sorting exercises in English) are described below.

Procedures for sort 1 (unstructured sorting exercises in English)

(1) Preparation for the sorting exercises

The following documents were prepared before the sorting exercises occurred:

- 56 index cards (4 × 6-cm) containing all 56 questions with one question printed per card;
- a one-page table listing all 56 questions; and
- a standard set of instructions describing the tasks the sorters were to do.

All the items, whether listed on the cards or in the table, were randomly sorted, using a random function provided by Microsoft Excel. The objective of using printed index cards was to facilitate the easy moving, rearranging and categorizing of cards by the sorters. The purpose of using the one-page table was to give the sorters an overview of the complete set of questions; if the sorter wanted to make any comments about particular questions, he or she could easily make such notes directly on this table. The purpose of the standard set of instructions was to give the sorters the ability to know how to go about categorizing these 56 questions in a way that ensured that all sorters received the exact same instructions. These instructions were previously tested with a separate judge to ensure their comprehensiveness and comprehensibility.

Four Ph.D. students who were experienced in answering questions posted by others in virtual communities were invited to participate in the first sorting round as

sorters. These four PhD students were from different departments or areas within McMaster University (one student was from the Department of Biology, while the remaining three were from different areas of the School of Business: Finance & Business Economics, Operations Research, and Information Systems).

(2) A trial sort

Prior to the sorting exercises, the sorters were given a standard set of instructions to read (see Appendix B). The sorters were allowed to ask as many questions as necessary to ensure they understood the procedure.

In order to help the sorters understand the sorting procedure, a trial sorting exercise was conducted (see Appendix C). The trial sorting exercise involved the use of seven questions pertaining to two constructs "information security concerns" (adapted from Pavlou et al. 2007) and "service quality" (adapted from Liu and Arnett 2000). These constructs were selected based on several criteria: i) the constructs were totally different from the constructs used in the proposed study; ii) the constructs were appropriate for the context of the trial study (i.e., online shopping); iii) the two constructs used in the trial exercise were compatible with each other; and iv) the pattern of categorizing the constructs in the trial exercise was similar to the expected pattern of categorizing the constructs in the current study. After the sorters finished the trial sorting exercise, the standard answers were provided to them; based on these answers, the sorters could check their results. The purpose of the trial sort was to ensure that the sorters understood the idea of sorting the items based on an underlying construct for each category, and to place

items in categories which best reflected the underlying construct. Based on the trial exercise, any misunderstandings resulting from the instructions were clarified. After the trial sort, the sorters were then permitted to do the formal unstructured sorting exercises in English as described below.

(3) The formal sorting exercises

In the formal sorting exercises, the sorters were given the 56 index cards containing one question per card. The sorters were asked to put the 56 cards into 12 to 14 categories so that the questions within a category were most similar in meaning to each other and different in meaning from those in other categories (Davis 1989). The sorters were also asked to provide their own label for each category; the questions in a category were eventually made up a construct.

Each sorter spent about 40 to 60 minutes doing the sorting exercise. After the formal sorting exercise was over, the sorters were asked to identify ambiguously worded questions (Kankanhalli et al. 2005); this was to minimize the potential of interpretational confounding (Burt 1976). The results for sort 1 are as follows.

Results of sort 1 (unstructured sorting exercises in English)

Table 5-3 below provides the information about the frequency with which the four sorters correctly placed the questions onto the intended constructs. The overall placement ratio of items within the target constructs was 84.8%. As indicated in the last column, this ratio for two constructs ("loss of knowledge power" and "enjoyment in helping") was 100%. Except the ratio for shared vision, all ratios were more than 70%. The ratio for the

social affiliation construct was the lowest one. Compared to Moore and Benbasat's (1991) study where the ratio for their "compatibility" construct was 53%, the ratio for "shared vision" is not considered too low. These results indicated that items were generally being placed as they were intended. In addition, for each pair of sorters in this sorting step, their level of agreement in categorizing items was measured using Cohen's Kappa (Cohen 1960). As shown in Table 5-4, Kappa scores averaged 78.2%, indicating the inter-rater reliability was acceptable (Moore and Benbasat 1991).

One sorter divided the "sharing effort" category (i.e., construct) into two categories: time and effort. Since this construct was designed to capture two aspects - time and effort, this categorization is not surprising. Given this, there two categories were put together in the Table 5-3. However, there was a need to reword certain item to reflect both of these two aspects (i.e., time and effort) in a single item. Thus, one item was reworded to reflect both time and effort incurred in knowledge sharing. Among the four sorters, three sorters created the N/A category, which was used to capture any question "too ambiguous" or "doesn't fit any category."

Table 5-3. Results of Unstructured Sorting Exercise in English (Sort 1)

Target Category	Actual Category														Total Items	Hit Rate (%)
	SE	LK	SA	EH	OS	KE	SR	RP	TR	PN	CM	SV	IK	N/A		
SE	14					1							1		16	87.5
LK		16													16	100
SA			14		3		1				1			1	20	70
EH				16											16	100
OS					15		1								16	93.8
KE						10								2	12	83.3
SR					2		18								20	90
RP								14	1			1			16	87.5
TR		1				2			18	1				2	24	75
PN										14		2			16	87.5
CM			2								13			1	16	81.3
SV				2				1	1			12			16	75
IK				1		1		2					16		20	80
Total Item Placements:			224					Hits			190			Overall Hits		84.8

Table 5-4. Inter-Sorter Agreement Cohen's Kappa (Sort 1)

Cohen's Kappa						Average
80.8	74.9	82.6	78.8	78.8	73.0	78.2

Examination of the off-diagonal entries in the placement matrix in Table 5-3 reveals that some items were ambiguous (i.e., fitting in more than one category). For one of the five items originally created for the "social affiliation" construct, three sorters confused it with the items for "online status seeking." This item also made the placement ratio of items for the social affiliation construct low. As a result, this item was dropped. Additionally, other items that were identified to be ambiguous were reworded.

After completing the sorting exercise, each sorter independently labeled their identified categories. Table 5-5 below shows the results. As scan through Table 5-5 shows how the sorters' labels very closely matched those of the original constructs.

Table 5-5. Results of individual sorters' construct labels

Constructs	**Sorters**			
	A	**B**	**C**	**D**
Sharing effort	Perceived effort	Work load/time consuming	Increase effort Time constraint	Burden
Loss of knowledge power	Threat of loss of unique	Risk/competition/ lose	Competition	Threats
Social affiliation	Sense of belonging /community	Personal preference/interest	Belonging	Relationship
Enjoyment in helping	Enjoyment in helping others	Help others	Enjoyment in helping others	Helping
Online status seeking	Status	Status/purpose	Status in the group	Motivation or benefits(result)
Knowledge self-efficacy	Self-efficacy	Ability/knowledge (myself)	Self confidence (efficacy)	Capability
Online score reward	Score reward is important	Score makes me like to answer questions	Get rewarded	Points reward
Reciprocity	Expectations of reciprocity	Return	If you help, others will help!	Reciprocity (expectation)
Trust	Trust	Perception of others and others' ability	Trust	Belief in other people
Pro-sharing norms	Custom of the community	Norms	Norm of conflicting views /diversity/criticism	Different norms

Table 5-5. Results of individual sorters' construct labels

Constructs	Sorters			
	A	B	C	D
Commitment	Attachment to the community	For community-related reason	Loyalty	Care about the BBS
Shared vision	Group goal	Common goal/view	Cooperation	Common feature
Intention to share knowledge	I will help others actively	Agree to answer questions	Plan to answer questions	Willingness to participate

Last, since the sorters were experienced in answering questions posted by others in certain virtual communities, the sorters were asked some open-ended questions regarding the importance and appropriateness of the constructs and items. Specifically, the sorters were asked the following questions.

1. Do you think these items are appropriate to measure the corresponding construct in virtual communities?
2. Can you suggest additional items (questions) to measure this construct?
3. Do you think this factor (construct) is important in affecting people's willingness to answering the questions posted by others in virtual communities?
4. Are there any other factors (constructs) that you believe to be important to affect people's willingness to share knowledge?

Based on the opinions of the sorters, the survey items were further refined.

All items remaining at this point (55 items) were then passed on to the next sorting round – sort 2: structured sorting exercises in English.

5.1.2.2 Sort 2: structured sorting exercises in English

In the second sorting round, four new sorters (different from the four sorters who participated in the first round) were given the remaining questions in English, and were asked to sort them. At this time, however, the sorters were provided with the names and definitions of the constructs, and thus they could sort the questions based on the fit between the questions and the construct definitions. Hence, this procedure is called structured sorting. The detailed procedures for the second sort (i.e., structured sorting exercises in English) are described below.

Procedures for sort 2 (structured sorting exercises in English)

(1) Preparation for the structured sorting exercises

The following documents were prepared before the structured sorting exercises occurred:

- 55 index cards (4 × 6-cm) containing all 55 questions with one question printed per card;
- a one-page table listing all 55 questions;
- a one-page table listing the definitions of the 13 categories (i.e., constructs); and
- a standard set of instructions describing the tasks the sorters were to do.

All the items, whether listed on the cards or in the table, were randomly sorted, using a random function provided by Microsoft Excel. The purposes for the printed index cards, the one-page table of 55 questions, and the standard set of instructions were similar

to the purposes described in the first sorting round. And the instructions were also previously tested with a separate judge to ensure their comprehensiveness and comprehensibility.

(2) A trial sort

Prior to the structured sorting exercises, the sorters were given a standard set of instructions to read (see Appendix D). The sorters were allowed to ask as many questions as necessary to ensure they understood the procedure.

In order to help the sorters understand the structured sorting procedure, a trial sorting exercise was conducted (see Appendix E). The trial sorting exercise involved a list of seven items (i.e., questions) and a table of the definitions of two categories (i.e., constructs[27]). After the sorters finished the trial sorting exercise, the standard answers were provided to them; based on these answers, the sorters could check their results. The purpose of the trial sort was to ensure that the sorters understood the idea of sorting the items based on the fit between the question and the definitions of the categories provided. Based on the trial exercise, any misunderstandings resulting from the instructions were clarified. After the trial sort, the sorters were then permitted to do the formal structured sorting exercises in English as described below.

(3) The formal structured sorting exercises

In the formal structured sorting exercises, the sorters were given the 55 index

27 Similar to the trial sort in the first round, the seven questions were pertaining to two constructs: "information security concerns" (adapted from Pavlou et al. 2007) and "service quality" (adapted from Liu and Arnett 2000).

cards containing one question per card. Sorters were required sort the questions by placing each question into a construct category based on the fit between the question and the definition of the category (i.e., construct). In order to ensure that the sorters were not forced to fit a question into one of the pre-defined categories listed, an "N/A" category was provided. Sorters were able to use this category to place questions they feel were "too ambiguous" or "do not fit any category" (Moore and Benbasat 1991).

Each sorter spent about 20 to 40 minutes doing the sorting exercise. After the formal sorting exercise was over, the sorters were asked to identify ambiguously worded questions (Kankanhalli et al. 2005) in order to minimize the potential of interpretational confounding (Burt 1976). The results for sort 2 are as follows.

Results of sort 2 (structured sorting exercises in English)

Table 5-6 below provides the information about the frequency with which the four sorters correctly placed the questions onto the intended constructs. The overall placement ratio of items within the target constructs was 91.4%, with all constructs above 80%. This indicated that items were generally being placed as they were intended. In addition, for each pair of sorters in this sorting step, their level of agreement in categorizing items was measured using Cohen's Kappa (Cohen 1960). As shown in Table 5-7, Kappa scores averaged 82.6%, indicating the inter-rater reliability was acceptable (Moore and Benbasat 1991).

Table 5-6. Results of Structured Sorting Exercise in English (Sort 2)

Target Category	Actual Category														Total Items	Hit Rate (%)
	SE	LK	SA	EH	OS	KE	SR	RP	TR	PN	CM	SV	IK	N/A		
SE	16														16	100
LK		16													16	100
SA			14							1	1				16	87.5
EH				16											16	100
OS					15		1								16	93.8
KE						10			1					1	12	83.3
SR					1		19								20	95
RP								16							16	100
TR						1			20	3					24	83.3
PN										15		1			16	93.8
CM			1						1	1	13				16	81.5
SV									1	1		14			16	87.5
IK						1		2					17		20	85
Total Item Placements:			220					Hits			201			Overall Hits		91.4

Table 5-7. Inter-Sorter Agreement Cohen's Kappa (Sort 2)

Cohen's Kappa						Average
82.2	82.3	76.3	88.2	86.2	80.3	82.6

Based on the second sorting exercises, wording of some items was further refined. All items remaining at this point were then passed on to the next sorting round.

For rounds three and four, since the formal data would be collected in China, the questionnaire was translated into Chinese, and then translated back to English, to verify accuracy. Further, the unstructured sorting and structured sorting exercises, which had been done on the English version of the questionnaire, was also done on the Chinese version of the questionnaire as described below.

5.1.2.3 Sort 3: unstructured sorting exercises in Chinese

Four new sorters participated in the third round of sorting exercises; they were Chinese-speakers living in China, and had experiences in knowledge sharing in virtual communities. These four sorters were asked to sort the remaining items. Again, they were not told what the underlying constructs are, and were asked to provide labels for each construct.

The procedures of this step are the same as the first sorting round; the difference was that this round used the Chinese version of the questionnaire instead of the English one.

Based on the third round of sorting exercises, wording and translation of some items was further refined. All remaining items were passed on to the fourth sorting round – structured sorting exercises in Chinese.

5.1.2.4 Sort 4: structured sorting exercises in Chinese

Four new sorters (who were different from the twelve sorters in the previous three rounds) participated in the fourth sorting round; they were also Chinese-speakers who were living in China and who had experiences in knowledge sharing in virtual communities. They were given the remaining questions from the third round, which were in Chinese, and were asked to sort these questions. Similar to the procedures in the second sorting round, the sorters of the fourth round were provided with the names and definitions of these constructs, but in Chinese. If the sorters found any question to be "too ambiguous" or not fit any pre-defined category," then they put this question into an "N/A" category, as was done in the second sorting round.

Based on the results of the fourth round of structured sorting and suggestions made from the sorters, the questions were further refined.

After this, the questions left were put into a table of final measures (see Appendix F) that places relatively easy, straightforward questions at the beginning of the survey[28] to help encourage respondent engagement and participation (Fowler 2001).

5.2 Data Analysis Method

5.2.1 PLS

This study uses Partial Least Squares (PLS) as the main statistical technique to analyze the collected data. PLS is widely used in IS research. Recently, more and more

28 This survey was approved by the McMaster University Research Ethics Board (MREB).

studies published in top IS journals (e.g., *MIS Quarterly*, *Information Systems Research*), use PLS as their main statistical technique. Some examples are Bock et al. (2005), Ko et al. (2005), Wasko and Faraj's (2005), Komiank and Benbasat (2006), Pavlou et al. (2007), Jarvenpaa et al. (2004), Nicolaou and McKnight (2006), and Ma and Agarwal (2006). One important reason for the heavy use and reliance on PLS for data analysis in the IS field may be that theoretical knowledge in the discipline is still in the formative stages where theoretical models and measures are often simultaneously developed (Chin 1998a). PLS is accepted as a method for testing theory in early stages, while covariance-based structural equation modeling (SEM) analysis (e.g., LISREL, AMOS) is usually used for theory confirmation (Fornell and Bookstein 1982). As Chin (1998a) argues, the use of covariance-based SEM (e.g., LISREL, AMOS) in IS research is likely premature, given the early stage of theoretical knowledge in the IS field.

Additionally, PLS is capable of testing not only the direct but also the interaction effects of constructs (Chin et al. 2003), which suits the requirement of the current study.

5.2.2 Sample size requirement

The role of sample size is very important in statistics. In most cases, researchers wish to determine whether or not a particular correlation significantly differs from zero. The key element in such a determination is the sample size on which the correlation is based. Researchers can achieve greater statistical power with increases in their sample size because larger sample sizes are associated with lower standard errors of the mean and narrower confidence intervals. If the sample size is too small, a relatively high value

of correlation coefficient can be statistically no different from a correlation of zero (Meyers et al. 2006).

However, no easily applicable and clear rule of thumb has been proposed for the sample size requirement (Marcoulides and Saunders 2006). Chin (1998b) suggests the least sample size requirement in PLS is 10 times the largest of two possibilities: 1) the block with the largest number of formative indicators (i.e., largest measurement equation) or 2) the dependent latent variable with the largest number of independent latent variables impacting it (i.e., largest structural equation). However, Chin (1998b) still warns researchers to be cognizant of the fact that, "*the stability of the estimates can be affected contingent on the sample size*" (p. 305). Additionally, Marcoulides and Saunders (2006) argue that a simple application of the generic PLS rule of thumb mentioned above may not always ensure sufficiently stable estimates and cannot be applied indiscriminately to all situations. Researchers must consider the distributional characteristics of the data, potential missing data, the psychometric properties of the variables examined, and the magnitude of the relationships considered before making a decision on an appropriate sample size to use. By contrast, the following are some rules of thumb for other statistical techniques. For multiple regression, Tabachnick and Fidell (2006) point out that a simple rule of thumb for testing the multiple correlation is $N \geq 50 + 8m$ (where m is the number of independent variables). And Comrey and Lee (1992) give the follows as a guide to sample sizes for factor analysis: 50 as very poor, 100 as poor, 200 as fair, 300 as good, 500 as very good, and 1000 as excellent.

Although the generic PLS rule of thumb (Chin 1998b) with small sample size requirement seems attractive, researchers seldom follow this rule when they use PLS in their studies, especially in top IS journals, because of the above-mentioned reasons. For example, in Wasko and Faraj's (2005) research on a professional virtual community, the sample size is 173 while the number of independent variables is 7. Ma and Agarwal (2006) studied two online communities with a sample size of 500 and 166 respectively while the number of independent variables was 6 and the number of control variables was 4. In Pavlou et al.'s (2007) research on online exchange relationships, they used two independent surveys with samples of 268 and 253 respectively, while the number of independent variables was 11 and the number of control variables was 5. Thus, for this study, based on the number of independent variables and the fact that this study examines interaction effects which require larger sample size (Chin et al. 2003), 900 cases are expected to collected, in order to ensure sufficiently stable estimates.

5.3 Pretest

After the measures were developed and validated by the above four rounds of sorting exercises, a pilot test (or pretest) of the instrument and procedures was conducted. The main objective of the pretest was to ensure that the measures demonstrate adequate reliability (Moore and Benbasat 1991). As mentioned earlier, the pretest is a follow-up procedure after the four rounds of sorting exercises, in order to examine and further improve the reliability and validity of the measures. Additionally, this test aimed to find out how the data collection protocols work under realistic conditions (Fowler 2001). The

researcher had a discussion with each respondent after they completed the questionnaire, which allowed the researcher to find out whether the respondents faced any difficulties completing the questionnaire, such as whether the instructions were unclear, or whether there were any problems in understanding the questions that were asked (Fowler 2001).

In the pretest, the formal questionnaire was completed by 46 respondents whose background was similar[29] to the target population of the final study. One of these 46 responses was identified as bad record through an "eye-ball test" (i.e., this participant did not answer the survey seriously. Many questions had the same extreme answer "strongly agree", and some of them were not reasonable).

SPSS 18.0 and SmartPLS 2.0 (Ringle et al. 2005) were used to analyze the pretest data with the remaining 45 responses and examine the reliability of the measures. Although the sample was small, the results of the pilot data analysis showed a reliable measurement model, with adequate reliability as well as convergent and discrminant validity. Also, the structural model (i.e., the main effects model) test showed some insights on several relationships which were significant as hypothesized. In what follows, the results of these analyses are discussed in detail.

5.3.1.1 Measurement Model Pretest

Before testing the measurement model using PLS, a recommended step is to

[29] The participants in the pilot study were also Chinese who were experienced in participating in certain knowledge-based virtual communities. Although these virtual communities were not necessarily the same virtual community of the final study, such virtual communities were also knowledge-based virtual communities and the communication language in them was also Chinese.

calculate the Cronbach alpha reliability coefficients for all multi-item scales. All the coefficients calculated through SPSS 18.0 were above the 0.70 cut-off (Cronbach 1951). The values of these coefficients are presented in Table 5-8.

In PLS, the first step was to assess the reliability and convergent validity of the measurement model. 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 (CR) developed by Werts et al. (1973). Table 5-8 shows that the lowest CR is 0.83, compellingly exceeding the recommended "0.70" threshold value (Fornell and Larcker 1981). The convergent validity of the constructs can be assessed by examining the average variance extracted (AVE), which attempts to measure the amount of variance that a latent variable component captured from its indicators relative to the amount due to measurement error. All the AVE values in Table 5-8 are greater than the generally recognized 0.50 cut-off, indicating that the majority of the variance is accounted for by the construct.

The next step was to evaluate the discriminant validity of the constructs. A first test for this is to compare the correlations among the constructs with the AVE (Gefen et al. 2000). As shown in Table 5-8, AVE of each construct is larger than its correlations with the other constructs, demonstrating discriminant validity (Fornell and Larcker 1981; Gefen et al. 2000).

A second way to evaluate convergent and discriminate validity is to compare the item loadings on their associated constructs to the cross-loadings with other constructs.

Table 5-9 presents a matrix of loadings and cross-loading produced by Smart PLS. Visual inspection of this matrix shows that items[30] load higher on the constructs they are supposed to load on (figures in shade) compared to the other constructs (seen on the rows of this matrix). This is an indication of adequate discriminant validity (Chin 1998b; Fornell and Bookstein 1982).

According to the reliability and construct validity analysis, it is reasonable to believe that the measures have adequate reliability as well as convergent and discriminant validity.

[30] The only exception was SR3 whose loading was lower than (but close to) the highest cross-loading. Since the Cronbachs alpha for this construct was pretty high (0.93), the AVE was above the cut-off of 0.50, and the square root of the AVE was much larger than the correlations between this construct and other constructs (shown in the corresponding rows and columns in Table 5-8), this item was not viewed to be problematic, given the small sample size of the pilot data.

