The Influence of Leader-Member Exchange Relationships on Team Members' Relationships and Knowledge Sharing Behaviour

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Declaration

I, Mingdong Zhong, hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published. I further declare that the work has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma at another University or institute of higher education.

Mingdong Zhong

Sept 26, 2017

Dedication

To my son Zhonghao

I dedicate this thesis to you, my dearest son, for all the companion and bedtime stories I have missed. You accompanied me to study in the UK since you were four years old. However, being a PhD mum, I had to spend a great deal of time and energy for my work. From not even knowing a single English alphabet letter and crying madly at your first day of schooling in the UK to being able to communicate with teachers and make friends at school, your performance is much better than mine. Thanks for giving me the strength to complete this journey, love you always.

Acknowledgements

It might be the case that with the increase of age, time passes by more quickly than before. The seemingly long journey of a four-year PhD goes as quickly as a blink. As a married, middle-aged woman with a family and a son, almost all my peers chose to stay at home, while I chose to study in the UK for a PhD. From time to time during the four years, I asked myself what was this for? After four years study, I think I found the answer: the four years not only helped me fulfil my PhD dream but also gave me the confidence to face any challenge in the future. The four-year experience made me stronger both academically and spiritually. In my generation, the title of Doctor represents the commanding height of education with a holy aura. It is a dream of our generation, while far away from our reach for all sorts of reasons. So, first of all, I would like to thank life that gave me the courage to make the decision to go for a PhD. The experience made me understand that learning should not be ended because of age and family chores. As long as you wish, it is never too late to do anything. You can always fulfil your dreams.

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I would like to thank Warwick Business School and Warwick University for providing excellent teaching staff as well as all kinds of training and supporting resources. All these, together with the beautiful campus, make me wish to stay longer and reluctant to say goodbye.

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Abstract

The importance of innovation for organizational competitive advantage and effectiveness is widely accepted (Love et al., 2011). Because of its potential to increase innovation, knowledge sharing (KS) has been of growing interest to researchers and managers (Kamaşak & Bulutlar, 2010). It is suggested that knowledge sharing is more likely to occur in supportive conditions when individuals have high-quality relationships with their leaders and co-workers (Carmeli et al., 2013). The purpose of the present study is to examine the association between the workplace relationships in teams and knowledge sharing, and how the pattern of knowledge sharing in teams is associated with team innovation and team performance.

Social exchange theory and the norm of reciprocity served as the theoretical foundation of the present study. A cross-sectional survey was utilized for data collection. The sample consisted of 223 members and 51 leaders from 51 teams which were collected from ten primary and middle schools as well as an aircraft corporation in Southern China. The results of the study demonstrated that both Leader-Member Exchange (LMX) and Team-Member Exchange (TMX) are positively associated with knowledge sharing at the individual and team levels. Furthermore, the results suggested a mediating effect of TMX between LMX and team-level knowledge sharing (team KS). In Addition, the result of the comparison of an individual's own LMX with the average LMXs in the team (RLMX) was found to moderate the relationship between LMX and TMX. However, the expected negative relationship between the variation in LMX relationships in a team (LMX differentiation) and TMX was not statistically significant. Finally, the study also found that the pattern of knowledge sharing in teams is positively related to team innovation and team performance, such that teams with more people sharing knowledge have better innovation and performance than teams with only a few people sharing knowledge.

The overall findings indicate that both LMX and TMX have a unique influence on knowledge sharing, and our understanding of how supportive social relationships influence wok outcomes should be expanded from looking at the vertical leader-follower relationship and the horizontal relationship with a team in isolation. Rather, the multi-level interactions of these two types of relationships should be considered together.

CHAPTER 1 INTRODUCTION

In an increasingly knowledge-based economy, knowledge sharing is central to organisational performance. Leadership is one of the key factors for facilitating enterprise growth and transformation (Bryman et al., 1996; Peterson et al., 2003), as well as fostering knowledge sharing within the organisations (Bradshaw et al., 2015; De Vries et al., 2010). However, the mechanism by which individuals are influenced by their leaders to share knowledge is less clear, including how the vertical leader-follower relationship interacts with other, lateral, relationships to influence knowledge sharing for individuals and teams. Addressing this question is important because the innovation and performance of teams depends largely on how leaders can effectively elicit (formally or informally) and integrate individual members' knowledge (Teece, 1998).

After more than 40 years of research, leader-member exchange (LMX) theory has become an important part of the leadership literature. LMX has been associated with organizational performance (Martin et al., 2016), organizational justice (Park et al., 2015), organizational support (Kraimer et al., 2011) and employee satisfaction (Fisk & Friesen, 2012; Volmer et al., 2011). These outcomes of LMX are in turn factors that are known to predict individuals' knowledge sharing. Thus, we would expect LMX to facilitate knowledge sharing, however the research on the relationship between LMX and follower knowledge sharing is limited. For this reason, to investigate the relationship between LMX and KS provides a new provision to the leadership and KS literature.

Furthermore, the leader-member relationship is not isolated from other relationships in teams. Except for the vertical relationship such as LMX, the horizontal relationships such as an individual's relationship with the team as a whole (TMX) also plays a critical role for an individual's work attitudes and behaviours (Ilgen, 1999). Therefore, from a team perspective, to investigate how both vertical relationships (LMX) and horizontal relationships (TMX) interact with

each other in teams provides a fuller understanding of workplace relationships for knowledge sharing.

The present study starts from one type of leadership, LMX, and drawing on social exchange theory (SET) and role theory expands our understanding of workplace relationships from vertical relationships (leader-member exchange, LMX) and horizontal relationships (team-member exchange, TMX) in isolation, to examining them together. This study investigates how these two basic relationships work simultaneously on individuals' knowledge sharing in teams, which ultimately relates to improved team innovation and performance.

This chapter elaborates on the background and value of the present study. Then, the current research and practice status in the main fields that are related to the present study are reviewed. Following these, the main questions of this study are put forward. Finally, the research method and prospective contributions of this study are discussed.

1.1 Research Background

Organizational innovation contributes to the development of organizational competitiveness (Yiu & Lau, 2008). Its importance for organizational competitive advantage and effectiveness is widely accepted (Love, Roper and Bryson, 2011). Innovative companies are said to win market reputation and customer loyalty and are superior to competitors in ability, reaction, and performance, enabling them to lead the market. Innovative organizations tend to rely on teams as the complex problems that are faced necessitate having individuals with different skills, experience, and knowledge (Lovelace et al., 2001).

Knowledge sharing is a critical factor to promote the organizations' innovation as it helps to maintain valuable resources, helps individuals and teams learn new

things, and solve problems (Majid & Wey, 2009). It also helps organizations to survive in a competitive, dynamic and unstable environment (Hooff & Weenen, 2004). Successful knowledge sharing has the potential to increase the capacity for innovation in organizations (Kamaşak and Bulutlar, 2010). A number of studies have demonstrated that knowledge sharing is critical because it enables organizations to improve innovation performance and avoid repetitive learning (e.g., Calantone et al., 2002; Scarbrough, 2003). It also brings the organization intellectual capital and important resources, thus contributing to the growth and development of the organization (Liao et al., 2004).

However, it is difficult to manage knowledge sharing since knowledge resides within the minds of every individual team member. In practice, employees may be unwilling or unable to share their work related experience, skills and knowledge with co-workers for various reasons (Lam & Lambermont-Ford, 2010; Seba et al., 2012). The factors that affect knowledge sharing include: 1) individual factors such as personality conflicts (Golen & Boissoneau, 1987) or not knowing the benefits of doing so (Cabrera & Cabrera, 2002); 2) organizational factors such as the physical distance between team members; and, 3) technology factors such as unavailability of technology (Lu et al., 2006).

Therefore, determining how to encourage employees to share knowledge has become the key to success or failure of knowledge management strategies (Bollinger & Smith, 2001). It is found that organizations can successfully promote knowledge sharing by changing employees' attitudes and behaviours towards knowledge sharing, which ultimately leads to an increased willingness to share knowledge (Connelly & Kelloway, 2003). As a result, recent knowledge management research has emphasized the management of people (Bell DeTienne et al., 2004; Yang, 2007a). For instance, Wiig (2012) suggests a people-focused knowledge management startegy, which focuses on how people create, share, and use knowledge to think, make decisions and take actions. Moreover,

Cabrera and Cabrera (2005) apply the term people management practice to refer to the practices that facilitate knowledge sharing among people. These practices fall into seven categories such as work design, staffing, training and development, performance appraisal, compensation and rewards, culture and technology (Cabrera & Cabrera, 2005).

The role that leaders play in fostering or hindering knowledge sharing should not be ignored (Gupta, 2008; Mäkelä & Brewster, 2009). For instance, a good-quality relationship with a follower leads to positive employee behaviour (Todorovic & Schlosser, 2007). Research shows that leaders in organizations and teams treat their subordinates differently based on factors such as the subordinate's ability and skills, their degree of trust and their motivation to take responsibilities, which often results in an in-group and out-group (Graen & Uhl-Bien, 1995). In addition to formal job responsibilities, the chosen in-group members also take responsibilities that are essential to the success of the organization and team. Therefore, they also receive more attention and support from the leaders. However, the out-group members are engaged in more routine work and have formal contractual relationships with their leaders (Liden & Graen, 1980). Subordinates engage in different behaviours according to the perceived quality of their relationship with their leader, including knowledge sharing (Scott & Bruce, 1994).

Moreover, research has shown that workplace relationships can be considered an important factor that stimulates employees to transform their own knowledge into organizational assets. For example Carmeli, Gelbard and Reiter-Palmon (2013) suggest that knowledge sharing tends to occur because of supportive conditions when individuals have good relationships with their leaders and co-workers. Their findings indicate that, in the workplace, not only vertical relationships (LMX) but also horizontal relationships such as members' relationships with their team (TMX) are related to knowledge sharing.

The present research, therefore, focused on the relationship between leader-member relationship (LMX) and knowledge sharing (KS), and how LMX as a vertical relationship interacts with the horizontal relationship TMX, and whether the two basic relationships have a unique relationship with knowledge sharing. I examine the interaction of LMX and TMX in the context of teams to see whether their relationship is related to the differentiation of LMX in the team such as relative LMX (RLMX) and LMX differentiation, and their relationship with knowledge sharing at the team level. Additionally, I examine whether many or a few people sharing knowledge in the team is more favourable to team innovation and performance.

1.2 Current Status of Research

1.2.1 Current Research Status on Knowledge Sharing

Knowledge sharing is a research area that has been receiving attention from increasingly more researchers (Masa'deh et al., 2015; Navimipour & Charband, 2016). Studies on knowledge sharing mainly focus on two directions. One is of the factors that influence an individual's willingness to share knowledge. The other is in the processes of knowledge sharing.

Individual Knowledge Sharing

Research on sharing knowledge at the individual level is mainly in the context of organizations or virtual communities. As individuals' attitudes determine individuals' behavioural intentions, which leads to individuals' behaviour (Bock et al., 2005), many studies focus on the motivation behind individuals' knowledge sharing. For instance, Lampel and Bhalla (2007) suggest that altruism and the norm of reciprocity motivate individuals to share their knowledge. Such knowledge sharing behaviour is also affected by an individual's identity to the team. Cho and colleagues (2010), studying the relationship of individual's sense

of belonging and knowledge sharing in the context of Wikipedia, found that the sense of belonging positively affects altruism, which leads to positive attitudes for knowledge sharing. The sense of belonging also positively relates to subjective norms, knowledge self-efficacy and reciprocity, which results in individual's knowledge sharing. Chang and Chuang (2011) studied the factors that motivate individuals sharing information with strangers in a virtual community and found that altruism, identity, reciprocity， and shared language are significantly related to knowledge sharing.

Many scholars have studied the antecedent factors that influence individuals' knowledge sharing. Sharratt and Usoro (2003) studying the antecedents of knowledge sharing in online communities, found that organizational structure, ease of use, perceived usefulness, sense of community and trust are all positively related to knowledge sharing. Cabrera and colleagues (2006) explored some of the psychological and organizational related factors that affect individuals' knowledge sharing. They found that self-efficacy, openness to experience and perceived support from co-workers and supervisors are most significantly related to knowledge sharing, followed by organizational commitment and a knowledge management system. Olivera, Goodman, and Tan (2008) found, in their study, that the high/low positions of knowledge sender and receiver, the consistency of knowledge requester's topic and knowledge sender's professional field as well as the cost of participating in knowledge sharing have a direct impact on individuals' knowledge sharing behaviour.

Drawing on the theory of cognitive integration, He and Wei (2009) investigated the factors that influence knowledge contribution and knowledge seeking. They found the factors that have an impact on individuals' knowledge contribution behaviour include the individual's social relationships, enjoyment in helping, management support and the cost of knowledge contribution. However, they found individuals may not contribute their knowledge purely because of

reciprocity or rewards. On the other hand, the factors that are related to individuals' knowledge seeking behaviour included the perceived usefulness of knowledge, social relationship and seeking efforts. However, knowledge growth, management support, and rewards had no relationships with individuals' knowledge seeking.

With the development of social capital theory, some recent studies focus on the influence of each dimension of social capital on the individual's intention and behaviour of knowledge sharing. Nahapiet and Ghoshal (1998) found that social capital is the collective behaviour formed from the development of the interpersonal network in the community. They argue that social capital is not a unidimensional concept but consists of three dimensions: structural (e.g., network ties and network configuration), relational (e.g., respect, friendship, and emotional attachment), and the cognitive (e.g., shared language, codes, and narratives). A study on the influence of the three dimensions of social capital on individuals' knowledge sharing by Huang and colleagues (2009), found that relational capital is negatively related to individuals' knowledge sharing intention. However, it is positively related to knowledge sharing intention indirectly through the structural capital.

The Processes of Knowledge Sharing

In addition to the factors that are related to knowledge sharing, some other researchers focus on the processes of knowledge sharing. For example, Nonaka and colleagues describe the processes of knowledge transformation, knowledge sharing, and innovation through several models that they have developed, such as the SECI model (Nonaka et al., 2000) and the synthesizing process of knowledge creation (Nonaka & Toyama, 2003). According to Nonaka, Toyama, and Konno's (2000) SECI model, there are four basic modes of knowledge conversions: socialization, externalization, combination, and internalization. They then suggest that knowledge is synthesized through the processes of converting

tacit knowledge into explicit knowledge (Nonaka & Toyama, 2003). From a different perspective, Kautz and Kjærgaard (2007) suggest that knowledge is transferred between implicit and tacit and from individual to group. According to them, people acquire knowledge through two ways: they obtain tacit knowledge through participating in practical activities and acquire explicit knowledge through reading. Then social interaction, interactive learning, virtual communication, and activity participation help to facilitate the transfer of knowledge.

Some scholars have simulated the process of knowledge sharing from the perspective of network dynamics. Morone and Taylor (2004) simulated the process of knowledge sharing and examined how individuals share knowledge face-to-face through interactive learning. They found three groups of individuals in knowledge learning: fast catching-up individuals, slow catching-up individuals, and unable to catch up individuals. Fast catching-up individuals reach the highest level of knowledge quickly, slow catching-up individuals increase the knowledge constantly over a much longer period of time, while unable to catch-up individuals are the people who cannot make any progress in knowledge learning. After a long-term knowledge sharing process, knowledge increased for the individuals with higher catching-up levels. However, the knowledge does not improve much for slow catching-up individuals. Collard and colleagues (2012) studied information mobility through social networks by simulating a multi-agent environment. They found that the dynamic characteristics of the network are associated with the peak value of the knowledge sharing as well as the time and scope of the peak value. Their findings help the understanding of information flow among people and answer the question of how information is spread through the population.

1.2.2 Current Research on Social Exchange and Workplace Relationships

The other main field of the present study is social exchange theory (SET). Despite the name, social exchange theory is not a theory but rather a conceptual model that is interdisciplinary and covers fields such as sociology, social psychology, and anthropology (Cropanzano & Mitchell, 2005). It is a widely used theory in organizational studies to understand behaviours in the workplace (Cropanzano & Mitchell, 2005). It is assumed that SET generates obligations and high-quality relationships through a series of interactions and transactions (Emerson, 1976).

The main constructs of the present study – LMX, TMX and KS, fall within the domain of SET. LMX and TMX both originate from SET. Knowledge sharing is the transaction of knowledge among people, thus, it can be viewed as a form of social exchange. Therefore the present study applies social exchange theory as the overarching theory to investigate knowledge sharing.

The existing SET literature is mainly at the organization level with a focus on the relationship between perceived organization support (POS) and outcomes such as commitment, justice, organizational citizenship behaviour (OCB), and workplace relationship such as leader-member exchange (LMX).

SET and Organizational Commitment and Justice

Drawing on social exchange theory, the employment relationship between employees and organizations can be regarded as a social exchange relationship. The organizational support is the employees' perceived support from the organization (termed as POS) and, to some extent, it can be viewed as an absolute reward from work. When the reward reaches or even exceeds employees' expectations, they are willing to stay with the organization, be loyal to the organization and develop a higher level of organizational commitment. On the other hand, organizational justice is a result of employees' comparison of what they get in comparison with similar others, which can be viewed as a

relative reward from work. The result of the comparison can influence employees' motivation, attitude, and behaviour. For instance, Loi, Hang-Yue, and Foley (2006) tested a model where they linked employees' justice, organizational support and organizational commitment. The results showed that employees' perceived justice contributed to the development of perceived organizational support (POS), which mediates the relationship between justice and organizational commitment.

The present study focuses on the leader-member and team-member level. The reciprocal relationship and the results of the comparison at the organization-member level (POS) work in a similar way at the leader-member and team-member level. For instance, at the leader-member level, when an individual receives benefits through a high-quality relationship with the leader, s/he is willing to reciprocate to the leader and be loyal to the leader. However, if individuals sense injustice from the comparison with peers, the results will influence their attitude and motivation towards work.

SET, Workplace Relationships and OCB

As social exchange theory suggests, the interactions between people are essentially exchange relationships, and a society is filled with the exchanges of individuals' actions and behaviour (Rupp & Cropanzano, 2002; Cropanzano & Mitchell, 2005). Blau (1964) argues that, in addition to the exchange of materials, individuals exchange non-material resources as well such as emotion, appreciation, information, reputation, and services in social life. This indicates that individuals in society are not pure "economic" rational. The relationship between an employee and the organization is an interdependent relationship based on the exchange of resources. Therefore, many researchers apply SET to explain or predict the relationship between employees' social responsibility and performance. Research shows that if employees perceive support from the organization (e.g., Agarwal, 2015; Chiang & Hsieh, 2012; Karavardar, 2014) or

perceive a high-quality relationship with the leader (e.g., Huang et al., 2014; Sun et al., 2013) they tend to have more organizational citizenship behaviour. Research further indicates that LMX and OCB have a closer relationship compared with the relationship between POS and OCB (e.g., Cropanzano & Mitchell, 2005; Masterson et al., 2000). The findings are important to management practice as it shows that organizations should make their employees feel that they are being recognized and supported by the organization. Leaders should build a relationship of mutual trust and respect with employees, in order to motivate employees' OCB.

Following the studies as mentioned earlier, the present study expands the existing literature to examine the individual-level social exchange relationship such as LMX and TMX and its relationship with knowledge sharing at both the individual and team level. Knowledge sharing can be viewed as a prosocial behaviour because it matches the definition that it is the action that tends to help a person and the helper is not motivated to do so by the obligations from work (Bierhoff, 2002). The questions that the present study tries to answer are discussed in detail in the next section.

1.3 Research Questions

A large body of research has shown that workplace relationships can shape team processes and outcomes (e.g., Boies & Howell, 2006; Liu et al., 2011a; 2011b; Sherony & Green, 2002). A study by Carmeli et al. (2013) suggest that individual relationships with their leaders would facilitate employees' knowledge sharing (KS), because it provides psychological conditions that foster exchanges including constructive feedback. However, research thus far has mainly focused on vertical relationships such as leader-member relationship (LMX), while horizontal relationships, such as team-member relationship (TMX), have been largely ignored. As the first key focus of this study, we argue that horizontal

relationships can equally provide supportive conditions for knowledge sharing and that both leader-member relationships and team-member relationships are responsible for distinct knowledge sharing behaviours which may ultimately foster increased team innovation (West, 2002).

Following examination of how different workplace relationships may be responsible more for unique outcome variables of knowledge sharing, we take a closer look at the multilevel nature of LMX, which is a previously neglected area of research (Harris et al., 2014). LMX theory has its fundamental premise that leaders form different types of exchange relationships with their subordinates (Liden & Graen, 1980). Beyond the level of the leader-member dyad, the differentiation in a team is believed to have a significant relationship with work outcomes at both the individual and team level (Anand et al., 2015). For instance, at the individual level, Ma and Qu (2010) found that the variability in LMX relationships in the team strengthens the relationship between LMX and an individual's performance. In a recent study by Harris et al. (2014), they found that LMX differentiation attenuates the association between LMX and employees' OCB and turnover intention. At the team level, LMX differentiation is found to be positively related to team performance (e.g., Liden et al., 2006; Naidoo et al., 2011). Therefore, the second part of the study further examines how contextual LMX constructs such as relative LMX (RLMX) and group LMX differentiation is associated with knowledge sharing in the team.

These answer the call of understanding how LMX theory operates at multiple levels (e.g., Harris et al., 2014). The two contextual LMX constructs included in the second part of the study are relative LMX (RLMX) and LMX differentiation. In this study, RLMX refers to an individual's LMX quality relative to the average LMX quality within a workgroup (Hu & Liden, 2013). LMX differentiation refers to the degree of within-group variation that leaders create when they form the different quality of relationships with different subordinates (e.g., Chen et al.,

2014; Epitropaki, 2015; Tordera & González-Romá, 2013).

In the last part of the study, I further the discussion on the relationship of high-quality workplace relationships and knowledge sharing and raise the question of how many people sharing knowledge in a team is best for team innovation and performance; and whether many members in a team sharing knowledge are more favourable to team innovation and performance or is only a few leading members sharing knowledge adequate for the team to succeed? This is the first study in KS literature that explores the pattern of knowledge sharing in the context of a team in order to facilitate team outcomes such as innovation and performance. In addition to the theoretical contribution of extending the understanding of KS literature, it also has a potential practical contribution of providing evidence for a good combination of knowledge sharing patterns for the leader to facilitate in the team.

To summarize, the purpose of the present study is to answer the question of how the vertical and horizontal relationships in the workplace predict knowledge sharing through the multi-level structure in a team and how the members in a team share knowledge that is more favourable to team innovation and performance. The three sub-research questions of the present study are:

1) At the individual level, whether workplace social exchange relationships such as LMX and TMX are differently responsible for the outcome variables at the individual or team level?

2) At the team level, how do differential leader-member relationships within the team influence individuals' social relationships and team level outcomes, such as team knowledge sharing, and how do they ultimately influence team innovation and performance?

3) Within a team, whether many members sharing knowledge or only a few leading members sharing knowledge is more favourable to team innovation and performance?

1.4 Research Methods

The epistemology and ontology of this research were based on a positivist paradigm and followed a quantitative methodological approach (Johnson & Duberley, 2000). As this research examines the association of social exchange relationships and employees' KS, positivism is believed to be particularly helpful in explaining human behaviour regarding cause and effect (May, 2001). In this respect, this research aims to answer inferential questions that try to explain a phenomenon rather than simply describe it which, in turn, leads to several hypotheses. A quantitative approach is, therefore, believed to be especially suitable for the testing of these hypotheses (Muijs, 2011).