Table 5-8. Construct correlations, AVE, CRs, and Cronbach's Alpha (Pilot Data)

	AVE	CR	Cron-bachs Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13
1.Affiliation	0.66	0.88	0.82	**0.81**												
2. Commit	0.73	0.91	0.88	0.38	**0.85**											
3. Efficacy	0.71	0.87	0.82	0.02	0.39	**0.84**										
4. Effort	0.61	0.86	0.80	-0.04	-0.15	0.14	**0.78**									
5. Ehelp	0.71	0.91	0.87	0.53	0.70	0.32	-0.28	**0.85**								
6. Intention	0.75	0.94	0.92	0.52	0.62	0.35	-0.30	0.67	**0.87**							
7. Norms	0.73	0.92	0.88	0.49	0.52	0.03	-0.22	0.48	0.39	**0.86**						
8. Power	0.73	0.92	0.88	-0.28	-0.21	-0.12	0.23	-0.25	-0.41	-0.08	**0.86**					
9. Recipr.	0.60	0.85	0.78	0.44	0.23	0.02	-0.14	0.30	0.51	0.31	-0.23	**0.77**				
10. Score	0.51	0.83	0.93	-0.31	-0.02	0.08	0.13	-0.14	-0.23	0.01	0.43	-0.01	**0.71**			
11. Status	0.84	0.96	0.95	0.17	0.17	0.29	0.09	0.19	0.08	-0.01	0.13	0.14	0.41	**0.92**		
12. Trust	0.76	0.95	0.94	0.44	0.30	0.04	-0.09	0.42	0.60	0.41	-0.07	0.48	-0.06	-0.07	**0.87**	
13. vision	0.78	0.93	0.91	0.25	0.22	0.34	0.15	0.40	0.51	0.24	0.10	0.31	0.00	0.09	0.59	**0.88**

Note.
Diagonal elements are correlations of each construct with its measures (square roots of AVE). Off-diagonal elements are correlations between constructs.

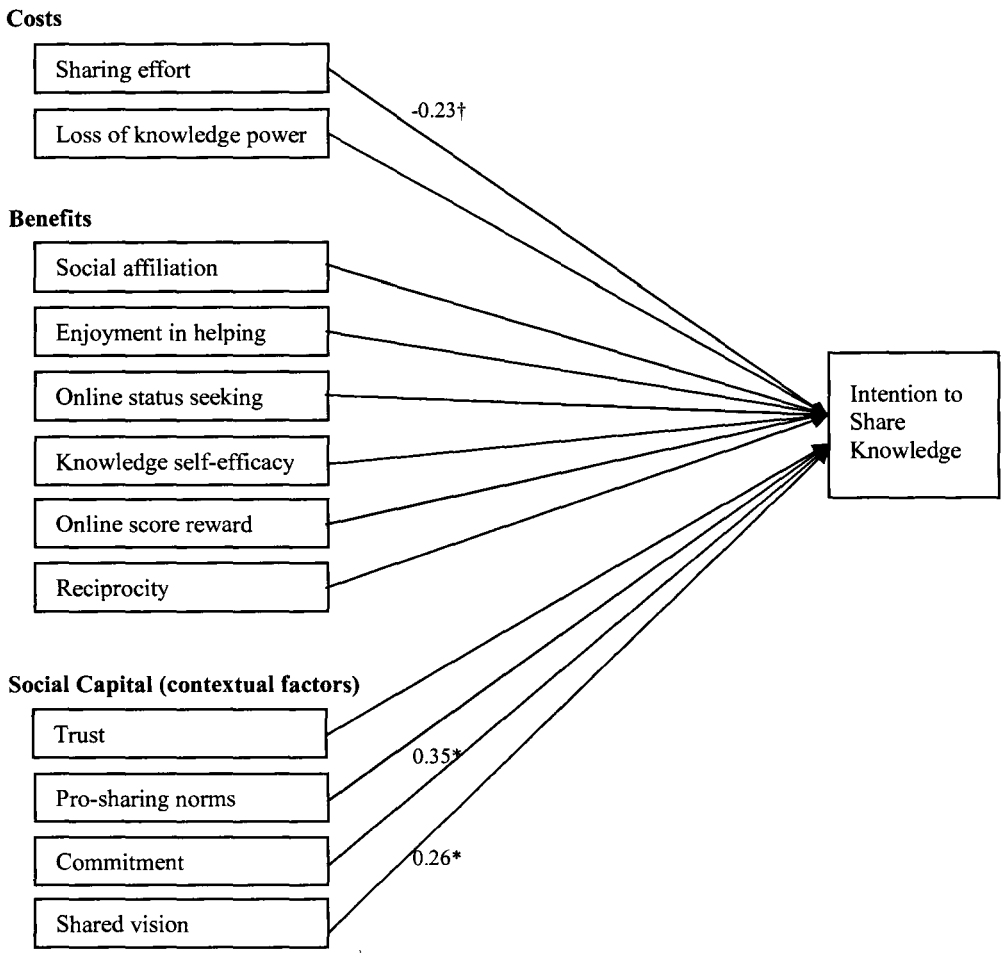
Table 5-9. Factor Loadings Produced by PLS (Pilot Data)

	Affil.	Commit	Ehelp	Efficacy	Effort	Intent	Norm	Power	Recipr.	Score	Status	Trust	vision
SA1	0.884	0.278	0.406	-0.127	-0.088	0.424	0.490	-0.268	0.401	-0.248	0.108	0.426	0.147
SA2	0.883	0.253	0.449	0.111	0.054	0.387	0.370	-0.292	0.301	-0.390	0.153	0.222	0.168
SA3	0.818	0.331	0.448	0.137	-0.010	0.461	0.269	-0.153	0.295	-0.165	0.253	0.317	0.272
SA4	0.638	0.346	0.402	-0.079	-0.085	0.398	0.476	-0.196	0.420	-0.208	0.024	0.453	0.196
CM1	0.194	0.741	0.537	0.268	-0.066	0.331	0.358	-0.226	0.110	-0.059	0.106	0.110	0.055
CM2	0.311	0.916	0.664	0.395	-0.162	0.648	0.600	-0.244	0.287	-0.061	0.088	0.361	0.257
CM3	0.386	0.922	0.633	0.319	-0.146	0.576	0.451	-0.200	0.178	-0.050	0.149	0.323	0.239
CM4	0.362	0.823	0.557	0.326	-0.125	0.495	0.313	-0.068	0.173	0.100	0.266	0.169	0.131
EH1	0.348	0.546	0.792	0.172	-0.212	0.429	0.355	-0.230	0.034	-0.246	0.134	0.189	0.173
EH2	0.378	0.417	0.732	0.278	-0.083	0.420	0.312	-0.383	0.170	-0.165	0.145	0.277	0.340
EH3	0.487	0.676	0.934	0.355	-0.329	0.614	0.431	-0.177	0.299	-0.132	0.184	0.375	0.392
EH4	0.534	0.684	0.908	0.277	-0.268	0.710	0.478	-0.136	0.405	-0.009	0.186	0.488	0.400
KE1	0.069	0.337	0.340	0.942	0.060	0.317	-0.020	-0.088	-0.007	0.045	0.319	-0.024	0.252
KE2	-0.002	0.399	0.283	0.959	0.179	0.360	0.082	-0.136	0.079	0.107	0.247	0.113	0.394
KE3	-0.271	0.200	0.169	0.556	0.294	0.039	-0.160	-0.004	-0.246	-0.047	0.081	-0.106	0.149
SE1	0.119	-0.019	-0.013	0.127	0.664	-0.146	0.074	0.163	-0.050	-0.067	0.032	-0.028	0.211
SE2	-0.059	-0.159	-0.283	-0.019	0.839	-0.329	-0.261	0.207	-0.110	0.238	0.203	-0.101	0.098
SE3	-0.126	-0.067	-0.227	0.275	0.803	-0.196	-0.197	0.182	-0.211	0.033	-0.038	-0.077	0.114
SE4	-0.006	-0.197	-0.269	0.167	0.815	-0.186	-0.191	0.168	-0.057	0.073	-0.005	-0.033	0.098
IK1	0.366	0.509	0.534	0.283	-0.230	0.861	0.240	-0.283	0.492	-0.045	0.278	0.464	0.375
IK2	0.557	0.496	0.606	0.217	-0.375	0.912	0.406	-0.389	0.538	-0.260	0.040	0.626	0.425
IK3	0.455	0.649	0.656	0.339	-0.242	0.928	0.394	-0.399	0.523	-0.251	0.020	0.620	0.553
IK4	0.433	0.608	0.592	0.340	-0.157	0.874	0.486	-0.212	0.404	-0.157	-0.044	0.578	0.613
IK5	0.439	0.416	0.484	0.349	-0.295	0.756	0.129	-0.509	0.200	-0.305	0.102	0.245	0.172
PN1	0.399	0.486	0.527	-0.130	-0.273	0.336	0.839	-0.109	0.272	-0.045	-0.075	0.346	0.164
PN2	0.437	0.355	0.355	0.028	-0.091	0.209	0.783	0.077	0.106	0.035	0.062	0.138	0.159
PN3	0.428	0.455	0.384	0.054	-0.143	0.331	0.957	-0.038	0.308	0.082	-0.035	0.374	0.235
PN4	0.434	0.453	0.361	0.116	-0.204	0.413	0.837	-0.138	0.307	-0.022	0.036	0.440	0.244

LK1	-0.307	-0.216	-0.309	-0.087	0.202	-0.384	-0.249	0.893	-0.312	0.319	0.076	-0.162	0.038
LK2	-0.312	-0.169	-0.163	-0.062	-0.028	-0.271	-0.072	0.743	-0.193	0.281	-0.007	-0.126	-0.022
LK3	-0.156	-0.170	-0.120	-0.056	0.333	-0.341	0.034	0.865	-0.161	0.407	0.173	0.068	0.215
LK4	-0.195	-0.178	-0.240	-0.179	0.243	-0.382	0.019	0.911	-0.123	0.445	0.187	-0.036	0.101
RP1	0.287	0.161	0.255	0.042	-0.012	0.248	0.257	-0.234	0.597	-0.147	0.236	0.102	0.029
RP2	0.285	0.152	0.099	0.112	0.067	0.379	0.243	-0.172	0.807	0.046	0.068	0.332	0.240
RP3	0.470	0.192	0.381	-0.004	-0.314	0.518	0.326	-0.195	0.860	0.038	0.167	0.609	0.358
RP4	0.272	0.216	0.159	-0.058	-0.073	0.362	0.120	-0.141	0.806	-0.032	-0.021	0.292	0.250
SR1	-0.287	0.043	-0.037	0.247	0.275	-0.101	0.034	0.402	-0.008	0.844	0.338	0.013	0.182
SR2	-0.138	0.084	0.066	0.234	0.274	-0.029	0.060	0.479	0.110	0.810	0.348	0.149	0.309
SR3	-0.241	0.126	0.105	0.475	0.195	0.102	0.058	0.318	-0.062	0.463	0.149	0.171	0.469
SR4	-0.177	0.116	0.057	0.323	0.133	0.003	-0.023	0.335	0.098	0.622	0.306	0.094	0.218
SR5	-0.332	0.033	-0.065	0.271	0.026	-0.106	0.019	0.366	-0.091	0.757	0.270	0.041	0.204
OS1	0.138	0.135	0.191	0.301	0.120	0.071	-0.054	0.048	0.097	0.356	0.958	-0.161	0.096
OS2	0.171	0.173	0.213	0.264	0.046	0.097	0.007	0.137	0.175	0.387	0.986	-0.038	0.105
OS3	0.192	0.203	0.151	0.286	0.123	0.062	0.020	0.205	0.108	0.444	0.960	0.000	0.062
OS4	0.041	0.124	0.080	0.226	0.176	0.001	0.187	0.335	0.201	0.683	0.754	0.062	0.218
TR1	0.205	0.187	0.325	-0.042	-0.199	0.506	0.242	0.012	0.447	0.036	-0.108	0.849	0.435
TR2	0.350	0.299	0.389	0.113	-0.025	0.481	0.334	0.010	0.445	0.051	0.031	0.904	0.442
TR3	0.429	0.239	0.335	-0.056	-0.030	0.500	0.270	-0.075	0.471	-0.041	-0.036	0.912	0.472
TR4	0.412	0.322	0.379	0.073	-0.094	0.554	0.325	-0.092	0.376	-0.121	-0.063	0.930	0.564
TR5	0.456	0.274	0.436	0.034	-0.095	0.567	0.352	0.004	0.360	-0.200	-0.123	0.881	0.566
TR6	0.438	0.265	0.302	0.104	-0.001	0.519	0.599	-0.240	0.430	0.009	-0.040	0.758	0.592
SV1	0.134	0.216	0.332	0.232	0.107	0.454	0.220	0.114	0.319	0.126	0.042	0.599	0.862
SV2	0.122	0.119	0.228	0.369	0.295	0.345	0.095	0.091	0.183	-0.031	0.022	0.425	0.881
SV3	0.399	0.240	0.407	0.325	0.077	0.555	0.331	0.074	0.418	-0.009	0.170	0.581	0.906
SV4	0.138	0.165	0.407	0.296	0.105	0.382	0.139	0.081	0.112	-0.100	0.062	0.432	0.886

5.3.1.2 Main Effects Model Pretest

In order to gain some insight on the significance of the path coefficients, the structural model was evaluated using SmartPLS 2.0 with bootstrapping, although the sample size for the pilot data was small. As shown in Figure 5-1, two hypotheses (i.e., the relation between commitment and intention to share knowledge, and the relation between shared vision and intention to share knowledge) are supported. Additionally, the significant level for the relationship between sharing effort and intention to share knowledge is $p<0.082$ (with a t-value of 1.78, see Table 5-10), which is close to the conventional significance level and thus has the potential to be significant. It is not surprising that only these relations are significant given that the sample size is a key element determining the significance level (Meyers et al. 2006). It was believed that when the sample size becomes larger, more paths would be significant.



†p<.10, *p<.05

Figure 5-1. Theoretical Model Pretest (Main Effects Model)

Table 5-10. Path Significance Tests (Pilot Study)

	Path Coefficient	Standard Deviation	Standard Error	T Statistics	P-value	Hypothesis Test
Affiliation -> Intention	0.1391	0.162	0.162	0.8585	0.3953	Not supported
Commitment -> Intention	0.3452	0.1447	0.1447	2.3849	0.0215	Supported
Efficacy -> Intention	0.1245	0.1265	0.1265	0.9843	0.3303	Not supported

Effort -> Intention	-0.2304	0.1293	0.1293	1.7821	0.0816	Not supported
Ehelp -> Intention	0.0118	0.1695	0.1695	0.0697	0.9447	Not supported
Norms -> Intention	-0.119	0.1341	0.1341	0.8872	0.3798	Not supported
Power -> Intention	-0.1815	0.1248	0.1248	1.454	0.153	Not supported
Reciprocity -> Intention	0.137	0.1165	0.1165	1.1763	0.2458	Not supported
Score -> Intention	-0.0725	0.1751	0.1751	0.4141	0.6808	Not supported
Status -> Intention	0.0042	0.1287	0.1287	0.0327	0.9741	Not supported
Trust -> Intention	0.213	0.139	0.139	1.5324	0.1326	Not supported
vision -> Intention	0.2634	0.1245	0.1245	2.1155	0.0401	Supported

Additionally, several minor changes were made to wording of the sentences used in the survey instrument to improve the questionnaire's readability and make it easier to understand.

To summarize, the measures that were developed and validated by the previous four rounds of sorting exercises and then pretested by the pilot study demonstrated adequate reliability, convergent validity, and discriminate validity. There is confidence in using these measures to capture participants' perception in the full-fledged data collection. As such and given the applied revisions on the wording and instructions, it was reasonable to believe that the full study would be feasible and yield analyzable responses.

The next section of the thesis describes the full-fledged data collection in the field setting and results of the data analyses.

Chapter 6: Data Analysis and Results

In order to test the proposed theoretical models and hypotheses, a field study was conducted, and the data collected were used to examine the measurement model and structural model. This chapter provides a thorough description of the analyses and results. It begins with a description of the research setting, the data collection process and the participants, followed by a preliminary analysis of the data. Then, both the main effects model and the interaction model are estimated with the data collected from the field setting. Also, the non-response bias, common method covariance, and the influences of the control variables are addressed.

6.1 Setting, Process and Participants

6.1.1 Research Setting

The research site of this study was an IT professional online virtual community in China. This virtual community has over seven million registered members who are mainly Chinese from China mainland, Taiwan, Hong Kong, Singapore, North America, Europe and other regions. The participants in this virtual community are IT professionals and use pseudonyms such as "netlover," "oo," "saucer," "waiting4u," etc. This virtual community provides about ten forums (i.e., BBS which are categorized and named by topics such as ".Net", Java, WEB programming, PHP, MS-SQL Server, Programming language, Database development, IBM technology, Windows, etc.) for IT professionals

to discuss and share ideas, expertise, and experiences relating to respective topics. For example, after one participant in the ".Net" forum posts a question relating to ".Net," other participants in the ".Net" forum would provide potential answers to this question and explain why they believe it is true.

Although members can participate in and switch to any of the forums mentioned above, each forum has its relatively permanent set of participants because each IT professional's expertise always concentrates on one main area. Most people always participate in the topic in which they are interested (i.e., to which their work is related). Although all these forums are discussing IT-related topics and participants are IT professionals, the climate (such as norms, trust, etc.) across the various forums seems to be different. For example, when the researcher posted a similar message on each of the forums, the responses from participants in the various forums were different. In some forums, people were very friendly; they responded to the message to show their support, even if they did not know how to answer the question. However, in other forums, people criticized the person (i.e., the researcher in this example) who posted the message in an unfriendly manner; some criticisms were not fair and showed that they doubted the credibility of the person.

There are potential reasons for these differences. First, some forums are very large and have a lot of participants, while others are small and have a limited number of participants. In the smaller forums, people seem to be more friendly and more likely to trust others, maybe because they want to attract more people to join their "army" (i.e., the

group of people in their forum), or maybe because it is easier to develop trust when the number of people is smaller. Second, given that participants in a particular forum have jobs that relate to the topic of the forum, the differences may be because of the different pressures or tensions associated with different jobs that people who join these forums have. Forums that attract participants with highly stressed jobs may tend to yield more cynical and less friendly responses, while forums that attract participants with low stressed jobs may tend to yield more friendly and positive responses. Third, the virtual community has a long history (about 10 years), so it is quite possible that different cultures and climates have formed differently across the various forums in the virtual community over such a long period of time.

The diverse norms, trust, and climate that exist across the forums in the virtual community make this virtual community a good choice for a research study site. Further, the virtual community is highly engaged and productive. Everyday, thousands of new discussions relating to information technology emerge in this virtual community, while millions of technological discussions have already been stored in the knowledge database. For these reasons, this online virtual community is believed to provide a good context for this study.

6.1.2 Process and Respondents

An online survey was used for data collection, with the URL of the online survey

posted (from mid-June to the end of August 2009) on the homepage page[31] of the website where the virtual community was hosted.

Compared to paper questionnaires, online surveys have some potential advantages, such as low unit cost of data collection, high speed of returns, and more control of the inconsistency between questions (Fowler 2001). One potential disadvantage is that such a survey is limited to samples of Internet users. But for the current study, this was not a problem because all participants of the virtual community were Internet users.

Sample Size

Overall, 973 complete responses were received. Three hundred randomly selected participants were offered an incentive in the form of a $5 prepaid cellphone card. Among these 973 responses, five responses were duplicate records. Duplicate records were detectable when two records were adjacent to each other and all the answers for the Likert-type scales and the open-ended questions in these records were identical. These duplicate records seemed to have been caused by participants clicking on the "submit" button more than once. After removing these five duplicate records, the eventual sample size was 968.

Missing Data

Among the 968 responses, six surveys had missing values. In one of these surveys,

[31] Specifically, the topic of the online survey was posted (as one topic of the news) in the news area on the homepage of the website. When people interested in this topic clicked this news item, they were led to a separate webpage where a general message about the survey was posted. This message provided general information to rally interest to participate in the research project and provided a URL link to this online survey. An online information sheet/consent form preceded the actual display of survey items.

the answer for the third item of the "trust" construct was missing; in another survey, the answer for the fourth item of the "pre-sharing norms" construct was missing. The pattern for the other four surveys with missing values was similar to these two, but the items were different. Given that the number of missing values was small (i.e., they only accounted for 0.6% of the entire dataset, much less the conventional 5% cut-off), and they were missing in a random pattern, this was not regarded as a serious problem (Meyers et al. 2006; Tabachnick and Fidell 2006). Thus, the six missing values were replaced with respective means which were calculated from available data (i.e., mean substitution), following the recommendations of Meyers et al. (2006) and Tabachnick and Fidell (2006).

Demographic Profile of the Respondents

Table 6-1 shows the demographic information of the respondents in this study. As can be seen, many respondents were well educated (86% had a university undergraduate or college education, 11.9% had graduate school or above education) and only 2.1% had high school (or below) education. This is reasonable to expect given that this virtual community is designed for IT professionals who were supposed to have professional knowledge which was acquired through education. While the years of experience of the study sample were diverse (from 0 to 16 years), most respondents had less than five years of experience, with an average of 3.3 years. The majority of participants had registered in the virtual community within the past five years, with an average of 2.3 years. The average age was 25.3 years old, indicating most participants were young IT professionals.

The majority of participants were male (93.9%). Given that the IT profession is a male-dominated career (Lemons and Parzinger 2007; Moss et al. 2007), this was a reasonable finding. When the researcher consulted a manager of the virtual community about the male-dominated study sample, the manager said that more than 90% of the members are male, so the study sample sufficiently reflected the male-dominated virtual community population.

Table 6-1. Demographic Information of Respondents (N=968)

Education		
	High school or below	2.1% (21/968)
	College (≤ 3 years)	24.9% (241/968)
	University undergraduate	61.1% (591/968)
	Graduate school or above	11.9% (115/968)
Working experience		
	≤ 1year	21.7% (210/968)
	(1, 2 years]	28.1% (272/968)
	(2, 3 years]	16.9% (164/968)
	(3, 4 years]	9.0% (87/968)
	Over 4 years	24.3% (235/968)
Tenure in the VC		
	≤ 1 year	32.0% (310/968)
	(1, 2 years]	29.9% (289/968)
	(2, 3 years]	17.0% (165/968)
	(3, 4 years]	6.1% (59/968)
	Over 4 years	15.0% (145/968)
Gender		
	Male	93.9% (909/968)
	Female	6.1% (59/968)
Age	Average	25.3 years old

6.1.3 Non-response bias

Researchers are advised to pay attention to the issue of non-response in empirical studies. Non-response refers to the failure to obtain observations on some elements

selected and designated for the sample (Kish 1965). When a person selected for a survey either cannot be contacted or refuses to participate, then non-response bias is introduced into the data. This study used a web-based survey to recruit participants. A recruitment message was posted on the homepage of the website; this approach has been argued by scholars (for example Grossnickle and Raskin 2000) to alleviate non-response bias. As Grossnickle and Raskin (2000, p.108) point out, "*The non-response bias associated with the inability to contact respondents is alleviated in online sampling; potential respondents are typically selected as they visit a website and must actively opt to participate or not.*"

Ideally, an approach to identify non-response bias is to compare the demographics of the respondents with the demographics of the population. However, strangers from all over the world can register (and leave) this virtual community freely. Only a pseudonym is needed in order to communicate with others in this virtual community. For birthday and gender, they feel free to decide whether they would like to provide or not provide such information, and they are never asked to report their education level and years of working experience. Hence, the virtual community does not record accurate demographic information thus making it impossible to compare the demographics of survey respondents with the demographics of the virtual community population. However, as mentioned previously, the male-dominated sample reflected the male-dominated virtual community membership. Also, the distribution of participants' tenure in the virtual community is consistent with the trend of the rapid development of this virtual

community in recent years. This hints at the possibility of that the study's sample population reflects the demographics of the population.

Further, the demographic information collected in this study echoes that of a previously published study by Chiu et al. (2006), whose research site is an IT-oriented virtual community in Taiwan. For example, the average age is 25.3 in this study, while it is 27.4 in Chiu et al.'s (2006); the average working experience is 3.3, while it is 4.7 in Chiu et al.'s (2006); the percentage of university level education in this study is 61.1%, while it is 57.4 in Chiu et al.'s (2006); and the percentage of college level education in this study is 24.9 %, while it is 21% in Chiu et al.'s (2006).

Finally, statistical analyses were performed to test for possible non-response bias. Time-stamp data collected with the questionnaire were used to differentiate the responses. That is, the responses were divided into three quartiles based on the submission time and were coded accordingly. Subsequently, Multivariate Analysis of Variance (MANOVA) was applied to test the omnibus difference between early and late responses, taking the continuous average score across each factor (e.g., average "knowledge sharing effort," average "social affiliation," average trust, etc.) as the dependent variables, and the categorical variable – submission time as the fixed factor. Wilks' Lambda of 0.953 (with P value = 0.18) for submission time revealed no omnibus differences between these groups. This suggests that on average, the earlier responses did not differ from the later ones.

In order to further double check non-response bias, following Armstrong and

Overton (1977)'s recommendations, T-tests were performed to compare the means between early and late responders for all the 13 major constructs and the five demographic variables. As shown in Table 6-2, only one major construct (i.e., enjoy helping) and one demographic variable (i.e., education) showed significant differences, similar to the level (1-2 significant variables) observed by Wakefield et al. (2008) and Ma and Agarwal (2007). Based on this result, early responders tended to have a higher education level. However, the difference between means (5.57 vs. 5.74) for the "enjoy helping" construct may not necessarily suggest that early responders enjoy helping others less, given the slight difference between the two means and the large sample size of this study. If the sample size were smaller, the significance level of this difference (showing whether or not this difference significantly differs from zero) would decrease (Meyers et al. 2006).

Table 6-2. Comparisons for early and late respondents

Constructs	Submission Time	Number	Mean	Sig. of Mean Differences (2-tailed)
Loss of knowledge power	Early	323	2.03	0.273
	Late	323	1.95	
Sharing effort	Early	323	3.26	0.606
	Late	323	3.21	
Social affiliation	Early	323	5.41	0.887
	Late	323	5.40	
Enjoy helping	Early	323	5.57	0.032
	Late	323	5.74	
Online status seeking	Early	323	5.02	0.538
	Late	323	4.97	
Knowledge self-efficacy	Early	323	5.14	0.514
	Late	323	5.20	
Online score reward	Early	323	4.54	0.126
	Late	323	4.39	

Reciprocity	Early	323	5.63	0.106
	Late	323	5.75	
Trust	Early	323	5.44	0.134
	Late	323	5.55	
Shared vision	Early	323	5.45	0.365
	Late	323	5.52	
Pro-sharing norms	Early	323	5.44	0.665
	Late	323	5.41	
Commitment	Early	323	5.31	0.601
	Late	323	5.27	
Intention to share knowledge	Early	323	5.44	0.280
	Late	323	5.52	
Gender	Early	323	1.06	1.000
	Late	323	1.06	
Age	Early	323	1.80	0.121
	Late	323	1.70	
Education	Early	323	6.90	0.000
	Late	323	6.58	
Tenure in the VC	Early	323	27.35	0.630
	Late	323	26.53	
Years of working experience	Early	323	3.45	0.090
	Late	323	3.10	

Based on all the above analyses and tests, it was concluded that non-response bias was unlikely a serious problem in this study.

6.2 Preliminary Analysis

As previously mentioned, data for estimating the research model and its associated thirteen latent variables were collected using seven-point Likert scales. A composite score was created for each latent variable by averaging the indicators. The descriptive statistics for each of these variables are outlined in Table 6-3.

As one can see, the means ranged from 2.01 to 5.64. For nine of the thirteen scores, the means ranged from 5.14 to 5.64, indicating that the distributions were

somewhat negatively skewed (i.e., they have a longer left tail). Only one distribution was positively skewed, given the low mean (2.01). This was also shown in the skewness scores (i.e., some were positive, while most were negative). Overall, there was little concern with regards to serious deviations from univariate normality, since all skewness values were below 2, and the kurtosis values were much below 7, as per the recommendation of Curran et al. (1996).

Four cases of rather large skewness and kurtosis (but within acceptable range) were in the distributions of the composite enjoy helping, reciprocity, trust, and loss of knowledge power. Three of them had a narrow and negatively skewed distribution that was comprised mostly with responses on the high-side, indicating that most participants enjoy helping others, perceive reciprocity, and trust others. One of them had a narrow and positively skewed distribution that was comprised mostly with response on the low-side, indicating that most participants do not fear of losing knowledge power when they share knowledge with others. While this may warrant transformation, this route was not chosen for the following five reasons.

First, transformed data are more difficult to interpret. Second, findings based on transformed data may not be compared with findings from previous studies using this scale. Third, simultaneous optimal transformation to multivariate normality of all of the variables can only marginally normalize this variable, as it has to maintain the normality of the rest of the variables.

Table 6-3. Descriptive Statistics for Composite Scores

Composite Score	N	Mean	Median	Std. Dev.	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis	Min	Max	VIF
Loss of power	968	2.01	2.00	1.00	1.51	0.08	3.24	0.16	1	7	1.24
Sharing effort	968	3.24	3.00	1.23	0.32	0.08	-0.45	0.16	1	7	1.19
Social affiliation	968	5.36	5.75	1.15	-1.31	0.08	1.92	0.16	1	7	1.65
Enjoy helping	968	5.63	6.00	1.02	-1.56	0.08	4.04	0.16	1	7	1.66
Status seeking	968	4.98	5.25	1.23	-0.84	0.08	0.63	0.16	1	7	1.57
Self-efficacy	968	5.14	5.50	1.12	-0.87	0.08	0.80	0.16	1	7	1.40
Online score	968	4.45	4.60	1.24	-0.40	0.08	-0.02	0.16	1	7	1.32
Reciprocity	968	5.63	6.00	0.96	-1.57	0.08	3.76	0.16	1	7	2.24
Trust	968	5.45	5.83	0.98	-1.50	0.08	3.47	0.16	1	7	2.30
Shared vision	968	5.46	5.75	1.08	-1.13	0.08	1.81	0.16	1	7	2.03
Pro-sharing norm	968	5.39	5.75	0.98	-1.15	0.08	1.76	0.16	1	7	1.51
Commitment	968	5.25	5.50	1.12	-0.71	0.08	0.60	0.16	1	7	1.60
Intention to share	968	5.44	5.80	0.99	-1.24	0.08	2.48	0.16	1	7	D.V.

Fourth, as Tabachnick and Fidell (2006, p.80) pointed out, "*In a large sample, a variable with statistically significant skewness often does not deviate enough from normality to make a substantive difference in the analysis. In other words, with large samples, the significance level of skewness is not as important as its actual size (worse the farther from zero) and the visual appearance of the distribution. In a large sample, the impact of departure from zero kurtosis also diminishes.*" For example, underestimates of variance associated with positive kurtosis (distributions with short, thick tails) disappear with samples of 100 or more cases; with negative kurtosis, underestimation of variance disappears with samples of 200 or more (Waternaux, 1976). Thus, the large sample size (i.e., 968) of the current study should diminish the impact of the skewness and kurtosis pretty much.

Lastly, an important reason is that PLS places minimal demands on variable distributions (Chin 1998b); and Wold (1982, p.200) even stated that "*The PLS approach is distribution-free*". Thus, the data could be used in later analytical procedure as is, given that the data is reasonably distributed within acceptable range.

Multicollinearity

Another concern that needed to be addressed was multicollinearity. Collinearity is a condition that exists when two predicators (i.e., independent variables) correlated very strongly (Meyers et al. 2006), indicating that they may be two similar measures of the same thing (Tabachnick and Fidell 2006). Correspondingly, Multicollinearity is a condition that exits when more than two predicators are very highly correlated. As a

general rule of thumb, it is recommended that two variables with a bivariate correlation in the middle 0.7s or higher should probably not be used in the same analysis (Allison 1999; Meyers et al. 2006; Tabachnick and Fidell 2006). As shown in Table 6-5, all the correlations in the current study were below the above cut-off. Based this criterion, multicollinearity was unlikely a serious problem in the current study.

Furthermore, the Variance Inflation Factor (VIF) was used to assess the multicollinearity. The VIF measures the degree of linear association between a particular independent variable and the remaining independent variables in the analysis. While a VIF value of 10 is considered problematic by Myers (1990) and Stevens (2002), Allison (1999) proposed a VIF value of 2.50 as a more conservative cut-off. As shown in the last column of Table 6-3, the VIF values for most variables were below 2.0, while the highest VIF was 2.30 (far below the cut-off of 10, and also below the conservative cut-off of 2.5). Thus, it was concluded that multicollinearity was not likely to be a serious problem in this analysis.

6.3 Measurement Model

Before actually testing the measurement model using PLS, a recommended step is to calculate the Cronbach alpha reliability coefficients for all multi-item scales. Except for the coefficient for the "knowledge self-efficacy" construct, all the coefficients calculated through SPSS 15.0 were above 0.80 (see Appendix G). The coefficient for the "knowledge self-efficacy" construct was 0.716, close to the 0.70 level considered acceptable for further data analysis (Cronbach 1951). To be conservative, there is a need

to further check the items of this construct. As shown in the "Item-Total Statistics" table in Appendix G, the Corrected Item-Total Correlation for the third item (which is the self-reported expertise) was 0.34, which is below the recommended rule of thumb of 0.40 (Hays and Hayashi 1990). This result is consistent with the result of the pilot study in which the loading of the third item was also low. Thus, this item was removed from this construct. In other words, the "knowledge self-efficacy" construct with two items left was used in the further data analysis.

Table 6-4. Result of Factor Analysis with a Promax Rotation (Pattern Matrix)

	Component												
	1	2	3	4	5	6	7	8	9	10	11	12	13
TR3	.928	-.028	.000	.007	-.026	-.048	.013	-.002	-.017	.002	.033	.001	-.001
TR2	.917	-.036	.035	.017	-.005	-.015	.027	-.053	-.003	-.008	-.007	-.061	-.011
TR4	.871	.006	-.007	-.013	.018	-.024	-.047	.056	.007	.026	.037	.009	.030
TR6	.838	.063	.028	-.008	.025	.000	-.054	.012	.010	.026	-.011	-.024	3.98E-005
TR1	.764	-.023	.040	.011	-.040	.025	.062	-.024	-.021	-.001	-.038	.020	-.006
TR5	.679	.034	-.068	-.040	.012	.099	.006	.036	.018	-.027	-.005	.073	.014
IK4	-.016	.988	.023	-.062	.001	.022	-.013	-.029	.011	-.059	-.035	-.038	.036
IK5	-.008	.934	.014	.015	.028	-.016	-.037	-.012	.021	-.044	-.005	.000	.033
IK3	.045	.831	-.007	.053	-.003	-.022	-.037	.033	-.047	.029	.035	.034	-.061
IK1	-.030	.829	.009	.006	-.024	.016	.091	.015	.025	.076	-.023	-.053	.017
IK2	.034	.810	-.012	.040	-.001	-.063	.014	.012	-.027	.020	.024	.074	.004
SR5	.065	.012	.856	-.022	-.011	-.027	.005	-.021	.034	-.087	-.027	.017	-.023
SR4	-.012	-.020	.841	-.022	-.030	-.102	.038	.024	-.029	-.013	.074	.042	.061
SR2	.019	.017	.825	.040	.002	.038	-.033	.013	.004	.008	-.020	.017	-.044
SR1	-.020	.034	.799	-.091	.051	.037	-.012	-.002	-.011	.033	.076	-.084	.016
SR3	-.014	-.003	.729	.101	.010	.099	.033	-.002	.010	.053	-.059	.044	-.061
EH3	.032	.062	-.001	.926	-.020	.032	-.005	-.048	.038	.007	-.037	-.073	-.015
EH4	-.007	.060	.028	.899	.016	.005	-.028	-.069	.022	.056	-.074	-.074	.011
EH1	-.059	-.030	-.037	.850	.003	-.028	.021	.059	-.009	-.022	.042	.027	.031
EH2	.030	-.079	-.010	.838	-.010	.009	.002	.105	-.044	-.060	.089	.079	-.011
PN3	.052	-.062	.003	.003	.929	-.021	-.011	.008	.020	.010	-.026	-.071	.025
PN2	-.081	-.003	.050	.010	.882	-.059	-.021	.015	.014	-.023	-.034	.020	.034
PN1	.011	.059	-.006	.029	.837	.047	.019	-.038	-.010	-.019	.047	-.013	-.033
PN4	.009	.028	-.041	-.060	.805	.032	.032	.024	-.016	.036	.007	.032	-.033

OS2	-.008	-.001	-.022	.011	-.004	.942	.021	-.024	-.009	-.022	.008	.027	-.009
OS3	.008	-.036	-.011	-.024	-.009	.930	-.014	.006	.014	.044	.019	-.016	.017
OS1	.041	.010	-.081	.043	-.005	.871	.038	.013	.006	-.070	.025	.055	-.023
OS4	-.044	-.018	.209	-.017	.004	.743	-.054	.010	-.028	.058	-.050	-.042	.062
CM1	-.024	-.023	-.001	-.002	.056	.052	.903	-.024	-.026	-.101	-.012	.049	-.006
CM3	.037	.005	-.006	.015	-.021	-.037	.874	.016	.024	.048	-.020	-.053	.043
CM2	.026	.013	.002	.013	.063	-.027	.868	-.013	-.023	-.044	.050	.046	-.032
CM4	-.022	.006	.029	-.035	-.087	.012	.770	.040	.023	.104	-.044	-.063	.030
SA2	.070	-.012	.000	-.032	-.001	.013	-.008	.923	.003	-.047	.001	-.063	.029
SA1	-.039	-.034	-.061	.017	.036	-.011	-.015	.869	.004	.041	.003	.017	.024
SA3	.065	.046	-.023	.037	.046	.071	-.021	.790	.007	-.033	-.049	-.065	-.062
SA4	-.097	.011	.111	.019	-.075	-.074	.072	.717	-.015	.045	.018	.109	-.004
LK1	.001	-.059	.048	.042	.037	-.008	.035	-.023	.863	.014	-.027	-.036	.022
LK2	.105	.005	-.036	.028	-.013	-.011	.036	-.088	.861	-.027	.004	.008	-.014
LK4	-.027	-.019	-.004	-.035	-.012	-.026	-.028	.079	.858	-.007	.006	.040	-.028
LK3	-.104	.076	-.002	-.029	.002	.038	-.052	.040	.753	.016	.057	.042	.023
SV3	-.015	-.012	.013	.031	.001	.019	.011	-.006	.039	.942	-.045	-.090	.017
SV4	.029	.014	-.021	-.006	.018	.005	-.028	-.019	-.040	.900	.030	-.001	-.036
SV1	.036	.006	.001	-.060	-.049	-.005	-.013	.031	.006	.895	-.041	-.042	.029
SV2	.002	-.027	-.029	.044	.066	-.040	.057	-.017	-.025	.680	.104	.223	-.026
SE4	.028	.060	-.017	-.056	-.022	.038	.052	.042	.041	-.028	.871	-.067	-.052
SE3	-.020	.059	-.047	-.020	-.049	.100	.040	-.020	.043	.069	.845	-.072	-.068
SE2	-.045	-.061	.077	.012	.034	.017	-.086	-.019	-.048	-.038	.745	.044	.106
SE1	.049	-.092	.053	.082	.026	-.148	-.045	-.029	-.004	-.014	.718	.032	.045
RP3	-.056	.007	-.005	.016	-.036	.033	-.009	-.006	.011	-.031	.001	.940	.036
RP2	.033	-.074	.054	-.058	-.022	-.035	-.016	.007	.042	-.016	-.070	.880	.005
RP4	.030	.078	-.037	-.004	.019	.040	.018	-.023	-.025	-.034	.037	.818	-.047
RP1	.158	.036	.002	.010	.050	.018	-.015	.014	.019	.128	-.050	.535	.010
KE2	-.021	.026	-.002	.003	-.013	.006	.035	.001	-.003	-.024	.012	-.026	.945
KE1	.054	.022	-.031	.021	.023	.032	-.007	-.002	.007	.032	.005	.043	.845

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
a Rotation converged in 8 iterations.
Total variance explained: 74.67%

Since PLS (or any variance-based approach to structural equation modeling) tends to bias the results toward higher estimates for indicator loadings in the measurement model (Chin 1998b; Chin et al. 2003; Keil et al. 2000), in order to be conservative, Principal Components Analysis (PCA) in SPSS was used to produce the factor loadings.

Table 6-4 provides the rotated loadings of principal components factor analysis; an oblique rotation (i.e., Promax) was utilized, following Meyers et al.'s 2006 recommendation[32]. As shown in Table 6-4, thirteen factors (components) were extracted, accounting for about 75% of the total variance. These thirteen factors were consistent exactly with the thirteen theoretical constructs. Furthermore, the indicators loaded much more strongly on the corresponding construct than on other factors in the model. (Further analysis using SmartPLS 2.0 found similar, but higher, loadings. And all item-loadings were greater than 0.70, the level that is generally considered acceptable (Fornell and Larcker 1981). For more details about the factor loadings statistics and the cross-loadings produced by PLS, see Appendix H.)

Next, PLS was used to further assess the inter-item reliability, convergent validity, and discriminant validity of the measures. Specifically, SmartPLS 2.0 was used to calculate the composite scale reliability (CR; Chin 1998b; Fornell and Larcker 1981; Werts et al. 1974) and average variance extracted (AVE; Chin 1998; Fornell and Larcher 1981). CR was used to assess the inter-item reliability, by measuring the internal consistency of a given block of indicators (Werts et al. 1974). The AVE was used to examine the convergent validity of the constructs, which attempted to measure the amount of variance that a latent variable component captured from its indicators relative

[32] For the rotation strategy, it is recommended that researchers could initially perform an oblique rotation solution (Meyers et al 2006). If the factor correlations are generally in the range of the high .3s or better, most researchers would probably opt to work with an oblique rotation. Thus, an oblique rotation (i.e., Direct Oblimin) was utilized. The component correlation matrix showed that 36% factor correlations were above the above criterion. Furthermore, an analysis using a common Varimax rotation method found similar, but slightly lower, loadings.

to the amount due to measurement error.

Table 6-5 summarizes the results of these analyses. As one can see, Cronbach's alphas exceeded 0.80. The lowest CR was 0.88, compellingly exceeding the recommended "0.70" threshold value (Fornell and Larcker 1981). The AVE of all measures were much higher than the cut-off value of 0.50 (Fornell and Larcker 1981) with the lowest AVE of 0.65. These results demonstrate the inter-item reliability and convergent validity of the measures. Moreover, AVE of each construct exceeds the intercorrelations of the construct with the other constructs in the model, in support of discriminant validity (Fornell and Larcker 1981; Gefen et al. 2000).

Additionally, the discriminant validity can also be assessed through inspection of the cross-loadings (in Table 6-4 and/or Appendix H), which are not substantial in magnitude compared with the loadings (Chin 1998b; Fornell and Bookstein 1982; Hulland 1999).

Based on the above reliability and construct validity analyses, it can be concluded that the model constructs had adequate reliability as well as convergent and discrminant validity. So far, the measures developed in this study have been validated and assessed by three major steps: 1) four rounds of sorting exercises, 2) pretest (i.e., pilot study), and 3) measurement model test with the full study data collected in the field setting. These procedures have ensured the reliability and validity of these measures and meet the requirements specified in the research design in the previous chapter.

Table 6-5. Construct correlations, AVE, CRs, and Cronbach's Alpha

	AVE	CR	Cron-bach's Alpha	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Affiliation	0.70	0.90	0.86	**0.84**												
2. Commit	0.75	0.92	0.89	0.41	**0.86**											
3. Efficacy	0.87	0.93	0.85	0.27	0.22	**0.93**										
4. Effort	0.65	0.88	0.82	-0.05	-0.22	-0.01	**0.80**									
5. Ehelping	0.78	0.93	0.90	0.50	0.31	0.43	-0.09	**0.88**								
6. Intention	0.80	0.95	0.94	0.46	0.54	0.40	-0.17	0.56	**0.90**							
7. Norms	0.75	0.92	0.89	0.35	0.42	0.26	-0.09	0.30	0.48	**0.86**						
8. Power	0.70	0.90	0.86	-0.16	-0.16	-0.05	0.33	-0.21	-0.23	-0.17	**0.84**					
9. Reciprocity	0.70	0.90	0.86	0.47	0.47	0.35	-0.06	0.43	0.55	0.52	-0.13	**0.84**				
10. Score	0.66	0.91	0.88	0.18	0.21	0.24	0.07	0.19	0.23	0.20	0.07	0.30	**0.81**			
11. Status	0.79	0.94	0.91	0.38	0.31	0.38	0.01	0.34	0.33	0.23	-0.03	0.37	0.46	**0.89**		
12. Trust	0.71	0.94	0.92	0.46	0.49	0.39	-0.11	0.46	0.58	0.48	-0.26	0.66	0.24	0.37	**0.84**	
13. Vision	0.77	0.93	0.90	0.40	0.50	0.35	-0.17	0.42	0.61	0.47	-0.19	0.62	0.23	0.32	0.62	**0.88**

Note. Diagonal elements are correlations of each construct with its measures (square roots of AVE). Off-diagonal elements are correlations between constructs.