More particularly, this research studies teams in organizations where knowledge sharing is important to accomplish team tasks and team-based knowledge, and where distinct teams are present. In these selected teams, members were required to interact frequently to share both tacit and explicit knowledge relevant to the team task. The survey questionnaires were sent through the Qualtrics online survey system to around 80 teams. Two sets of questionnaires were designed for team members and team leaders respectively. Members were required to fill out a TMX survey asking about their relationships with the whole team. They were also asked to fill out an LMX survey focused on their relationship with their leader. Finally, they were asked about their degree of knowledge sharing with individual team members. This allowed evaluation of member-to-member KS as well as aggregation of the team level for an assessment of overall team KS. In order to avoid the common method bias and to improve the reliability of the results, a set of questionnaires were designed for

team leaders to provide multi-source data. It focused on the assessment of knowledge sharing within the team, and the innovation and performance of the team as a whole.

This research followed the ethical guidelines of Warwick Business School (WBS) and the University of Warwick. Participation in the study was voluntary, and all data collected from individuals and organizations were kept confidential. The data were kept secure by the researcher as suggested by the guidelines of the university.

1.5 Prospective Contributions

1.5.1 Theoretical Contributions

The present study expects to make some theoretical contributions. Firstly, drawing on social exchange theory and the norm of reciprocity, this study addresses an unanswered question in the LMX literature – whether and how LMX influences people outside the leader-member relationship (Sias & Jablin, 1995, Tse et al., 2008).

Secondly, the existing literature focuses on how leaders affect individual, group and organizational level outcomes, yet the role that co-workers play in the overall group's functioning remains relatively unknown (Omilion-Hodges & Baker, 2013). This is a gap in the existing literature as horizontal relationships are a critical part of workplace relationships and are believed to have powerful implications to employees' work behaviours (Ilgen, 1999).The present research expands the view of workplace relationships from vertical to include horizontal relationships and addresses this gap by examining how vertical exchange relationships (e.g., LMX) and horizontal exchange relationships (e.g., TMX) simultaneously relate to employees' knowledge sharing.

Thirdly, this research studied LMX and TMX simultaneously to examine their unique relationship with knowledge sharing and their outcomes at the team level to advance LMX theory.

Fourthly, the study addresses the gap in the existing knowledge sharing literature by applying LMX (Aslani et al., 2012; Wang & Noe, 2010) to develop an understanding of how social relationships in the workplace have an association with knowledge sharing at both the individual and team level. This stresses the importance of social relationships for knowledge sharing.

Fifthly, the quality of leader-member relationships vary in the same team. However, empirical research on the role of LMX differentiation at the team level in relation to team outcomes, such as KS, is relatively scarce (Le Blanc & González-Romá, 2012). This research attempts to advance LMX-theory by examining how LMX differentiation is associated with workplace relationships and team outcomes.

Finally, the majority of research on knowledge sharing mainly focuses on the processes and results of knowledge sharing on individual, group and organizational levels and the factors that have influence on individuals' knowledge sharing. The present study further explores, for the first time, whether the number of members sharing knowledge in a team matters to team outcomes such as innovation and performance.

1.5.2 Practical Contributions

Except for the theoretical contributions, this study also expects practical contributions. Firstly, the investigation of workplace relationships helps leaders understand how their relationship with individual members may have consequences for the other relationships in their teams. It also helps leaders

understand additional interpersonal factors that may need to be considered when building and managing teams.

Secondly, the examination of knowledge sharing helps leaders and members in teams understand the importance of sharing knowledge in the team because knowledge sharing helps raise individual knowledge to the team level in order to develop collective knowledge which can improve team innovation and performance (Teece, 1998) and, most importantly, how these will become true through establishing positive workplace relationships.

Thirdly, a high-quality leader-member relationship encourages the members to share their knowledge within the team (Cabrera & Cabrera, 2005). Knowledge sharing contributes to team innovation and team performance which leads to maintenance and improvement of organization capability (Wang & Wang, 2012). Therefore, the present research of LMX on KS helps leaders to improve their relationships with their subordinates with the purpose of encouraging them to share knowledge to improve team innovation and team performance.

Finally, through the examinations of LMX, TMX, RLMX and LMX differentiation, this research reminds leaders to pay attention to the influence of workplace interpersonal relationships on knowledge sharing (Lu et al., 2006). When leaders deal with the relationships with their subordinates, they should also pay attention to other relationships such as the variance of leader-member relationship quality in the team and members' relationship with colleagues in the team. A good balance of all the social relationships in the workplace helps the leaders achieve better team innovation and performance.

CHAPTER 2 LITERATURE REVIEW

In this chapter, we start by reviewing the constructs we are examining. More specifically, we firstly review the meaning of knowledge sharing and the factors that may influence knowledge sharing in organizations. Then the main outcomes of knowledge sharing in the workplace such as innovation and performance are reviewed. Because knowledge sharing can be seen as a form of social exchange, the literature of social exchange theory is reviewed as the overarching theory of this study. Following that, the literature that views knowledge sharing as a form of social exchange is reviewed. Then, two specific types of social exchange relationships – leader-member exchange (LMX) which represents vertical social exchanges and team-member exchange (TMX) which represents horizontal social exchanges, and their relationships with knowledge sharing are reviewed. Finally, the literature of differential social relationships in the form of relative LMX (RLMX) and LMX differentiation and their associations with knowledge sharing are reviewed in the context of teams. The key constructs of this study, their main relationships and their sequences to be discussed in this chapter are illustrated in Figure 2.1 below:

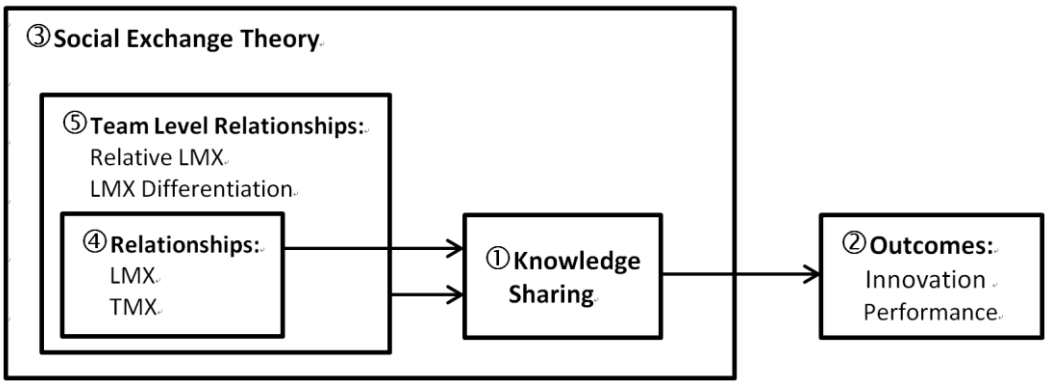

Figure 2.1 A diagram of key constructs and their relationships

2.1 Knowledge Sharing (KS)

2.1.1 Definition of KS

The knowledge management literature shows a variety of definitions of knowledge, for example, Nonaka (1994) recognizes knowledge as a multidimensional concept which is based on information and justified by one's belief. Zander and Kogut (1995) suggest that knowledge includes information and know-how. Davenport and Prusak (1998) suggest knowledge as something deeper and richer than data or information. Despite the differences in definition, it is commonly agreed that knowledge is a concept which is wider than information.

Another consensus on knowledge is that it is an intangible asset that contributes to an organization's competitive advantages (e.g., Bock & Kim, 2001; Teece et al., 1997). This is because when knowledge is shared, it is likely to contribute to the development of collective knowledge (Cabrera et al., 2006), which is believed to be able to surpass the sum of what each individual can do (Liu et al., 2011). Knowledge sharing has the potential to increase organizational performance (Davenport & Prusak, 1998) by making full use of the existing knowledge in order to avoid repeating the same mistakes and to reduce duplication (Al-Hawamdeh, 2003). Moreover, as a valuable organizational resource, knowledge sharing can reduce the risk of knowledge loss through retirement, turnover, and competition (Dalkir & Liebowitz, 2011). Therefore, knowledge sharing is important to teams and organizations.

Bartol and Srivastava (2002) suggest that knowledge sharing occurs when individuals share work-related information and experiences with each other. Van Den Hooff and De Ridder (2004) add that, in addition to mutually exchanging knowledge, the two parties within the knowledge sharing process also jointly create new knowledge. Therefore, this study regards knowledge sharing as the provision of the individual's own knowledge and experience to other members of

the organization in order to help or collaborate with them and develop new skills or methods to accomplish work-related tasks.

2.1.2 Factors that Influence KS

However, knowledge sharing and the efforts made to enhance KS in teams may be ineffective, as employees only share their knowledge with co-workers when they are willing to do so (e.g., Lam & Lambermont-Ford, 2010; Seba et al., 2012). Scholars have stressed the fact that employees are reluctant to share knowledge even when they are encouraged or rewarded for doing so (e.g., Bock et al., 2005; Seba et al., 2012). The reasons that make it difficult to encourage employees to share their knowledge with others include:

a) The tacit knowledge owned by employees is highly personalized, and thus difficult to formalize and share. Just like Polanyi (1966) states that a person knows more than s/he can tell.

b) Knowledge sharing behaviour is a voluntary behaviour which is similar to other voluntary behaviours such as helping and Organizational Citizen Behaviours (OCBs) (Frey, 1993). Employees may be reluctant to share knowledge due to a lack of confidence with the knowledge they own.

c) A core motivation of knowledge sharing is a good relationship between the knowledge transmitter and recipient (Michailova & Hutchings, 2006). A bad relationship may lead to less or even no sharing of knowledge between the two.

d) Knowledge shows a person's ability at work. Employees are afraid of losing their unique value when other people acquire the same ability through knowledge sharing.

For these reasons, it can be a challenging task to promote and successfully achieve KS (Davenport, 1994; Fisher & Fisher, 1998; Lam & Lambermont-Ford, 2010), as teams and organizations cannot force employees to do so.

To address the concerns mentioned above, researchers have identified many factors that facilitate employees' knowledge sharing behaviour. In general, this study groups these factors into six major categories: knowledge factors, personal factors, interpersonal factors, team factors, organizational factors, and IT factors.

Knowledge Factors

There are various ways to classify the types of knowledge. For example, Christensen (2007) classifies knowledge that can be shared into four types: professional knowledge, coordinating knowledge, object-based knowledge and know-how knowledge. Meanwhile, Hara and Hew (2007) suggest that the shared knowledge can be divided into three types: cultural knowledge, book knowledge, and practical knowledge. Regardless of the difference in knowledge classification, it can be divided into two basic types: tacit and explicit knowledge (Nonaka & Takeuchi, 1995). Tacit knowledge refers to the type of knowledge that is gained through one's experiences and stored in one's mind (Nonaka & Takeuchi, 1995). It is difficult to pass on to others in the form of formal languages (Polanyi, 1966). However, explicit knowledge is the type of knowledge that can be acquired by others in the form of formal languages such as documentation and instructions. As explicit knowledge can be transformed into formal language, it can, therefore, be more easily shared compared to tacit knowledge (Nonaka & Takeuchi, 1995). Thus, the degree of tacitness or explicitness determines the difficulty of the knowledge to be shared (Blankenship & Ruona, 2009).

Personal Factors

Knowledge sharing consists of a knowledge provider and a knowledge receiver. The motivation of knowledge provider and the absorptive capacity of knowledge receiver directly affect the effectiveness of their knowledge sharing. For example, Cyr and Choo (2010) suggest that knowledge sharing is a rational calculus. The knowledge provider weighs the costs and benefits of sharing before a decision is made. The knowledge provider may also have their personal preference to favour a certain type of sharing (Cyr & Choo, 2010). On the other hand, the effectiveness of knowledge sharing also depends on the recipient's knowledge absorption, which refers to an individual's ability to take in, organize and apply new knowledge (Kayes et al., 2005). The process of knowledge sharing will be slowed down if the knowledge recipient has a lower level capacity to take in, digest or absorb knowledge.

Interpersonal Factors

Interpersonal factors include the knowledge providers' relationship quality as well as their structural relationship with knowledge recipients. A high-quality relationship between the knowledge provider and receiver is positively related to knowledge sharing, while a low-quality relationship is negatively related to knowledge sharing (Constant et al., 1994). A good relationship between two individuals leads to more interactions between the two, which ultimately results in more willingness to share knowledge. For example, Ma and Yuen (2011) examine knowledge sharing through an interpersonal relationship perspective and find that the quality of a social relationship is one of the determinants of knowledge sharing. The structural relationship with the knowledge recipient refers to the relationship based on the functional distance or power distance at the workplace (Cyr & Choo, 2010). According to Cyr and Choo (2010), functional distance concerns the question of whether the knowledge recipient is from the same work unit as the knowledge provider, whereas power distance concerns

the question as to whether the recipient or provider is the boss. Based on this, Cyr and Choo classify three types of knowledge sharing targets: close co-worker, distant co-worker, and leader. Their study found that the individual's knowledge sharing varies among the three types of sharing targets. This is because individuals are generally more willing to share knowledge with friends rather than someone that they do not know. Moreover, from the members' point of view, sharing knowledge with leaders makes a bigger difference than sharing knowledge with co-workers. This is because leaders have the power to allocate the resources and opportunities to the team. Members believe that they can establish a good relationship with the leaders by sharing knowledge with them.

Team Level Factors

As teams have become the basic building blocks of organizations, increasingly more work has been performed at the unit of the team. Therefore, it is important to know the factors at the team level that can facilitate knowledge sharing. Studies on team level knowledge sharing indicate various factors that facilitate the KS in teams. Mesmer-Magnus and DeChurch (2009) found three factors that can enhance team knowledge sharing: task demonstrability, discussion structure, and cooperation. The authors also found three factors that detract from knowledge sharing in teams: information distribution, informational interdependence, and team member heterogeneity. Moreover, Bartol and Srivastava (2002) suggest using team level rewards for the knowledge sharing in the team. They expect the individuals to link their knowledge sharing with the improvement of the whole team rather than a single colleague. They suggest that team-level rewards help to develop a sense of cooperation and reciprocity in the team so that more team members are involved in the knowledge sharing, which leads to the improvement of team performance. Still other researchers suggest creating a knowledge sharing culture in teams to promote knowledge sharing (Mueller, 2014; Zakaria et al., 2004).

From a different angle, MacNeil (2003) points out that the knowledge management (KM) literature lacks a link with human resource management (HRM). She suggests investigating KS from the perspective of interpersonal relationships and emphasizes the critical role of line managers. She suggests that the line managers should play the role of facilitators for knowledge sharing within teams because line managers are the ones who have the interpersonal and learning skills to encourage knowledge sharing in teams (MacNeil, 2003; 2004). Through the interpersonal perspective, Staples and Webster (2008) also highlight a positive relationship between trust and knowledge sharing in teams. The present study furthers the direction of the interpersonal dimension and investigates how social relationships are associated with members' knowledge sharing.

Organizational Factors

The factors within an organization that influence knowledge sharing include organizational culture, climate, and structure. Both organization culture and organizational climate are intangible features of an organization. But they are different from each other. Organization culture is the foundation based on which the organization is built. It develops over a long-term and consists of values and traditions of an organization. Different from organization culture, organization climate is more on the surface and more about how it is like to work in the organization. If describing an organization as a person, organization culture is the personality while organization climate is more related to the mood of the person (Zohar & Hofmann, 2012). Despite the difference, both organization culture and climate influence the individual's knowledge sharing in a similar way. Both create an atmosphere which inspires employees' motivation for knowledge sharing. An open and free atmosphere promotes the information flow among employees. And an atmosphere filled with tolerance and pro-social norms also motivates employees to share knowledge. For instance, researchers found that a lack of culture becomes a barrier to knowledge sharing (Sun & Scott, 2005). It is also

found that a favourable organization climate creates an atmosphere which influences employees' intention to engage in knowledge sharing which, ultimately, leads to knowledge sharing behaviour (Chen et al., 2012).

The last organizational factor that influences knowledge sharing is organizational structure. Because the structure of an organization considerably affects the communication among employees, it is not surprising to find that it influences employees' knowledge sharing as well. Blankenship and Ruona (2009) studied the associations of different organizational structures on knowledge sharing and identify six types of social structures in organizations, comprising: work groups, project teams, strategic communities, learning communities, communities of practice (CoPs) and informal networks. Depending on the type of structure, it facilitates or hinders employees' knowledge sharing (Gorry, 2008). Take the structure of project team as an example. It is a group of people that gathers for a specific task. These people may come from different departments with different backgrounds. The project team provides a platform for these people to work together so that they can have more opportunities to share their ideas and experiences in order to accomplish the task.

IT Factors

As the virtual society has become the second society of human beings, it has also been regarded as an important means of communication, learning and knowledge sharing (Seba et al., 2012). Therefore, information technologies have been widely used in companies to facilitate knowledge sharing (Tohidinia & Mosakhani, 2010). Basic technologies such as the intranet, computer-based information systems, and electronic media applied in organizations are believed to facilitate the sharing of valuable information (Jarvenpaa & Staples, 2000). Hendriks (1999) believes that IT helps to overcome knowledge sharing barriers caused by distance both physically and socially. And it also provides access to databases which may otherwise be beyond the reach of an individual (Hendriks,

1999). However, IT can also be a factor that hinders knowledge sharing. For instance, failure to provide immediate maintenance, lack of compatibility with different software and systems, and lack of IT training may all become barriers to knowledge sharing (Riege, 2005).

Other Hampering Factors

Just as there are a variety of facilitators of knowledge sharing, its barriers are equally varied. Some of the facilitators might become obstacles if they do not reach a favourable level. For instance, knowledge tacitness (Teece, 1986), knowledge recipient's low absorptive capacity (Kayes et al., 2005) or unsuitable group and organizational structure in the workplace (Gorry, 2008) may hinder knowledge sharing. Research also shows a list of barriers to knowledge sharing such as an individual's ineffectiveness in communication (Hendriks, 1999), cross-culture barriers (Chow et al., 2000), national culture difference (Ford & Chan, 2003) and group size (Connelly & Kelloway, 2003), etc. It is worth mentioning that contrary to common belief, rewards do not seem to increase employees' intentions to share knowledge (Bock et al., 2005; Seba et al., 2012).

2.2 Outcomes of KS

Knowledge sharing within organizations has attracted considerable attention from researchers and managers. Through knowledge sharing, individuals participate in knowledge creation (Nahapiet & Ghoshal, 1998) and learning. Knowledge sharing also facilitates performance and innovation which, ultimately, increases organizational competitive advantages (Jackson et al., 2006). In this section, some main outcomes of knowledge sharing are reviewed.

KS & Knowledge Creation

As Van Den Hooff and De Ridder (2004) propose, knowledge sharing not only includes mutual knowledge exchange between individuals but also the creation

of new knowledge together. Therefore, knowledge sharing facilitates knowledge creation. In reality, if a solution is generated through knowledge sharing, it is normally believed to be the best possible one to the problem (Huang, 2009). In the same vein, Nahapiet and Ghoshal (1998) suggest that knowledge is created through the processes of knowledge combination and knowledge sharing. Nonaka and Konno (1998) also introduce the concept of "Ba", which refers to a place developed in the company for employees to gather together with the purpose to help them socialize, exchange ideas and promote knowledge sharing and creation (Nonaka, 2000).This place can be physically created in the workplace or virtually. As this place provides a platform for individuals to socialize and to share knowledge, it is regarded as a foundation for knowledge creation, and the idea is applied in Japanese companies to encourage knowledge sharing for knowledge creation.

KS & Learning

Research states that learning is embedded in the sharing process (Huang, 2009). When knowledge is shared in the workplace, individuals are involved in activities such as discussions and debates, which promote learning (Nahapiet & Ghoshal, 1998). Knowledge sharing and learning are closely related. Knowledge sharing goes through the whole processes of individual learning and organizational learning, whereas organizational learning provides an internal atmosphere and platform for knowledge sharing. Learning effectively promotes new knowledge acquisition and creation, and turns the new knowledge into organizational knowledge, which makes an organization more creative and competitive (Law & Ngai, 2008). Yang (2007b) empirically investigated the relationship of knowledge sharing and organizational learning on organizational effectiveness and found that knowledge sharing helps to turn individual knowledge into organizational knowledge and is positively related to organizational learning which eventually promotes organizational effectiveness.

KS & Performance Achievement

It is commonly believed that knowledge sharing improves performance achievements at all levels in organizations (e.g. Cummings, 2004; Du et al., 2007; Huang, 2009). For instance, a recent empirical study by Kim and Yun (2015) found that co-workers' knowledge sharing is positively related to individual's task performance. At the team level, Jiang and colleagues (2016) found that knowledge sharing in teams mediates the relationship of team empowerment and team performance. At the organization level, Wang and colleagues (2014) found that both tacit and explicit knowledge sharing has a positive relationship with organizational performance.

Knowledge sharing improves communications, collaboration and learning among employees. It also connects different networks and makes thoughts-collision possible, which leads to knowledge creation (Tsai, 2000, 2001). At the same time, knowledge flow within the organization stimulates innovation (Sáenz et al., 2012). Knowledge sharing facilitates knowledge creation, individual and organizational learning, as well as innovation. These advantages gradually penetrate into all aspects of an organization and, as a result, improve an organization's long-run performance (Du et al., 2007).

KS & Innovation

Before discussing the relationship between knowledge sharing and innovation, it is necessary to first distinguish innovation from creativity, a concept that often appears together with innovation and can be easily confused with it. Despite the fact that creativity is generally believed to facilitate innovation (Sarooghi et al., 2015), some researchers argue that creativity is, in fact, a part of innovation processes because innovation consists of two stages: generating creative ideas as the first stage and implementing the ideas as the second stage (Shalley & Zhou, 2008). Innovation is distinguished from creativity at the process of idea implementation (Rosing et al., 2011). Therefore, it is commonly agreed that

creativity focuses on idea generation whereas innovation emphasizes idea implementation (Anderson et al., 2014; Sarooghi et al., 2015).

Knowing the meaning of innovation, it is easier to understand that the generation and implementation of ideas in the workplace depend heavily on employees' knowledge, skills, and experience. Therefore, innovation and knowledge are closely related as knowledge is a critical element in order to achieve innovation (Liao et al., 2007). As previously discussed, knowledge sharing contributes to the development of collective knowledge (Cabrera et al., 2006), creation of new knowledge, and organizational competitive advantages (Jackson et al., 2006), therefore, knowledge sharing can be seen as a valuable input for innovation (Wang & Wang, 2012). Thus, the sharing of knowledge has become an important activity for working teams and organizations.

There are empirical studies across different professions and countries that demonstrate the association between knowledge sharing and innovation. For instance, Liao, Fei, and Chen (2007) collected data from 170 firms in Taiwan's knowledge-intensive industries and found that knowledge sharing is associated with innovation capacity through absorptive capacity. Hu, Horng, and Sun (2009) used a sample of 621 employees of international tourist hotels in Taiwan and found that knowledge sharing is positively related to innovation performance of hotel services and moderated by team culture. This indicates that organizations need to encourage knowledge sharing behaviours plus a good team culture in order to achieve innovative performance. Another empirical study based on data from 89 high technology firms in Jiangsu Province, China found that both explicit and tacit knowledge sharing facilitate innovation which ultimately leads to performance (Wang & Wang, 2012). Kamaşak and Bulutlar (2010) used data from 264 middle and top-level managers in Turkey and found that knowledge collecting, the activity of taking in or receiving knowledge from others, had a significant relationship with all types of innovations. Meanwhile knowledge

donating, the activity of providing knowledge to others, is associated with two specific types of innovations – exploitative innovation and ambidextrous innovation, but not exploratory innovation. These two studies further indicate that the two dimensions of KS – knowledge collecting and knowledge donating both have their unique influence on different types of innovation.