The next concern that should be addressed in the data analysis is common method variance.

6.4 Assessment of Common Method Variance

Common method variance (Campbell and Fiske, 1959; Fiske, 1982) should be considered in behavioural studies when the data are self-reported and the independent and criterion data are collected concurrently. Common method bias may result from social desirability and consistency motif (Podsakoff et al. 2003; Podsakoff and Organ 1986). Social desirability is labeled because questionnaire items may prompt responses that will present the person in a favorable light; and consistency motif refers to that respondents have an urge to maintain a consistent line in a series of answers (Podsakoff and Organ 1986).

Studies have shown that social desirability and consistency motif may occur when self-report data was collected in the real world, especially in organizational research, for example: when asking supervisors about their "structuring behaviors", or scaling job attitudes and tension, or soliciting respondents' perceptions of an external environmental variable (for example the supervisor's behaviour, formalization of organizational process) (Podsakoff and Organ 1986; Williams et al. 2003). However, in the current research setting, i.e., an online virtual community, where millions of strangers from all over the world communicate with others using pseudonyms, the problem of social desirability and consistency motif may be less serious than that is in the real world. Further, in the current study, the participants were not asked to report their identifications and employing

organizations (and they were not asked to report this information when they registered in the virtual community either). These natures of the current study should have made the participants "*less likely to edit their responses to be more socially desirable, lenient, acquiescent, and consistent with how they think the researcher wanted them to respond*" (Podsakoff et al. 2003, p.888), and thus make the common method bias less serious.

Furthermore, statistical analyses were performed to assess the severity of common method bias. The first statistical procedure used in an attempt to control for common method variance was Harman's one-factor test. In this procedure, all of the variables of interest were entered into a factor analysis. Following this, the results of the unrotated factor solution were examined to determine the number of factors that are necessary to account for the variance in the variables (Podsakoff and Organ 1986). This technique would indicate whether a single factor emerged or one general factor accounted for a majority of the covariance among the measures (Podsakoff et al. 2003; Schriesheim 1980). Results of exploratory factor analysis (see Appendix I) showed that thirteen factors were extracted and the first factor accounted for 30.4 percent (this number was smaller, and thus better, than the percentage (34%) of Wakefield et al. (2008)). Hence, common method bias did not likely contaminate the results because multiple factors emerged and no single factor accounted for a majority of the covariance (Podsakoff and Organ 1986; Wakefield et al. 2008).

The second statistical procedure to assess common method variance was proposed by Liang et al. (2007) who followed Podsakoff et al. (2003) and Williams et al. (2003).

Following Liang et al.'s (2007) detailed instructions, a common method factor whose indicators included all the principal constructs' indicators was included in the PLS model; and then each indicator's variances substantively explained by the principal construct and by the method were calculated. As shown in Appendix J, the results demonstrated that the squared values of the method factor loadings was 0.0046, while the squared values of the substantive factor loadings was 0.739. As Williams et al. (2003, p.916) state, "*the squared values of the method factor loadings can be interpreted as the percent of indicator variance that is method biased (while the squared loadings linking the substantive latent variables with their indicators interpreted as the percent of substantive variance).*" Thus, the squared values of the method factor loadings (i.e., 0.0046) indicates that only 0.46% of indicator variance was method biased in the current study (Williams et al. 2003). Liang et al. (2007) use another (but similar) criterion, i.e., the ratio of substantive variance to method variance. Following Liang et al. (2007), the average method-based variance of the current study was 0.0046, while the average substantively explained variance of the indicators was 0.739[33]. The ratio of substantive variance to method variance was about 161:1. This ratio was much larger (and thus better) than Liang et al.'s (2007) ratio (i.e., 42:1), indicating a very small magnitude of method variance. In addition, while all of the substantive factor loadings were very significant (at $p<0.0001$, with an average T-statistics of 44), most method factor loadings were not significant. The ratio of the average t-value for the substantive factor loadings to the

[33] In Liang et al.'s (2009) study, the average substantively explained variance of the indicators is .67, while the average method-based variance is .016. The results of the current study seem to be better.

average t-value for the method factor loadings was about 53:1, showing that the significance levels for the method factor loadings were much less than those for the substantive factor loadings. In sum, it was concluded that the common method variance was limited and the related bias was unlikely to be a serious concern for the current study.

6.5 Model and Hypothesis Testing

The structural model was evaluated using SmartPLS 2.0 with bootstrapping to estimate the significance of the path coefficients. All variables (i.e., predictor, moderator, and dependent variables) were modeled as latent variables or constructs with reflective indicators. Following Chin et al (2003), the main effect model was evaluated first. Then, the interaction effects were added and the interaction model was evaluated.

6.5.1 Main effects model

The main effects model was estimated using 500 iterations of the bootstrapping technique in SmartPLS 2.0. Figure 6-1 presents the estimates of the main effects model[34]. The explanatory power of the main effects model was evaluated by looking at the R^2 value in the dependent variable – intention to share knowledge. The R^2 value indicates that the main effects model explained 57.1 percent of the variance for the intention to share knowledge. The data supported hypotheses 4, 6, 9, 10, 11, &12.

[34] To make the model look trim, the constructs in the main effect model and the following interaction model are represented by rectangles, although latent variables are conventionally represented by ovals or circles. This is consistent with the style in some top-tier journals, such as *MIS Quarterly*, where constructs are represented by rectangles.

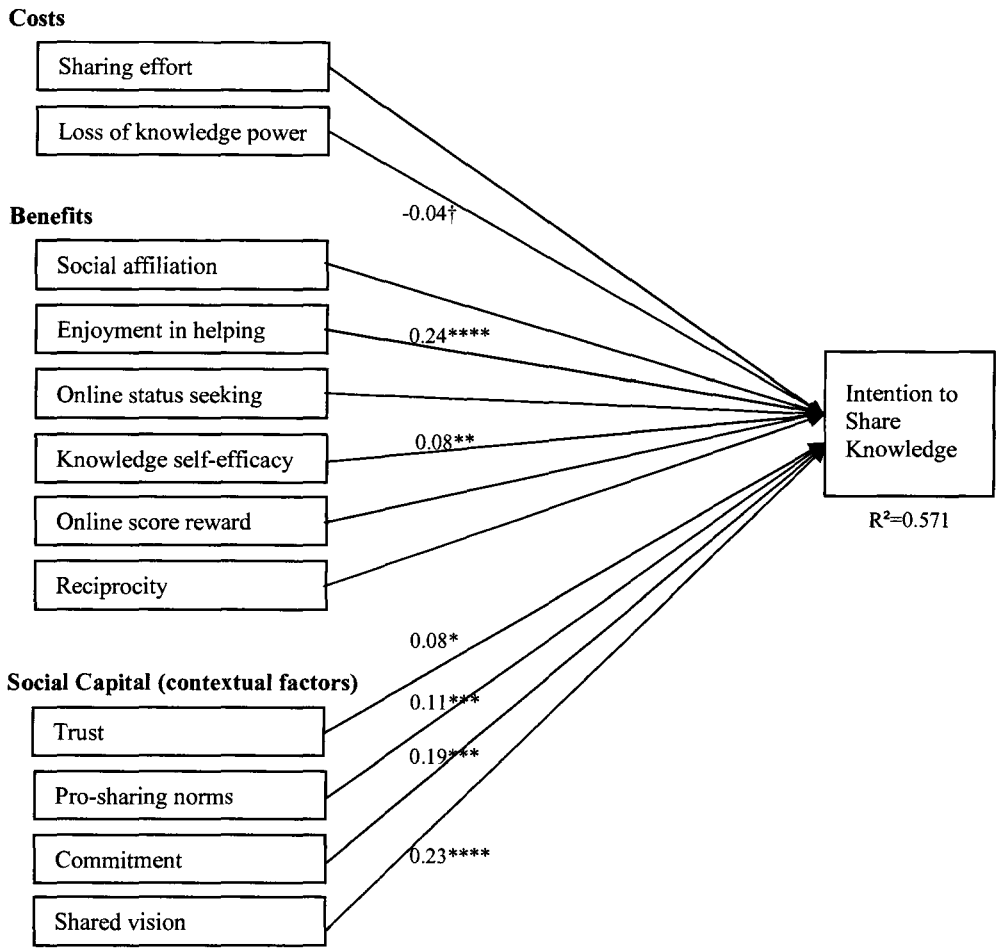


Figure 6-1. Theoretical Model Test (Main Effects Model)

As shown in Figure 6-1 and Table 6-6, none of the two cost-related hypotheses were fully supported, albeit both were negative as hypothesized.

Table 6-6. Path Significance Tests (Main Effects Model)

	Path Coefficient	Standard Deviation	Standard Error	T Statistics	P-Value	Hypothesis Test
Affiliation -> Intention	0.047	0.033	0.033	1.408	0.1595	Not supported

Commit -> Intention	0.193	0.039	0.039	5.004	<.0001	Supported
Efficacy -> Intention	0.081	0.031	0.031	2.604	0.0094	Supported
Effort -> Intention	-0.036	0.024	0.024	1.502	0.1334	Not supported
Ehelping -> Intention	0.244	0.038	0.038	6.485	<.0001	Supported
Norms -> Intention	0.110	0.032	0.032	3.456	0.0006	Supported
Power -> Intention	-0.040	0.024	0.024	1.693	0.0908	Not supported
Reciprocity -> Intention	0.039	0.043	0.043	0.907	0.3646	Not supported
Score -> Intention	0.017	0.028	0.028	0.629	0.5295	Not supported
Status -> Intention	-0.008	0.028	0.028	0.290	0.7719	Not supported
Trust -> Intention	0.083	0.040	0.040	2.065	0.0392	Supported
Vision -> Intention	0.227	0.039	0.039	5.842	<.0001	Supported

Two of the six hypotheses relating to benefits (motivations) were supported: 1) "enjoyment in helping" significantly ($p<0.0001$) and positively related to the intention to share knowledge; and 2) knowledge self-efficacy significantly ($p<0.01$) and positively related to the intention to share knowledge. However, hypotheses 3, 5, 7& 8 were not supported.

Regarding the factors derived from the social capital theory, all of the four hypotheses were supported. As hypothesized, trust, pro-sharing norms, commitment, and shared vision positively and significantly ($p<0.05$, $p<0.001$, $p<0.001$, $p<0.0001$ respectively) related to the intention to share knowledge.

Based on the main effects model, the interaction model was created by incorporating the moderation effects of certain social capital factors on the relationship between the factors pertaining to social exchange theory and the dependent variable – intention to share knowledge, following Chin et al.'s (2003) instructions.

6.5.2 Interaction model

The interaction model incorporates not only the main effects but also the interaction effects (Chin et al. 2003). Similar to the predictor and dependent variables in the main effects model, the interaction variables (i.e., moderator variables) are also viewed as latent variables or constructs. Product indicators reflecting the latent interaction variables were created by multiplying the indicators from the predictor and the moderator variables. In order to reduce the potential for multicollinearity, the variables were mean-centered at the indicator level prior to create the interaction variables (Aiken and West 1991; Chin et al. 2003; Venkatesh et al. 2008). The interaction model and hypothesized relationships were estimated using 500 iterations of the bootstrapping technique in SmartPLS 2.0.

6.5.2.1 Assessment of Multicollinearity

Given the inherent overlap between the main effect terms and interaction terms, there may be a potential for multicollinearity. In order to assess multicollinearity in the interaction model, the variance inflation factors (VIFs) were examined. A composite score for each interaction construct was created by averaging all the scores of the product indicators for this interaction construct (i.e., all the scores of the product indicators were summed and then divided by the number of product indicators). Then SPSS 15.0 was used to calculate the VIFs based on the composite scores. As Table 6-7 shows, all VIFs were less than the cut-off value of 2.5 recommended by Allison (1999), suggesting that multicollinearity was not a serious problem in the interaction model analyses. Further,

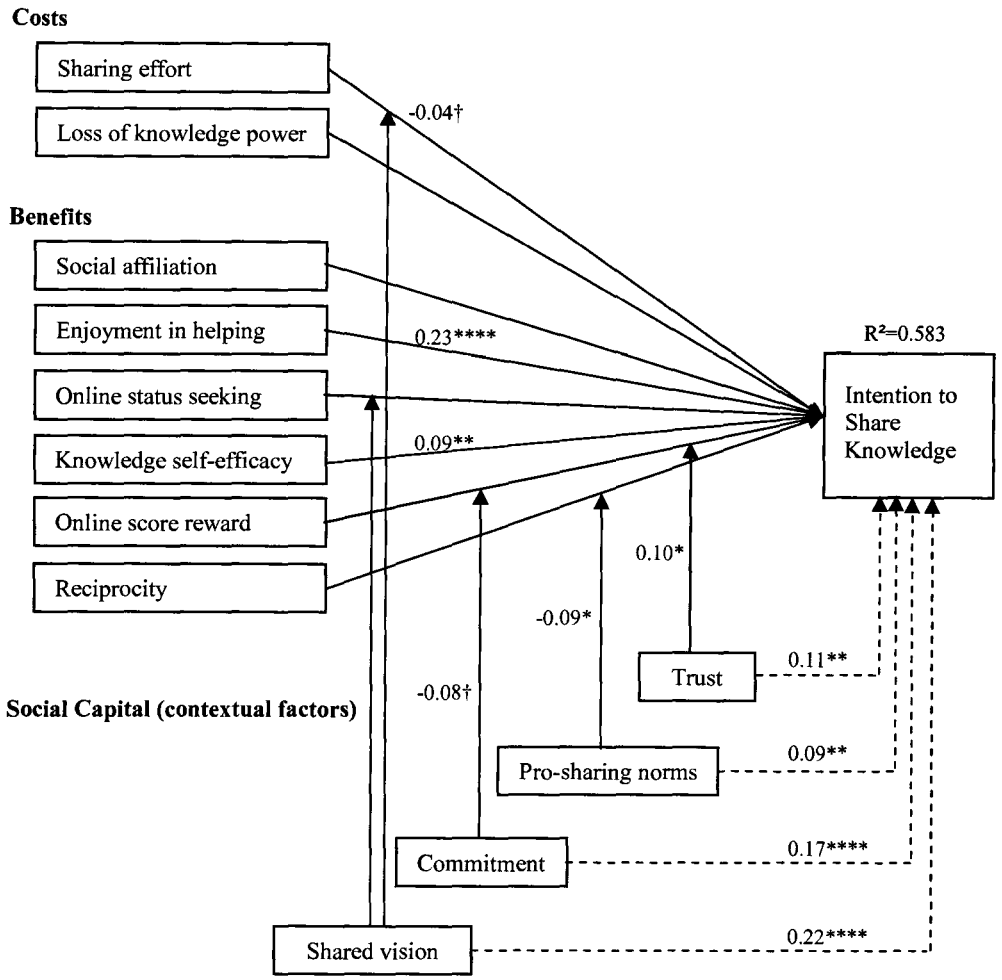
mean-centering largely remedies the potential problems for multicollinearity (Aiken and West 1991; Venkatesh et al. 2008).

Table 6-7. Variance Inflation Factors (VIFs) for the Interaction Model

Composite Score	N	Mean	Median	Std. Dev.	Tolerance	VIF
Loss of knowledge power	968	2.01	2.00	1.00	0.79	1.27
Sharing effort	968	3.24	3.00	1.23	0.81	1.23
Social affiliation	968	5.36	5.75	1.15	0.60	1.66
Enjoy helping	968	5.63	6.00	1.02	0.59	1.70
Online status seeking	968	4.98	5.25	1.23	0.63	1.59
Knowledge self-efficacy	968	5.14	5.50	1.12	0.69	1.45
Online score reward	968	4.45	4.60	1.24	0.75	1.33
Reciprocity	968	5.63	6.00	0.96	0.42	2.37
Trust	968	5.45	5.83	0.98	0.41	2.47
Shared vision	968	5.46	5.75	1.08	0.47	2.12
Pro-sharing norms	968	5.39	5.75	0.98	0.64	1.55
Commitment	968	5.25	5.50	1.12	0.61	1.63
Reciprocity * Pro-sharing norms	968	0.47	0.23	1.66	0.53	1.89
Online score reward * Trust	968	0.26	0.05	1.84	0.56	1.80
Online score reward*Commitment	968	0.26	0.06	1.79	0.62	1.60
Online status seeking*Shared vision	968	0.42	0.14	1.88	0.62	1.60
Sharing effort*Shared vision	968	-0.22	-0.07	1.51	0.86	1.16
Intention to share knowledge	968	5.44	5.80	0.99	Dependent Variable	

6.5.2.2 Moderation effect tests

Figure 6-2 and Table 6-8 show the detailed test results for the interaction model. As one can see, the impact of reciprocity on the intention to share knowledge was moderated by the level of pro-sharing norms that participants perceived. In essence, when pro-sharing norms were perceived to be at a higher level, the impact of reciprocity on the intention to share knowledge was lower. Conversely, when pro-sharing norms in a virtual community were perceived to be weak, reciprocity played a more important role in influencing them to share knowledge with others in this virtual community. Thus, hypothesis 14 was supported ($p<0.05$).



†p<.10, *p<.05, **p<.01, ***p<.001, ****p<.0001

Figure 6-2. Theoretical Model Test (Interaction Model)

As Figure 6-2 indicates, trust moderates the relationship between an online score reward and the intention to share knowledge. In essence, the influence of the online score reward on the intention to answer questions posted in a virtual community is positively moderated by how much an individual trust in the knowledge seekers in the virtual

community. Given that the score reward will be given by the knowledge receivers (i.e., the persons who ask the questions) based on an evaluation of the quality of the answers, the potential knowledge provider (i.e., the individual who intends to answer the questions asked) may be wondering whether the knowledge receivers would eventually give the score reward, and/or whether the amount of score is fair. As such, the impact of the online score reward on the intention to share knowledge is contingent upon whether the potential knowledge provider trusts the knowledge seekers. If the potential knowledge provider does not trust the people who ask the questions (i.e., doubt whether the persons asking questions would give a fare score reward), the promised online score would not motivate the potential knowledge provider to share his or her knowledge. Thus, hypothesis 13 was supported ($p<0.05$).

Table 6-8. Path Significance Tests (Interaction Model)

	Path Coefficient	Standard Deviation	Standard Error	T Statistics	P-value	Hypothesis Test
Affiliation -> Intention	0.043	0.0332	0.0332	1.2963	0.1952	Not supported
Commit -> Intention	0.1747	0.0374	0.0374	4.6675	<.0001	Supported
Effort*Vision -> Intention	-0.0016	0.0498	0.0498	0.0316	0.9748	Not supported
Efficacy -> Intention	0.0903	0.0305	0.0305	2.9572	0.0032	Supported
Effort -> Intention	-0.0423	0.0238	0.0238	1.7781	0.0757	Not supported
Ehelp -> Intention	0.2339	0.037	0.037	6.3196	<.0001	Supported
Norm -> Intention	0.0911	0.0282	0.0282	3.2317	0.0013	Supported
Power -> Intention	-0.0319	0.0242	0.0242	1.3171	0.1881	Not supported
Reciproc. *Norm -> Intention	-0.0932	0.0384	0.0384	2.4245	0.0155	Supported
Reciprocity -> Intention	0.0316	0.0428	0.0428	0.7366	0.4615	Not supported
Score*Commit -> Intention	-0.0755	0.0406	0.0406	1.8589	0.0633	Not supported
Score*Trust -> Intention	0.0978	0.0439	0.0439	2.2268	0.0262	Supported
Score -> Intention	0.0094	0.0283	0.0283	0.3327	0.7394	Not supported
Status*Vision -> Intention	0.039	0.0341	0.0341	1.1427	0.2534	Not supported
Status -> Intention	-0.0027	0.0299	0.0299	0.0913	0.9273	Not supported
Trust -> Intention	0.1125	0.0408	0.0408	2.7597	0.0059	Supported
Vision -> Intention	0.2164	0.0413	0.0413	5.2331	<.0001	Supported

The significance level for the moderation effect of commitment on the relationship between an online score reward and the intention to share knowledge was $p<0.063$ (with t-value of 1.86, as shown in Table 6-8). This result is not significant because it was below the conventional cut-off of statistical significance (i.e., 0.05).

As for the remaining two moderation effects, i.e., the moderation effect of shared vision on the relationship between sharing effort and the intention to share knowledge as well as the moderation effect of shared vision on the relationship between online status seeking and the intention to share knowledge, they were not significant (Table 6-8 provides the p-values and t-values). Thus, hypothesis 16 and hypothesis 17 were not supported.

Further, the magnitude of the moderating effects was assessed by comparing the R^2 for this interaction model with the R^2 for the main effects model, which excluded the interaction terms (Chin et al. 2003). As shown in Figure 6-2, the R^2 for the interaction model was 0.583, while the R^2 for the main effects model was 0.571 (found in Figure 6-1). Following Chin et al. (2003), Cohen's f^2 for the hypothesized interactions was calculated[35], which represents the extent to which a phenomenon is present in a given population sample. The f^2-statistics was 0.03, indicating that the magnitude of the interaction effects is in the range between small and medium.

Generally, the moderating effects have been difficult to detect. As Chin et al.

[35] Cohen's f^2 is calculated as: $f^2 = [R^2(\text{interaction model}) - R^2(\text{main effects model})]/[1 - R^2(\text{main effect model})]$. For f^2, values of 0.02, 0.15, and 0.35 are considered to be small, medium, and large effect sizes respectively (Cohen 1988; Chin et al. 2003).

(2003) reported, of the 8110 published articles over a 15-year period for the IS journals they reviewed, only 74 articles contained moderator variables. Further, among the studies employing moderators (i.e., contingency studies), only 21 percent of the moderators tested were found to be significant. While most (71%) of the contingency studies they reviewed did not report the magnitude of the moderating effects, the remaining moderator estimates only yielded small to medium effects. Thus, even with a small-to-moderate size of the moderation effects, these estimates in the current study are precious, given the general moderation effects' significance level in the area mentioned above. And these results help inform us of the conditions (namely trust and norms) under which the online score reward and reciprocity become factors motivating people to share knowledge with others in virtual communities.