2.3 Social Exchange Theory (SET)

2.3.1 Exchange Resources, Principles and the Formation of SET

Social exchange theory (SET) is one of the most influential conceptual frameworks commonly applied to explain workplace behaviours (Rupp & Cropanzano, 2002). According to Blau (1964), social exchange occurs when someone makes a repayment and stops when there is no more repayment. The microstructures of society originate from the exchange of the individual's expectation of social reward (Blau, 1964). Individuals interact with others in order to gain the things they need through exchanges. In order to better understand the power of social exchange theory in explaining workplace behaviours, Cropanzano and Mitchell (2005) outline three main assumptions of the theory, comprising: a) resources exchanged, b) exchange principles, and c) relationships that emerge. Drawing on the resource theory of social exchange (Foa & Foa, 1980), there are six types of resources that can be exchanged: money, goods, services, status, information, and love. These exchange resources also apply to organizations.

With regard to the principles of exchange, Homans' (1958) behaviouristic exchange theory suggests six, including: 1) success proposition, 2) stimulus proposition, 3) value proposition, 4) deprivation/satiation proposition, 5) aggression/approval proposition, and, 6) rationality proposition. From the perspective of social structure, Blau (1964) identifies five principles of social exchange: 1) rational principle, 2) reciprocity principle, 3) justice principle, 4)

marginal utility principle and 5) imbalance principle. According to Homans (1958) and Blau (1964), egoism is the basic rule of human behaviours. All individuals intend to maximize their benefits in the exchange, and therefore the most important exchange rule of social exchange is the norm of reciprocity. This norm states that when individuals receive help from others, they feel obliged to repay the benefit they have received (Gouldner, 1960). The fundamental function of reciprocity is that it makes the receiver feel obligated to return the favourable treatment s/he received. This felt obligation is assumed to be the underlying process which makes reciprocity a basic mechanism contributing to the association between social exchange relationships and workplace behaviours (Rhoades & Eisenberger, 2002). The norm of reciprocity has, therefore, been used in organizational studies to explain a wide variety of behaviours, such as OCBs, in-role behaviour, organizational commitment (Settoon et al., 1996), pro-organizational behaviour (Umphress et al., 2010), social support giving and receiving (Bowling et al., 2005) and helping behaviour at work (Deckop et al., 2003).

Finally, the processes from which the social exchange relationships have been generated can be explained with Cropanzano and colleagues' (2016) generic model of social exchange. The model identifies three parts of social exchange: a) an initiating action, b) a reciprocating response and c) a relationship between the two parties. The initiating action refers to the initial behaviours by actors who provide the benefit or do harm to the target. Examples of workplace initiating actions may include supervisor's support or justice as positive actions, and abusiveness or bullying as negative actions. Depending on the initiating action, the target responds with good (productive) or bad (counterproductive) behaviours of his/her own. Through these interactions between actors and targets, usually, supervisors, subordinates or co-workers in the workplace, a high or low quality of the relationship between the two parties is generated.

As each of the three parts of SET, the exchange resources, principles and its formation, contains different constructs in different cases and contexts. Therefore, SET is more of a broad conceptual framework rather than a single theory (Cropanzano et al., 2016).

In this study, the emphasis is on two types of exchange relationships that most commonly exist in the workplace. One is the exchange relationship an individual has with his/her supervisor (leader-member exchange, LMX) and the other is the exchange relationship an individual has with his/her work team as a whole (team-member exchange, TMX). In section 2.4, LMX and TMX and their relationships with knowledge sharing will be reviewed.

2.3.2 KS as a Form of Social Exchange

Social Exchange theory (SET) follows three basic principles: a) there is a series of exchanges that exist in society; b) an individual tends to minimize the cost and maximize the benefits of the exchange (Cyr & Choo, 2010); c) the norm of reciprocity that makes an individual repay what they have received from others (Blau, 1964). I will review these principles on knowledge sharing one by one.

Firstly, researchers suggest that knowledge sharing is based on the exchange (Sharratt & Usoro, 2003; Van Den Hooff & De Ridder, 2004). As Van Den Hooff and De Ridder (2004) state, knowledge sharing is a process where individuals mutually exchange their knowledge. This indicates a two-way process of knowledge sharing where knowledge as a resource is provided by one party and received by the other (Sharratt & Usoro, 2003). For this reason, De Vries and Van Den Hooff (2006) suggest that knowledge sharing consists of two dimensions: knowledge donation and knowledge collection. Therefore, knowledge sharing is a form of exchange.

Secondly, during the process of knowledge sharing, the knowledge provider weighs the costs and benefits of sharing before action is taken (Cry & Choo, 2010). People get involved in the exchange relationship only when they foresee a repayment from the exchange. The costs of knowledge sharing include: losing one's unique value (Renzl, 2008), losing knowledge authority (Gray, 2001), the time spent and effort made to organize the knowledge (Markus, 2001), and revealing personal insight (Cabrera & Cabrera, 2002). Meanwhile, the benefits of knowledge sharing may include: reputation enhancement and influence expansion (Casimir et al., 2012), self-efficacy (Hsu et al., 2007), expected reciprocal benefits and trust (Hsu & Lin, 2008).

Finally, the knowledge recipient feels obligated to repay the help they get from others (Bock & Kim, 2001). Therefore, knowledge sharing is a form of social exchange (Casimir et al., 2012; Cry & Choo, 2010) because it matches the three key principles of SET, which is the existence of exchange behaviour, obtaining benefit from the exchange and reciprocity norm. In this study, we have applied social exchange theory to examine its effects on KS through the forms of both vertical exchange (leader-member exchange, LMX) and horizontal exchange (team-member exchange, TMX), which is discussed in the next section.

2.4 Social Exchange Relationships & KS

2.4.1 Leader-Member Exchange (LMX)

Definition of LMX

The distinct contribution of LMX theory lies in the suggestion that leaders develop varying qualities of relationships with each of their subordinates (Dansereau, Cashman & Graen, 1973), which implies that every leader-member relationship is unique and different in quality. Although there is no unified definition for LMX, researchers suggest some characteristics of it. Scandura and colleagues (1986) suggest five elements of LMX: 1) LMX is a system that consists

of different components and their relationships; 2) it consists of two parties within a dyadic relationship; 3) the behaviours of the two parties are closely related; 4) the two parties have influence on a certain outcome simultaneously; 5) the outcomes of LMX provides information or solutions to a problem. Graen and Uhl-Bien (1995) suggest that LMX refers to the differential relationships leaders develop with their subordinates in the workplace and the high/low quality of the exchange relationships determine the way managers treat their subordinates and the roles the subordinates play.

Theoretical Base and the Development of LMX

There is a great deal of research on the development of LMX. For example, Liden and colleagues (1993) suggest that LMX is formed at an early stage of the dyadic relationship (within the first two weeks). Therefore, the first two weeks is critical to the development of LMX as it is the time that leaders are likely to form their impression of subordinates' working abilities. As the first impression is difficult to change once developed, much of the exchange relationship is based on the initial impression (Engle & Lord, 1997). However, the commonly accepted theoretical base of LMX includes Role Theory and Social Exchange Theory (SET).

Drawing on role theory, social exchange and norm of reciprocity, Hsiung and Tsai (2009) suggest that the exchange quality is determined through the processes of role making. The processes start from the first stage when limited information is exchanged based on the responsibilities of the roles each party plays and the rules of economic exchange. After that, leaders go on to pass the role expectation to their subordinates through a series of tasks in order to examine subordinates' performance and motivations. In this process, subordinates react to either accept or refuse the information from leaders, which determine their roles in the workplace. For those subordinates who decide to accept the tasks and perform well, high-quality LMX are developed. Meanwhile, for those who choose to refuse the tasks from the leader, lower quality of LMX are established.

By the end, some subordinates choose to further develop a mature reciprocal relationship with their leaders, while others play the roles according to their employment contracts (Hsiung & Tsai, 2009).

The above role-making processes thus create high- and low-quality relationships between leaders and members. A low-quality leader-member relationship refers to the contractual relationship that does not exceed the scope of the employment contract. However, a high-quality leader-member relationship is primarily a social exchange that may exceed the responsibility in the employment contract as high-quality LMX subordinates are willing to take more responsibilities in order to maintain their position in the team and their relationships with the leader. As individuals play different roles in organizations, the content of social exchange relationships are different, which leads to different types of LMX relationships (Greguras & Ford, 2006).

Outcomes of LMX

The quality of LMX is related to the characteristics of the subordinates (Colella & Varma, 2001), leaders (Herman & Mitchell, 2010), their interactions (Sin et al., 2009) as well as the context they are in (Wayne et al., 2002). And the relationship between the leader and member is associated with the subordinate's behaviour (Liden & Graen, 1980) and his/her status in the organization (Nishii & Mayer, 2009).

On the individual level, the employee's job attitudes and performance are the two most significant outcomes of LMX (Erdogan & Enders, 2007; Martin et al., 2016; Volmer, 2011). This is because when subordinates have a higher quality relationship with their leaders, they have better socialization and less stress from the roles they are playing, thus better expectations and behaviours (Thomas & Lankau, 2009). Some research focuses on the relationship between LMX and job attitudes such as job satisfaction and employees' commitment as the

consequences of LMX. For example, Epitropaki and Martin (2005) looked at the role of implicit leadership on LMX and the outcomes in a longitudinal study and found that implicit leadership theories have a significant relationship with the quality of leader-member exchange relationships which leads to greater employee commitment, job satisfaction, and well-being. In a more recent study, Van Vianen and colleagues (2011) found a positive relationship between LMX and employees' commitment based on a sample of 360 employee-supervisor dyads from Taiwan, China. Performance as another main outcome of LMX has been examined in many studies. For example, Settoon et al. (1996) found that LMX is associated with job performance and citizenship behaviours. Using data of 162 leader-follower dyads from China, Wang et al., (2005) explored employees' task performance as an outcome of LMX in a Chinese context.

At the organizational level, Wayne and colleagues (1997) suggest that LMX plays a critical role in employees' perceived organizational support (POS). When leaders deliver organizational resources, provide opportunities, information as well as emotional support to their subordinates, it is associated with subordinates' POS.

2.4.2 LMX and KS

As previously discussed, there are five categories of factors, i.e., knowledge factors, personal factors, interpersonal factors, organizational factors and IT factors that predict employees' knowledge sharing. Among them, interpersonal factors should be considered first (Du et al., 2007) as interpersonal relationships have a significant influence on an individual's engagement in social exchange behaviours such as knowledge sharing (Choi, 2006; Liao et al., 2004). This is because the individual who is in a high-quality relationship feels valued and is more confident in overcoming work-related difficulties and more willing to share work-related information and knowledge with others (Carmeli et al., 2009).

However, it is argued that LMX as a leadership approach has not yet been fully extended to the study of knowledge management in organizations (Hislop, 2013; Von Krogh et al., 2012), and further study has been suggested to investigate the importance of leadership in facilitating employees' knowledge sharing (Nonaka & Toyama, 2005). Since knowledge sharing is an interpersonal process, it is more logical to use leadership theories with a focus on such interpersonal relationships to further enhance our understanding of employees' knowledge sharing. For this reason, the present study will use the LMX approach to examine its association with employees' KS.

A high-quality leader-member relationship is characterized by trust, respect and mutual obligation (Graen & Uhl-Bien, 1995). Trust has been found to facilitate KS (e.g., Lee et al., 2010). For example, Dirks and Ferrin (2002) found that trust in leaders is positively related to knowledge sharing in teams. Concersely, a lack of trust in leaders makes employees feel uncomfortable to share their knowledge and expertise with their group members, thus resulting in less or no knowledge sharing (Jones, 2002). Respect often appears together with trust. Huysman and Wulf (2006) found that the sense of trust and respect stimulates people's knowledge sharing attitude. Several studies propose that an environment with a high degree of trust shared norms and respect are replete with social capital which, in turn, is directly linked to knowledge sharing (Nahapiet & Ghoshal, 1998). Finally, mutual obligation refers to mutually reciprocal behaviours such as the sense of returning a favour (Lesser & Storck, 2001). Many studies have supported the positive effect of reciprocity on knowledge sharing (e.g., Hau et al., 2013; Reinholt et al., 2011; Tamjidyamcholo et al., 2013). For instance, Chang and Chuang (2011) found that knowledge sharing is facilitated by the sense of reciprocity because when the knowledge transmitter knows that his/her invested efforts can be reciprocated, s/he is motivated to contribute more.

2.4.3 Team-Member Exchange (TMX)

Since the primary contribution of LMX theory lies in its premise that leaders form different types of exchange relationships with their subordinates, it is therefore not surprising to find that LMX research has mostly been concentrated on vertical exchange relationships, which emphasize the relationship quality between leader and member. The qualities of horizontal relationships, meanwhile, have been largely ignored. Only recently as the relevance of teams has become more prevalent have social exchange relationships embedded in work teams started to receive increasing attention (e.g., Tse et al., 2008). It has become evident that there are different types of exchange relationships at different levels that exist within teams such as leader-member exchange (LMX), co-worker exchange (CWX), team-member exchange (TMX), network exchange (Walker et al., 2000), organization-member exchange (Sherony & Green, 2002) and leader-team exchange (Harrison & Shaffer, 2005). This section will explain team-member exchange in detail as we believe it is an important form of social exchange in the workplace that predicts the employee's knowledge sharing.

Derived from LMX, the construct of team-member exchange (TMX) refers to an individual's relationship to his or her team as a whole. It assesses the reciprocity relationship between an individual and his/her team (Seers, 1989). Similar to LMX, TMX draws on role theory and social exchange theory. It has been shown to relate to workplace outcomes such as job performance, organizational commitment, job satisfaction and turnover intentions (Banks et al., 2014; Hellman et al., 1993; Seers, 1989). However, there are a few differences between the two exchange relationships—LMX is a vertical exchange relationship while TMX is a horizontal exchange relationship. Besides, TMX is not dyadic like LMX (Seers et al., 1995). Moreover, the resources of reciprocity are different because leaders in LMX have access to more resources and have more power compared with their subordinates, while all members in the TMX relationship are more equal in terms of resources and power (Banks et al., 2014). Finally, LMX is

developed to examine the employee's role-making and supervisor's leadership, whereas TMX is developed to examine employee's role-making and team dynamics in the workplace.

Despite the fact that the number of studies on TMX and work outcomes are far less than those on LMX and work outcomes, research has shown a variety of work-related outcomes that are associated with TMX such as members' job performance, job satisfaction (Seers, 1989), commitment and turnover intentions (Banks et al., 2014; Hellman et al., 1993), organizational citizenship behaviour (Liu et al., 2011b), as well as team member's identification with the team (Hellman et al., 1993). One of the first few studies on the effect of TMX quality on member's creativity was conducted by Liao and colleagues (2010). They found a positive relationship between TMX and team member's creativity mediated by team member's self-efficacy and moderated by TMX differentiation. They also found a positive relationship between LMX and team member's creativity mediated by team member's self-efficacy and moderated by LMX differentiation. Their research contributes to the LMX and TMX literature in that they found both LMX and TMX have the unique impact on creativity through employees' self-efficacy. This suggests that LMX and TMX may have a differential relationship with other individual behaviours, such as KS.

2.4.4 TMX and KS

Similar to the relationship between LMX and KS, research on TMX and KS has received even less attention in the literature. There are only a handful of studies that demonstrate the relationship between TMX and KS. Liden et al. (2000) suggest that individuals who experience high-quality TMX relationships are likely to engage in the exchange of resources and support, which may further result in more knowledge sharing. This has been recently shown by a study (Liu et al., 2011a) that found the work unit TMX is positively related to the intention to

share knowledge. Based on a sample of 301 participants representing 52 teams from technology companies in Taiwan, China, the authors suggest that work unit TMX plays the role as an indicator of TMX relationship climate so that individuals who work in a high-quality TMX climate are likely to reciprocate the favour they have received from other team members with more knowledge sharing. Whereas, in a low-quality TMX climate, individuals are likely to hold the knowledge they have in order to minimize the risk that the others may not return the favour they offered. A more recent study by Chae, Seo, and Lee (2015) also found a positive relationship between TMX and knowledge sharing. According to the authors, in the context of a team, members have opportunities to take in other peoples' knowledge and use it to improve their own expertise. A high-quality TMX allows the members of the team to interact with each other more effectively (Liao et al., 2010), therefore creating better knowledge sharing in the team. Except for the direct positive relationship between TMX and KS, Monica Hu, Ou, Chiou, and Lin (2012) found that TMX mediates the relationship between knowledge sharing and innovation.

2.4.5 LMX vs. TMX

As previously discussed, both LMX and TMX explain the quality of reciprocal relationships among individuals in the workplace. However, the former focuses on the vertical supervisor-subordinate relationship while the latter focuses on horizontal relationships among members in the same team. In terms of work outcomes, both constructs are related to a similar range of work outcomes such as job performance and creativity. Therefore, the question that remains unanswered for these social exchange relationships is whether and how LMX and TMX differentially influence work outcomes. Do they both matter equally? Does one of them matter less in the presence of the other? Does the weight and importance of each social exchange vary for specific outcomes? This study includes both of the social exchanges to help to gain a more complete

understanding of the social exchange dynamics within teams (Banks et al., 2014; Liao et al., 2010) and sheds light on some of these questions. Practically, it helps members to determine whether they should devote more time and energy to building up relationships with their leaders or with their colleagues (Banks et al., 2014). It also reminds the leader that in certain situations, horizontal relationships, such as team-member relationships, may be something that they should not ignore while building a team.

There are only a few studies that examine the joint effects of LMX and TMX in the workplace. The first study that simultaneously examines LMX and TMX as predictors of employee creativity by Liao and colleagues (2010) found that both LMX and TMX had the unique indirect relationship with employee creativity through self-efficacy. Following Liao and colleagues' study, Muñoz-Doyague and Nieto (2012) also found that both LMX and TMX have positive relationships with members' creative performance; however, LMX has a stronger relationship with creative behaviour than TMX. In the same line, Banks et al. (2014) examined the relationships of both LMX and TMX on four main workplace outcomes – job performance, job satisfaction, commitment and turnover intentions. The results indicate that TMX is a better predictor of commitment and job satisfaction than LMX, while less predictive than LMX for job performance and turnover intentions.

All of these studies recognize the importance of both vertical and horizontal relationships in the workplace and have tried to answer the question of which form of relationship has a stronger relationship with certain work outcomes. The present study compares the associations of LMX and TMX with KS in order to add something new to the literature.

2.5 Team Level Relationships

LMX is rooted in the concept of differentiation (Liden et al., 2006). The differentiation exists at different levels in the workplace and is believed to be associated with work outcomes, not only to individuals in the team but also to the whole team (Anand et al., 2015). For instance, in a dyadic LMX relationship, it is found that the leader's and member's view of the same relationship is often different (Epitropaki & Martin, 2015). This dispersion of dyadic relationships moderates the relationship between individual LMX and job performance (Gooty & Yammarino, 2016). At the individual-within-group level, the differentiation represents the actual difference and how the individual's work relationship differs from the average LMX (ALMX) relationships in the team. This difference is defined as relative LMX (RLMX) (Hu & Liden, 2013). Research shows that RLMX is positively related to the individual's in-role performance, OCB, and job satisfaction through self-efficacy (Hu & Liden, 2013). At the team level, the differentiation of LMX indicates the variability of LMX quality within the team, which has been found to have association with individual outcomes such as satisfaction with co-workers, organizational commitment and withdrawal behaviours (Erdogan & Bauer, 2010), as well as team outcomes such as work unit commitment (Le Blanc & González-Romá, 2012) and team performance (Liden et al., 2006; Naidoo et al., 2011). Thus, there is a reason to conclude that since LMX works simultaneously at multiple levels, the differentiation of LMX is related to outcomes at multiple levels as well.

Despite the fact that LMX theory has been a popular topic and received continuous attention for more than 40 years, research on its differentiation is still rare (Anand et al., 2015). It is argued that most of the LMX studies isolate the relationship from the wider contexts such as the team or organization in which they are embedded (Hu & Liden, 2013). The lack of multilevel LMX research prevents researchers from understanding how contextual LMX constructs such as RLMX and LMX differentiation operate to be related to member and team

outcomes (Harris et al., 2014). To fill this gap, the present study further explores how the differentiation of LMX operates at both individual-within-group level (RLMX) and team level (LMX differentiation) and their association with members' exchange relationship, such as TMX, as well as team level outcomes such as team knowledge sharing and team innovation.

2.5.1 Relative LMX (RLMX)

Definition and Theoretical Base of RLMX

Relative LMX (RLMX) is an individual's LMX quality relative to the average LMX quality within a workgroup (Hu & Liden, 2013). It is a construct at the individual-within-group level because it is the result of the individual's own LMX minus the average LMX within the group. It indicates the individuals' comparison of their own LMX quality with their peers in the same team in order to know their standing within a workgroup. RLMX, therefore, has the characteristic of relativity. It is rooted in social comparison theory, which suggests that individuals have the intention to compare themselves with similar others such as co-workers in the workplace and it is closely related to member's attitudes and behaviours in the team (Greenberg et al., 2007).

RLMX indicates an individual's position in the team through his/her relationship with the leader compared to other co-workers (Hu & Liden, 2013). A high RLMX indicates that an individual develops a higher quality relationship with the leader and thus gains more trust from the leader relative to their peers (Hu & Liden, 2013). Individuals who are trusted by the leader are more likely to be trusted by other members in the team as well (Lau & Liden, 2008). Therefore, individuals with higher RLMX are more easily accepted and respected by the team. Thus, high RLMX individuals are more willing to share what they know with others in the team. However, low RLMX individuals have a lower position in the team. Compared with their peers, they have lower quality relationships with the leader.

So, they do not gain as much trust and respect as those high RLMX individuals in the team. Therefore, they are less motivated to share what they know with others.

Comparison of Some Contextual LMX Constructs

There are two other individual-within-group LMX constructs that are similar to RLMX, but different in measurement or computations. The first is LMX social comparison (LMXSC) introduced by Vidyarthi et al. (2010) which represents the LMX comparison between one's own LMX and the relationship they perceive other colleagues in the workplace have with the leader (Vidyarthi et al., 2010). However, it is different from RLMX which represents the actual difference of an individual's LMX from the average LMX in the team as it is operationalized as an individual's LMX minus the mean LMX of the team. LMXSC is directly rated by the individual with a six-item scale developed by Liden and Erdogan and used in Erdogan (2002). Therefore, it represents an individual's subjective assessment of the LMX difference (Vidyarthi et al., 2010).

The other construct is LMX relational separation (LMXRS) introduced by Harris and colleagues (2014). Unique from RLMX and LMXSC, LMXRS assesses the employee's LMX similarity with the group by using a separation measure of heterogeneity. It represents a Euclidean distance which avoids any judgment as to whether an individual's LMX relationship is better or worse than the other LMXs (Harris & Kirkman, 2014).

As LMXSC is collected in a rather subjective way while LMXRS does not include directional information of whether the individual's LMX position is better or worse than the average LMX within a team, this research uses RLMX to indicate an individual's actual LMX standing compared with the other members in the same team.

Outcomes of RLMX

Within the limited empirical studies concerning RLMX and its outcomes, it has been found that RLMX has an association with employees' turnover (Graen et al., 1982) and job satisfaction (Hu & Liden, 2013). Although they did not use the construct of RLMX, Graen and colleagues' (1982) study on the role of LMX in employee's withdrawal process demonstrated that the higher the value of LMX minus ALMX (average LMX in a workgroup), the lower employees' turnover rate will be. In Hu and Liden's (2013) study examining the mechanisms between RLMX and its outcomes, they found that RLMX has an impact on the employee's in-role performance, OCB, and job satisfaction through employee self-efficacy.

However, results on the relationship of RLMX with some work outcomes are not consistent. For example, findings for RLMX on job performance are not consistent. Applying WABA (within-and between-entities analysis), Schriesheim et al. (1998) found a positive relationship between RLMX and job performance. However, applying the same method in another study, Schriesheim et al. (2000) found the relationship between RLMX and job performance does not exist. The inconsistency also exists in the results of the relationship between RLMX and employees' OCB. For example, Henderson et al. (2008) suggest that the social comparison process helps individuals understand their position in a team. When RLMX increases, individuals' psychological contract fulfilment increases as well, this increases their OCB. However, the results of the study did not show that RLMX has a direct association with sportsmanlike behaviours and helping, which are the two dimensions of OCB in that context. But, in a more recent study, Hu and Liden (2013) found that RLMX has a significant relationship with OCB through self-efficacy. The inconsistency in RLMX outcomes may be because the processes between the differences of LMX and the outcomes are rather complicated. The outcomes may rely on employees' reaction to the difference, which depends on employees' own LMX status and the characteristics of the organization, hence the inconsistencies in outcomes (Kauppila, 2016). It may also,

to some extent, be due to the alternative ways to collect, measure, and compute RLMX (Martin et al., 2017).

Mediating Mechanisms between RLMX and Its Outcomes

Research on the mechanisms between RLMX and its outcomes are mainly from the perspective of social psychology and focus on the constructs such as psychological contract fulfilment (Henderson et al., 2008), social identity (Tse et al., 2012) and self-efficacy (Hu & Liden, 2013).

For example, Henderson and colleagues (2008) found that psychological contract fulfilment fully mediates the relationship between RLMX and work outcomes such as job performance and sportsmanlike behaviours. Drawing on social exchange theory (Blau, 1964), the authors found that individuals with high RLMX are able to gain more resources or awards from their leader. As the leader can be viewed as the representative of the organization, therefore, high RLMX individuals believe that the organization is fully committed to its obligation and feel that they are obligated to behave in a way that is in favour of the organization such as OCBs or increased performance. However, low RLMX individuals do not gain many resources from the leader. When they find that other people gain more than they do, they have the feeling of injustice. Since they do not feel that they gain what they should do, they feel that they do not owe anything to the organization (Henderson et al., 2008).

Tse and colleagues (2012) found that social identification mediates the relationship between RLMX and employees' job performance. They argue that RLMX represents the position an individual has in the team which is related to self-concept (Buunk & Gibbons, 2007). High RLMX members have a positive self-concept, which leads to increased identity with their colleagues, whereas low RLMX members only focus on their own benefits. Therefore, high RLMX increases members' social identification, which makes the members realize their roles in

the team and stimulates them to play their roles well. Therefore, high RLMX members tend to show increased job performance (Tse, 2012).

Hu and Liden (2013) found that self-efficacy partially mediates the relationship between RLMX and employee job performance and job satisfaction, and fully mediates the relationship between RLMX and OCB. This is because high RLMX members gain more self-efficacy through comparison to others which helps them realize their ability and increases their self-confidence. This contributes to employees' performance improvement, encourages them to do jobs beyond their responsibilities and helps employees keep a positive attitude at work which increases their job satisfaction (Hu & Liden, 2013).

Moderating Mechanisms between RLMX and Its Outcomes

Researchers have found some mechanisms that moderate the relationship between RLMX and social cognition processes such as psychological contract fulfilment, social identity, and self-efficacy. The mechanisms are negative affectivity (Tse et al., 2012), team identification and team supportive behaviour (Hu & Liden, 2013).

Tse and colleagues (2012) empirically found that negative affectivity moderates the relationship between RLMX and the individual's social identification. They suggest that individuals' interpretation of RLMX is related with their own personalities. Individuals with less negative affectivities are likely to feel and react to their RLMX standing within a team in a positive way, which enhances the association of RLMX and their social identity. Conversely, individuals with more negative affectivities are likely to respond to their RLMX in a negative way, thus, weakening the association of RLMX and their social identification (Tse et al., 2012).

Drawing on social comparison theory and the effects of assimilation and dissimilation, Hu and Liden (2013) found that the relationship between RLMX and self-efficacy is moderated by team identification and team supportive behaviour. In their study, the assimilation effect refers to individuals' expectation of being similar to the team target, whereas dissimilation effect refers to the individuals' expectation of being different from the team target. They argue that when the climate of team identification and team support is high, both high and low RLMX members are influenced by the assimilation effect; therefore, it reduces high RLMX members' psychological superiority and, at the same, time motivates low RLMX members, increasing their self-confidence and self-efficacy. However, when the climate of team identification and team support is low, both high and low RLMX members are influenced by the dissimilation effect; therefore, it increases high RLMX members' psychological superiority and, at the same time, decreases low RLMX members' self-confidence and weakens their self-efficacy (Hu & Liden, 2013).

2.5.2 LMX Differentiation

LMX suggests that leaders develop a varying quality of relationships with each of their subordinates due to the limitation of resources and energy, and that leaders adopt a differentiating management style and strategy to their subordinates (Dansereau et al., 1975). Only recently, the differentiation in LMX has gradually received attention from scholars. This is because LMX differentiation provides a more comprehensive interpretation of the influence of LMX on both team and individual levels. In the workplace, high and low-quality of LMXs exist in the same team. Except for their own relationships with their leader, members also perceive co-workers' relationships with the leader and the degree of differentiation. All these are related to their work attitudes and behaviours (Henderson et al., 2008; Liao et al., 2010). Therefore, to investigate LMX in a social context, such as teams and organizations, allows the examination

of employees' reaction to the differentiation of work-related outcomes at the team- or organizational-level (Graen & Uhl-Bien, 1995; Hooper & Martin, 2008).

Definition of LMX Differentiation and Measurement

Different from RLMX, which is rooted in social comparison theory (Greenberg et al., 2007) and representing the actual difference between an individual's own LMX and the average LMX in the team (an individual-within-team construct), LMX differentiation is a team-level construct and an objective measurement, which refers to the degree of within-group variation that leaders create when they form a different quality of relationship with different subordinates (e.g., Chen et al., 2014; Epitropaki & Martin, 2015; Tordera & González-Romá, 2013). Each team has only one value of LMX differentiation for the whole team.

As LMX differentiation is a construct based on LMX it is, therefore, computed from the measurement of LMX collected with the scale of LMX-7 (Graen & Uhl-Bien, 1995) or multi-dimensional LMX (Liden & Maslyn, 1998). The computations include variance, standard deviation (SD) and within-group agreement coefficient (Rwg), where variance and SD are the most commonly used methods (e.g., Erdogan & Bauer, 2010; Henderson et al., 2008). The bigger the value of variance or SD, the higher the degree of the variation of LMX in the team, or LMX differentiation.

Outcomes of LMX Differentiation

A considerable amount of research has been done on the effects of LMX differentiation on individuals and teams. However, the results are inconsistent. The results can be mainly divided into two groups: negative effects of LMX differentiation and positive effects of differentiation.

Most of the studies find that LMX differentiation has negative effects on both individuals and teams. Researchers suggest that the differentiation in the

relationship between leaders and members indicates the leader's non-neutrality, violating the principle of equality and consistency (Gooty & Yammarino, 2016; Harris et al., 2014; Hooper & Martin, 2008) and, as a result, employees may think the leader is unjust (Bolino & Turnley, 2009) which leads to negative outcomes. For example, at the individual level, Hooper and Martin (2008) found that employees' perception of LMX variability in the workplace was negatively related to employees' job satisfaction and wellbeing. Erdogan and Bauer (2010) found that when the justice climate was low in teams, LMX differentiation increased employee's negative work attitudes and co-worker relations and also increased employees' withdrawal behaviours. At the team level, the negative effects include a decline of individual job satisfaction (Schyns, 2006), increase in team conflict and damage to team effectiveness (Boies & Howell, 2006).

However, some studies show that LMX differentiation can have a positive effect under some circumstances. For example, in a multi-level study, Liden and colleagues (2006) found that LMX differentiation is significantly related to individual performance for those employees with low-quality LMX relationships with their leader. They argue, in a highly differentiated team, low LMX members realize the differentiation and make efforts to improve their performance in order to become a high LMX member with the aim of receiving favoured treatment from the leader. Conversely, in lowly differentiated teams, leaders treat all members similarly. Therefore, members have no motivation to change their situations. Moreover, on the team level, Le Blanc & González-Romá (2012) found LMX differentiation is positively related to both team commitment and team performance when mean LMX is low.

Summary

In this literature review chapter, the key elements of this research and their relationships were reviewed. The constructs of knowledge sharing (KS), social exchange theory (SET), social exchanges such as leader-member exchange (LMX)

and team-member exchange (TMX), team level relationships such as relative LMX (RLMX) and LMX differentiation, and work outcomes such as innovation and performance were reviewed in terms of their definition, influential factors, work outcomes, and current research status with examples in order to provide a background knowledge for this research. In the next chapter, research hypotheses are formulated based on the reviewed constructs

CHAPTER 3 HYPOTHESES DEVELOPMENT

3.1 Part 1: Vertical Relationship or Horizontal Relationship: Are They Both Important to Knowledge Sharing?

As reviewed in the previous chapter, social exchange theory provides a theoretical basis for the present study. The application of both social exchange theory and the norm of reciprocity help us understand the association of exchange relationships and employees' behaviours in the workplace. With the deepening of the research in this field, we can further question whether workplace relationships such as LMX and TMX are uniquely related to certain work outcomes (Banks et al., 2014).

In the first part of the present research, I focus on two forms of social exchanges in a team, namely leader-member exchange (LMX) and team-member exchange (TMX). TMX is recently derived from LMX as a result of the increasing importance of teams to organizations (e.g., Tse et al., 2008). Despite the distinction that LMX represents vertical relationships, and TMX represents the horizontal relationship, there are still similarities between the two constructs. However, studies of TMX are limited, not to mention studies that include both LMX and TMX. Therefore, it remains unclear if LMX and TMX are two distinct constructs that have a unique association with certain outcome variables. It is important to know the distinctiveness of LMX and TMX as this helps to determine how each of the two constructs contributes to the social exchange literature. Further, if both LMX and TMX have relationships with a specific work outcome, it could be helpful to know which form of the relationship has a stronger association with a certain outcome. This has practical implications as it helps members understand how each type of relationship in the workplace is related to their work. Leaders would also know how to improve certain work outcomes through managing their relationships with their members.

Therefore, the main objective for this part of the study is to explore whether and how workplace relationships such as LMX and TMX are simultaneously and differentially related to knowledge sharing at both the individual and team level. Figure 3.1 illustrates the models for this part of the study, where we argue that both LMX and TMX have the unique relationship with knowledge sharing at both individual- and team-level. Moreover, we hypothesize that LMX has a stronger relationship with individual KS and a weaker relationship with team KS compared with TMX. In the following sections, the multi-level and multi-recipient nature for both social relationships and knowledge sharing will be discussed. After that, relationships in the models will be described in more detail.

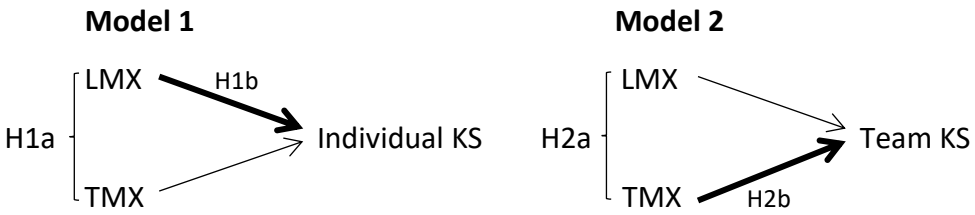

Figure 3.1 Models for Hypotheses H1(a,b) and H2(a,b)

3.1.1 Multi-level and Multi-Recipient of Social Relationship

The social exchange relationship is a multi-level construct in that it suggests people develop relationships at different levels in the workplace, including at the individual (e.g., leader-member exchange, LMX, and co-worker exchange, CWX), team (e.g., team-member exchange, TMX) and organization level (e.g., perceived organization support, POS). Moreover, research indicates that different social relationships influence certain work outcomes towards different recipients (Becker, 1992; Lavelle et al., 2007).

Because of the consideration that different forms of social exchanges may result in behaviours toward different recipients, researchers started to examine different types of social exchanges simultaneously in order to distinguish their

respective contributions to different recipients. Employee-organization exchange (termed as perceived organizational support, POS) and supervisor-subordinate exchange (LMX) are the two forms of social exchanges that have been most commonly examined together as a start of this research trend (e.g. Cropanzano et al., 2002; Valentine et al., 2006). Drawing on SET (Blau, 1964) and the reciprocity norm (Gouldner, 1960), the assumption is that POS is expected to be associated with the employee's behaviours toward the organization because the employee feels obliged to repay the support they received from the organization. In the same vein, LMX is expected to relate to employees' behaviours that benefit supervisors because employees feel in debt to the supervisor.

To verify the assumption, Settoon, Bennett, and Liden (1996) conducted a study to examine the contribution of different exchange relationships to employee outcomes. Based on a sample of 254 hospital employees from 28 groups in the southern US, they found that POS is positively related to commitment towards the organization, while LMX is associated with employee citizenship and in-role behaviours which intend to aid supervisors and co-workers. Wayne, Shore, and Liden (1997) developed and tested a model that investigates the distinctiveness of POS and LMX as well as their respective antecedents and consequences. The results indicate that POS and LMX are two distinct constructs. And, as expected, LMX is positively related to outcomes that benefit the leader such as employee performance, OCB and doing favours for the leaders. Whereas outcomes that result from POS such as affective commitment and quit intentions are directed toward the organization. Finally, a more recent study by Tekleab and Chiaburu (2011) empirically investigates five forms of social exchanges: perceived organizational support (POS), trust in the organization (TO), leader-member exchange (LMX), trust in the supervisor (TS) and psychological contract fulfilment (PCF). They classify these social exchanges into exchanges with the supervisor (LMX and TS) and exchanges with the organization (POS, TO and PCF). Results

based on a sample of 448 employees support the existence of organization-oriented and supervisor-oriented social exchange relationships.

3.1.2 KS at Multi-level and KS towards Multi-recipient

As discussed in the literature review, knowledge sharing can be viewed as a form of social exchange. Therefore, knowledge sharing should have the same multi-level and multi-recipient characteristics as social exchanges. Nonaka (1994) suggests two ways to classify the dimensions of knowledge. Except for the commonly acknowledged tacit-explicit dimensions, the author suggests that knowledge can also be classified into individual knowledge and collective knowledge. The former refers to the knowledge owned by an individual, while the latter refers to the accumulated knowledge that exists at the organization level as a result of working together (David & Fahey, 2000; Lam, 1997). In addition, Ipe (2003) suggests that knowledge exists at different levels as organizational, group and individual levels. Because knowledge exists at different levels in an organization, the sharing of knowledge is likely to exist at different levels as well. For example, researchers define knowledge sharing on the individual level as the process of two individuals mutually sharing their work-related knowledge, skills, and experiences which contribute to individual learning (Andrews & Delahaye, 2000). However, knowledge sharing on group or organizational level functions as a link between an individual and a group or an organization which transfers the individual's knowledge to the group or organizational level (Hendriks, 1999).

Study on the recipients of knowledge sharing has been largely ignored in the literature of knowledge management (Cyr & Choo, 2010). To date, only two studies (Cyr & Choo, 2010; Ford & Staples, 2006) involve the topic of knowledge targets and examine the relationship of knowledge recipient and sharing behaviour. The results indicate that the sharing targets significantly affect

individuals' sharing behaviour. Ford and Staples (2006) identify three knowledge sharing targets: close colleagues, distant colleagues, and generalized others. They argue that individuals' willingness to share knowledge largely depends on their relationship with the sharing targets. The empirical results indicate that individuals are more willing to share their knowledge with close colleagues and friends, and less willing to share with distant colleagues or people that they are not familiar with. In Cyr and Choo's (2010) study, they classify three knowledge targets: close co-worker, distant co-worker, and leader. They argue that knowledge sharing behaviour will be affected by the degree of closeness between two individuals. Moreover, individuals are more willing to share knowledge with leaders in order to keep a high-quality relationship with them, which is a key connection to LMX. Therefore, they put the three targets in the order of their influence on sharing behaviour from most to least as: leader, close co-worker and distant co-worker.

The above discussion demonstrates that knowledge sharing is a multi-level and multi-recipient construct. Further to the main objective to investigate whether and how LMX and TMX are simultaneously related to KS, the present study moves a step further to examine whether LMX and TMX have a different association with knowledge sharing at individual and team levels. More specifically, based on the above multi-level and multi-recipient discussions, I argue that LMX should have a stronger relationship with individual level KS than TMX, while TMX should have a stronger relationship with team level KS than LMX. This is important because it helps to determine which form of social exchange is responsible to a specific outcome variable. The next two sections will describe the development of the arguments in greater detail.

3.1.3 LMX, TMX and KS at the Individual Level

Drawing on the social exchange theory and reciprocity norm, LMX suggests that high-quality leader-member relationships motivate individuals to help leaders fulfil their goals as a repayment for the benefits they received through the relationships with leaders. Because of the hierarchy in organizations, leaders have more access to resources than the members do. When leaders give scarce resources to members, they do not expect a repayment from members in the same form. As far as employees are concerned, they can return the benefits in one form or another such as doing favours for the leaders (Wayne et al., 1997) or doing things that can help leaders or other co-workers (Settoon et al., 1996). Therefore, we argue that in leader-member exchanges, members may return the benefits by doing things toward someone beyond the two parties within the dyadic exchange relationship. However, the ultimate beneficiaries are the leaders. More specifically, in the present study, if an individual receives benefits through a high-quality relationship with the leader, s/he is likely to reciprocate by helping the leader to accomplish his/her goals. If accomplishing the goals requires the individual to share knowledge with a third party such as his/her co-worker, the individual is likely to do so in order to reciprocate to the leader as well as to maintain their role within the team (Ohana & Meyer, 2010). Moreover, a high-quality leader-member relationship not only reflects the positive supervisor-subordinate interaction but also promotes a high-quality relationship with co-workers who have an equal quality relationship with the leader (Sherony & Green, 2002). These high-quality interpersonal relationships facilitate employees' citizenship behaviours (Yakovleva et al., 2010), which increases the exchange of information between individuals and motivates knowledge sharing between team members (Carmeli et al., 2009).

Although studies on the relationship between LMX and knowledge sharing are limited, there are still some examples that can support the proposed relationship. For example, in the study on influential factors of knowledge sharing behaviours,

Tohidinia and Mosakhani (2010) empirically find that an anticipated reciprocal relationship is positively associated with individuals' knowledge sharing behaviour. The authors argue when individuals anticipate long-term reciprocal interactions with others, they are more likely to develop positive, cooperative behaviours (Heide & Miner, 1992) and a set of moral transformations (Kelley, 1967) which lead to knowledge sharing with others. Yu and Chu (2007) also find a positive relationship between LMX and members' willingness to share knowledge and expertise with others in the virtual community. The above outcomes, therefore, support the statement that LMX is positively associated with individual KS.

Research has shown that team-member relationships (TMX) have positive association with members' work-related outcomes, such as organizational commitment (Liden et al., 2000; Major et al., 1995), job performance (Liden et al., 2000), job satisfaction (Golden, 2006), turnover intention (Liden et al., 2000; Major et al., 1995), and employee attitudes and behaviours at work (Ilgen, 1999). Liden et al. (2000) suggest that individuals who experience high-quality TMX relationships are likely to engage in the exchange of resources and support, which may further result in more knowledge sharing. A recent study by Liu et al. (2011a) describes TMX as a "climate indication of a positive social exchange characterized by the flexibility, discretion, and open-ended relationships shared among unit members" (Liu et al., 2011a: 277). The results of their study show that work unit TMX increases intention to share knowledge through increasing members' team commitment. Thus, the quality of TMX relationship is directly linked to members' knowledge sharing. Given this, as well as the work discussed earlier that the sharing target has a significant relationship with the sharing behaviour (Cyr & Choo, 2010), I make the following hypotheses:

H1a: The quality of an individual's relationship with the leader (LMX) and an individual's relationship with the whole team (TMX) are both positively related with the individual's knowledge sharing (individual KS).

H1b: LMX has a stronger relationship than TMX with the individual's knowledge sharing (Individual KS).

3.1.4 LMX, TMX and KS at the Team Level

As discussed earlier, high-quality LMX members are likely to reciprocate to help leaders to accomplish their goals. If the leaders' goals concern the improvement of the team as a whole, such as the KS in the team, the members are likely to do so in order to repay what they have received from the leaders. Through this, they can maintain the good relationship they have with their leaders. This, therefore, indicates a positive association between LMX and team KS.

As discussed in the literature review, team-member relationships indicate a member's perceived relationship with the team as a whole. Again, based on social exchange theory and the norm of reciprocity, TMX is believed to be associated with members' knowledge sharing behaviour. Individuals who experience high-quality TMX are more willing to engage in the exchange of resources and support, while individuals with low-quality TMX minimize the exchange with other members in the team (Liden et al., 2000). Moreover, TMX can be viewed as a climate indicator of the team which shows the exchange quality among the members in the team (Liu et al., 2011a). Therefore, individuals in a high TMX climate are likely to reciprocate with co-workers in order to show that they value the relationship and that they have the intention to maintain the good relationship with the team. Conversely, individuals under a low TMX climate are likely to minimize the exchanges with the team (Liu et al., 2011a). Finally, TMX represents an individual's team identity (Banks et al., 2014). The

team identity is an aggregation of the perceptions of other members' identity in the work team (Jacob, 1970). Such an aggregation makes the team complete (Seers et al., 1995). Therefore, individuals in a high-quality TMX relationship form strong team identity which makes them treat the team as a whole while ignoring the different relationships they may have with each of the members in the team (Banks et al., 2014). Consequently, TMX is positively associated with the KS in the team (team KS). Again, considering that the knowledge sharing target has a significant association with the knowledge sharing behaviour (Cyr & Choo, 2010), I make the following hypotheses concerning the KS at the team level:

> **H2a:** The quality of an individual's relationship with the leader (LMX) and an individual's relationship with the whole team (TMX) are both positively related with the knowledge sharing in the team (team KS).

> **H2b:** TMX has a stronger relationship than LMX with members' perspective of knowledge sharing within the whole team (team KS).

3.2 Part 2: Multilevel Social Exchanges in the Team and the Outcomes

In the first part of the present study, we examined how LMX and TMX are related to individual knowledge sharing and team knowledge sharing respectively. In this part of the study, LMX and TMX are investigated in the context of teams to examine how they interact with each other and their relationships with KS in the team; how contextual LMXs (such as relative LMX and LMX differentiation) are related to the individual relationships (such as LMX and TMX) in a team.