6.5.3 Model Fit Measure

Compared with the covariance-based structural equation modeling (SEM) analysis (e.g., LISREL, AMOS), PLS (as a variance-based approach to SEM) does not provide overall model fit (or goodness of fit) indices, such as Chi-square, CFI, AGFI, etc. (Chin 1998a; Gefen et al. 2000). Fortunately, a global fit measure for PLS path modeling, GoF ($0 \leqslant$ Gof $\leqslant 1$), has recently been suggested by Tenenhaus et al. (2005). GoF is defined as the geometric mean of the average communality and average R^2 (for endogenous constructs). Corresponding to this definition, the equation to calculate GoF is as follows:

$$GoF = \sqrt{(\text{Average (AVE)} * \text{Average } (R^2))}$$

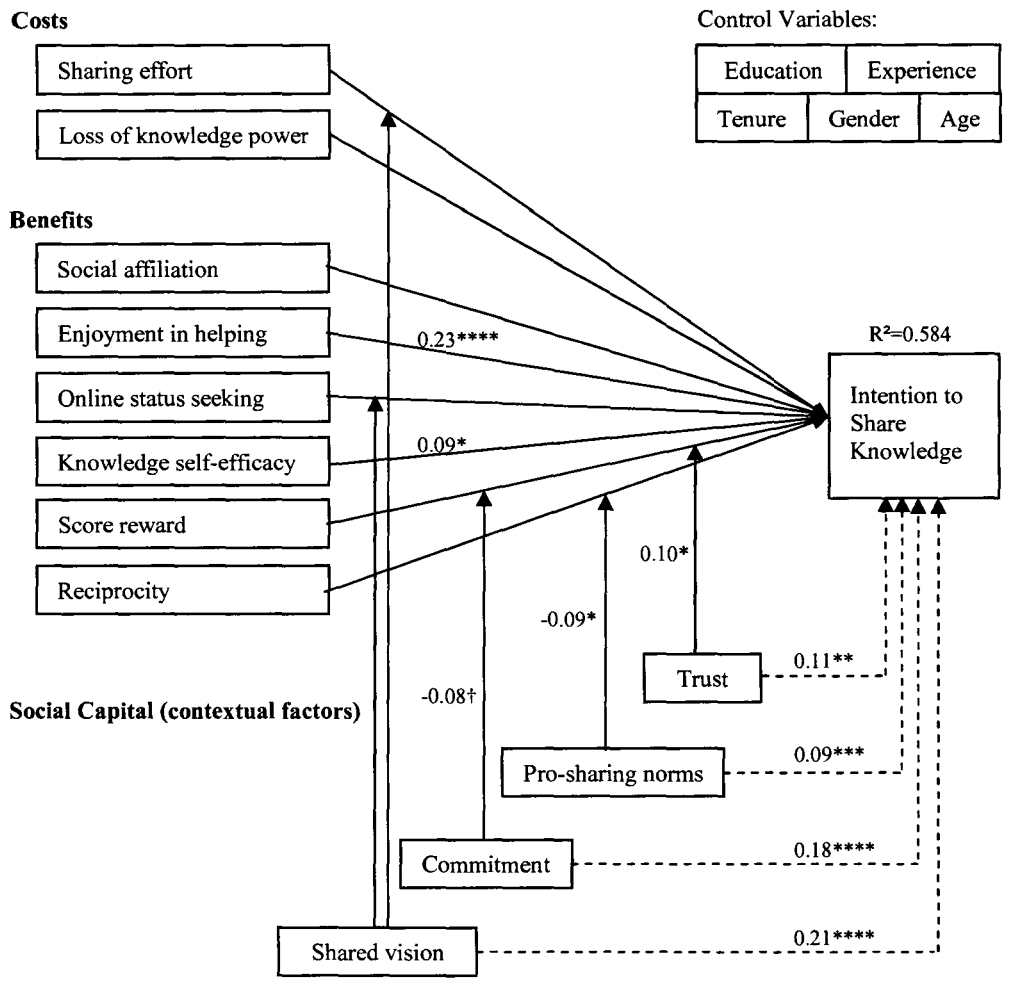
Furthermore, Wetzels et al. (2009) derived the following GoF criteria[36] for small, medium, and large effect sizes of R^2: GoF(small) = 0.1, GoF(medium) = 0.25, GoF(large) = 0.36, in line with the effect sizes for R^2 (small: 0.02; medium: 0.13; large: 0.26) proposed by Cohen (1988).

Calculated by substituting the values respectively in the above equation, the GoF value for the interaction model of the current study was 0.6569. Compared to the above baseline values for validating the PLS model globally (Tenenhaus et al. 2005; Wetzels et al. 2009), a GoF value of 0.6569 exceeds the large effect size cut-off value of 0.36, indicating that the interaction model[37] in the current study performed well.

[36] Because communality equals AVE in the PLS path modeling approach, Wetzels et al. (2009) proposed a cut-off value of 0.5 for communality, as suggested by Fornell and Larcher (1981). Then Wetzels et al. (2009) calculated the Gof (as the criteria or cut off) by substituting the minimum average AVE of 0.50 and the effect sizes for R^2 in the equation defining GoF: GoF = $\sqrt{}$(Average (AVE) * Average (R^2)).

[37] As for the main effects model, a GoF value of 0.6501, which exceeds the cut-off value of 0.36, indicates that the main effects model also performs well.

6.6 Control Variables



†p<.10, *p<.05, **p<.01, ***p<.001, ****p<.0001

Figure 6-3. Theoretical Model (Interaction Model) with Control Variables

Further analysis was carried out to assess the impacts of the control variables, in order to make sure the significant results were not due to covariation with these variables. In organizational contexts, prior studies suggest that education (Constant et al. 1994),

work experience (Constant et al. 1994), gender (Jarvenpaa and Staples 2000), and age (Jarvenpaa and Staples 2000) may affect knowledge sharing behaviours. In the context of virtual communities, past studies also suggest that tenure in field (representing how much experience an individual has, Wasko and Faraj 2005), and tenure in the virtual community (Ma and Agawal 2007) may have influences on knowledge sharing. These control variables (education, experience, tenure in the virtual community, gender, and age) were included in the model together with the 12 main effects construct and 5 interaction terms. Then the new model was tested using 500 iterations of the bootstrapping technique in SmartPLS 2.0. The results were shown in Figure 6-3 and Table 6-9.

Table 6-9. Path Significance Tests (Interaction Model) with Control Variables

	Path Coefficient	Standard Deviation	Standard Error	T Statistics	P-value	Hypothesis test
Affiliation -> Intention	0.0419	0.0326	0.0326	1.2853	0.199	Not supported
Age -> Intention	-0.0027	0.0297	0.0297	0.0921	0.9266	Not significant
Commit -> Intention	0.1788	0.035	0.035	5.1026	<.0001	Supported
Edu -> Intention	-0.0188	0.0285	0.0285	0.6608	0.5089	Not significant
Efficacy -> Intention	0.0889	0.0347	0.0347	2.561	0.0106	Supported
Effort -> Intention	-0.0382	0.026	0.026	1.469	0.1422	Not supported
Effort * Vision -> Intention	-0.0035	0.0497	0.0497	0.0697	0.9444	Not supported
Ehelping -> Intention	0.2344	0.0357	0.0357	6.5669	<.0001	Supported
Gender -> Intention	0.0084	0.0217	0.0217	0.3892	0.6972	Not significant
Norms -> Intention	0.0934	0.0271	0.0271	3.4425	0.0006	Supported
Power -> Intention	-0.0351	0.0238	0.0238	1.4743	0.1407	Not supported
Reciprocity -> Intention	0.0314	0.0426	0.0426	0.7379	0.4608	Not supported
Recip. * Norms -> Intention	-0.0906	0.0399	0.0399	2.2716	0.0233	Supported
Score -> Intention	0.0083	0.0293	0.0293	0.2825	0.7776	Not supported
Score * Commit -> Intention	-0.075	0.0388	0.0388	1.9338	0.0534	Not supported
Score * Trust -> Intention	0.0974	0.0421	0.0421	2.3144	0.0209	Supported
Status -> Intention	-0.0014	0.0302	0.0302	0.0479	0.9618	Not supported
Status * Vision -> Intention	0.0366	0.0367	0.0367	0.9975	0.3188	Not supported
Tenure -> Intention	-0.0329	0.0271	0.0271	1.216	0.2243	Not significant
Trust -> Intention	0.1126	0.0395	0.0395	2.8527	0.0044	Supported
Vision -> Intention	0.2141	0.0398	0.0398	5.3848	<.0001	Supported
YofExp -> Intention	0.0364	0.0417	0.0417	0.8738	0.3824	Not significant

As one can see in Figure 6-3 and Table 6-9, the significant main effects were still significant, and the non-significant main effects were still not significant, with similar t-values as before (i.e., those shown in Table 6-8). The impact of sharing effort was still not significant, with a slightly decrease of t-value (from 1.78 to 1.47). All of the five interaction terms remained almost exactly the same as those found in Table 6-8. Further, none of the control variables had a significant impact on the intention to share knowledge. After including the control variables, the R^2 for the dependent variable changed very slightly, from 0.583 to 0.584. Thus, the inclusion of the control variables did not significantly increase the variance explained.

Based on the above test results, it can be concluded that the results of hypotheses tests in the interaction model (shown in Table 6-8) was stable and independent of control variables.

Chapter 7: Discussion and Conclusion

The previous chapter described how costs, benefits, and social capital factors influence an individual's willingness to share knowledge with others in virtual communities. Also, it demonstrated how the impacts of some costs and benefits are contingent upon social capital factors.

Building on the theories, research models, and results presented in previous chapters, the goal of this chapter is five-fold: 1) to address the study's research questions; 2) to outline its theoretical contributions; 3) to discuss its strengths and limitations; 4) to suggest future research directions; and 5) to indicate implications for practice.

7.1 Answers to Research Questions

Two research questions raised at the beginning of this study were: 1) whether costs and benefits really do affect an individual's intention to share knowledge with others in a virtual community; and 2) whether the impacts of costs and benefits are contingent upon certain social capital factors. Corresponding to these two research questions, the aim of this study was two-fold: 1) to test the main effects model with the direct effects of costs, benefits, and social capital factors on an individual's intention to share knowledge; and 2) to test the interaction model which was created by incorporating the interaction effects into the main effects model. The results of the main effects model and the interaction model can be used to answer these two research questions respectively.

7.1.1 Main Effects (research question 1)

The results of the main effects model showed that half of the factors under study have significant impacts on an individual's intention to share knowledge with others in a virtual community. In what follows, these results are discussed in sequence of costs, benefits, and social capital factors.

Costs

Although the impacts of the two costs of sharing effort and loss of knowledge power were not significant at the $p<0.05$ level (with $p=0.13$ and $p=0.09$ respectively), the two effects were actually negative as hypothesized.

Benefits

The benefits in the study's research model include two intrinsic benefits and four extrinsic benefits, which were factors derived from social exchange theory. Both of the two intrinsic benefits (i.e., enjoyment in helping and knowledge self-efficacy) had significant influences[38] on an individual's intention to share knowledge with others. These results are consistent with Kankanhalli et al.'s (2005) findings.

However, these significant results differ from the Wasko and Faraj (2005) study, where the effects of these two intrinsic benefits were not significant. One potential explanation for this difference between the two studies may be that in the virtual community of the current study, members use pseudonyms, while in the online

[38] As discussed early, the effects of the two intrinsic benefits seem to be direct (i.e., not contingent upon social capital factors), because intrinsic benefits are sought as ends desired by people and social capital factors would not play a significant role in influencing the value of the two benefits to the knowledge providers (Kankanhalli et al. 2005)

community of the Wasko and Faraj (2005, p.43) study, members use real names with "*the first and last names of the participants [being] visible as part of the message header*". As Wasko and Faraj (2005) point out, the weak influence of the two intrinsic motivations (i.e., benefits) in their study may be due to the non-anonymous nature of the online community in their study. Further, the online community (with 7,000 members) in Wasko and Faraj (2005) study is much smaller than the virtual community (with millions of registered members) in the current study. This difference (i.e., small community size) may be another reason that makes extrinsic rewards more salient than intrinsic returns to motivate people to share knowledge in Wasko and Faraj's (2005) study.

Consistent with the effect of image in Kankanhalli et al.'s (2005) study in the organizational context, the impact of online status seeking in the current study was not significant, given that online status seeking in the virtual community context is the counterpart of the image construct in the organizational context. However, the reputation construct in the Wasko and Faraj (2005) study was significant. The explanation for this difference is similar to the above. That is, while the virtual community in the current study has millions of registered member who use pseudonyms, the online community in Wasko and Faraj's (2005) study has only 7,000 members who use real names (with the first and last names visible as part of the message header). Thus, the nature of Wasko and Faraj's online community (i.e., the community is much smaller and people put real names on each message) makes reputations easier to develop. Reputation may therefore become a more salient motivator.

Consistent with Kankanhalli et al. (2005) and Wasko and Faraj (2005), the effect of reciprocity was not significant. Additionally, the direct effects of online score reward and social affiliation were not significant. However, rather than drawing the conclusion that these three extrinsic benefits (motivators) are not important in affecting people's intentions to share knowledge, there is a need to examine these extrinsic benefits under certain context and conditions (i.e., social capital factors). Before discussing the interaction effects between social capital factors and the extrinsic benefit factors, the direct effects of these social capital factors are first discussed below.

Social capital factors

As mentioned previously, the four factors (i.e., trust, pro-sharing norms, commitment, and shared vision) defining the social context and conditions for knowledge sharing were derived from social capital theory (Nahapiet and Ghoshal 1998; Putnam 1993). All of the direct impacts of these four social capital factors on individuals' intention to share knowledge were significant. These results are consistent with Nahapiet and Ghoshal's (1998) theory about the impact of social capital on creating and sharing intellectual capital (i.e., knowledge) in general, and consistent with the findings of prior studies (e.g., Wasko and Faraj 2005; Chiu et al. 2006; Hsu et al. 2007) in particular.

Specifically, consistent with Ridings et al. (2002), Chiu et al. (2006), and Hsu et al. (2007), trust has a significant influence on an individual's intention to share knowledge. Also, the direct impact of pro-sharing norms on an individual's intention to share knowledge was significant, indicating that when an individual feels that people in

the virtual community are open to conflicting views, tolerant for failure (Leonard-Barton 1995), open to criticism (Starbuck 1992; Leonard-Barton 1995), and willing to value and respond to diversity (Leonard-Barton 1995), this individual is more inclined to share knowledge with others.

The direct effect of commitment on an individual's intention to share knowledge was significant. Given the conceptual overlap between the commitment construct and the identification construct (Ashforth and Mael 1989), this result is consistent with Chiu et al. (2006). However, Wasko and Faraj (2005) did not get the significant effect of commitment; and they suspected that this might be due to other constructs' effects in their model.

As previously mentioned, commitment is defined as a "psychological attachment" (Kiesler 1971) to a person (Coleman 1990) or to a collective. Prior studies find that such psychological attachment to a collective exists in organizations (so called organizational commitment), and organizational commitment is positively related to certain social behaviours desired by the organization, such as knowledge sharing behaviours (Cabrera et al. 2006). People may suspect whether such a psychological attachment to a collective exists in virtual communities when participants are hundreds of thousands strangers using pseudonyms. The result of the current study shows that the psychological attachment to a virtual community does exists, and also has a positive influence on certain social behaviours desired by the community, specifically knowledge sharing behaviours. This finding implies that practitioners such as the builders (or founders) and managers of

virtual communities can promote and cultivate such a psychological attachment and then harvest the social behaviours desired by the community.

Finally, the direct effect of shared vision on an individual's intention to share knowledge was also significant, which is consistent with Chiu et al. (2006). This result is not surprising given that the reason for so many strangers coming together is that they wish to learn from each other, share knowledge with each other, and help each other. Such a shared vision acts as "a bonding mechanism" (Tsai and Ghoshal (1998, p. 467) that brings participants of the virtual community together to share their valuable resource – knowledge with each other. Given the nature of virtual communities (i.e., participants are strangers using pseudonyms, the population of strangers is very large, and participation is open, voluntary and unstable), virtual communities really need such a bonding system to bind members. This finding informs practitioners that they should highlight and strengthen this shared vision in order to bring people together, bind them tightly, in order to promote cooperative action (specifically knowledge sharing) between virtual community participants.

All the significant direct effects of the four factors mentioned above indicate that the social capital factors were very important in influencing individuals to decide to share their knowledge. Further, the importance of the four social capital factors was manifested not only by their direct effects on knowledge sharing, but also by their moderation effects on the impacts of some costs and benefits on knowledge sharing, These moderation effects are discussed below.

7.1.2 Interaction Effects (research question 2)

The second research question is: Are the impacts of costs and benefits on an individual's intention to share knowledge contingent upon certain social capital factors? This research question is answered by evaluating the interaction model.

The results of the interaction model test showed that the impact of an online score reward on a potential knowledge provider's intention to answer questions is contingent upon the potential knowledge provider's trust in the individuals asking the questions (i.e., the potential knowledge recipients). This is reasonable to expect because the online score was given to the knowledge provider by the knowledge recipient based on his or her evaluation of the quality of the answers the knowledge provider provided. Since the exchange between the knowledge and online score did not occur simultaneously, the members in the virtual community were strangers using pseudonyms, and the online score was a limited resource for everybody, it was possible that some knowledge recipients had the intention (or disposition) to refuse to give the score or give less score than deserved, given that the knowledge recipients had the authority to do so. Also, the potential knowledge recipients may not have enough competence to understand the answer and thus be unable to assess its quality fairly (Mayer el al. 1995). No matter if the knowledge recipients fail to intentionally or unintentionally give an online score fairly, the knowledge provider takes a risk when answering a question. Thus, the influence of an online score promised to an individual is contingent upon the knowledge provider's trust in the knowledge seekers. This trust implies a general belief in the knowledge recipient's

good intent, integrity, as well as competence to understand (and thus evaluate) an answer (Mayer el al. 1995).

Additionally, consistent with Kankanhalli et al. (2005)'s findings on the moderation effect of pro-sharing norms on the relationship between reciprocity and knowledge contribution in electronic knowledge repositories in an organizational context, the results of the current study showed that the impact of reciprocity on an individual's intention to share knowledge is moderated by pro-sharing norms in a virtual community. If an individual perceives that the virtual community has such norms (which can enhance the climate for knowledge sharing) as openness to conflicting views, failure (Leonard-Barton 1995), criticism (Starbuck 1992; Leonard-Barton 1995), and willingness to value and respond to diversity (Leonard-Barton 1995), this individual may share his or her knowledge without the need for extrinsic benefits (Nahapiet and Ghoshal 1998) such as reciprocity. In such a climate, potential knowledge providers would likely share their knowledge even in the absence of reciprocity benefits. Conversely, as Kankanhalli et al. (2005) point out, when pro-sharing norms are perceived to be weak, reciprocity may be a salient motivator for knowledge providers.

Finally, the remaining three interaction effects proposed, i.e., the moderation effect of commitment on the relationship between online score reward and the intention to share knowledge, the moderation effect of shared vision on the relationship between sharing effort and the intention to share knowledge, as well as the moderation effect of shared vision on the relationship between online status seeking and the intention to share

knowledge, were not significant. Apart from identifying the moderation effects that are significant as above, this study may also contribute to theory by unveiling the moderation effects that were not significant.

In what follows, theoretical contributions of this study are discussed in detail.

7.2 Theoretical Contributions

Given the empirical support for the stable theoretical model as well as the valid and reliable measures, this research contributes to the literature in several important ways.

First, this work goes beyond simply testing the direct effects of factors on knowledge sharing to testing the conditions for these effects, i.e., testing the moderation effects of social capital factors on the impacts of some costs and benefits. The results of this study show that the impact of extrinsic benefits, such as online score reward and reciprocity, appear to be moderated by social capital factors such as trust and pro-sharing norms. This indicates that the provision of extrinsic benefits alone may not be adequate motivators of knowledge sharing in virtual communities. By identifying the moderation effects, the current study provides a deeper understanding and closer explanation for people's willingness to share knowledge in virtual communities.

Second, to the best of the researcher's knowledge, this is the first study that developed a brand new construct – online score reward. Although the online sore reward has been designed and used for several years to motivate members to perform desired behaviours, specifically knowledge sharing behaviours in knowledge-based virtual communities, nobody has developed such a construct in academe. Borrowing ideas from

the organizational rewards construct (Bartol and Locke 2000; Kankanhalli et al. 2005), this new construct (online score reward) was created with multiple items (i.e., five questions) based on social exchange theory (Blau 1964). To ensure validity and reliability, this new construct was developed and validated following rigorous procedures including four rounds of sorting exercise (Q-sort), pre-test, and eventual empirical test, as recommended by Churchill (1979), Moore and Benbasat (1991) and Straub (1989). Furthermore, based on contingency theory (McKeen et al. 1994; Weill and Olson 1989), the conditions for the impact of this new construct on an individual's intention to share knowledge were examined. Specifically, as mentioned earlier, the impact of the online score reward on an individual's intention to share knowledge is contingent upon his or her trust in knowledge seekers.

Third, this study also developed two other constructs, social affiliation and online status seeking, by borrowing items from other areas (such as psychology and marketing) and refining and adapting them in the virtual community context. These two constructs are not new (unlike the online score reward construct), given that similar constructs have already existed in the IS area (for example the belongingness construct and the image construct respectively). However, the existing constructs are not specific to the online virtual community context. These two constructs were developed and adapted specifically for online settings, especially for online virtual communities. Like the online score reward construct, these two constructs were also developed and validated by rigorous procedures including four rounds of sorting exercise (Q-sort), pre-test, and

eventual empirical test (Churchill 1979; Moore and Benbasat 1991; and Straub 1989). Further, the condition for the impact of online status seeking on an individual's intention to share knowledge was tested, although the moderation effect was not significant.

Fourth, this study may enrich the social exchange and social capital theories in the following ways: 1) testing social exchange theory using a full set of cost and benefit factors (including 2 costs and 6 benefits) in virtual communities; and 2) examining the interaction between social capital and social exchange theories in the virtual community context. This is the first study that tests the interaction effects between the constructs derived from social exchange theory and constructs derived from social capital theory in the virtual community context. Although Kankanhalli et al. (2005) tested similar interaction effects in an organizational context, these effects have not been studied in virtual communities.

Last, but not least, this research contributes to the literature by providing detailed procedures (like instructions and examples) for Q-sort specific to online settings, especially for online virtual communities. It is hoped that these detailed and specific instructions and examples could be useful for other studies that will be using Q-sort to develop measures in online settings.

7.3 Practical Contributions

This work has important implications for practitioners such as the builders (or founders) and managers of knowledge-based virtual communities. Collectively, the results of this study offer suggestions to founders and managers about how to promote

knowledge sharing in knowledge-based virtual communities.

First, the results underscore the importance of enjoyment that a knowledge provider experiences when helping others on his or her intention to share knowledge. Thus, the builders or managers of knowledge-based virtual communities can attempt to raise the level of knowledge providers' enjoyment in helping others. One approach is to provide mechanisms to encourage knowledge recipients to express (to the knowledge providers) their gratitude for the knowledge they received. As Davenport and Prusak (1998) find, the realization that their colleagues have benefitted from their knowledge contribution can increase the feeling of altruism among knowledge providers. And the feeling of altruism brings about knowledge providers' enjoyment in their helping behaviours.

Second, the results inform the builders or managers about the value of knowledge self-efficacy perceived by knowledge providers. Based on this, the managers can raise the perceptions of knowledge self-efficacy among valued knowledge providers by indicating to them that the knowledge they provided makes a significant difference to other people (e.g., other professionals) in the field. One suggestion is that the valuable messages recorded in the knowledge database of a virtual community should highlight the pseudonym of the provider of the particular knowledge, given that thousands of previous messages have been stored in the knowledge database of the knowledge-based virtual community (like the IT professional virtual community in the current study) for members to search. For this reason, simply recording previous messages into the knowledge

database is not a wise approach. Rather, the management of the virtual community should edit the message (i.e., knowledge) so as to highlight the owner or provider of the knowledge. This approach can enhance the knowledge self-efficacy of prior knowledge providers, and also can attract more potential knowledge providers, and eventually motivate both previous knowledge providers and potential knowledge providers to share their knowledge with knowledge seekers.

Third, this study shows that the online score reward is an important factor to motivate potential knowledge providers to share their knowledge with others. This seems to be the reason why the online score reward has been used so widely in online virtual communities, especially knowledge-based virtual communities. However, the results reveal that the impact of the online score incentives is contingent upon a knowledge provider's trust in the knowledge seekers in the virtual community. In essence, if the potential knowledge provider does not trust that the knowledge seekers will eventually give the online score after receiving the answers, or the amount of online score given is fair, the potential knowledge provider would not share his or her knowledge even if the online score is promised to be given to the knowledge provider. Thus, trust provides an important context and condition for knowledge sharing to happen in knowledge-based virtual communities. Furthermore, in addition to the moderation effects of trust on the impact of the online score reward, trust has a significant direct influence on an individual's intention to share knowledge. Thus, it is not surprising that Davenport and Prusak (1998, p. 35) recognize trust being "*at the heart of knowledge exchange*". As such,

the managers of the virtual community, for example the bulletin board administrators and moderators, should adapt any strategy necessary to creating an atmosphere where members would like to trust others. Specifically, the virtual community could enact policies monitoring whether members' intent is good, and whether knowledge recipients eventually give to knowledge providers the online score fairly. Based on these policies, the bulletin board administrators and moderators should monitor the posting messages carefully. If someone shows evil intent or is cheating (e.g., not give the online score as promised), or is posting spam messages, the bulletin board administrators or moderators should take prompt actions, such as deleting the messages, warning the member, or locking the user account.

Fourth, the managers of the virtual community can raise the perception of reciprocity benefit among members by highlighting situations where requests for help from the persons (who previously shared knowledge with others) have been promptly answered, as suggested by Kankanhalli et al. (2005). Also, if some knowledge providers shared their experiences regarding reciprocity, the managers of the virtual community could spread and highlight their stories so as to strengthen the perception of reciprocity among members. Reciprocity appears to be particularly important when pro-sharing norms in a virtual community are weak. Alternatively, managers of the virtual community can strengthen pro-sharing norms to reduce the necessity of reciprocity benefit for knowledge providers to share their knowledge with others. Furthermore, this study reveals that the direct effect of pro-sharing norms is also very important for

motivate individuals to share their knowledge with others. Therefore, it is very important to promote and build pro-sharing norms in knowledge-based virtual communities. The builders and managers of the virtual community could enact policies and rules to ensure the climate in the virtual community is open to conflicting views, tolerance for failure (Leonard-Barton 1995), openness to criticism (Starbuck 1992; Leonard-Barton 1995), and willing to value and respond to diversity (Leonard-Barton 1995). Practically, too much criticism may indicate that some people are not open to conflicting views, are not tolerant for failure, or do not like diverse ideas. Thus, the bulletin board administrators and moderators could monitor the responding messages. If somebody criticizes others too harshly, or even attack others using abusive language, the moderators should warn this individual. Actually, in this study, some respondents reported that one of the major factors dissuading them from answering others' questions is the fear of harshly abusive attacks on the answers they provided as well as on the knowledge providers themselves.

Fifth, the results show that the sense of commitment to a virtual community is an important factor influencing an individual's willingness to share knowledge with others. Thus, the managers of the virtual community can promote the sense of commitment among members, especially among the experienced individuals. As Wasko and Faraj (2005) point out, creating and maintaining a set of core and experienced individuals plays an important role in developing and sustaining a professional virtual community. The idea here is to strengthen the sense of commitment of this "critical mass" of knowledge providers.

Last, results of this study suggest that managers of a virtual community can promote shared vision among members to encourage them to share knowledge with others. Managers of the virtual community can explicitly state the shared vision of the virtual community in the message board, including highlight that the common goal here is to learn from each other and share knowledge with each other, the common vision is to help others solve their problems.

7.4 Strengths and Limitations

This study has several strengths that enhance the validity of the results. Also, this work has certain limitations, given that no research is perfect (McGrath 1982). Both the strengths and limitations are discussed below.

7.4.1 Strengths

This study has several major strengths. The first strength of this work is that this study is based on real world data with a large sample size. The data was collected from one of the world's largest IT professional virtual communities, which has millions of registered members. The real world data are more valid than a convenience sample composed of student subjects (Sears 1986; Ferber 1977; Wells 1993). Further, the large sample size (i.e., 968 data points) also strengthens the validity of this study, given scholars' warning that the stability of statistical estimates can be affected contingent upon the sample size (Chin 1998b; Marcoulides and Saunders 2006). Covariances (like correlations) and parameter estimates are less than stable when estimated from small

samples (Tabachnick and Fidell 2006). Both Principal Factor Analysis (like PCA) and Structural Equation Modeling (SEM) require large sample size to produce stable estimates (Tabachnick and Fidell 2006). Especially for this study which tested moderation terms, a large sample size helped produce stable results. As Chin et al. (2003, p.203) point out, "*Small sample sizes clearly should be avoided when analyzing moderator variables*". Comrey and Lee (1992) give the follows as a guide to sample sizes for factor analysis: 50 as very poor, 100 as poor, 200 as fair, 300 as good, 500 as very good, and 1000 as excellent. Given that the sample size of 968 is very close to cut-off of 1000, the sample size of this study can be regarded as excellent. Thus, the statistical estimates based on this large sample size are believed to be very stable, strengthening the validity of this study.

The second strength of this work is that all measures used in this study were validated using four rounds of sorting exercises (i.e., Q-sort) and pretest, following the rigorous procedures recommended by Moore and Benbasat (1991) and Straub (1989). As Jacoby (1978) argues, a statistical result based on poor measures, whether it is significant or not, does not make sense. The final data analysis proved the validity and reliability of the measures used in this study. Thus, the statistical results of this study were based on solid measures and avoided the problem of GIGO – garbage in, garbage out (i.e., the problematic routine of research with poor measures warned by Churchill (1979)).

The third strength of this work is that the results of hypotheses tests are independent of control variables and the model is stable without serious non-response

bias and common method variance.

The last, but not least, strength is that this work is a contingency study testing moderators (Chin et al. 2003). It would be less convincing to say that all factor impacts exist in all conditions. It seems to be more reasonable and realistic that some impacts may be contingent upon certain conditions. Chin et al.'s (2003) review of the IS literature back to 1980 shows the importance of moderators which were found to be present from the start. As a contingency study, this work may provide a deeper and closer explanation for the real world phenomenon.

7.4.2 Limitations

Although this dissertation makes a number of important theoretical and practical contributions and has several major strengths as discussed above, some limitations of this study should be acknowledged.

First, the study used self-reported measures for both the independent and dependent variables. Some steps recommended by the literature to detect common method bias have been taken, such as Harman's one-factor test, and the approach recommended by Podsakoff et al. (2003) and Liang et al. (2007) (i.e., including in the structural model a common method factor whose indicators included all the principal constructs' indicators and then comparing each indicator's variances substantively explained by the principal construct and by the method). These tests show that the common method variance was limited and the related bias did not likely contaminate the results of this study. However, an actual measure for the dependent variable (i.e.,

knowledge sharing) would be able to show the real behaviours in virtual communities. For example, the actual measure could be the quantity and quality of knowledge contribution; and such a measure can be acquired by counting and rating the messages posted by knowledge providers[39].

Second, the study used cross-sectional data, rather than longitudinal data for testing the model. Like most IS studies, the current study established causal relationships in the model based on prior established theory (specifically social exchange theory (Blau 1964; Homans 1958) and social capital theory (Nahapiet and Ghoshal 1998)). Then the significance of the relationships was tested using SEM technique, specifically PLS in this study. As Gefen et al. (2000, p.40) point out, "correlation analysis, including linear regression and SEM, can be used to show that the correlations found in the data are in accordance with the causation predicted by an established theory-base (Bollen, 1989)". However, it is acknowledged that the current study shares the same limitation with other studies that use cross-sectional data. Although longitudinal data alone cannot establish causation either based on the criteria suggested by Cook and Campbell (1979) and Gefen et al. (2000)[40], longitudinal data will help understand how certain factor, such as trust, develop over time in virtual communities (Ba 2001).

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[39] However, as mentioned before, it should be acknowledged that it may not be feasible to rate and count the messages in a very large (e.g., millions of members) and active virtual community which has a long history (e.g., 10 years). Given the large population, active members, and long history, the total number of questions answered by all the respondents since the date they registered may be hundreds of thousands. Thus, it may not be feasible to count and rate all these posting messages.

[40] As Gefen et al. (2000, p.40) mentioned, "Typically, establishing causation requires showing (Cook and Campbell, 1979): 1. association, 2. temporal precedence, and 3. isolation". While longitudinal data can show temporal precedence, longitudinal data alone can not rule out rival hypotheses (called isolation).

Furthermore, the generalizability of the results may be limited, as the study examined only a single knowledge-based virtual community (although it consists of ten different forums with different climates developed over a ten-year history) in a particular culture. Testing across different types of virtual communities, and testing for cross-cultural effects would enhance the external validity of the results. For example, Hofstede (1991) categorizes countries into two cultures: long-term orientation and short-term orientation, and further posits that social relations and societal norms may differ between short- and long-term-orientation cultures (Fang 2003). Given that Chinese society is ranked as a long-term oriented culture (Hofstede 1991) and societal norms may influence the norms in virtual communities, the virtual community norms in a short-term oriented culture may differ from those found in the current study whose data was collected from a long-term oriented culture (i.e., Chinese society). These potential differences across cultures can be addressed in future research.

7.5 Future research opportunities

It is always very important to reveal future research opportunities or directions given Albert Einstein's famous words "Great scholars do not solve problems – instead, they create them." Some opportunities for future research are identified as follows.

First, given that this study is limited to a knowledge provider's perspective, future research can be conducted from a knowledge receiver's perspective as well as from the third party, i.e., a virtual community sponsor's perspective. As indicated in Figure 2-1, three entities (a knowledge provider, knowledge receiver, and communication medium)

are involved in the process of knowledge sharing. Thus, there are potentially three angles to study knowledge sharing. A knowledge receiver's (or knowledge seeker's) perspective should be quite different from the knowledge provider's perspective. Some factors, such as shared knowledge base, knowledge quality, reputation of knowledge provider, trust, etc., could be examined from a knowledge seeker's perspective.

In addition to a knowledge provider' perspective and a knowledge receiver's perspective, a virtual community sponsor's perspective is also important, not only because the sponsor financially supports the technological platform (i.e., the information systems including a website) of an online virtual community, but also because the sponsor enacts rules to regulate participant activities in the virtual community. The sponsor's efforts can affect participants' behavioural intentions in the virtual community (Porter and Donthu 2008), including the willingness to share knowledge with others. In addition to the perspectives from the knowledge provider and seeker, a sponsor's perspective can help facilitate the emergence of a complete picture of knowledge sharing in virtual communities.

Second, converse to willing to share knowledge with others, people may withhold their knowledge (hiding or hoarding knowledge, Webster et al. 2008) when they communicate with others. It would be interesting to study why some people in virtual communities choose to withhold their knowledge, rather than share their knowledge with others. Some factors, such as machiavellianism and perception of territoriality (Webster et al. 2008), as well as fear of losing knowledge power, may influence people's

knowledge withholding behaviours.

Third, in future research, other research methodologies, such as longitudinal studies and experiments, could be used in examining knowledge sharing behaviours in virtual communities. Longitudinal studies or experiments could allow for stronger inferences of causality (Webster et al. 2008). Further, it would be interesting to conduct cross-cultural studies to examine how culture moderates participants' willingness to share their knowledge in virtual communities. It is possible that culture difference can affect the factors derived from social capital, given that social capital may assume difference levels of importance in different cultures (Ramström 2008). For example, societies influenced by different cultures may value commitment differently (Lincoln and Kalleberg 1990).

Fourth, motivation theories, such as the theory of reasoned action (TRA) (Ajzen and Fishbein 1980; Fishbein and Ajzen 1975) and its successor, the theory of planned behaviour (TPB) (Ajzen 1985), can also been applied to study knowledge sharing behaviours in virtual communities, given that TRA (or TPB) has been widely employed in the study of specific behaviours (Ajzen and Fishbein 1980) in general, and applied to knowledge sharing behaviours in organizational contexts (Bock et al. 2005) in particular.

Finally, in the construct level, future studies can incorporate multidimensional trusting beliefs as well as an actual measure for knowledge contribution. In an online environment, the importance of trust has been emphasized by many researchers. The current study treats trust as a single variable rather than examines each trusting belief or

factor separately, for the purpose to be parsimonious (Hassanein and Head 2007; Schlosser et al. 2006). However, future research can examine sundry detailed trusting beliefs (Butler 1991; Mayer et al. 1995) related to the knowledge sharing behaviour in virtual communities. Additionally, given that the current study used self-reported measure for the dependent variable, a future research direction will be to apply this research model in predicting actual knowledge contribution in virtual communities.

7.6 Conclusion

This dissertation aims to advance empirical research in the realm of knowledge sharing in virtual communities and to help practitioners better understand the factors that inhibit (cost) or motivate (benefit) such behaviour. The impact of some costs and benefits (factors derived from social exchange theory) may be contingent upon certain social context or conditions (factors derived from social capital theory). To this end, two research models were developed (i.e., a main effects model and an interaction model) that integrate these two theories together. New constructs specific to the virtual community context were also incorporated. To test these models, an online survey was administered to 968 members of a large IT professional virtual community comprising millions of registered users. The responses were then used to analyze the direct effects of costs, benefits, and social capital factors on knowledge sharing, as well as how the impacts of costs and benefits are contingent upon certain social capital factors.

Achieving its goals, this dissertation has made a number of substantial contributions. First, this work goes beyond simply testing the main effects of the factors

on knowledge sharing, to reveal the circumstances under which the impacts of a set of factors on promote knowledge sharing in virtual communities could be more effective. Second, this study developed a brand new construct – online score reward, and further examined the conditions for the impact of this new construct on the intention to share knowledge. Specifically, the impact of an online score reward on an individual's intention to share knowledge is contingent upon his or her trust in the knowledge seekers. Third, borrowing items from other areas, this study developed two more constructs specific to the virtual community context - social affiliation and online status seeking. All the constructs were developed and validated by Q-sort, pre-test, and empirical test. Fourth, this study may enrich the social capital and social exchange theories by applying them and testing the interaction between them in the virtual community context, especially when the social exchange theory was tested using a full set of constructs (i.e., both cost and benefit factors). Finally, the detailed instructions and examples for Q-sort specific to online settings are hoped to be useful for other researchers using Q-sort to develop measures in online settings.

This work has four major strengths: 1) the real word data with a large sample size (968) was used to test the research model and hypotheses, 2) measures were developed and validated following rigorous procedures (i.e., Q-sort, pre-test and empirical test), 3) the model is stable and independent of control variables (also without serious non-response bias and common method variance); and 4) this is a contingency study. This study also has some limitations, based on which future research opportunities are

suggested. It is hoped that future researchers can study knowledge sharing from other perspectives (such as a knowledge seeker's or a virtual community sponsor's perspective), or from a converse angle (e.g., study knowledge withholding rather than sharing), or using other methodologies (such as longitudinal or cross-cultural research) as well as other theories.

Overall, the results of this dissertation revealed a comprehensive and deeper understanding of the factors affects knowledge sharing in virtual communities, given that not only direct effects of the factors but also interaction effects of the factors are examined. It is hoped that the findings of this study will help the founders or builders of knowledge-based virtual communities better promote online knowledge sharing behaviours and improve the sustainability of such communities in the future. Extending this contribution, this study is also hoped to facilitate knowledge sharing, learning and knowledge accumulation in society as a whole.

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Appendices

Appendix A: Definition of Constructs

Construct (Abbreviation)	Definition	References
Sharing effort (SE)	The time and effort expended by an individual to access and review questions posted in a virtual community, and to codify and post answers back to the virtual community.	Markus 2001; Wasko and Faraj 2005
Loss of knowledge power (LK)	The perception of losing power, competitive advantage, and unique value due to knowledge shared with others in a virtual community.	Kankanhalli et al. 2005; Gray 2001
Social affiliation (SA)	An individual's desire for social contact or belongingness, and tendencies to receive social gratification from the harmonious relationships, and from a sense of communion with others.	Murray 1938; Wiesenfield et al. 2001;Veroff and Veroff 1980
Enjoyment in helping (EH)	The perception of pleasure obtained from helping others through sharing knowledge with others in a virtual community.	Wasko and Faraj 2005
Online status seeking (OS)	The belief that relevant online activities can improve a person's standing in a virtual community, and result in enhancing that person's prestige, honor, or deference.	Berger et al. 1972; Lampel and Bhalla 2007
Knowledge self-efficacy (KE)	The confidence in one's ability to provide knowledge that is valuable to others in a virtual community.	Kankanhalli et al. 2005
Online score reward (SR)	The importance of score incentives provided for sharing knowledge with others in a virtual community.	Ba et al 2001; Kakanhalli et al. 2005
Reciprocity (RP)	The expectation that knowledge sharing with others in a virtual community leads to one's own future requests for knowledge being met.	Davenport and Prusak 1998; Kankanhalli et al. 2005
Trust (TR)	The belief in the good intent, competence, and integrity of the participants in a virtual community with respect to sharing and reusing knowledge.	Kankanhalli et al. 2005; Mayer et al. 1995

Construct (Abbreviation)	Definition	References
Pro-sharing Norms (PN)	The prevalence of norms that are intended to facilitate knowledge sharing in a virtual community.	Kankanhalli et al. 2005; Nahapiet and Ghoshal 1998
Commitment (CM)	The psychological attachment to a virtual community, representing a sense of obligation to the fate of the virtual community, care for the virtual community, or a sense of loyalty to the virtual community.	Coleman (1990); Kiesler (1971); Wasko and Faraj (2005)
Shared vision (SV)	The common interest, goal, value that are held by members in a virtual community with respect to helping, sharing knowledge, and learning from others in the virtual community.	Chiu et al. 2006; Tsai and Ghoshal 1998
Intention to share knowledge (IK)	The extent to which a participant is willing to, or intends to, share expertise, idea, experience or information with others in a virtual community by answering questions posted in the virtual community.	Bock et al. 2005; McKnight et al. 2002

Appendix B: Instructions for the unstructured sorting exercises

This study investigates the factors influencing people's willingness to answer questions posted by others in a virtual community, like a Bulletin Board System (BBS). A questionnaire will be used to capture people's perceptions of factors that may affect their willingness to answer questions posted in a BBS. All the questionnaire items are listed in the attached table.

Please arrange the 56 questions (cards) into twelve to fourteen categories so that the questions within a category are most similar in meaning to each other, and dissimilar in meaning from those in other categories; each category may have three to six questions. After you have categorized the questions, please provide a label to this set of related questions.

If you find any question "too ambiguous" or "doesn't fit any category," please place this question into an "N/A" category.

Some questions may be reversely worded. Whether a question is reversely worded does not matter; the categorization of a question is only based on the topic to which a question relates.

If you find some questions are ambiguously worded or have grammatical errors, please correct these directly on the table and/or individual cards. Much appreciated!

If you have any questions, please don't hesitate to ask.

Appendix C: A trial exercise for the unstructured sort

In order to help you understand the procedure you are being asked to carry out, the following is given as an example of how to conduct an unstructured sorting exercise:

The following seven questions pertain to an online shopping website; the seven questions have been randomly arranged.

No.	Items (questions)
1	I feel secure in providing sensitive information when transacting with this website.
2	This online shop provides follow-up services to customers.
3	I would feel totally safe providing sensitive information about myself to this website.
4	This online shop assures to solve customers' problems.
5	I would feel secure sending sensitive information to this website.
6	The security issue of sensitive information was a major obstacle to my online purchases from this website.
7	This online shop provides reliable services to customers.

After reading each question, you find that some questions (1, 3, 5, 6) are talking about security or safety, while the other questions (2, 4, 7) relate to "provides follow-up services to customers," "assures to solve customers' problems," or "provides reliable services to customers." It appears that the seven questions belong to two categories: the first category is about information security, while the second category is about service quality. Thus, corresponding labels may be given to each category as follows:

No.	Items (questions)	Label
1	I feel secure in providing sensitive information (e.g., credit card number) when transacting with this website.	Information Security Concerns
3	I would feel totally safe providing sensitive information about myself to this website.	
5	I would feel secure sending sensitive information to this website.	
6	The security issue of sensitive information was a major obstacle to my online purchases from this website.	
2	This online shop provides follow-up services to customers.	Service Quality
4	This online shop assures to solve customers' problems.	
7	This online shop provides reliable services to customers.	

Appendix D: Instructions for the structured sorting exercises

This study investigates the factors influencing people's willingness to answer questions posted by others in a virtual community, like a Bulletin Board System (BBS). A questionnaire will be used to capture people's perceptions of the factors that may affect their willingness to answer questions posted in a BBS. All the questionnaire items are listed in the attached table. The 55 questions were supposed to belong to 13 categories; the definition of each category is provided in another attached table called "Definition of Categories".

Please arrange the 55 questions (cards) into the corresponding categories based on the fit between the questions and the category.