Although LMX theory has been studied for over 40 years, and despite the fact that differentiation is the central idea of LMX, the study on LMX differentiation and the variance of LMX quality within a workgroup is still in its infancy. Therefore, as reviewed in Chapter 2 of the present study, the findings of the

effects of LMX differentiation in organizations remain inconsistent. Because LMX differentiation is considered to be a potential construct related to the entire workgroup, it has received increasing attention from researchers. In this part of the study, I examine two types of contextual LMX constructs, namely relative LMX (RLMX) and LMX differentiation, and their effects on LMX, TMX, and team level outcomes such as team level knowledge sharing. The theoretical basis and the development of each hypothesis of the study are discussed in the following sections.

Figure 3.2 illustrates a multilevel model, where we argue that team-member exchange mediates the relationship between leader-member exchange and team knowledge sharing. Moreover, relative LMX (RLMX) on the individual-within-group level plays the role of moderator between the relationship of leader-member exchange and team-member exchange. Finally, LMX differentiation (from the member's perspective and leader's perspective respectively) on the team level is negatively related to members' relationship with the team as a whole. These relationships will now be described in more detail.

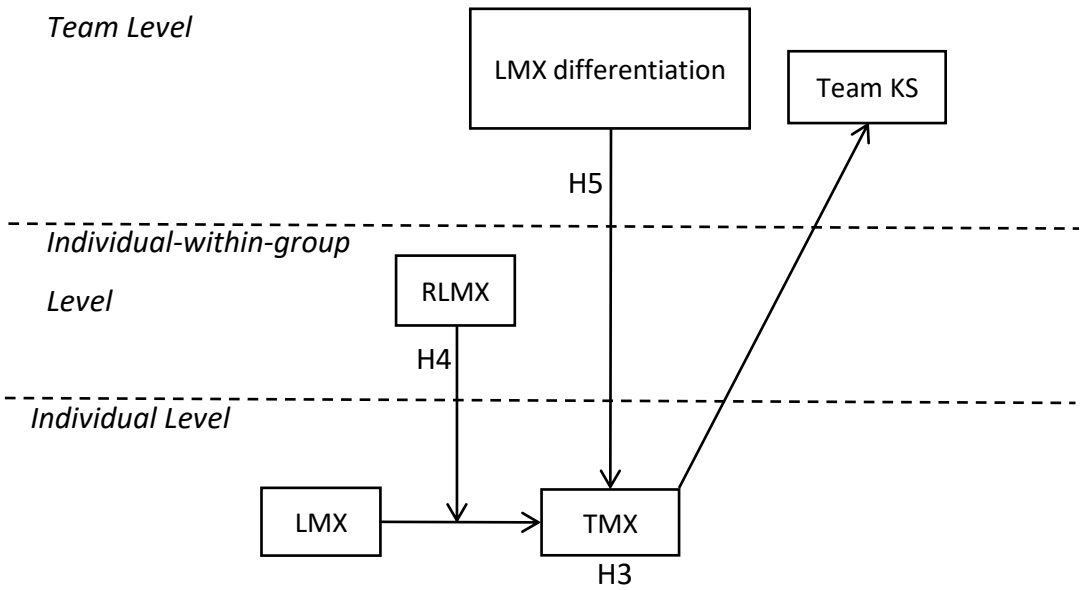

Figure 3.2 A multilevel model of social exchanges in the team and the outcomes

3.2.1 TMX Mediates the Relationship between LMX and Team KS

In this part of the study, I further investigate how LMX and TMX interact with each other and their relationships with knowledge sharing in the context of a team. The first question involved here is how one form of social exchange can have influence on another; more specifically, in this study, how the leader-member relationship is related to the team-member relationship and their relationships with knowledge sharing within the whole team.

As far as LMX theory is concerned, under a high-quality leader-member relationship, the two parties within a dyadic relationship experience reciprocity which creates obligations between them. At the same time, they experience mutual trust and respect. All these motivate the member to internalize both the leader and whole team's goals (Graen & Uhl-Bien, 1995). More specifically, members within a high-quality LMX are more likely to accomplish team tasks for the sake of the leader and are more willing to make extra effort to engage in activities that are not specified by the organization. In a similarly way, Banks et al. (2014) suggest that individuals who treat workplace high-quality relationships as important would make an effort to maintain the relations at a high level for both their supervisors and co-workers. In this regard, this recent meta-analytic review suggests that LMX is positively correlated to TMX (Banks et al., 2014).

Tse et al. (2008) also describe a positive relationship between LMX and TMX that is mediated by workplace friendship. As a high-quality leader-member relationship is characterized with mutual trust, respect and commitment (Graen and Uhl-Bien, 1995), the authors suggest that members in the high-quality LMX experience emotional bonding and associated benefits. Therefore, they are more likely to place a high value on the development of friendship at work. On the other hand, friendship in teams facilitates the quality of TMX. This is because friendship is a unique interpersonal relationship at work in that it is developed according to team members' wishes, rather than being compulsory. This

voluntary interdependence creates affective bonding in the workplace and provides emotional support to team members which motivate members to develop high-quality TMX (Tse et al., 2008). Therefore, a high-quality LMX is related to a high-quality TMX.

Some researchers use identity to explain the relationship between LMX and TMX (e.g., Sluss & Ashforth, 2007; Tse et al., 2008). It is suggested that high-quality LMX continuously creates and delivers the message of similar values and identity under the ongoing interaction between the two parties of the relationship (Tse et al., 2008). Under these circumstances, individuals within the group form similar values and identity. It is believed that the relationships between leaders and members form interpersonal identity which may extend to other forms of identities such as team identity (Sluss & Ashforth, 2007).

Based on the above discussion, we suggest a positive relationship between LMX and TMX. It must be emphasized that TMX has a positive relationship with team KS. This is because when an individual has a high-quality relationship with the team, s/he is likely to get involved in the exchanges in the team (Liden et al., 2000). Moreover, TMX acts as a climate indicator of the relationships in the team. High TMX indicates high-quality relationships in the team and, therefore, more knowledge sharing in the team. Meanwhile low TMX indicates low-quality relationships in the team, hence less knowledge sharing in the team. Additionally, TMX also represents team identity (Banks et al., 2014), where high-quality TMX members form stronger team identity compared with low-quality TMX members, which makes them treat the team as a whole and share knowledge with the team while ignoring the difference in relationships they may have with different colleagues.

Because LMX has a positive association with TMX which, in turn, relates to team KS, I propose TMX plays the role of the mediator in the relationship between

LMX and team KS. This means, the quality of LMX is associated with team KS through TMX. For example, if the relationship between a leader and a member is of high quality, the member is likely to help the leader to accomplish the team tasks by sharing his/her knowledge with the whole team for the sake of reciprocity. The high-quality TMX relationship acts as a positive climate within the team which enhances members' willingness to share knowledge. On the other hand, if LMX is of low quality, then members have a lack of motivation to accomplish the tasks for the team. The low-quality TMX relationships will hinder KS among members. Hence, this association could be summarized in the following hypothesis:

> **H3:** Team-member relationships (TMX) mediate the relationship between leader-member relationships (LMX) and knowledge sharing in the team.

3.2.2 RLMX Moderates the Relationship between LMX and TMX

Relative LMX refers to an individual's own LMX compared with the average LMXs in the team. It has been argued that it is more valuable to investigate relative LMX in context rather than looking at absolute LMX (Epitropaki & Martin, 2013) because individuals have the intention to compare themselves with co-workers who are similar to them, and the results from the comparison are closely related to members' attitudes and behaviours in teams (Greenberg et al., 2007). Therefore, contextual LMX constructs are developed to examine individuals' attitudes and behaviours while taking the context into consideration (Johns, 2006). In this section, we examine a contextual LMX construct, namely relative LMX (RLMX), and its role in the relationship between LMX and TMX. RLMX is a construct at the individual-within-group level, which refers to an individual's LMX quality relative to the average LMX quality within a work group (Hu & Liden, 2013). A high RLMX indicates that an individual develops a higher quality

relationship with the leader compared with other co-workers and thus gains more trust and resources from the leader (Hu & Liden, 2013). Conversely, a low RLMX individual develops a lower quality relationship with the leader and therefore receives limited resources from the leader.

Most researchers operationalize RLMX by deducting the mean LMX of the team from an individual's LMX, which represents the actual difference of an individual's LMX from the average LMX in the team (e.g., Epitropaki & Martin, 2013; Henderson et al., 2008). However, some researchers (e.g., Hu & Liden, 2013) apply a polynomial regression approach suggested by Edwards (1994) to measure RLMX in order to obtain a better estimate rather than a difference score. The present study adopts Henderson et al.'s (2008) suggestion to use the mean LMX as the reference point to measure RLMX because it not only shows the actual distance an individual is away from the average LMXs in the team but also indicates whether an individual's LMX position is better or worse than the average point.

It is suggested that the differentiated social exchanges motivate individuals' reciprocity behaviours (Epitropaki & Martin, 2013). In examining social exchange relationships in the context of a team with differentiated LMX, individuals with high RLMX have a better-than-average LMX in the team and, as a result, they are able to obtain more resources from the leader. At the same time, because high RLMX individuals develop higher quality relationships with the leader, they gain more trust from the leader (Hu & Liden, 2013). Individuals who gain trust from the leader are more likely to gain trust from their co-workers as well (Hu & Liden, 2013). These feelings reinforce the individuals' belief that they are more favoured by the leader as well as their co-workers; therefore, high RLMX individuals hold positive attitudes toward their team, which strengthen the effect of LMX on TMX. Conversely, low RLMX individuals have a worse-than-average LMX in the team, which means their relationships with the leader are

lower than the average LMXs in the team. As a result, their chances to obtain resources and opportunities are less than the average others. These lead the low RLMX individuals to perceive that they are not regarded highly by the leaders, and they are the unimportant person in the team. Therefore, they hold negative attitudes toward their team, which attenuates the effect of LMX on TMX. Hence, a hypothesis could be formulated as follows:

> **H4:** Relative LMX moderates the relationships between individual level LMX and TMX, such that the relationship will be stronger when RLMX is higher, but weaker when RLMX is lower.

3.2.3 LMX Differentiation and TMX

Different from RLMX which is an individual-within-group construct that represents an individual's LMX quality relative to the average LMX quality within a workgroup (Hu & Liden, 2013), LMX differentiation reflects the relational quality variance at the group level. It is a group-level construct which represents the degree of LMX variation within a workgroup that leaders create when they form different quality of relationships with different subordinates (e.g., Chen et al., 2014; Epitropaki, 2015; Tordera & González-Romá, 2013). Therefore, the high/low RLMX indicates that an individual's LMX quality is higher or lower than the average LMX quality within a workgroup. However, the high/low LMX differentiation indicates whether the range of LMX quality in the workgroup is broad or small.

It is believed that team members are aware of the difference in LMX quality (Duchon et al., 1986) which leads to member's social category processes (van Knippenberg & Schippers, 2007). Through the social category processes, members form their social identities (Hogg & Terry, 2000), which make them like and trust members in the same category (Tajfel & Turner, 1986). When LMX

differentiation is low, individuals can easily categorize themselves in the team. They treat themselves as indivisible parts of the team and make efforts to contribute to the team. Therefore, when LMX differentiation is low, meaning the range of variance is small, it facilitates members' ties to team identity. However, when LMX differentiation is high, it means the range of LMX difference is broad, and subgroups can appear in a team. When the gap between subgroup identity and team identity becomes bigger, members' contributions are no longer to the team but the subgroup. Therefore, high LMX differentiation decreases a member's relationship with the team.

Moreover, as LMX differentiation shows the non-neutrality of leaders, researchers (Gooty & Yammarino, 2016; Harris et al., 214; Liao et al., 2010) think that it violates the principle of equality which is a critical reason for individuals to engage in team activities. When LMX differentiation is high, individuals perceive that they are not treated fairly. They would experience the feelings of disappointment, frustration and even anger, which reduce their team identity and the motivation to contribute to team works (Hooper & Martin, 2008). Therefore, LMX differentiation is negatively related to the member's relationship with the team. This argument is in line with Hooper and Martin's (2008) findings that LMX differentiation is negatively related to employees' reactions via its negative influence on individuals' perceived relationship with the team.

As far as the computation of LMX differentiation is concerned, there is no consensus yet (Anand et al., 2015). Researchers use standard deviation (SD) of LMX in a team (e.g., Gooty & Yammarino, 2016), variance of LMX in a team (e.g., Erdogan & Bauer, 2010), or a within-group agreement coefficient (Rwg) (e.g.，Boies & Howell, 2006) to compute the differentiation of LMX. The present study uses the standard deviation of members' ratings of LMX to examine LMX differentiation at the team level. The hypothesis, therefore, could be formulated as follows:

H5: Team level LMX differentiation is negatively related to members' relationships with the team (TMX).

3.3 Part 3: KS, Innovation and Performance in Team: A Few Sharing vs. Many Sharing

Following our multilevel examination of how LMX and TMX interact with each other and how contextual LMX constructs such as relative LMX (RLMX) and LMX differentiation are related to LMX and TMX, in the third part of the research, I reiterate the relevance of team knowledge sharing for team innovation and team performance, and then examine whether many members in the team sharing knowledge or only a few leading members sharing knowledge is more favourable to team innovation and team performance. This study takes the existing literature a step further regarding the relationships among knowledge sharing, innovation, and performance as it explores which knowledge sharing pattern in teams may have higher innovation and better performance.

3.3.1 Team Knowledge Sharing and Team Innovation

A critical condition of innovation is the knowledge base in the team and organization (Harris, 2008). Innovation requires team members to identify problems, study the problems and ultimately solve the problems. These processes require team members to have a sufficient accumulation of knowledge (Harris, 2008). Knowledge sharing can satisfy part of this condition. However, a member's knowledge must also be transferred to the team level or organization level before it can be applied and become an innovation (Ipe, 2003). Through the knowledge sharing process in the team, an individuals' knowledge can be transferred to relevant others in the team (Bartol & Srivastava, 2002). Knowledge can also be gathered through knowledge sharing which, in turn,

develops collective intellect (Van den Hooff & Van Weenen, 2004). Moreover, knowledge sharing helps make use of existing individual knowledge (Lin, 2007) and develops competitive advantage (Liao, Fei & Chen, 2007), which motivates innovation within the organization. Therefore, knowledge sharing is a very important part of innovation. In the next two paragraphs, I will further discuss how knowledge sharing facilitates innovation in teams through the SECI model developed by Nonaka and colleagues as well as the donating and collecting processes of knowledge sharing.

As previously stated, knowledge can be classified into two basic types: tacit and explicit (Nonaka & Takeuchi, 1995). The former refers to the type of knowledge that is gained from someone's experience and is difficult to pass on to the other people in the form of language. The latter refers to the type of knowledge that can be transformed into formal language. As discussed earlier, the SECI model of knowledge creation (Nonaka, Toyama & Konno, 2000) consists the transformation from tacit knowledge externalized to explicit knowledge to explicit knowledge internalized to tacit knowledge, then the new tacit knowledge externalized to new explicit knowledge, the cycle goes on in such way. In each cycle, individual and team tacit knowledge and explicit knowledge are improved and increased, which provide the necessary knowledge reserves for future innovation activities. In this sense, individual knowledge can be seen as raw material for the development of new knowledge (Brachos et al., 2007) and a valuable input of innovation (Wang & Wang, 2012).

From a different angle, knowledge sharing consists of knowledge donating and knowledge collecting (Van den Hooff & De Ridder, 2004). Knowledge donating is the activity that individuals communicate their own knowledge with the others (Van den Hooff & De Ridder, 2004). It enables individual knowledge to move to team or even organization knowledge which, in turn, increases the organization's knowledge reserves. If an organization motivates employees to contribute their

knowledge, the knowledge reserves in the organization are increased, therefore the chances to develop new ideas is increased, which ultimately leads to innovation in the organization (Darroch & McNaughton, 2002). Whereas, knowledge collecting is to consult others in order to obtain their knowledge (Van den Hooff & De Ridder, 2004). Knowledge collecting includes socialization and internalization which transfer organization or team knowledge into individual knowledge. An organization that has the ability to take in knowledge is more likely to have a better absorptive capacity which improves innovation (Lin, 2007). In this sense, knowledge sharing increases the team or organization's ability to transform and exploit knowledge which facilitates the capacity for innovation (Lin, 2007).

There are many empirical studies that support the relevance of knowledge sharing for innovation. For example, Hu, Horng, and Sun (2009) found significant and strong relationships among knowledge sharing, team culture, and innovation. Similarly, Hong, Doll, Nahm, and Li (2004) discovered a positive relationship between knowledge sharing and new product development. Wang and Wang (2012) further found that both tacit knowledge and explicit knowledge facilitate innovation. Although there are many studies on the relationship of knowledge sharing and innovation at different levels, there is no research, yet, concerning what kind of knowledge sharing pattern in a team best facilitates team innovation. Therefore, the objective of this part of the study is to examine the knowledge sharing patterns in a team; specifically, I examine whether a team with many members sharing knowledge is better than a team with only a few members sharing knowledge to facilitate innovation in the team.

There is little previous research in knowledge sharing literature that we can refer to that focuses on these patterns of sharing. However, Quinn, Anderson and Finkelstein's (1998) study provides some clues. The authors propose that knowledge grows exponentially when shared. This is because when two people

share knowledge with each other, they both obtain new information and their knowledge grows linearly. However, when more people are involved in knowledge sharing, they are not only sharing their own knowledge but also sharing the knowledge they gained from others. Thus, the feedback on the knowledge they have shared is not simply for their own knowledge, but their newly gained knowledge as well. Therefore, the knowledge grows exponentially. If we follow this logic, when more people are involved in knowledge sharing, more knowledge can be gained, developed and improved, which contributes to better team innovation capability. Therefore, I propose the hypothesis:

> **H6:** Teams with many members sharing knowledge have a higher rate of innovation compared with teams with a few members sharing knowledge.

3.3.2 Team Knowledge Sharing and Team Performance

Knowledge sharing is a critical process in a working team. Lacking knowledge sharing could affect the team's efficacy and performance (Srivastava et al., 2006). Because KS improves decision-making (Davenport et al., 1996), problem-solving (Carmeli et al., 2013), coordination (Wittenbaum et al., 2004) and creativity (Nonaka & Takeuchi, 1995), which all facilitate performance, it is believed that KS is associated with team performance.

Firstly, KS may improve decision-making because by sharing the knowledge within the team, people can rely on other people's experience and come up with more options, which can lead to a better decision (Lee et al., 2010). Secondly, by sharing knowledge, the problems can be better understood, potential effects can be foreseen, and solutions can be identified (Lee et al., 2010). Thirdly, through the experience of sharing knowledge with each other, team members are able to understand and interact with each other more, thus enhancing teamwork. This enables people to coordinate efficiently and, therefore, to achieve a better team

performance (Wittenbaum et al., 2004). Consequently, it is believed that knowledge sharing is critical for the team's performance (Hong et al., 2004; Lee et al., 2010). Hence the hypothesis:

> **H7:** A team with many members sharing knowledge has better performance compared with a team with a few members sharing knowledge.

CHAPTER 4 METHODOLOGY AND DATA

This chapter first elaborates the methodology and procedure of the present research. Then the development of the questionnaire and ethical considerations of the study are discussed. Following these, detailed information on the data collected for the pilot study and main study are presented respectively as well as the measurements for each of the main constructs. Finally, the data for the main study are presented.

4.1 Research Methodology

The principles and the appropriate choice of research methodology have been discussed by a number of scholars as the key starting point of research (Bryman and Bell, 2015; Saunders et al., 2012). Bryman and Bell (2015) provide a list of considerations when researchers need to start a project, they are:

1) To consider whether the nature of the relationship between the theory and research is of a deductive approach or an inductive approach;
2) To consider whether the epistemological is positivism or interpretivism;
3) To consider whether the ontological position is objectivism or constructionism.

The above-listed considerations are discussed for the present study. Firstly, this study intends to examine how social relationships in the workplace interact with each other and their relationships with important work outcomes such as employees' knowledge sharing at individual and team levels as well as innovation and performance at the team level. Based on the existing literature, hypotheses were developed for empirical testing. Therefore, the present research follows a deductive approach, which means the theory and hypotheses come first and drive the process of data collection. Findings from the data collected could either confirm or reject the hypotheses, which lead to a reconfirm or revision of the

theory (Bryman and Bell, 2015). Secondly, the epistemology of this research is based on a positivist paradigm. This is because positivism suggests that the purpose of a theory is to generate hypotheses that can be tested (Bryman and Bell, 2015). Positivism is believed to be particularly helpful in explaining human behaviour in terms of cause and effect (May, 2001). Finally, the ontological position of this research follows an objective perspective as it takes the social world as something external to social actors.

It is believed that a quantitative research strategy: 1) emphasizes quantification in data collection and analysis, 2) entails a deductive approach to the relationship between theory and research, and 3) emphasizes theory testing (Bryman and Bell, 2015). In a similar way, Herman and colleagues (1987: p.20) said that the quantitative research methodology is "concerned primarily with measuring a finite number of pre-specified outcomes, with judging effects, with attributing cause by comparing the results of such measuring, summarizing, aggregating, comparing measurements and on deriving meaning". In this respect, a quantitative research methodology meets the needs of this study.

4.2 Research Procedure

A pilot study was conducted prior to the main research in order to pre-test the questionnaire that would be used in the main project. Specifically, to assess the clarity of all the items in the questionnaire that had been translated into Chinese as well as the reliability and validity for each of the scales. The pilot also provides a chance to measure the time that it would take the participants to complete the questionnaire so that we can have a better control of the time and improve the design of the study. The pilot study was carried out through the online survey system Qualtrics in mainland China, where the main project would be conducted, in order to pre-test the operation of the system in China so that we can solve any problems that may arise beforehand. Using a convenience sampling strategy,

data were collected through my contacts under the condition that the participants should have the experience of working in a team for more than a year.

Following the pilot study, the main project was conducted in 10 primary and middle schools and an aircraft corporation in the southern part of China. The main project is a study of teams, which requires data from both team leaders and team members. I required teams with one leader and at least four members. The teams should be established for at least half a year. And the teams should have a common task to complete. Through the connection I have with the Education Department in Jiashan, Zhejiang Province of China, permission was given to collect data on site from 10 primary and middle schools in that area. Two months before the arrival of China, detailed requirements for the teams needed as well as the schedule of the data collection were discussed with the Deputy Director of the Education Department in Jiashan.

After arrival, a meeting was held firstly with the Deputy Director and his assistant to discuss again the requirements of the teams and arrangements for the research. After the meeting, a list of the ten schools and their contact persons were provided to me by Jiashan Education Department. Five days later, a meeting with the contact person from the ten schools was held in the meeting room of the Education Department. I briefly introduced the research project and then discussed the detailed arrangements of the data collection such as the specific date and time for me to collect data on site, the requirements of the type of team I sought for the research and the voluntary nature of the participants. Each of the schools agreed to provide four teams for the research, which makes the teams from the schools reach 40 in total. All the schools agreed to allow me to use after lunchtime to collect data from team members. They also agreed to arrange the questionnaires to be completed in one location, either a meeting room with computer and internet facilities or a computer lab in the

school. However, as it was difficult to fix a time for team leaders to fill in the questionnaires, the link of the questionnaire was sent to the leaders to complete in their spare time.