If you find any question "too ambiguous" or "doesn't fit any category," please place this question into an "N/A" category.

Some questions may be reversely worded. Whether a question is reversely worded does not matter; the categorization of a question is only based on the topic to which a question relates.

If you find some questions are ambiguously worded or have grammatical errors, please correct these directly on the table and/or individual cards.

If you have any questions, please don't hesitate to ask.

Much appreciated!

Appendix E: A trial exercise for the structured sort

In order to ensure you understand the procedure, the following is given as an example of how to conduct a structured sorting exercise:

The following seven questions pertain to an online shopping website; the seven questions have been randomly arranged.

ID	Items (questions)
1	I feel secure in providing sensitive information (e.g., credit card number) when transacting with this website.
2	This online shop provides follow-up services to customers.
3	I would feel totally safe providing sensitive information about myself to this website.
4	This online shop assures to solve customers' problems.
5	I would feel secure sending sensitive information to this website.
6	The security issue of sensitive information was a major obstacle to my online purchases from this website.
7	This online shop provides reliable services to customers.

These seven questions were supposed to belong to 2 categories. The definitions of the two categories are given as follows.

Category	Definition
Information Security Concerns	A customer's beliefs about an online shop's inability and unwillingness to safeguard his or her monetary information from security breaches during transmission and storage.
Service quality	The extent to which the online shop serves the customers, regarding the rapidity of response, assurance, reliability and follow-up service.

Based on the fit between the questions and the definitions of the categories, you

find that some questions (1, 3, 5, & 6) are talking about the security or safety, and thus these questions fit the definition of "information security concerns." The other questions (2, 4, & 7) relate to "provides follow-up services to customers," "assures to solve customers' problems," or "provides reliable services to customers," and thus fit the definition of "service quality." Hence, the seven questions are placed into the two categories as follows.

ID	Items (questions)
	Information Security Concerns
1	I feel secure in providing sensitive information (e.g., credit card number) when transacting with this website.
3	I would feel totally safe providing sensitive information about myself to this website.
5	I would feel secure sending sensitive information to this website.
6	The security issue of sensitive information was a major obstacle to my online purchases from this website.
	Service Quality
2	This online shop provides follow-up services to customers.
4	This online shop assures to solve customers' problems.
7	This online shop provides reliable services to customers.

Appendix F: Survey Instrument

The following questions are measured using seven-point Likert scales:

"Strongly Disagree; Disagree; Slightly Disagree; Neutral; Slightly Agree; Agree; Strongly Agree"

Construct	Item Wording and Code	Reference(s)
Loss of Knowledge Power (LK)	If I answer questions posted by others in this virtual community, my competitive advantage will be threatened because my knowledge is shared with others. (LK1)	Adapted from Kankanhalli et al. (2005)
	Answering questions posted by others in this virtual community makes me lose my knowledge that differentiates me from others. (LK2)	Adapted from Kankanhalli et al. (2005)
	If I share my knowledge with others in this virtual community, the person who acquires my knowledge will become my competitor. (LK3)	Adapted from Kankanhalli et al. (2005)
	Answering questions posted by others in <name of the virtual community> reduces my unique value since I have shared my technical knowledge that no one else has. (LK4)	Adapted from Kankanhalli et al. (2005)
Sharing Effort (SE)	The effort is high for me to answer the questions posted in this virtual community. (SE1)	Adapted from Kankanhalli et al. (2005)
	It is laborious to answer the questions posted in this virtual community. (SE2)	Adapted from Kankanhalli et al. (2005)
	I am worried that if I answer the questions posted in this virtual community, I will have to spend additional time answering follow up questions. (SE3)	Adapted from Kankanhalli et al. (2005)
	I am afraid that my answers posted in this virtual community will evoke additional clarifications, on which I need to spend more time and effort. (SE4)	Adapted from Kankanhalli et al. (2005)
	It is very important for me to have a feeling of togetherness or closeness with others. (SA1)	Adapted from Chiu et al. (2006)

Social Affiliation (SA)	It is important for me to feel a sense of belonging. [Sense of belonging] (SA2)	Adapted from Vázquez-Carrasco and Foxall (2006)
	It is important for me to establish a friendly relationship with others. [harmonious relationship] (SA3)	Adapted from Vázquez-Carrasco and Foxall (2006)
	If I feel unhappy or kind of depressed, I usually try to be around other people to make me feel better. [emotional support] (SA4)	Adapted from Hill (1987)
	I often have a strong need to be around people who are impressed with what I am like and what I do. [Attention] (SA5) (Dropped after the first round of sort)	Adapted from Hill (1987)
Enjoyment in Helping (EH)	I really like helping other people. (EH1)	Adapted from Wasko and Faraj (2005)
	It feels so good to help others solve their problems. (EH2)	Adapted from Wasko and Faraj (2005)
	I enjoy helping others in this virtual community. (EH3)	Adapted from Wasko and Faraj (2005)
	I enjoy helping others by answering question posted by others in this virtual community. (EH4)	Adapted from Kankanhalli et al. (2005)
Online Status Seeking (OS)	Answering questions posted by others can improve my standing in this group (i.e., this virtual community). (OS1)	Developed based on Lampel and Bhalla (2007)
	I feel that answering questions posted by others improves my status in this virtual community. (OS2)	Adapted from Wasko and Faraj (2005)
	I answer questions posted by others to improve my reputation in this virtual community. (OS3)	Adapted from Wasko and Faraj (2005)
	I share my knowledge with others in order to achieve a higher hierarchical status in this virtual community. (OS4)	Developed based on Manolopoulos (2006)
Knowledge Self-efficacy (KE)	I have confidence in my ability to provide answers that others in this virtual community consider valuable. (KE1)	Adapted from Kankanhalli et al. (2005)
	I have the expertise needed to provide valuable answers in this virtual community. (KE2)	Adapted from Kankanhalli et al. (2005)

	Self-rated expertise - Please indicate your level of expertise: from novice = 1 to expert = 7. (KE3)	Adapted from Wasko and Faraj (2005)
Online Score Reward (SR)	It is important for me to get a score or credit of points (i.e., online score) as a reward when I share my knowledge with others through answering their questions in this virtual community. (SR1)	Developed based on Kankanhalli et al. (2005)
	I really hope to get a score or credit of points (i.e., online score) as a reward, when I share my knowledge with others in this <name of the virtual community>. (SR2)	Developed based on Kankanhalli et al. (2005)
	The online score rewarding mechanism in <name of the virtual community> motivates me to answer the questions posted by others in this virtual community. (SR3)	Developed based on Kankanhalli et al. (2005)
	The higher the online score in reward for answering a question posted by others is in this virtual community, the more likely I would answer that question. (SR4)	Developed based on Kankanhalli et al. (2005)
	In order to get a score or credit of points (i.e., online score) as a reward, I answer the questions posted by others in this virtual community. (SR5)	Developed based on Kankanhalli et al. (2005)
Trust (TR)	I believe that people in this virtual community use others' knowledge appropriately. [Benevolence] (TR1)	Adapted from Kankanhalli et al. (2005)
	I believe that people in this virtual community will not do something that is harmful to the person who answers their questions. [Benevolence] (TR2)	Developed based on Kankanhalli et al. (2005)
	I believe that the intentions of people in this virtual community are benevolent. [Benevolence] (TR3)	Adapted from Pavlou et al. 2007
	I believe that people in this virtual community are sincere and genuine when they communicate with others. [Integrity] (TR4)	Adapted from McKnight et al. (2002)
	I believe that individuals who ask questions in this virtual community have the required knowledge base to understand the answers	Developed based on McKnight et al. (2002) and Nelson and

	provided by other members. [Competence] (TR5)	Cooprider 1996
	I believe that people in this virtual community are truthful in dealing with one another.[Integrity] (TR6)	Adapted from McKnight et al. (2002)
Reciprocity (RP)	In this virtual community, people reciprocate the help they have received, through answering questions posted by others. (RP1)	Developed based on Wasko and Faraj (2005)
	I believe that other members will help me, so it's only fair to help other members. (RP2)	Adapted from Wasko and Faraj (2005)
	When I answer questions posted in this virtual community, I expect somebody to respond when I ask some questions in future. (RP3)	Adapted from Kankanhalli et al. (2005)
	When I contribute knowledge to this virtual community, I expect to acquire knowledge from it when I am in need. (RP4)	Adapted from Kankanhalli et al. (2005)
Shared vision (SV)	People in this virtual community share the common vision of helping others solve their problems. (SV1)	Adopted from Chiu et al. (2006)
	People in this virtual community share the same goal of learning from each other. (SV2)	Adopted from Chiu et al. (2006)
	People in this virtual community share the same value that helping others is pleasant. (SV3)	Adopted from Chiu et al. (2006)
	People in this virtual community hold the common goal of sharing knowledge with each other. (SV4)	Developed based on Tsai and Ghoshal (1998)
Intention to share knowledge (IK)	I intend to answer the questions posted by others in this virtual community frequently in the future. (IK1)	Adapted from Bock et al. (2005)
	I will always provide my knowledge at the request of others in this virtual community. (IK2)	Adapted from Bock et al. (2005)
	I will try to share my expertise with others in this BBS. (IK3)	Adapted from Bock et al. (2005)
	I predict that I would answer the questions posted by others in this virtual community frequently. (IK4)	Developed based on Wasko and Faraj (2005); Venkatesh et al. 2003

	I plan to help others who need help/information in this virtual community. (IK5)	Developed based Ma and Agarwal (2007)
Pro-sharing Norms (PN)	There is a norm of openness to conflicting views in this virtual community. (PN1)	Adapted from Kankanhalli et al. (2005)
	There is a norm of tolerance of mistakes in this virtual community. (PN2)	Adapted from Kankanhalli et al. (2005)
	There is a norm of openness to criticism in this virtual community. (PN3)	Adapted from Kankanhalli et al. (2005)
	There is a norm of willingness to value and respond to diversity in this virtual community. (PN4)	Adapted from Kankanhalli et al. (2005)
Commitment (CM)	I would feel a loss if this virtual community were no longer available. (CM1)	Adopted from Wasko and Faraj (2005)
	I really care about the fate of this virtual community. (CM2)	Adopted from Wasko and Faraj (2005)
	I feel a great deal of loyalty to this virtual community. (CM3)	Adopted from Wasko and Faraj (2005)
	When people criticize this virtual community, I feel kind of sad. (CM4)	Adapted from Ma and Agarwal (2007)

Demographics

1. Your gender: ☐ Male ☐ Female

2. How old are you? Please check.

☐ Under 18 ☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39 ☐ 40-44

☐ 45-49 ☐ 50-54 ☐ 55-59 ☐ 60-64 ☐ 65+

3. What is your highest education level obtained? Please check.

☐ Primary school ☐ Secondary (high) school ☐ Vocational/Technical ☐

Junior College ☐ University Undergraduate (bachelors degree) ☐

Masters degree ☐ Doctoral degree

4. How many months have you been a member of <name of the virtual community>?

___ month(s)

On average, how many hours per week do you spend in this virtual community? ___ hour(s)

Other questions:

5. When you interact with others in <name of the virtual community>, are you anonymous?

☐ I am anonymous. ☐ I reveal my real identity.

6. Any other factors that you believe to be important to affect people's willingness to share knowledge in <name of the virtual community>:

_____

7. Any comments regarding this survey:

_____

8. If you like, you can provide some other virtual communities for knowledge sharing:

_____

9. Your pseudonym in <name of the virtual community>: _____

Approved by the MREB

Rationale for choosing items

The following provides how the above construct items are developed, including the rationale for choosing the selected survey items.

Sharing Effort (SE)

All of the four "sharing effort" items listed above are adapted from Kankanhalli et al. (2005) for the context of virtual community. As previously mentioned, Kankanhalli et al. (2005) used the term "codification effort" as the name of this construct, which refers to the time and effort required to explicate and codify knowledge. Although the items of "sharing effort" in the current study are similar to the items of "codification effort" in Kankanhalli et al. (2005), sharing effort is more appropriate to reflect the dynamic interaction in the virtual community; and thus this study uses "sharing effort" as the name of this construct. Sharing effort refers to the time and effort required to answer the questions posted in the virtual community; this consists of the time and effort spent on accessing the network, reviewing the questions, choosing the question, explicating, codifying, and posting answers.

Loss of Knowledge Power (LK)

The "loss of knowledge power" items are also adapted from in Kankanhalli et al. (2005). Although Kankanhalli et al. (2005) developed four items for the "loss of knowledge power" construct, the proposed study adapts only three of them because the

one item that was omitted relates to "unique value" (it was felt that this item would not be appropriate for an virtual community context where it would be difficult for an individual to be "unique"). Among the three items adapted, one item (i.e., LK1) is slightly revised and split into two separate items, creating a new item (i.e., changing "competitive advantage will be threatened (LK1)" to "others will become my competitor (LK3)"). Since the context of these four questions has changed from an organizational setting to a virtual community context, the current study validates these items again. This is because excising selected items from a previously validated instrument may not result in a validated derivative instrument (Straub 1989).

Social Affiliation (SA)

Five items are used to capture data concerning the "social affiliation" construct. Two items (i.e., sense of belonging, and friendly relationship with others) are adapted from Vázquez-Carrasco and Foxall (2006). Two other items (i.e., emotional support, and attention) are adopted from Hill (1987). Finally, SA1 (i.e., sense of belonging) is adapted from Chiu et al (2006).

Enjoyment in Helping (EH)

The "enjoyment in helping" construct has four items, three of which are adapted from Wasko and Faraj (2005), and one is adapted from Kankanhalli et al. (2005). While the three items adapted from Wasko and Faraj (2005) focus on "helping," the item adapted from Kankanhalli et al. (2005) focuses on both "helping" and "answering questions posted by others."

Online Status Seeking (OS)

Four items are used to capture data concerning the "online status seeking" construct. Two of them (i.e., OS2 and OS3) are adapted from Wasko and Faraj (2005). Compared to the original items used by Wasko and Faraj (2005), the revised items focus on knowledge sharing (i.e. answering questions) rather than participation in the virtual community. Another item (OS1) is developed based on the item used by Lampel and Bhalla (2007) that used a single item in their study. The last item (OS4) is developed based on Manolopoulos (2006), slightly differing from OS2 in wording.

Knowledge Self-efficacy (KE)

The "knowledge self-efficacy" construct has three items, two of which are adopted from Kankanhalli et al. (2005) and adapted for the context of virtual communities. The third item (self-rated expertise) is adapted from Wasko and Faraj (2005), given that self-rated expertise also shows one's confidence in his or her knowledge and thus indicates his or her knowledge self-efficacy.

Online Score Reward (SR)

A detailed description of how the items for the online score reward construct are adapted and developed is provided in the "item creation" subsection in Chapter 5 in the body text of this thesis.

Reciprocity (RP)

Four items are used to capture data concerning the reciprocity construct. Two items (RP3 and RP4) are adapted from Kankanhalli et al. (2005), one (RP2) is adapted

from Wasko and Faraj (2005), and one (NR1) is developed based on Wasko and Faraj (2005).

Trust (TR)

The trust construct has six items. The first item (TR1) relating to benevolence (i.e. use other's knowledge appropriately) is adapted from Kankanhalli et al. (2005). Another item (TR2), also relating to benevolence (i.e., will not do something harmful to the knowledge provider), is developed based on Kankanhalli et al. (2005). One more item (TR3) relating to benevolence is adapted from Pavlou et al. (2007); this item focuses on the benevolence of the general intention of the participant.

Two other items (TR4 and TR6), which are concerning "integrity", are adapted from McKnight et al. (2002). McKnight et al. (2002) have an item relating to "honest"; this item is not adapted by the proposed study, because the members use pseudonyms in virtual communities and it is possible that some members consider such a characteristic (i.e., fake name) as dishonest. Instead, the items (i.e., TR4 and TR6) relating to "sincere and genuine" and "truthful" are adapted from McKnight et al. (2002).

The item "TR5" is relating to competence of the knowledge receiver to understand the knowledge provided by others. This item is developed based on McKnight et al. (2002) and Nelson and Cooprider (1996). It is a newly developed item which focuses on the required knowledge base (Nelson and Cooprider 1996) processed by a knowledge receiver (i.e., the shared knowledge base between the knowledge receiver and the knowledge provider). Overall, these six items cover three dimensions of trust, i.e.,

benevolence, integrity, and competence (Mayer et al. 1995).

Pro-sharing Norms (PN)

The construct "pro-sharing norms" has four items, all of which were adapted from Kankanhalli et al. (2005). These four items are relating to a norm of openness to conflicting views, tolerance for failure (Leonard-Barton 1995), openness to criticism (Starbuck 1992; Leonard-Barton 1995), and willingness to value and respond to diversity (Leonard-Barton 1995).

Commitment (CM)

Commitment to the virtual community has four items. Three of them are adopted from a complete set of items used by Wasko and Faraj (2005). The last one (CM4) is adapted from Ma and Agarwal (2007).

Shared vision (SV)

The "shared vision" construct has four items. Three items (i.e., SV1, SV2 and SV3) are adopted from a complete set of items used by Chiu et al. (2006). These three items are relating to the vision of helping others solve problems, the goal of learning from each other, and the value that helping others in pleasant. Another item (SV4), which is relating to the goal of sharing knowledge with each other, is developed based on Tsai and Ghoshal (1998) and Wasko and Faraj (2005).

Intention to share knowledge (IK)

The construct "intention to share knowledge" has five items, three of which were adapted from Bock et al. (2005). A slightly change was made on one of the items (IK1).

That is, "more frequent" was changed to "frequently," because if an individual has shared knowledge very frequently, he or she may intend to share knowledge as frequently as before, but he or she will not necessarily share knowledge more frequently than before. A change was also made on another item (IK3). That is, the phrase "more effective" was deleted because the participants may be confused by how they can be effective or more effective. Two more items (IK4 and IK5) were developed based on Wasko & Faraj (2005) and Ma & Agarwal (2007) respectively; one is relating to "predict to answer other's questions," and another is relating to "plan to help others who need help/information."

Appendix G: Cronbach Alpha

Cronbach's Alpha Reliability

Construct	Cronbach's Alpha
Social affiliation	0.857
Commit	0.885
Knowledge self-efficacy	0.716
Sharing effort	0.819
Enjoy helping	0.904
Intention to share knowledge	0.939
Pro-sharing norms	0.886
Loss of knowledge power	0.858
Reciprocity	0.886
Online score reward	0.879
Online status seeking	0.911
Trust	0.919
Shared vision	0.901

Reliability Statistics (for the "Knowledge Self-efficacy" Construct)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.701	0.716	3

Item-Total Statistics (for the "Knowledge Self-efficacy" Construct)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
KE1	8.597	4.816	0.580	0.538	0.539
KE2	8.864	4.323	0.674	0.573	0.412
KE3	10.289	5.046	0.343	0.139	0.846

Appendix H: Factor Loadings Produced using PLS

Compare factor loadings and cross-loadings (Produced using SmartPLS 2.0)

	Affil.	Commit	Efficacy	Effort	Ehelp	Intent	Norms	Power	Recip.	Score	Status	Trust	Vision
SA1	0.858	0.335	0.233	-0.032	0.434	0.385	0.310	-0.137	0.412	0.102	0.295	0.376	0.352
SA2	0.877	0.336	0.237	-0.024	0.421	0.378	0.286	-0.134	0.384	0.144	0.336	0.398	0.307
SA3	0.847	0.357	0.218	-0.077	0.444	0.416	0.319	-0.160	0.388	0.148	0.342	0.413	0.340
SA4	0.763	0.344	0.205	-0.019	0.387	0.370	0.255	-0.107	0.395	0.198	0.286	0.340	0.335
CM1	0.349	0.880	0.185	-0.195	0.250	0.446	0.382	-0.146	0.409	0.198	0.287	0.408	0.395
CM2	0.379	0.896	0.186	-0.154	0.284	0.496	0.420	-0.155	0.454	0.186	0.255	0.463	0.454
CM3	0.372	0.899	0.222	-0.205	0.297	0.499	0.363	-0.137	0.417	0.169	0.262	0.453	0.470
CM4	0.312	0.774	0.168	-0.194	0.230	0.412	0.271	-0.106	0.341	0.176	0.256	0.358	0.399
KE1	0.280	0.230	0.946	-0.019	0.427	0.408	0.280	-0.063	0.380	0.233	0.378	0.416	0.377
KE2	0.209	0.175	0.914	0.006	0.372	0.327	0.190	-0.032	0.256	0.214	0.334	0.303	0.266
SE1	-0.059	-0.190	-0.013	0.774	-0.057	-0.153	-0.065	0.235	-0.049	0.030	-0.067	-0.074	-0.128
SE2	-0.043	-0.210	0.038	0.808	-0.060	-0.154	-0.067	0.236	-0.044	0.103	0.047	-0.099	-0.144
SE3	-0.033	-0.141	-0.026	0.796	-0.082	-0.117	-0.095	0.295	-0.056	0.039	0.044	-0.101	-0.108
SE4	-0.009	-0.139	-0.034	0.837	-0.102	-0.130	-0.080	0.303	-0.058	0.042	0.017	-0.093	-0.147
EH1	0.440	0.250	0.358	-0.046	0.837	0.447	0.253	-0.168	0.357	0.125	0.262	0.356	0.327
EH2	0.507	0.272	0.369	-0.008	0.861	0.457	0.276	-0.192	0.416	0.176	0.318	0.429	0.356
EH3	0.434	0.286	0.393	-0.111	0.921	0.527	0.261	-0.184	0.369	0.182	0.323	0.419	0.387
EH4	0.408	0.278	0.401	-0.144	0.903	0.527	0.283	-0.200	0.368	0.195	0.304	0.406	0.405
IK1	0.422	0.533	0.361	-0.177	0.493	0.894	0.418	-0.187	0.477	0.220	0.330	0.505	0.569
IK2	0.442	0.498	0.374	-0.153	0.524	0.907	0.455	-0.232	0.540	0.194	0.278	0.556	0.586
IK3	0.449	0.470	0.332	-0.143	0.526	0.900	0.440	-0.247	0.517	0.194	0.293	0.548	0.574
IK4	0.360	0.455	0.350	-0.168	0.445	0.884	0.399	-0.186	0.428	0.210	0.304	0.466	0.494
IK5	0.397	0.453	0.370	-0.143	0.504	0.894	0.435	-0.183	0.475	0.211	0.294	0.498	0.521
PN1	0.308	0.379	0.229	-0.055	0.294	0.448	0.871	-0.149	0.458	0.185	0.233	0.439	0.417