I also gained permission to collect data from an aircraft corporation in Shanghai, China through a friend of mine. However, due to the confidential nature of the organization, I was not able to collect the data on site, nor dispatch the links to the questionnaires with an external email address to the organization's email. The aircraft corporation provided 44 design teams for the present research. Because I could not collect data on site, nine contact persons were provided by the aircraft corporation for dispatching the two sets of questionnaires to the leaders and members in their organizations respectively. Each of the nine contact persons was given a specific link to the questionnaires so that each of them had a special channel to the questionnaires. Although I could not introduce the research project to the participants from the aircraft corporation in person, detailed information such as the voluntary nature of the survey and instructions on how to access and complete the questionnaire was provided to the nine contact persons in written form. A chat group was established in WeChat as a communication platform to clarify any questions that may arise between the contact person and me.

The links of the questionnaires were administrated using the snowball method. This is a very useful function of Qualtrics as it not only provides information about which channel a response comes from but also calculates the total number of responses from a specific organization. Each of the teams was also given a code number to fill in at the beginning of the questionnaire so that responses can be allocated to a specific team in an organization. Because of the confidentiality of the survey, none of the participants from the schools and the aircraft corporation had to reveal their identification in the survey. Any submitted responses were directly recorded in the database in Qualtrics, and

only the researcher had access to examine these data. Nobody from the organization or team would have access to any participant's response. Relationships between leaders and members were post hoc matched through the names of the subordinates provided by leaders and names of the co-workers provided by the subordinates.

4.3 Questionnaire Development

As both pilot study and main study collected data from China, we needed to go through the process of translating the scales into Chinese. Because some of the chosen scales already underwent studies that had been conducted in China we, therefore, sought out the Chinese version of the scales from the authors who used the scales for their research in China and have their studies published.

I found the Chinese version of LMX-MDM from Professor Wang Hui who has conducted many research projects on leader-member exchange in China (Law et al., 2010; Wang et al., 2005). We only amended the Chinese translation of one of the items to make it closer to the original English meaning. This item is "I respect my supervisor's knowledge of and competence on the job", while Wang's Chinese translation in English reads "My supervisor's knowledge of and competence on the job are well known to others". Therefore, we amended the translation of this item to make it closer to the original meaning. The Chinese version of TMX is from Liu Yan who conducted a TMX study in China (Liu et al., 2011a). This measure was used as provided with no necessary changes.

Since the rest of the scales: Team Knowledge Sharing, Team Innovation, and Team Performance were all developed in English, all of them underwent a translation and back-translation process (Brislin, 1986). All items were translated from English into Chinese by the author and back-translated into English by a bilingual British Chinese person. Then three business school PhDs who are from

English speaking countries were invited to compare the original items and back-translated items to secure a high degree of accuracy. Modifications were made to resolve the minor discrepancies identified. As a further check, five bilingual business school PhDs were invited to complete the Chinese version of the questionnaire and were asked to check for the meaningfulness, relevance, and clarity of all the items and comment on any perceived ambiguous items. The feedback received indicated that no changes to the questionnaire were necessary.

4.4 Ethical Consideration

This research follows the ethical guidelines of Warwick Business School (WBS). Participation in the study is voluntary, and all of the data collected from individuals and organizations will be kept confidential. Data will be kept secure by the researcher as suggested by the guidelines of the university.

As the questionnaires contain items that require the participants to evaluate their relationships with their supervisors as well as their colleagues in the same working team, and they also need to show their liking and disliking of a supervisor and/or a certain colleague, the type of information requested may have made the participants worry about giving true responses. In order to allay such concerns, we stressed at the beginning and in the middle of the questionnaire that this survey would be fully confidential and nobody from the participants' organization and the team would have access to the responses. The person who would examine the questionnaire would be the author and PhD supervisors. We also stressed that the participation in the survey was entirely voluntary. Participants could choose to withdraw before the start of the survey or anytime in the middle of the survey without consequence.

4.5 Pilot Study and Measures

The pilot was conducted in China through the Qualtrics online survey system for a period of three weeks, from February 13th, 2015 through March 5th, 2015. The link to the questionnaire was e-mailed to the researcher's contacts to fill in, and they were also advised to invite their friends, families, relatives, and colleagues to participate in the survey. The criteria for the attendees were that they must have experience of working in a team for at least one year and be able to read Chinese. During the survey period, a total of 213 participants submitted their questionnaires, among them 205 were completed. Within the 205 completed participants, the gender division of respondents was 42.2% male and 57.8% female. The age group of the respondents was 8.3% below 25 years of age, 25.4% between 26 and 30, 48.8% between 31 and 40, 13.7% between 41 and 50 and 3.9% above 50. Among the respondents, 2.5% had completed a PhD degree, 25% had completed a master's degree, 44.6% had completed a bachelor's degree, 24% had completed diploma, and 3.4% had completed high school or below.

Leader-Member Relationship

The relationship between a leader and member is measured with a 12-item scale developed by Liden and Maslyn (1998). As this scale consists of four dimensions, namely affect, loyalty, contribution and professional respect, it is called LMX-MDM in order to distinguish from the other commonly used scale LMX-7. From the data collected through the pilot, the overall Cronbach α of LMX-MDM is 0.94 and the coefficient α for the four sub-dimensions are affect = 0.90, loyalty = 0.84, contribution = 0.85 and professional respect = 0.88. Although the CFA shows that the four-factor model does not fit, as this research does not have predictions at the sub-dimension level, we grouped the 12 items together (Wang et al., 2005) to calculate the average across all the items as the scale score to measure leader and member's perception of their relationships with each other.

Team-Member Relationship

The member's relationship with the team as a whole was measured with the 10-item exchange in team scale by Seers (1989). The Chinese version of the scale was obtained from Yan Liu, who conducted a TMX study in China with this scale (Liu et al., 2011a). This provided validity evidence that the measure of TMX works in a Chinese context. In Liu's Chinese version of the scale, responses have been unified on a five-point Likert scale from 1 = "Strongly Disagree" to 5 = "Strongly Agree". The results of our pilot study show that the Cronbach α of the scale is 0.90.

Individual Knowledge Sharing

Van den Hooff and Hendrix's (2004) scale of knowledge sharing was used to measure the knowledge sharing between individuals. The scale contained eight items with two dimensions: knowledge donating and knowledge collecting. This scale has been used in a number of studies (Van den Hooff et al., 2002). In one of the studies conducted by Van den Hooff and Hendrix (2004), the reliabilities of the two dimensions are 0.85 and 0.77 respectively. With the data collected for our pilot study, results of the Cronbach α for knowledge donating and knowledge collecting are 0.95 and 0.96 respectively. The Cronbach α for the whole scale is 0.97. CFA results did not show two dimensions since we did not have predictions at the sub-dimension level. Therefore the whole scale would be used to measure the knowledge sharing between individuals.

Team Knowledge Sharing

Initially, Faraj and Sproull's (2000) four-item scale was used in the pilot to measure the knowledge sharing in the team. However, the results of the pilot study show the Cronbach α of team KS is only 0.46. Moreover, the CFA results of this single dimension team knowledge sharing scale show two dimensions instead of one. This scale contains two positive items and two negative items. CFA results show that the two negative items came up as a second factor.

Therefore, we utilized an alternative measure for the main project with Connelly and Kelloway's (2003) five-item team knowledge sharing scale.

All variables for the pilot study were on a five-point scale except for Team KS, which was on a seven-point scale. The number of participants, mean and standard deviation for each of the measured variables for the pilot study and their correlations are shown in Table 4.1 below:

Table 4.1 Descriptive statistics and correlations among variables for pilot study (N=205)

	Variable	M	SD	1	2	3	4
1	LMX	3.64	.65	(.94)			
2	TMX	3.73	.50	.42**	(.90)		
3	Individual KS	3.65	.45	.29**	.47**	(.97)	
4	Team KS	4.35	.78	.07	.20**	.27**	(.46)

** Correlation is significant at the 0.01 level (2-tailed).

I conducted a series of CFAs for the key variables in the pilot study (i.e. LMX, TMX, individual KS, and team KS) in order to examine the discriminant validity of the measures. Results for some of the models can be shown in Table 4.2 below. The results indicate that the proposed four-factor model is a better fit than, for example, the one-factor model (△Chi-square =4309.39, △*df* = 7, *p*<.00) and the three-factor model (△Chi-square = 702.84, △*df* = 3, *p*<.00) which combines LMX and TMX into one factor.

Table 4.2 Correlations among variables for Pilot Study

Model	χ^2	*df*	CFI	NNFI	RMSEA	Notes
4-factor	1245.80	521	.90	.80	.08	LMX, TMX, Individual KS, Team KS
3-factor	1948.64	524	.74	.67	.12	LMX + TMX, Individual KS, Team KS
1-factor	5555.19	528	.07	.07	.22	LMX, TMX, Individual KS, Team KS as one factor

4.6 Main Project and Measures

Necessary amendments were made in the questionnaire after the pilot study. As the main research was conducted in teams from organizations and we collected data from both team members and team leaders, two sets of questionnaires were designed with one for the team leaders and the other for team members. The member's questionnaire included questions on demographic information and some scales to measure different workplace relationships and some workplace outcomes. However, the leader's questionnaire included questions on demographic information and evaluations on work outcomes at the team level. In the next few sections, both of the questionnaires are discussed in detail.

4.6.1 Member's Questionnaire

The scales used in the member's questionnaire are explained in detail in this section, they are: 1) member's perception of leader-member relationship; 2) team-member exchange relationship; 3) member's perception of their own knowledge sharing with colleagues in the team; and 4) member's perception of the knowledge sharing in their team.

Member's Perception of Leader-Member Relationship

Member's perception of LMX was measured with the 12-item multi-dimensional scale LMX-MDM developed by Liden and Maslyn (1998). The LMX-MDM scale is based on role theory and social exchange theory, and contains four dimensions: affect, loyalty, contribution, and professional respect. It is viewed as another LMX scale besides LMX-7 and has gone through adequate reliability and validity tests (Schriesheim et al., 1999). As Liden and Maslyn (1998) report, the CFA of LMX-MDM shows that each of the four dimensions contributed to overall LMX, with an overall reliability of 0.89 for the whole scale from an organizational sample. Therefore, they suggest that the whole scale of LMX-MDM could be used when overall LMX is the construct of interest.

Except for the tests conducted by Liden and Maslyn (1998), the LMX-MDM scale has also been translated into Chinese by Wang and colleagues (2005) and used in a pilot study of 262 bank employees in China in order to test its psychometric characteristics in a Chinese sample. They found a four-factor model and the coefficient α for the four dimensions were 0.82, 0.63, 0.80 and 0.86 respectively. In their main study of 162 leader-member relationships in China, the coefficients α for the four dimensions were 0.85, 0.68, 0.83 and 0.88 respectively. CFA was conducted to further assess the LMX-MDM scale, and the reported findings show four first-order factors and one second-order factor (χ^2 = 86.97, *df* = 50, p<.01; RMSEA = 0.08; CFI = 0.96; TLI = 0.95).

The coefficients α for the four dimensions of the main research data for this study are 0.90, 0.80, 0.87 and 0.88 respectively and the coefficient α of the whole scale is 0.95. As there is no prediction in the sub-dimension level in the present study, the composite of the 12 items is applied to measure the members' perception of their relationship with their leader. Sample items are: "I like my supervisor very much as a person" (affect), "My supervisor would come to my defence if I were 'attacked' by others" (loyalty), "I do work for my supervisor that goes beyond what is specified in my job description" (contribution), and "I am impressed with my supervisor's knowledge of his/her job" (professional respect)." Responses were changed from its original seven-point Likert scale to a five-point Likert scale (1 = "Disagree" and 5 = "Agree") the same way as Wang and colleagues (2005) applied in their research conducted in China. This also keeps consistent with other scales used in the present research for measuring different types of workplace relationships such as team-member relationships, which are all on a five-point scale.

Team-Member Exchange Relationship

The reciprocal exchange quality of an employee's relation to the team was measured on a 10-item scale taken from the 34-item scale of team concept developed by Seers (1989). There are three dimensions in the scale, they are: 1) "exchange", which refers to the quality of relationships an individual develops with other colleagues in the same team; 2) "meetings", which refers to the effectiveness of team meetings; and 3) "cohesiveness", which refers to the cohesive-ness of the team as a whole. The ten items are within the "exchange" dimension. As the other two dimensions ("meetings" and "cohesiveness") are not relevant to our study, we did not use them.

Half of the ten items are about the member's contribution to the team while the other half is about what members receive from the team. Seers conducted his research at two points in time, about 12 months apart. The 10-item team-member exchange scale has a reliability of 0.85 and 0.82 for time one and time two respectively. The reliability of the present main research data is 0.93. An example of the items is "Do other members of your team usually let you know when you do something that makes their jobs easier (or harder)." Responses are made on a five-point Likert scale from 1 = "Strongly Disagree" to 5 = "Strongly Agree".

Member's Perception of Individual Knowledge Sharing in the Team

Knowledge sharing refers to the process where individuals mutually exchange the knowledge they have and then use the obtained knowledge to create new knowledge. The words "mutually exchange" imply that the knowledge sharing process consists of both bringing knowledge and getting knowledge (Van den Hooff and De Ridder, 2004). Individual knowledge sharing in this research is measured with a scale that consists of "knowledge donating" and "knowledge collecting" developed by Van den Hooff and Hendrix (2004). The coefficients α for the two dimensions of the main research data are 0.96 and 0.93 respectively,

and the coefficient α of the whole scale is 0.97. Sample items are: “When I have learned something new, I tell my colleague about it” (donating) and “When I need certain knowledge, I ask my colleagues about it” (collecting). Each of the items is rated from 1 = “Strongly Disagree” to 5 = “Strongly Agree”. The scale is rated by members for the knowledge sharing with each of their four colleagues in the same team.

Member’s Perception of Team Knowledge Sharing

Team knowledge sharing in this research is defined as the exchange of tacit and explicit knowledge relevant to the team task. As the results of the pilot study show a low Cronbach α (0.46) of the measurement for team knowledge sharing and the CFA result of the scale shows two dimensions instead of one. These results indicate a potential problem of the scale. Therefore, an alternative five-item scale developed by Connelly and Kelloway (2003) was used in the main project to measure leaders’ perception of knowledge sharing in their teams. The scale was developed to measure participants’ perceptions of the knowledge sharing in their organizations (α = 0.85). It has also been used to measure knowledge sharing in teams. For example, Staples and Webster (2008) used this scale in their study to measure knowledge sharing in teams and explored the relationship between team knowledge sharing and trust as well as task interdependence. The result of coefficient α of the main research data collected from the members is 0.70.

As the scale was designed to assess organizational level attributes, therefore, in the present research items were modified using the word “team” instead of “organization”. Sample items are: “Members in this team keep their best thoughts to themselves (reverse coded)”, and “Members in this team are willing to share knowledge and thoughts with others”. The original response is on a seven-point Likert-type scale anchored by 1 = “No, I disagree” to 7 = “Yes, I

agree". In order to keep consistent with the responses of the other scales, we reworded the responses from 1 = "Strongly disagree" to 7 = "Strongly agree".

Relative LMX

In accordance with the studies by Henderson et al. (2008), we computed relative LMX by subtracting the mean LMX in the team from each team members' LMX score.

LMX Differentiation

We operationalized LMX differentiation as the variance of LMX score within a team, which is in accordance with Liden et al.'s (2006) measure of this variable. We computed this variable by taking the standard deviation of the LMX scores within the team.

Control Variables

I controlled for employee gender, age, and the duration of leader-member relationship as these variables have been theoretically suggested to be related to work outcomes (Epitropaki et al., 2016; Jiang and Zhou, 2016). Gender was created as a dummy variable with 0 for male and 1 for female. Age was measured with five categories: 1) below 25 years old, 2) between 26 and 30, 3) between 31 and 40, 4) between 41 and 50, and 5) above 50. The relationship duration between leader and member was measured in months. I also controlled for the organization type to examine if the type of organization has a relationship with a member's knowledge sharing in the team as well as team outcomes such as team performance and innovation. Organization type was created as a dummy variable with 0 for the manufacturing industry and 1 for schools.

4.6.2 Leader's Questionnaire

This section explains the scales used in the leader's questionnaire in detail, they are: 1) leader's perception of team knowledge sharing (Team KS); 2) leader's perception of team innovation (Team Innovation); and 3) leader's perception of team performance (Team Performance).

Leader's Perception of Team Knowledge Sharing

In order to keep in line with the measure of team knowledge sharing from the member's perspective, the leader's perception of team knowledge sharing was measured with the same five-item scale developed by Connelly and Kelloway (2003). The coefficient α of the main research data collected from leaders is 0.73. Sample items are: "Members in this team keep their best thoughts to themselves (reverse coded)", and "Members in this team are willing to share knowledge and thoughts with others". Members responded on a seven-point Likert-type scale anchored by 1 = "No, I disagree" to 7 = "Yes, I agree".

Leader's Perception of Team Innovation

Team leaders in this research are direct leaders of the teams. Therefore they are expected to have close contact with the team and are knowledgeable about the innovation in their teams. Team innovation was measured using four items adapted from Anderson and West (1998) to be answered on a five-point Likert scale from 1 = "Strongly Disagree" to 5 = "Strongly Agree". Sample items are: "Team members often implement new ideas to improve the quality of our products and services", and "This team gives little consideration to new and alternative methods and procedures for doing their work (reverse coded)". One of the items has a minor adjustment from "Team members often implement new ideas to improve the quality of our products and services" into "Team members often implement new ideas to improve the quality of our work" in order to better suit the research context. The coefficient α of the main research data is 0.70.

Leader's Perception of Team Performance

The leader's perception of the performance of his/her team was measured with a nine-item scale developed by Henderson and Lee (1992). Leaders were asked to compare their current team with a team that they have served on or observed. Managers are commonly asked to rate team performance on five measures: 1) adherence to budgets, 2) adherence to schedules, 3) innovation, 4) project quality, and 5) overall performance or efficiency. This nine-item scale by Henderson and Lee (1992) was assessed by the team leaders in three aspects of team performance, namely: the team's efficiency, effectiveness and elapsed time. These three aspects are in line with the two dimensions of team performance, namely: team efficiency and team effectiveness suggested by Ancona and Caldwell (1992). The Cronbach's α in the present study is 0.95. Sample items include: "The amount of work the team produces" (efficiency), "Effectiveness of the team's interactions with people outside of the team" (effectiveness), and "The team could have done its work faster with the same level of quality" (time). Leaders responded on a seven-point Likert-type scale anchored by 1 = "Extremely Low" to 7 = "Extremely High".

Control Variables

I controlled for the type of organizations as data are collected from two different types of organizations – schools and manufacturing industry. I wanted to examine if the type of organization is related to team outcomes such as team performance and team innovation. Organization type was created as a dummy variable with 0 for manufacturing industry and 1 for schools.

4.7 Data Collected for the Main Project

The setting for the main study is in China and is conducted in two fields: one in the educational field with ten primary/middle schools in Jiashan, Zhejiang

province, China and the other in the manufacturing industry of a large aircraft corporation in Shanghai, China. The reasons for collecting data from these two types of organizations were: 1) Foremost, to increase the number of teams, and 2) as schools and manufacturing industry are two different types of organizations, they require different forms of work, therefore, may have different levels of knowledge sharing. Collecting data from two types of organizations provides the opportunity to examine whether the type of organization is related to team work outcomes such as performance, innovation and knowledge sharing in the team.

The survey was conducted in these organizations through Qualtrics for a period of two months, from the end of April, 2015 to the end of June, 2015. The survey was carried out in 44 design teams in the aircraft corporation as well as 40 administration teams from the schools. The entire 84 teams meet the definition of a team in this research as they all have one leader and at least four team members in the team and knowledge sharing is important to accomplish team tasks.

During the survey time period, a total of 40 leaders from the aircraft corporation and 40 leaders from the schools submitted their questionnaires, among them 37 leaders from the aircraft corporation and 37 leaders from the school completed their questionnaires. On the subordinates' side, 192 responses were received from the aircraft corporation, and 195 responses were received from schools. Among them, 182 members from the aircraft corporation and 167 members from the school fully completed their questionnaires.

I inserted three catch questions in the leader's questionnaire and four catch questions in the member's questionnaire, and filtered the data based on the criterion that: 1) leaders should answer two out of the three catch questions correctly, and 2) at least three members in a team answered three out of four catch questions correctly. After filtering, the dataset contained 51 teams, among

which 31 were from the aircraft corporation, and 20 were from the schools. Results of the data filtering can be seen in Table 4.3:

Table 4.3 Information on filtered dataset

	Received		Completed		Dataset
Aircraft	**Leader**	40	**Leader**	37	31 teams
	Member	192	**Member**	182	
Schools	**Leader**	40	**Leader**	37	20 teams
	Member	195	**Member**	167	
Total	**Leader**	80	**Leader**	74	51 teams
	Member	387	**Member**	349	

Among leaders, the gender division is 49.1% male and 50.9% female. The age group is 1.9% below 25 years of age, 7.5% between 26 and 30, 66% between 31 and 40, 18.9% between 41 and 50 and 5.7% above 50. All respondents hold above bachelor degrees, among them, 3.8% have completed a PhD degree, 71.7% have completed a master's degree, 24.5% have completed a bachelor's degree. The average time that the leaders have been working in their current field and working for their current organizations is 15.6 years and 12.8 years respectively. The average time that their teams have been in existence is eight years. The team size division is 22.6% with five members or below, 52.8% of 6-10 members, 17% of 11-20 members and 7.5% of above 20 members. The average time that the respondents have been a leader in the team is six years. 56.6% of the leaders are junior management, 39.6% are middle management and the rest 3.8% are top management.

Among the member participants, the gender division is 47.2% male and 52.8% female. The age group of the members is 7.4% below 25 years of age, 27.1% between 26 and 30, 47.2% between 31 and 40, 15.7% between 41 and 50 and 2.6% above 50. Among the members, 0.9% hold PhD degrees, 5.7% have completed a master's degree, 80.3% have completed a bachelor's degree, and

13.1% are diploma holders. The average time that the respondents have been working in their current organizations is 7.3 years respectively. The average time that their teams have been in existence is 6.7 years. The team size division is 27.5% with five members or below, 45.4% of 6-10 members, 17.5% of 11-20 members and 9.6% of above 20 members. The average time that the respondents have been a member in the team is 3.15 years and the average time that they have been working with their current team leaders is 4.4 years.

A post-hoc match of leader-member pairs was made through the name of subordinates provided by leader participants and the name of colleagues provided by member participants in the questionnaires. We managed to match a total of 223 pairs of leader-member relationships. The sample of 223 pairs of relationships included 223 members and 51 leaders from 51 teams. Therefore, the average number of team members participating in the survey is 4.37 members per team. Among the 223 members, 27.4% are from teams with 3-5 members, 44.4% are from teams with 6-10 members, 17.9% are from teams with 11-20 members and 10.3% are from teams with more than 20 members.

Prior to testing the hypotheses, a series of CFAs were conducted including all variables of the main study (i.e. LMX, TMX, individual KS, member-rated team KS, and leader-rated team KS). The results for some of the models are shown in Table 4.4. The results indicate that the proposed five-factor model is a better fit than all the other tested models such as the one-factor model (ΔChi-square = 2743.82, Δdf = 7, p<.00) or the four-factor model (ΔChi-square = 557.35, Δdf = 3, p<.00) which combines LMX and TMX into one factor as they are highly correlated. These results indicate the discriminant validity of the measures.