PN2	0.273	0.314	0.210	-0.081	0.239	0.373	0.828	-0.120	0.410	0.177	0.154	0.351	0.355
PN3	0.291	0.343	0.233	-0.093	0.256	0.383	0.884	-0.141	0.424	0.159	0.175	0.426	0.391
PN4	0.332	0.399	0.217	-0.096	0.257	0.442	0.868	-0.164	0.480	0.155	0.212	0.449	0.444
LK1	-0.145	-0.115	-0.020	0.253	-0.161	-0.196	-0.124	0.855	-0.105	0.090	-0.003	-0.212	-0.153
LK2	-0.167	-0.109	-0.034	0.258	-0.170	-0.173	-0.135	0.831	-0.092	0.032	-0.035	-0.169	-0.141
LK3	-0.099	-0.133	-0.011	0.298	-0.145	-0.147	-0.123	0.764	-0.081	0.077	0.019	-0.212	-0.136
LK4	-0.130	-0.167	-0.093	0.299	-0.218	-0.241	-0.171	0.892	-0.130	0.029	-0.055	-0.257	-0.198
RP1	0.418	0.432	0.328	-0.106	0.404	0.518	0.471	-0.148	0.834	0.248	0.324	0.613	0.584
RP2	0.335	0.336	0.227	-0.047	0.269	0.349	0.377	-0.055	0.789	0.248	0.251	0.480	0.443
RP3	0.405	0.380	0.318	-0.019	0.371	0.444	0.412	-0.074	0.874	0.272	0.326	0.522	0.508
RP4	0.407	0.414	0.278	-0.033	0.363	0.486	0.451	-0.124	0.849	0.237	0.310	0.562	0.532
SR1	0.067	0.107	0.166	0.127	0.054	0.117	0.126	0.094	0.159	0.767	0.344	0.112	0.120
SR2	0.160	0.168	0.204	0.050	0.181	0.201	0.163	0.050	0.262	0.869	0.398	0.209	0.200
SR3	0.222	0.254	0.239	-0.008	0.252	0.274	0.220	0.012	0.326	0.876	0.448	0.269	0.280
SR4	0.105	0.129	0.189	0.131	0.106	0.131	0.119	0.073	0.200	0.776	0.307	0.145	0.140
SR5	0.072	0.119	0.147	0.070	0.083	0.116	0.112	0.099	0.186	0.778	0.329	0.142	0.100
OS1	0.380	0.307	0.338	0.013	0.341	0.329	0.227	-0.038	0.358	0.349	0.884	0.368	0.294
OS2	0.338	0.290	0.342	0.007	0.313	0.309	0.209	-0.029	0.338	0.406	0.930	0.333	0.287
OS3	0.330	0.257	0.345	0.030	0.285	0.276	0.188	0.000	0.316	0.403	0.911	0.321	0.288
OS4	0.281	0.221	0.343	-0.016	0.271	0.265	0.177	-0.025	0.278	0.498	0.825	0.277	0.267
TR1	0.361	0.420	0.311	-0.130	0.366	0.462	0.371	-0.226	0.527	0.215	0.316	0.791	0.498
TR2	0.334	0.401	0.310	-0.106	0.360	0.454	0.390	-0.220	0.511	0.201	0.286	0.837	0.493
TR3	0.389	0.424	0.331	-0.081	0.394	0.487	0.410	-0.237	0.567	0.186	0.281	0.890	0.536
TR4	0.435	0.419	0.367	-0.064	0.418	0.519	0.446	-0.215	0.601	0.197	0.321	0.897	0.562
TR5	0.390	0.400	0.319	-0.088	0.360	0.462	0.391	-0.182	0.535	0.173	0.334	0.771	0.487
TR6	0.400	0.415	0.346	-0.108	0.411	0.526	0.442	-0.222	0.578	0.222	0.326	0.873	0.549
SV1	0.329	0.412	0.305	-0.183	0.330	0.513	0.358	-0.165	0.502	0.191	0.271	0.518	0.856
SV2	0.387	0.467	0.308	-0.071	0.397	0.548	0.475	-0.159	0.640	0.206	0.272	0.575	0.856
SV3	0.338	0.443	0.326	-0.183	0.382	0.542	0.388	-0.145	0.502	0.220	0.307	0.519	0.896
SV4	0.344	0.427	0.295	-0.146	0.365	0.552	0.419	-0.200	0.544	0.194	0.276	0.557	0.902

Sample: 968

Statistics for the factor loadings

	Factor Loading	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)	P-value	Cronbach's Alpha
SA1 <- Affiliation	0.858	0.017	0.017	49.380	<.0001	
SA2 <- Affiliation	0.877	0.013	0.013	66.809	<.0001	
SA3 <- Affiliation	0.847	0.016	0.016	54.279	<.0001	0.857
SA4 <- Affiliation	0.763	0.020	0.020	39.000	<.0001	
CM1 <- Commit	0.880	0.012	0.012	74.465	<.0001	
CM2 <- Commit	0.896	0.010	0.010	86.909	<.0001	0.885
CM3 <- Commit	0.899	0.009	0.009	104.121	<.0001	
CM4 <- Commit	0.774	0.020	0.020	39.263	<.0001	
EH1 <- Ehelping	0.837	0.018	0.018	47.061	<.0001	
EH2 <- Ehelping	0.861	0.016	0.016	55.342	<.0001	
EH3 <- Ehelping	0.921	0.010	0.010	97.023	<.0001	0.904
EH4 <- Ehelping	0.903	0.011	0.011	84.704	<.0001	
KE1 <- Efficacy	0.946	0.005	0.005	199.276	<.0001	
KE2 <- Efficacy	0.914	0.010	0.010	94.854	<.0001	0.846
SE1 <- Effort	0.774	0.034	0.034	22.799	<.0001	
SE2 <- Effort	0.808	0.028	0.028	28.800	<.0001	
SE3 <- Effort	0.796	0.034	0.034	23.378	<.0001	0.819
SE4 <- Effort	0.837	0.029	0.029	29.393	<.0001	
IK1 <- Intention	0.894	0.010	0.010	88.685	<.0001	
IK2 <- Intention	0.907	0.009	0.009	100.458	<.0001	
IK3 <- Intention	0.900	0.010	0.010	94.519	<.0001	0.939
IK4 <- Intention	0.884	0.011	0.011	80.919	<.0001	
IK5 <- Intention	0.894	0.011	0.011	84.676	<.0001	
PN1 <- Norms	0.871	0.011	0.011	81.455	<.0001	
PN2 <- Norms	0.828	0.019	0.019	44.016	<.0001	
PN3 <- Norms	0.884	0.014	0.014	63.921	<.0001	0.886
PN4 <- Norms	0.868	0.012	0.012	72.953	<.0001	
LK1 <- Power	0.855	0.021	0.021	40.203	<.0001	
LK2 <- Power	0.831	0.024	0.024	34.786	<.0001	
LK3 <- Power	0.764	0.033	0.033	23.315	<.0001	0.858
LK4 <- Power	0.892	0.015	0.015	61.550	<.0001	
RP1 <- Reciprocity	0.834	0.014	0.014	58.385	<.0001	
RP2 <- Reciprocity	0.789	0.023	0.023	34.655	<.0001	
RP3 <- Reciprocity	0.874	0.014	0.014	63.906	<.0001	0.859
RP4 <- Reciprocity	0.849	0.015	0.015	58.346	<.0001	
SR1 <- Score	0.767	0.028	0.028	27.821	<.0001	
SR2 <- Score	0.869	0.014	0.014	62.237	<.0001	0.879
SR3 <- Score	0.876	0.016	0.016	55.875	<.0001	

SR4 <- Score	0.776	0.027	0.027	29.183	<.0001	
SR5 <- Score	0.778	0.027	0.027	28.507	<.0001	
OS1 <- Status	0.884	0.010	0.010	89.780	<.0001	
OS2 <- Status	0.930	0.006	0.006	161.602	<.0001	
OS3 <- Status	0.911	0.010	0.010	87.876	<.0001	0.911
OS4 <- Status	0.825	0.017	0.017	49.704	<.0001	
TR1 <- Trust	0.791	0.023	0.023	34.669	<.0001	
TR2 <- Trust	0.837	0.015	0.015	55.535	<.0001	
TR3 <- Trust	0.890	0.010	0.010	88.778	<.0001	
TR4 <- Trust	0.897	0.009	0.009	98.345	<.0001	0.919
TR5 <- Trust	0.771	0.021	0.021	36.461	<.0001	
TR6 <- Trust	0.873	0.015	0.015	60.240	<.0001	
SV1 <- Vision	0.856	0.012	0.012	69.569	<.0001	
SV2 <- Vision	0.856	0.013	0.013	64.289	<.0001	
SV3 <- Vision	0.896	0.011	0.011	83.131	<.0001	0.901
SV4 <- Vision	0.902	0.010	0.010	93.715	<.0001	

From Bootstrapping - outer loadings (1000 cases)

Appendix I: Unrotated Factor Analysis

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.438	30.440	30.440	16.438	30.440	30.440
2	4.506	8.344	38.784	4.506	8.344	38.784
3	2.843	5.266	44.050	2.843	5.266	44.050
4	2.717	5.032	49.081	2.717	5.032	49.081
5	2.161	4.002	53.083	2.161	4.002	53.083
6	1.976	3.659	56.742	1.976	3.659	56.742
7	1.874	3.470	60.212	1.874	3.470	60.212
8	1.636	3.030	63.242	1.636	3.030	63.242
9	1.565	2.899	66.141	1.565	2.899	66.141
10	1.338	2.479	68.619	1.338	2.479	68.619
11	1.169	2.165	70.785	1.169	2.165	70.785
12	1.064	1.970	72.755	1.064	1.970	72.755
13	1.036	1.919	74.674	1.036	1.919	74.674
14	.688	1.275	75.949			
15	.686	1.270	77.219			
16	.593	1.099	78.318			
17	.575	1.065	79.383			
18	.552	1.023	80.405			
19	.530	.982	81.387			
20	.500	.926	82.312			
21	.492	.911	83.223			
22	.464	.860	84.083			
23	.442	.818	84.901			
24	.430	.797	85.698			
25	.410	.758	86.457			
26	.396	.733	87.190			
27	.384	.711	87.901			
28	.367	.680	88.581			
29	.360	.668	89.248			
30	.349	.646	89.895			
31	.339	.628	90.522			
32	.324	.600	91.122			
33	.312	.578	91.701			
34	.310	.574	92.275			
35	.294	.545	92.820			
36	.277	.513	93.333			
37	.275	.509	93.841			

38	.265	.490	94.332			
39	.256	.474	94.806			
40	.248	.459	95.265			
41	.243	.449	95.714			
42	.236	.436	96.151			
43	.216	.400	96.550			
44	.211	.391	96.942			
45	.204	.378	97.319			
46	.200	.369	97.689			
47	.195	.361	98.049			
48	.186	.345	98.394			
49	.164	.304	98.698			
50	.158	.292	98.990			
51	.153	.284	99.274			
52	.146	.271	99.544			
53	.129	.240	99.784			
54	.117	.216	100.000			

Extraction Method: Principal Component Analysis

Component Matrix(a)

	Component												
	1	2	3	4	5	6	7	8	9	10	11	12	13
IK2	.763	-.145	.058	.073	.193	.242	.062	.156	-.134	-.053	-.200	-.060	-.110
IK3	.750	-.141	.036	.098	.174	.229	.074	.167	-.143	-.081	-.240	-.082	-.067
TR4	.740	-.064	.176	-.032	-.304	-.033	-.239	.025	.038	.196	-.159	.052	.076
IK1	.737	-.097	-.015	.041	.308	.223	.035	.146	-.178	-.058	-.201	-.015	-.065
TR6	.728	-.064	.119	-.065	-.267	.001	-.228	.020	.026	.190	-.181	.029	.094
SV2	.716	-.063	.218	-.126	-.026	.081	-.108	.044	.041	-.304	.196	.031	.097
IK5	.714	-.092	.014	.081	.249	.300	.086	.116	-.184	-.035	-.268	-.050	-.121
RP1	.713	-.001	.158	-.101	-.105	-.006	-.082	-.057	.143	-.104	.049	-.124	-.154
TR3	.707	-.097	.160	-.062	-.315	-.041	-.269	.070	.042	.241	-.139	.023	.093
SV4	.689	-.112	.114	-.147	.000	.139	-.194	.038	-.002	-.389	.144	.127	.218
IK4	.681	-.093	-.035	.038	.282	.289	.066	.128	-.227	-.036	-.299	-.040	-.134
SV3	.678	-.071	.055	-.144	.093	.161	-.220	-.001	.023	-.367	.164	.180	.249
RP4	.672	.031	.226	-.089	-.124	-.062	-.025	-.011	.140	-.134	.082	-.276	-.297
TR1	.664	-.062	.055	-.092	-.230	-.052	-.244	.049	.038	.207	-.105	-.004	.073
TR2	.660	-.076	.105	-.098	-.291	-.023	-.265	.048	.026	.265	-.141	.017	.125
TR5	.657	-.045	.122	-.033	-.202	-.092	-.218	-.021	-.010	.152	-.135	-.010	.023
RP3	.651	.101	.207	-.065	-.118	-.046	-.052	-.049	.214	-.158	.139	-.265	-.374
SV1	.645	-.095	.066	-.153	.050	.127	-.244	.027	.029	-.369	.124	.193	.192
CM2	.621	-.104	.076	-.252	.310	-.271	.067	.229	-.098	.227	.228	-.038	-.007
CM3	.614	-.116	.023	-.226	.374	-.242	-.019	.217	-.078	.227	.233	.049	.015
EH3	.608	-.026	-.142	.495	.085	.245	.046	-.037	.142	.151	.156	-.182	.202
EH4	.605	-.043	-.164	.448	.081	.285	.061	-.060	.148	.125	.168	-.156	.197
EH2	.595	.016	-.049	.524	-.040	.092	.108	.003	.178	.120	.187	-.166	.120
PN4	.586	-.102	.236	-.251	-.076	-.029	.387	-.296	-.122	.002	-.005	.002	.075
PN1	.582	-.052	.222	-.212	-.084	.028	.422	-.298	-.151	.049	-.001	-.028	.100
CM1	.577	-.083	-.002	-.263	.341	-.311	.060	.183	-.113	.247	.242	-.046	-.034
SA3	.570	-.010	-.005	.317	.062	-.373	.176	.001	.186	-.080	-.197	.164	.028

RP2	.559	.080	.198	-.165	-.141	-.062	-.069	-.053	.274	-.130	.103	-.223	-.332
SA1	.548	-.015	.073	.355	.058	-.386	.189	.001	.228	-.136	-.118	.231	-.031
SA2	.546	.036	.027	.358	.039	-.427	.178	.034	.219	-.073	-.189	.264	-.026
PN3	.542	-.088	.231	-.255	-.113	.028	.438	-.380	-.096	.079	.007	.057	.125
EH1	.539	-.027	-.063	.514	.044	.159	.111	-.022	.161	.117	.207	-.141	.121
KE1	.532	.169	-.046	.203	-.046	.254	-.163	-.250	-.129	.163	.203	.387	-.316
OS1	.520	.396	-.249	.141	.020	-.295	-.149	-.212	-.280	-.059	-.030	-.175	.023
SA4	.514	.068	.019	.237	.082	-.297	.172	.127	.255	-.131	-.063	.168	-.070
CM4	.510	-.065	-.037	-.216	.365	-.232	-.051	.209	-.065	.145	.200	.063	.017
OS2	.502	.460	-.320	.100	.021	-.278	-.158	-.230	-.309	-.094	-.019	-.163	.034
PN2	.498	-.061	.206	-.242	-.074	.062	.476	-.350	-.060	.042	.019	.032	.055
SR1	.223	.606	-.258	-.277	-.088	.140	.176	.161	.076	.005	-.042	.096	.040
SR5	.234	.591	-.289	-.298	-.086	.145	.150	.172	.196	.085	-.061	.025	.008
SR4	.253	.583	-.237	-.249	-.109	.156	.174	.224	.184	.048	.020	.093	-.031
SR2	.342	.581	-.309	-.240	-.088	.141	.154	.151	.187	.013	-.043	.015	.043
SR3	.432	.517	-.311	-.221	-.033	.105	.127	.114	.173	-.002	.004	-.023	.061
LK1	-.228	.505	.367	-.058	.399	.076	-.151	-.214	.187	.116	-.061	.010	.091
OS4	.445	.497	-.390	.020	-.013	-.143	-.095	-.187	-.196	-.104	-.021	-.038	.038
LK3	-.203	.489	.370	.017	.363	.065	-.113	-.172	.119	.005	-.097	-.001	.013
OS3	.476	.486	-.304	.097	.008	-.272	-.181	-.240	-.300	-.116	-.024	-.109	.055
LK4	-.291	.483	.425	-.018	.386	.015	-.143	-.182	.212	.048	-.118	-.002	.046
SE2	-.143	.476	.361	.227	-.266	.035	.128	.187	-.220	-.029	.119	.032	-.038
LK2	-.222	.444	.427	-.053	.377	.079	-.215	-.182	.152	.141	-.092	-.048	.076
SE4	-.150	.468	.500	.231	-.150	-.080	.104	.315	-.297	-.026	.038	.001	.047
SE3	-.141	.459	.464	.231	-.122	-.051	.055	.293	-.317	-.078	.069	-.024	.080
SE1	-.154	.360	.441	.207	-.254	.062	.116	.232	-.132	.020	.125	.019	.014
KE2	.417	.200	-.098	.229	-.007	.276	-.148	-.236	-.158	.207	.228	.453	-.357

Extraction Method: Principal Component Analysis.
a 13 components extracted.

Appendix J: Common Method Bias Analysis

Construct	Indicator	Substantive Factor Loading (R1)	T-Statistics for R1	$R1^2$	Method Factor Loading (R2)	T-Statistics for R2	$R2^2$	T-value of R1 / T-value of R2
Affiliation	SA1	0.881	43.473	0.777	-0.025	0.887	0.001	49.017
	SA2	0.920	51.444	0.846	-0.052	1.948	0.003	26.405
	SA3	0.813	26.634	0.660	0.042	1.181	0.002	22.549
	SA4	0.726	25.514	0.527	0.042	1.540	0.002	16.566
Commitment	CM1	0.908	50.037	0.824	-0.035	1.455	0.001	34.380
	CM2	0.872	37.928	0.760	0.034	1.173	0.001	32.340
	CM3	0.883	46.532	0.780	0.019	0.771	0.000	60.330
	CM4	0.789	27.380	0.622	-0.022	0.768	0.000	35.665
Efficacy	KE1	0.894	84.270	0.799	0.076	4.905	0.006	17.182
	KE2	0.969	100.705	0.939	-0.077	4.782	0.006	21.061
Effort	SE1	0.729	32.320	0.531	-0.021	0.871	0.000	37.120
	SE2	0.779	44.993	0.607	-0.001	0.055	0.000	819.539
	SE3	0.840	72.839	0.706	0.012	0.590	0.000	123.413
	SE4	0.871	93.674	0.758	0.008	0.525	0.000	178.528
Ehelp	EH1	0.872	34.010	0.760	-0.042	1.254	0.002	27.119
	EH2	0.846	37.353	0.716	0.031	1.183	0.001	31.588
	EH3	0.919	52.780	0.845	-0.005	0.226	0.000	233.748
	EH4	0.887	44.278	0.787	0.014	0.553	0.000	80.026
Intention	IK1	0.868	32.955	0.754	0.030	1.079	0.001	30.534
	IK2	0.839	31.263	0.704	0.080	2.930	0.006	10.670
	IK3	0.849	28.533	0.721	0.059	1.883	0.003	15.152
	IK4	0.991	34.470	0.982	-0.126	3.625	0.016	9.510
	IK5	0.936	39.164	0.875	-0.047	1.790	0.002	21.883
Norm	PN1	0.832	40.105	0.692	0.049	1.919	0.002	20.895
	PN2	0.875	40.394	0.766	-0.061	2.724	0.004	14.829
	PN3	0.923	49.719	0.852	-0.049	2.091	0.002	23.774
	PN4	0.824	43.077	0.678	0.059	2.778	0.004	15.504
Power	LK1	0.858	60.327	0.735	0.014	0.702	0.000	85.997
	LK2	0.842	53.819	0.709	0.015	0.888	0.000	60.641
	LK3	0.790	38.945	0.625	0.020	0.916	0.000	42.512
	LK4	0.859	48.971	0.738	-0.046	2.409	0.002	20.330
Reciprocity	RP1	0.659	18.696	0.435	0.203	5.560	0.041	3.362
	RP2	0.948	31.480	0.899	-0.175	5.216	0.031	6.035
	RP3	0.940	33.414	0.883	-0.077	2.247	0.006	14.873

	RP4	0.806	22.302	0.650	0.047	1.228	0.002	18.169
Score	SR1	0.831	48.616	0.691	-0.078	3.723	0.006	13.058
	SR2	0.841	58.401	0.707	0.038	1.933	0.001	30.215
	SR3	0.754	35.644	0.568	0.159	6.338	0.025	5.624
	SR4	0.828	46.650	0.686	-0.047	2.480	0.002	18.808
	SR5	0.853	64.677	0.727	-0.075	3.961	0.006	16.328
Status	OS1	0.838	48.401	0.702	0.062	2.773	0.004	17.456
	OS2	0.933	78.712	0.870	-0.008	0.508	0.000	154.914
	OS3	0.938	87.765	0.880	-0.037	2.060	0.001	42.600
	OS4	0.842	44.815	0.708	-0.016	0.628	0.000	71.339
Trust	TR1	0.755	15.920	0.570	0.044	1.051	0.002	15.155
	TR2	0.919	30.473	0.844	-0.094	2.995	0.009	10.173
	TR3	0.957	42.795	0.915	-0.078	3.118	0.006	13.724
	TR4	0.887	39.205	0.787	0.012	0.464	0.000	84.549
	TR5	0.697	18.480	0.485	0.085	2.398	0.007	7.707
	TR6	0.835	26.878	0.697	0.042	1.273	0.002	21.115
Vision	SV1	0.902	25.761	0.813	-0.055	1.363	0.003	18.902
	SV2	0.746	22.339	0.556	0.137	3.963	0.019	5.637
	SV3	0.935	41.137	0.875	-0.048	1.717	0.002	23.966
	SV4	0.925	41.057	0.856	-0.030	1.054	0.001	38.961
Average		0.856	43.917	0.739	0.0001		0.0046	53.176