Table 4.4 CFAs for main study

Model	χ2	df	CFI	NNFI	RMSEA	Notes
5-factor	873.07	344	.90	.85	.08	LMX, TMX, Individual KS, member-rated Team KS, leader-rated Team KS
4-factor	1430.42	347	.80	.75	.12	LMX + TMX, Individual KS, member-rated Team KS, leader-rated Team KS
1-factor	3616.89	351	.38	.36	.21	LMX, TMX, Individual KS, member-rated Team KS, and leader-rated Team KS as one factor

CHAPTER 5 ANALYSIS AND RESULTS

This chapter presents details of the data analysis for the three parts of the research one by one in order to test the hypotheses stated in chapter 3. In each part of the analysis, the techniques used to analyse the data are discussed. After that, the procedures of data organizing and each of the variable abbreviations are explained. This is followed by the descriptive statistics of the variables and their correlations. Finally, the results of hypotheses testing are presented.

5.1 Part 1: Vertical Relationship or Horizontal Relationship: Are They Both Important to Knowledge Sharing?

5.1.1 Analysis Techniques

In this first part of the research, we first tested whether both LMX and TMX have unique relationships with an individual's knowledge sharing as well as the knowledge sharing in a team. We then further tested whether the two independent variables LMX and TMX are related to KS differently and whether the differences in the relationships are significant. As discussed in chapter 3 part 1, we hypothesize that both LMX and TMX should have unique relationships with KS at the individual and team level. Moreover, LMX has a stronger relationship than TMX with an individual's knowledge sharing with the other individuals in their team (Individual KS). However, we hypothesize that TMX has a stronger relationship than LMX with the knowledge sharing the individual engages in within their team as a whole (Team KS).

In order to test the hypotheses in this part of the research, a multiple regression analysis was run in SPSS Statistics 22 to test if both IVs (LMX and TMX) have a significant association with the DVs (individual KS or team KS) and which IV (LMX or TMX) is the stronger predictor of the DVs (individual KS or team KS). In multiple regression, the standardized coefficients (beta) can answer the question of which independent variable has a greater effect on the dependent variable. We then further tested whether the two beta weights are significantly different

from each other by estimating their corresponding 95% confidence intervals. If the confidence intervals overlap by less than 50%, the difference in beta weights is considered statistically significant (Cumming, 2009).

5.1.2 Data Organization and Variable Abbreviations

As discussed in Chapter 4, after filtering according to criteria, the dataset collected through the survey contains 223 members in 51 teams. The variables needed in the first part of the research are all of the members' ratings. All these variables were computed by taking the mean of all the items in the scale. The descriptions of the measured variables are shown in Table 5.1 below.

Table 5.1 Variables and Descriptions for Research Part 1

Variable	Description
LMX	Member's perspective of the relationship with leader (take the mean of all 12 items in the scale)
TMX	Member's perspective of the relationship with the whole team (take the mean of all 10 items in the scale)
Individual KS	Member's average knowledge sharing with colleagues in the team (take the mean of all 8 items in the scale).
Team KS	Member's perspective of team knowledge sharing (take the mean of all 5 items in the scale)

5.1.3 Descriptive Statistics and Correlations

The number of subjects, mean, standard deviation and correlations for each of the measured variables and four control variables (gender, age, LMX relationship duration and organization type) for research part1 are shown in Table 5.2 below. All variables for this part of the study were on a five-point scale except for Team KS, which was on a seven-point scale. The results of the correlation coefficients show that all the main variables for this part of the study are highly correlated. However, considering the associations between these variables – LMX and TMX both refer to workplace exchange relationships, individual KS and team KS are both KS behaviour, but at different levels, therefore the correlations are considered within the acceptable range.

Table 5.2 Descriptive statistics and correlations among variables for research part1 (N=223)

	Variable	M	SD	1	2	3	4	5	6	7	8
1	Gender	.52	.50	-							
2	Age	2.77	.89	.10	-						
3	LMX Duration	57.26	52.75	-.19**	.22**	-					
4	Org Type	.35	.48	.48**	.16*	-.24**	-				
5	LMX	4.08	.50	-.36**	-.00*	.24**	-.36**	(.95)			
6	TMX	4.05	.49	-.31**	.04	.09	-.23**	.71**	(.93)		
7	Individual KS	4.06	.55	-.25**	.02	.17**	-.37**	.67**	.75**	(.97)	
8	Team KS	5.60	.69	-.14*	.11	.18**	-.08	.69**	.67**	.63**	(.70)

Notes:

1) *Correlation is significant at the 0.05 level (2-tailed).
2) **Correlation is significant at the 0.01 level (2-tailed).
3) Gender: 0 for male, 1 for female.
4) Age: 1 for people below 25 years old, 2 for people between 26 and 30, 3 for people between 31 and 40, 4 for people between 41 and 50, and 5 for people above 50.
5) Organization Type: 0 for manufactory industry, 1 for school.

5.1.4 Hypotheses Testing

Firstly, a multi-variant regression with the four control variables (gender, age, LMX relationship duration, and organization type) was run and the results show that the four control variables are not significantly related to individual KS and team KS, which indicates that a member's gender, age, relationship duration with the leader, and the organization type they are in have no effect on their knowledge sharing with co-workers and team knowledge sharing. Therefore, I removed the control variables from the final analysis as they have no significant effect on the outcome variables in this study. Then, multiple regressions were run to test whether LMX or TMX is the stronger predictor of individual KS and member's perspective of team KS. Two multiple regressions were conducted for Model 1 and Model 2. The multiple linear regressions calculated for Model 1 was to predict Individual KS based on LMX and TMX. A significant regression equation was found $F(2, 220) = 160.16$, $p<.000$ with an R^2 of .59. Both LMX and TMX were significant predictors of Individual KS. The results support hypothesis H1a that both LMX and TMX have significant relationships with individual level knowledge sharing. Another multiple linear regression was conducted for Model 2 to predict Team KS based on LMX and TMX. A significant regression equation was found $F(2, 220) = 130.21$, $p<.000$ with an R^2 of .54. Both LMX and TMX were significant predictors of Team KS as well. This supports hypothesis H2a that both LMX and TMX have significant relationships with team level knowledge sharing.

As both IVs (LMX and TMX) were found to significantly relate to the DVs (Individual KS and Team KS) in both of models, the standardized coefficients (beta) were then examined as they indicate which predictor has a stronger effect on the dependent variable. The results of the analysis are shown in Table 5.3.

Table 5.3 Standardized coefficients and 95% CIs for research part 1

Model	IVs	DV	Beta	95% CIs (Standardized)	
				Lower	Upper
1 (H1)	LMX	Individual KS	.28	.05	.50
	TMX		.55	.35	.77
2 (H2)	LMX	Team KS	.43	.27	.58
	TMX		.36	.20	.52

The above table shows that TMX has a stronger effect (b=.55) than LMX (b=.28) on individual's knowledge sharing. Whereas, LMX has a stronger effect (b=.43) than TMX (b=.36) on member's perspective of knowledge sharing in the team. The results were opposite to that expected. However, we continued the analysis to examine whether their relationships with KS are significantly different from each other.

Cumming's (2009) method of testing the difference between two beta coefficients was applied here to examine whether the two IVs have significantly different relationships with the DVs. According to Cumming (2009), when the confidence intervals (CIs) of independent variable means overlap less than 50%, their beta weights are statistically significantly different from each other. We firstly tested Model 1. In order to test whether LMX (b = .28) and TMX (b = .55) standardized beta weights were significantly different from each other, their corresponding 95% CIs were estimated via bias-corrected bootstrap (1,000 re-samples). If the CIs overlapped by less than 50%, their beta weights would be considered significantly different from each other ($p < .05$) (Cummings, 2009). Therefore, to be more precise, half of the average of the overlapping CIs was calculated (.11). Adding it to the LMX beta weight lower bound estimate (.05), equalled .16. As the TMX upper bound estimate of .77 exceeded the value of .16, the difference between the two IVs LMX and TMX standardized beta weights ($\triangle b = .27$) was not considered statistically significantly larger than the TMX beta weight ($p > .05$). It can be concluded that the difference between LMX and TMX standardized beta weights was not considered statistically significant.

The same method was applied to model 2 to test whether the beta weights of the two IVs were significantly different from each other by estimating their corresponding 95% confidence intervals. The above table shows the confidence intervals (CIs) for both LMX and TMX of model 2, the two independent variables CIs means overlap more than 50%. Therefore their beta weights are not significantly different from each other.

The tests of the differences between the two betas for LMX and TMX show that the two IVs have different effects on individual KS and team KS respectively. However, the difference is not considered statistically significant. The results do not support hypotheses H1b and H2b. A summary of support and non-support of the hypotheses in this part of the research is summarized in Table 5.4.

Table 5.4 Summary of supported and not supported hypotheses for research part 1

Hypotheses	Outcome
H1a: The quality of an individual's relationship with the leader (LMX) and an individual's relationship with the whole team (TMX) are both positively related with the individual's knowledge sharing (individual KS).	Supported
H1b: LMX has a stronger relationship than TMX with the individual's knowledge sharing (Individual KS).	Not supported
H2a: The quality of an individual's relationship with the leader (LMX) and an individual's relationship with the whole team (TMX) are both positively related with the knowledge sharing in the team (team KS).	Supported
H2b: TMX has a stronger relationship than LMX with members' perspective of knowledge sharing within the whole team (team KS).	Not supported

5.2 Part 2: Multilevel Social Exchanges in Teams and the Outcomes

5.2.1 Analysis Techniques

In the second part of this research, the quality of leader-member relationships (LMX) and team-member relationships (TMX) are investigated in the context of a team. Instead of examining the two constructs separately, they are examined at the same time in order to see how they interact with each other and their effects on the knowledge sharing of the whole team. In addition, an individual-within-group level construct (RLMX) and a team level construct (LMX differentiation) are introduced in this part of the research to examine their how they are associated with the relationship of LMX and TMX at the individual level.

The data for this part of the research are multilevel because the LMX data are grouped into higher level units such as Relative LMX (RLMX) at the individual-within-group level and LMX differentiation at the team level. As shown in chapter 3 figure 3.2, the model of the research is multilevel as well. Suitable techniques need to be applied for the treatment of the non-independent nature of the data. Therefore, this part of the analyses was conducted in MPlus with the "type = complex". This is an approach that allows data modelling to describe the multilevel structure of the research. It also adjusts the standard errors of the regression coefficient to be able to explain the nested data structure (Stapleton et al., 2016). The analyses that are conducted with MPlus (type = Complex) include confirmatory factor analysis (CFA), structural equation modelling (SEM), mediation effect (H3), moderation effects (H4), and regression (H5). The variables and their expected relationships are described in greater detail in chapter 3 part 2.

CFA and SEM in MPlus

The purpose of confirmatory factor analysis (CFA) is to test how well the model for the relationships between observed variables and latent variables fits the

data. CFA is the first step of doing a structural equation modelling (SEM). SEM then further tests the model by adding causal paths between the factors. It allows the examination of relationships between one or more IVs and one or more DVs (Tabachnick and Fidell, 2001). It is a powerful technique which includes the analysis of multiple regressions, factor analysis, and path analysis.

In this part of the research, the CFA and SEM of the full model include two individual-level constructs (LMX and TMX), one team level construct (Team KS), one individual-within-group level construct (RLMX) and a team level construct (LMX differentiation) were conducted firstly in MPlus to test the fit of the model. After that, the mediation effect of TMX (H3) between the relationship of LMX and team KS in the multilevel model was tested. Then, the moderation effect of RLMX (H4) on the relationship of LMX and TMX was tested. The tests of mediation and moderation effects are explained in detail in the next few sections. Finally, the negative relationship between LMX differentiation and TMX (H5) was tested.

Mediation and Moderation Tests in MPlus

The purpose of mediation models is to examine if there is a relationship between predictors and outcomes and the nature of the relationship. A commonly accepted and used method to test the mediation effect is the four-step approach by Baron and Kenny (1986). However, in MPlus the four-step approach is simplified into one step: the indirect effect. The idea lies in the fact that the indirect effect of X on Y via M is a result of path a and path b, that is a*b. It represents the part of the predicted change in Y, caused by one unit change in X, is due to the effect of X on M, and M in turn influences Y. The test of the indirect effect (a*b) is a test of the difference between the influence of X on Y with and without taking the mediator into consideration. Therefore, when the indirect effect (a*b) is significant, the mediator M mediates the relationship of X and Y.

Different from the mediation test, the moderation model hypothesizes that the strength of the relationship between the predictor and outcome variable change in the direction of either increase or decrease according to the moderating variable(s). In MPlus, if the coefficient of the interaction term is significant ($p<.05$), it supports the moderation effect. The effect size for the moderator can be calculated by running the model twice, once with interaction term and the second time without the interaction term, and then examining the change on r-square.

5.2.2 Data Organization and Variable Abbreviations

CFA is conducted in MPlus with observed variables in order to test how well the model for the relationships between observed variables and latent variables fits the data. This is followed by the SEM to test the causal paths between the constructs further. Latent variables of LMX, TMX, and Team KS, as well as measured variables of RLMX and LMX differentiation, are used in the analyses for hypothesis testing. The main variables and their descriptions for research part 2 are listed in Table 5.5 below.

Table 5.5 Variables and Descriptions for Research Part 2

Variable	Description
LMX	Member's perspective of their relationship with the leader.
TMX	Member's perspective of their relationship with the team as a whole.
Team KS	Leader's perspective of team knowledge sharing, as a whole.
RLMX	An individual's LMX relative to the average LMX in a team, computed as an individual's LMX deducted from the LMX mean of the team.
LMX Differentiation	The variance of LMX quality within a team, computed as the standard deviation of LMX scores within a team, as rated by members.

5.2.3 CFA and SEM

CFA and SEM are conducted in MPlus to identify the model fit. RMSEA, TLI and CFI are the main fit indexes used in MPlus. Their indexes, abbreviation and general rule for acceptable fit are shown in Table 5.6.

Table 5.6 Main Fit Indexes in MPlus (Adapted from Schreiber et al, 2006)

Abbrev	Indexes	Good fit (continuous data)	Good fit (categorical data)
RMSEA	Root Mean Square Error of Approximation	<.06 to .08	<.06
CFI	Comparative Fit Index	>=.95	>=.95
TLI	Tucker-Lewis Index	>=.95	>=.96

The results of CFA and SEM show a good model fit with RMSEA=.05, CFI=.91 and TLI=.90.

5.2.4 Descriptive Statistics and Correlations

The number of subjects, the mean, standard deviation, and correlations for each of the measured variables and four control variables (gender, age, LMX relationship duration, and organization type) for research part 2 are shown in Table 5.7. Both LMX and TMX are on a five-point scale, while Team KS is on a seven-point scale. It is necessary to explain the reason that the mean of RLMX is zero. As RLMX represents the distance of an individual's LMX to the mean LMX score in the team, when an individual's LMX score is higher than the mean LMX score in the team, then RLMX is a positive score. While, if an individual's LMX score is lower than the mean LMX score in the team, then RLMX is a negative score. The positive RLMXs and negative RLMXs might cancel out with each other in the sample, hence RLMX M=.00. It is worth pointing out, also, that RLMX and

LMX differentiation are both computed from member's rating of LMX score, they have differences in their meanings. As mentioned earlier, RLMX represents the distance of an individual's LMX to the mean LMX score in the team, while LMX differentiation represents the variance in LMX scores in the team. They have more differences in their meanings than their names seem to suggest. Therefore, their correlation is .00 which indicates that they have no linear relationship, but not necessarily no relationship between the two variables.

Table 5.7 Descriptive statistics and correlations of variables for research part 2 (N=223)

	Variable	M	SD	1	2	3	4	5	6	7	8	9
1	Gender	.52	.50	-								
2	Age	2.77	.89	.10	-							
3	LMX Duration	57.26	52.75	-.18**	.22**	-						
4	Org Type	.35	.48	.48**	.16*	-.24**	-					
5	LMX	4.08	.50	-.34**	-.00*	.23**	-.33**	-				
6	TMX	4.05	.49	-.29**	.04	.13	-.22**	.71**	-			
7	Team KS	5.90	.70	-.17*	.11	.10	-.16*	.68**	.75**	-		
8	RLMX	.00	.30	-.06	.00	-.00	.00	.60**	.36**	.44**	-	
9	LMX Differentiation	.23	.26	.38**	.12	-.15*	.78**	-.26**	-.17**	-.21**	.00	-

Notes:

1) *Correlation is significant at the 0.05 level (2-tailed).
2) **Correlation is significant at the 0.01 level (2-tailed).
3) Gender: 0 for male, 1 for female.
4) Age: 1 for people below 25 years old, 2 for people between 26 and 30, 3 for people between 31 and 40, 4 for people between 41 and 50, and 5 for people above 50.
5) Organization Type: 0 for manufactory industry, 1 for school.

Prior to the hypotheses testing, a multi-variant regression with the four control variables was run and the results show that the four control variables are not significantly related to the team-member exchange relationship and team KS. Therefore, we removed the control variables from the final analysis as the results indicate that a member's gender, age, their relationship duration with the leader, and the organization type they are working for are not related to the outcome variables in this study.

5.2.5 Hypotheses Testing

H3: TMX Mediates the Relationship between LMX and Team KS

I tested the mediation effect of TMX between the relationship of LMX and Team KS in the above-discussed full model using bootstrap with MPlus Version 7.4 (Muthén & Muthén, 1998-2015). The results indicate that TMX significantly predicts Team KS (coeff=1.03, significance=.00) and LMX is significantly related to TMX (coeff=.70, significance=.00). The result of the test for an indirect effect indicates a significant result (coeff=.54, significance=.00). The 95% indirect confidence interval does not cover zero (.41, .66). Therefore the coefficient is deemed significant as well. The path coefficients of the mediation model are shown in Table 5.8. These findings support the hypothesis that TMX plays a mediating role between the relationship of LMX and Team KS.

Table 5.8 Path coefficients of the mediation model

Path	Path Coefficient
LMX → TMX (X → M)	.70**
TMX → Team KS (M → Y)	.74*
Indirect Link	.38*
Direct Link	.41*
Notes: *p<.05; **p<.01	

H4: RLMX Moderates the Relationship of LMX and TMX

In order to test the moderation effect of RLMX on the relationship between LMX and TMX with MPlus, it is necessary to estimate the coefficient of the interaction term. Therefore, the interaction term (CLMXRLMX) was created by multiplying mean centred LMX and mean centred RLMX. It is also possible to estimate the effect size of the moderation effect by running the model twice, once with the interaction term and the second time without, noting the r-squared for both models and calculating the change.

Firstly, we ran the model with the interaction term. The interaction term is statistically significant (coeff=.35, significance=.02). The result of r-square indicates that the predictors – LMX, RLMX and their interaction term collectively explain 52.4% of the variance in TMX. Then, the model without the interaction term was run to assess the variance explained by the interaction term. The results show that the model without the interaction term explains 50.6% of the variance in TMX. Therefore, the interaction term explains an additional 1.8% (52.4% - 50.6% = 1.8%) of the variance in TMX. As the coefficient of interaction term is significant (p=.02), it indicates that the moderation effect exists. Figure 5.1 illustrates the moderating effect of RLMX on the relationship between individual level LMX and TMX. The form of the interaction indicates that when RLMX is high, individual level LMX and TMX are positively related. However, in the condition when RLMX is low, the relationship between individual LMX and TMX is less strong. The results support the hypothesis that RLMX moderates the relationship of LMX and TMX.

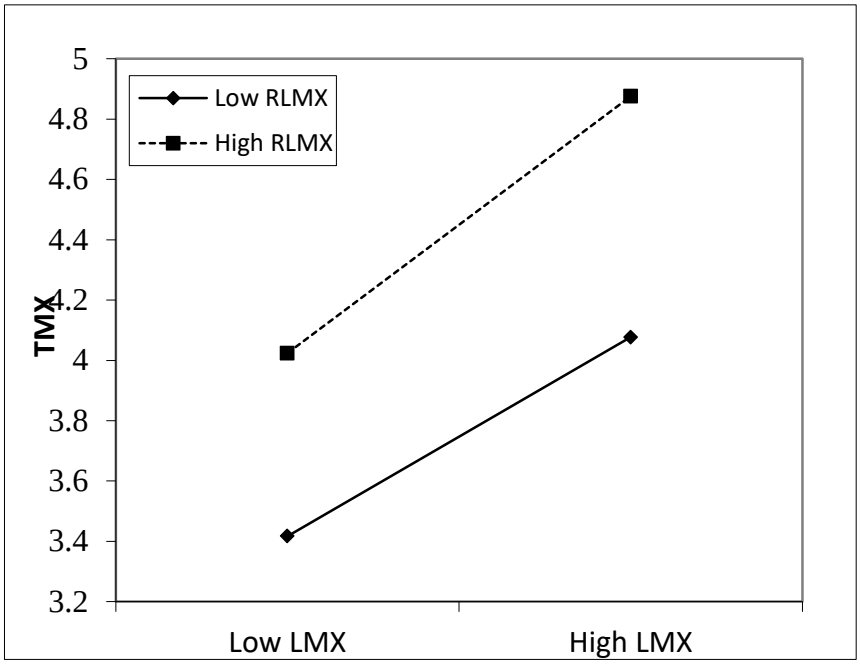

Figure 5.1 The Moderating Effect of RLMX on the Relationship of individual level LMX and TMX

H5: LMX Differentiation and TMX are Negatively Related

To investigate whether LMX differentiation is associated with TMX, path analysis of the two variables was tested in the full model in MPlus. The results indicate that LMX differentiation is not significantly related to TMX (coeff=-.19, significance=.24). Hence, the findings do not support the hypothesis that LMX differentiation is negatively related to TMX, although the results are in the direction that we predict.

Table 5.9 shows the hypotheses that were tested and a summary of support and non-support of the hypotheses.

Table 5.9 Supported and not supported hypotheses Summary for research part 2

Hypotheses	**Outcome**
H3: Team-member relationship (TMX) mediates the relationship between leader-member relationship	Supported

(LMX) and knowledge sharing in the team.	
H4: Relative LMX moderates the relationships between individual level LMX and TMX, such that the relationship will be stronger when RLMX is higher, but weaker when RLMX is lower.	Supported
H5: Team level LMX differentiation is negatively related to member's relationships with the team (TMX).	Not Supported

5.3 Part 3: Team KS & Team Innovation and Performance: A Few Sharing vs. Many Sharing

5.3.1 Analysis Techniques

In the third part of the research, the question that is explored is whether a team with many members sharing knowledge is more favourable for team innovation and team performance than simply a few of the members sharing knowledge. As stated in Chapter 3, it is hypothesized that a team with many members sharing knowledge will have better innovation and performance capability compared to a team that only has a few members sharing knowledge. Given that the pattern of sharing is a team level characteristic, the analysis is conducted at the team level.

To enable the test for the hypotheses, the collected teams were divided into four categories through a mean split on team knowledge sharing and the variance of knowledge sharing within the team. Teams whose knowledge sharing is above the average, while the variance of knowledge sharing in the team is below the average, were defined as a team with many people willing to share knowledge (Category 1). Teams that have both team knowledge sharing and the variance of knowledge sharing in the team above the average were defined as a team with a

few members sharing a lot of knowledge (Category 2). Teams characterized by both team knowledge sharing and the variance of knowledge sharing in the team score below the average were defined as a team with many members not sharing knowledge (Category 3). Teams characterized by team knowledge sharing scores below the average and the variance of knowledge sharing in the team scores above the average were defined as a team with only a few members sharing knowledge (Category 4). The four categories are illustrated in Figure 5.2.

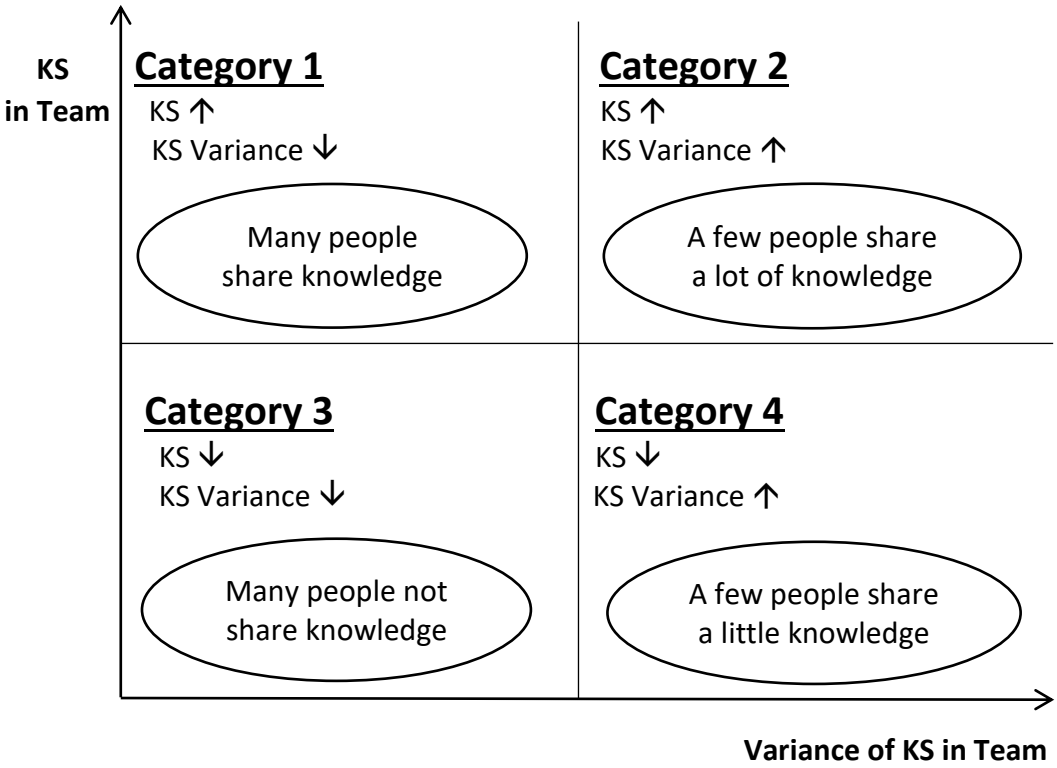

Figure 5.2 Four Categories of Knowledge Sharing in Teams

The variance of members' average knowledge sharing with colleagues in the team is calculated from each member's rating of their own knowledge shared with each of their colleagues in the team, and the results are used for the X-axis. The calculation of the X-axis variable will be discussed in greater detail in the next section. In the Y-axis, we used both mean KS computed from the member's perspective of KS (calculation will be discussed in next section) and team KS from the leader's perspective. This means the analyses were run twice for this study,

once with KS variance for X-axis and mean KS from a member's perspective for Y axis and then another one with KS variance for X-axis and team KS from the leader's perspective for the Y-axis. This way provides a different source of rating for team KS with member rating as an internal source and leader rating as an external source.

After dividing the teams into four categories, the means of team innovation and team performance for the four categories were examined to observe any differences in the different categories of teams on the two team outcomes – performance and innovation. T-Tests were conducted to further for significant differences for the four categories.

5.3.2 Data Organization and Variable Abbreviations

Because the analyses in this part of the research are at the team level, the constructs such as members' ratings of team KS and the variance of KS in the team need to be computed at the unit of a team. In the first step, the construct of a member's knowledge sharing with each of their colleagues in the team is computed by taking the mean of all the items in the individual KS scale. In the second step, the mean of a member's KS with all colleagues across the team is computed. This represents an individual's average knowledge sharing with all of their colleagues in the team. Based on this result, the third step is to calculate the mean and standard deviation for all individuals' average KS with colleagues in the team. The results of the means are labelled "Mean KS" which represents the average of team members' average knowledge sharing with colleagues across the team. The results of the standard deviations are labelled "KS Variance" which represents the variance of members' average knowledge sharing with colleagues in the team. The calculations and descriptions of the two constructs are illustrated in Figure 5.3 below.

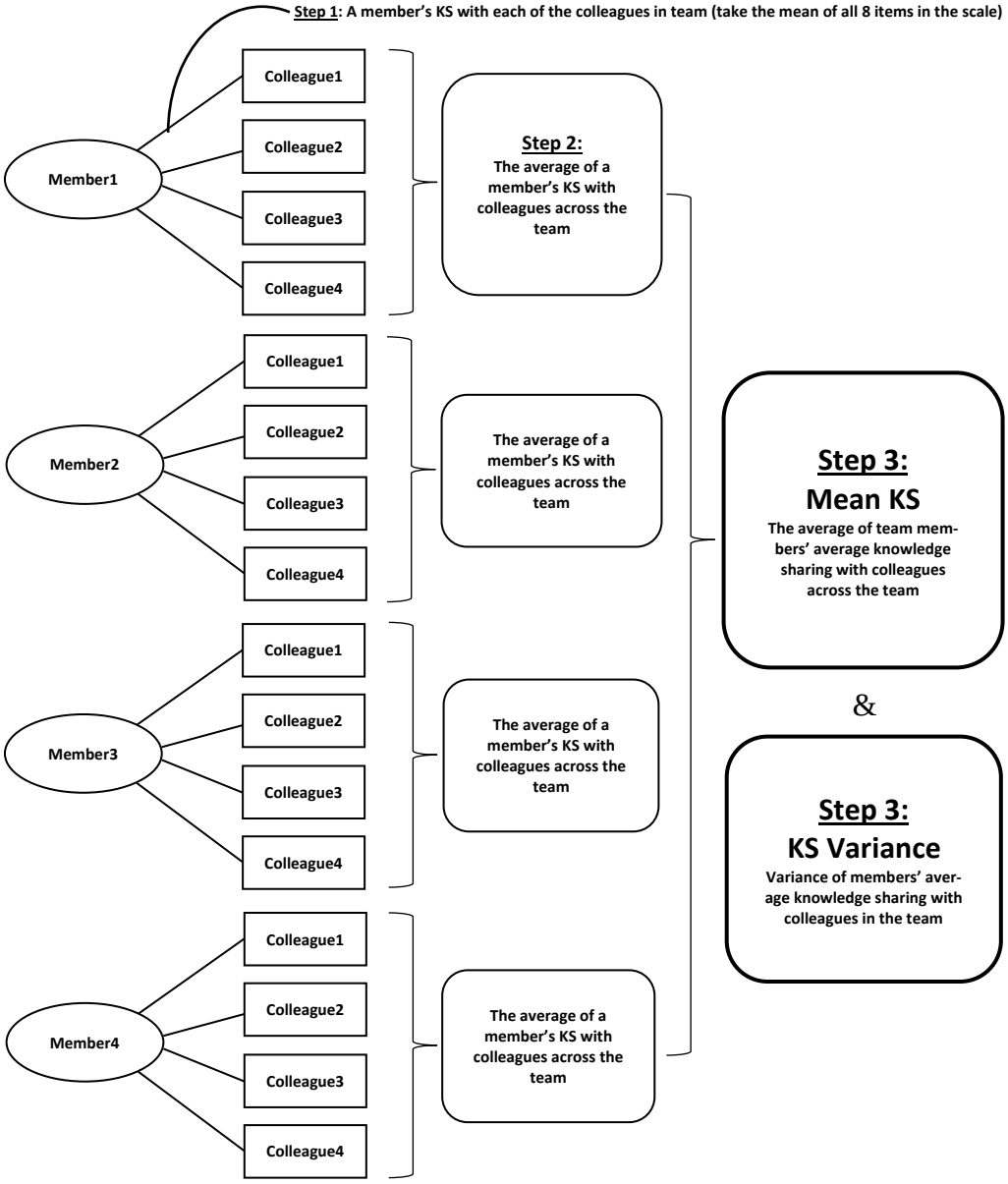

Figure 5.3 Computing Mean KS and KS Variance in Teams

The constructs of Team KS, Team Innovation, and Team Performance are all measured by the leader of the team as a whole. They are computed by taking the mean of all items in the scale. The descriptions for each of the measured variables are shown in Table 5.10 below.

Table 5.10 Variables and Descriptions for Research Part 3

Variable	Description
Mean KS	The average of team members' average knowledge sharing with colleagues across the team.
KS Variance	Variance of members' average knowledge sharing with colleagues in the team.
Team KS	Leader's perspective of knowledge sharing in team (take the mean of all five items in the scale)
Team Innovation	Leader's perspective of team innovation (take the mean of all the four items in the scale)
Team Performance	Leader's perspective of team performance (take the mean of all the nice items in the scale)

5.3.3 Descriptive Statistics and Correlations

Both KS and team innovation are on a five-point scale whereas team KS and team performance are on a seven-point scale. The number of subjects, the mean, standard deviation, and correlations for each of the measured variables and control variable (organization type) for research part 3 are shown in Table 5.11 below:

Table 5.11 Descriptive statistics and correlations of variables for research part 3 (N=51)

	Variable	M	SD	1	2	3	4	5	6
1	Organization Type	.39	.49	-					
2	Mean KS	4.04	.42	-.47**	-				
3	KS Variance	.29	.32	.72**	-.36*	-			
4	Team KS	5.90	.70	.28*	.19	.09	-		
5	Team Innovation	3.88	.56	-.20	.47**	-.21	.67**	-	
6	Team Performance	5.68	.86	-.34*	.54**	-.37**	.40**	.77**	-

Notes:
1) *Correlation is significant at the 0.05 level (2-tailed).
2) **Correlation is significant at the 0.01 level (2-tailed).
3) Organization Type: 0 for manufactory industry, 1 for school.

5.3.4 Hypotheses Testing

In order to test the hypothesis in this part of the research, as a first step, the means of team innovation and team performance for the four categories were analysed to compare their differences. The results are shown in Table 5.12 below.

Table 5.12 Means of team innovation and team performance by categories (X axis: KS Variance, Y axis: Mean KS)

		Mean	
	N	**TM Innovation**	**TM Performance**
Category 1	15	4.22	6.08
Category 2	5	3.75	5.89
Category 3	20	3.76	5.64
Category 4	11	3.68	5.09
Total	51	3.88	5.68

The results of the means of team innovation and team performance for each of the categories indicate that teams in category 1, many people share knowledge, have the highest means for both team innovation (M=4.22) and team performance (M=6.08). However, teams in category 4, only a few members share knowledge, have the lowest means of both team innovation (M=3.68) and team performance (M=5.09). Category 2 and category 3 are below those of category 1, while higher than those of category 4.

As stated earlier, leaders' rating of team KS is used in this part of the analysis as an external source of knowledge sharing rating for the team in order to examine for any difference between the internal and external sources of knowledge sharing rating on outcome variables such as team innovation and team performance. The results of using leaders' rating of team KS are shown in Table 5.13.

Table 5.13 Means and SDs of team innovation and team performance by categories (X axis: KS Variance, Y axis: Team KS)

		Mean	
	N	**TM Innovation**	**TM Performance**
Category 1	19	4.25	6.06
Category 2	9	4.03	5.72
Category 3	16	3.61	5.56
Category 4	7	3.29	4.86
Total	51	3.88	5.68

Similar results apply to using leaders' rating of team knowledge sharing. Teams in category 1 again have the highest means of both team innovation (M=4.25) and team performance (M=6.06). Teams in category 4 still have the lowest means in both team innovation (M=3.29) and team performance (M=4.86). Category 2 and category 3 again have the scores in between category 1and category 4. It is worth pointing out that the type of organization (manufacturing industry or school) had no significant influence on team performance and team innovation. I therefore removed the control variable from the final analysis as it is not related to the outcome variables that are of interest in this part of the study.

In order to test whether the differences between the four categories on team innovation and team performance are statistically significant, t-tests were conducted between the four categories. The results of the t-tests are shown in Table 5.14 below.

Table 5.14 Sigs and effect sizes for team innovation and team performance between the 4 categories (X axis: KS Variance, Y axis: Mean KS / X axis: KS Variance, Y axis: Team KS)

	KS Variance & Mean KS				KS Variance & Team KS			
	TM Innovation		TM Performance		TM Innovation		TM Performance	
Category	Effect Size	Sig	Effect Size	Sig	Effect Size	Sig	Effect Size	Sig
1 & 2	0.88	.11	0.24	.64	0.41	.32	0.40	.34
1 & 3	1.02	.01	0.62	.08	1.69	.00	0.71	.04
1 & 4	1.04	.02	1.27	.00	2.35	.00	1.58	.00
2 & 3	0.02	.96	0.30	.56	0.70	.12	0.20	.64
2 & 4	0.10	.86	0.81	.16	1.29	.02	0.89	.10
3 & 4	0.15	.69	0.67	.09	1.11	.02	1.01	.04

The effect size (Cohen's d) is calculated with the formula by Pustejovsky (2014) for unpaired sample sizes n1 and n2: Cohen's d = t * square root (1/n1+1/n2). When d >= 0.2 but is less than 0.5, it indicates a small effect, when d >= 0.5 but is less than 0.8, it indicates a medium effect, and when d >= 0.8, it indicates a large effect. The above table shows that most of the effect sizes between the four categories have small to large effects. The underlined results are the categories that are significantly different from each other. Their effect sizes are all large except categories 1 and 3 in team performance when using KS variance and team KS, which shows a medium effect size.

The above results also indicate that when using members' rating of team KS, the difference on team innovation between category 1 and category 3 (p=.005) and category 1 and category 4 (p=.015) is statistically significant. This means that a team with many members sharing knowledge is significantly different in team innovation compared with a team where many members are not sharing knowledge. These findings support the hypothesis that a team with many members sharing knowledge has better innovation capability compared with a team in which only a few members are sharing knowledge.

The results of team performance show that the difference in team performance between category 1 and category 4 are statistically significant. This indicates that

a team with many members sharing knowledge has significantly better team performance than a team in which only a few members are sharing knowledge. This result supports the hypothesis that a team with many members sharing knowledge has better performance capability compared to a team in which only a few members are sharing knowledge.

When leaders' ratings of team KS are used, more category pairs have statistically significant results in team innovation and performance. Categories 1 and 3 ($p = .00$), category 1 and 4 ($p = .00$), category 2 and 4 ($p = .02$) and category 3 and 4 ($p = .02$) are statistically significantly different in team innovation. Moreover, categories 1 and 3 ($p = .04$), category 1 and 4 ($p = .00$) and category 3 and 4 ($p = .04$) are statistically significantly different in team performance. This may be due to the common source bias as team KS, team innovation, and team performance are all rated by leaders although it provides a different source of team KS ratings.

Table 5.15 shows the hypotheses that were tested and a summary of support and non-support of the hypotheses.

Table 5.15 Supported and not supported hypotheses summary for research part 3

Hypotheses	Outcomes
H6: Teams with many members sharing knowledge have a higher rate of innovation compared with teams with a few members sharing knowledge.	Supported
H7: A team with many members sharing knowledge has better performance compared with a team with a few members sharing knowledge.	Supported

CHAPTER 6 DISCUSSION AND CONCLUSIONS

Following the results outlined in Chapter 5, this final chapter firstly discusses the findings in relation to the literature and the hypotheses, and then we draw a conclusion from this discussion. This chapter also presents the implications of the research for practice followed by a discussion of the limitations of the present research. Finally, suggestions for future research are given.

6.1 Discussion

In this project, data were collected from 223 members within 51 teams and their leaders. Data at the individual level were aggregated at the team level in order to test the relationships among variables at the team level. Through statistical analyses, the present research verifies the relationships among LMX, TMX, knowledge sharing, innovation and performance at the individual level, individual-within-team level as well as the team level. This research consisted of three parts and tested seven hypotheses in total. The results of the studies can be summarized in table 6.1 below. Explanations for the findings and their significance to the literature will be presented in the next few sections.

Table 6.1 Research Results Summary

	Hypotheses	**Outcome**
H1a	The quality of an individual's relationship with the leader (LMX) and an individual's relationship with the whole team (TMX) are both positively related with the individual's knowledge sharing (individual KS).	Supported
H1b	LMX has a stronger relationship than TMX with the individual's knowledge sharing (Individual KS).	Not supported
H2a	The quality of an individual's relationship with the	Supported

	leader (LMX) and an individual's relationship with the whole team (TMX) are both positively related with the knowledge sharing in the team (team KS).	
H2b	TMX has a stronger relationship than LMX with members' perspective of knowledge sharing within the whole team (team KS).	Not supported
H3	Team-member relationships (TMX) mediate the relationship between leader-member relationships (LMX) and knowledge sharing in the team.	Supported
H4	Relative LMX moderates the relationships between individual level LMX and TMX, such that the relationship will be stronger when RLMX is higher, but weaker when RLMX is lower.	Supported
H5	Team level LMX differentiation is negatively related to members' relationships with the team (TMX).	Not Supported
H6	Teams with many members sharing knowledge have a higher rate of innovation compared with teams with a few members sharing knowledge.	Supported
H7	A team with many members sharing knowledge has better performance compared with a team with a few members sharing knowledge.	Supported

6.1.1 Discussion on Research Part 1

In the first part of the research, I mainly focused on the study of two forms of social exchange relationships at work, namely leader-member exchange (LMX) and team-member exchange (TMX) and their effects on knowledge sharing. With the development of more than 40 years of research, LMX theory is a mature area of research (Graen & Uhl-Bien, 1995). However, research on TMX is not as well developed as LMX. This research is one of the few studies that explore whether

LMX and TMX have unique relationships with specific outcome variables. In addition, this is the first study to explore how LMX and TMX simultaneously work on KS at both the individual level and team level. This study helps to determine whether LMX and TMX both facilitate KS at different levels and is thus a valuable addition to the TMX literature.

So far, there are only three studies in the LMX literature which have investigated both LMX and TMX on certain workplace outcomes (Banks et al., 2014; Liao et al., 2010; Muñoz-Doyague & Nieto, 2012). For instance, Muñoz-Doyague and Nieto (2012) found that both LMX and TMX have a unique influence on individuals' creativity. Moreover, they found that TMX has a stronger relationship than LMX with creativity. Similarly, Liao and colleagues (2010) found that both LMX and TMX have relationships with an individual's creativity through the individual's self-efficacy. However, they did not compare which form of relationship has more influence than the other. Through a meta-analytic study, Banks and colleagues (2014) found that TMX has an influence on job commitment and job satisfaction, but not on job performance and turnover intentions. And compared with LMX, TMX has a weaker relationship with job commitment and job satisfaction. These three studies were the start for examining LMX and TMX at the same time which showed that both LMX and TMX have unique relationships with certain work outcomes. Additionally, the present study moves a step further regarding the outcome variables at the team level. It is found that both of the relationships are related to knowledge sharing, not only at the individual level (individual KS) but also at the team level (team KS). This finding expands the literature of LMX and TMX in that both of the two individual-level social relationships predict the team-level outcome. It also answers the call for extending research on the relationship between leadership and KS (Hislop, 2013; Von Krogh et al., 2012).

In addition, this study has found that the horizontal relationship (TMX) is equally as important as the vertical relationship (LMX) on individual knowledge sharing. In a study which examines the relationship between TMX and individual innovation, Scott and Bruce (1994) failed to find support for their hypothesis of the relationship between TMX and individual innovation. Their explanation for this unexpected result was that it might be due to the low level of intragroup task interdependence, because when the task interdependence is low, members' interaction is low as well; therefore, the team-member relationship may be vague or even not exist in the team. Our finding, to some extent, validates Scott and Bruce's (1994) hypothesis that TMX is associated with individual innovation as knowledge sharing is viewed as a critical factor to innovation (Lin, 2007). This finding also extends Liu and colleagues' (2011a) study where they suggest a positive relationship between TMX and knowledge sharing intention through team commitment.

Moreover, although the finding that TMX has a stronger relationship than LMX with individual KS is not supported, it is in line with Muñoz-Doyague and Nieto's (2012) finding that TMX has a stronger relationship than LMX with individual creativity. This is a valuable addition to the existing LMX and TMX literature because it not only shows that horizontal relationships function equally alongside vertical relationships but also that horizontal relationships may be a stronger predictor of certain workplace outcomes. Future research may explore why TMX has a stronger relationship than LMX with work outcomes such as KS, creativity, and innovation at the individual level. This could be an interesting research direction because different from LMX, in which leaders can use their power to give more resources and opportunities to members as exchange conditions for KS and innovation, TMX is a horizontal relationship which is based on purely emotional and affectional support. Why does TMX still have a stronger relationship than LMX with KS? Does that mean compared with resources, the emotional and affectional support from the team is more important to an

employee's exchange behaviour; or do teammates provide more instrumental support than leaders? This finding also has practical implications for leaders to encourage good relationships in the team in order to achieve certain team outcomes.

6.1.2 Discussion on Research Part 2

In the second part of the research, we used workplace social exchange relationships at the individual level and the relationships in the context of the teams as predictor variables on Team KS. We hypothesized that the individual level TMX mediates the relationship between LMX and Team KS (H3), the individual-within-team level RLMX moderates the relationship of LMX and TMX (H4) and that the team level construct LMX differentiation has a negative relationship with TMX (H5).

Mediation Effect of TMX

The results of the mediation test support the hypothesis that TMX plays the role of mediator between the relationship of LMX and Team KS. Unlike the first part of the research, here, we used the leader's perspective of Team KS as the outcome variable in order to avoid common method variance. This finding is in line with the indirect positive relationship of LMX and TMX found by Herman et al. (2008), and further suggests a mediation effect of TMX between LMX and KS.

First of all, this finding explains whether and how LMX is related to team-level outcomes which are beyond the leader-member level. The existing studies of LMX mainly emphasize the testing of the relationship between LMX quality and work-related outcomes at the leader-member level (Graen & Uhl-Bien, 1995; Ilies et al., 2007). Researchers are interested in whether and how LMX affects outcomes beyond leader-member level such as the team level (Graen & Uhl-Bien, 1995). With the development of LMX differentiation, researchers have started to

use LMX differentiation to explain how LMX influences team level outcomes as the contextual construct of LMX differentiation transforms the individual level LMX to team level. For instance, Boies and Howell (2006) applied LMX differentiation and mean LMX in the team to explain team level outcomes such as team potency and team conflict. Le Blanc and González-Romá (2012) also conducted an empirical study to investigate the relationship between LMX differentiation, and team commitment and team performance where they found a positive relationship between LMX differentiation and the two team level variables. The present study, however, suggests that LMX, itself, is related to team level outcomes (team KS) through TMX. This finding also explains how a vertical relationship (LMX) and horizontal relationship (TMX) interact with each other in a work team and their relationship with team-level outcomes. The findings add additional knowledge to our understanding of LMX in terms of how the leader-member relationship is related to another relationship that is beyond the leader-member dyadic and how this is further associated with team-level knowledge sharing. This is important to managers as it reminds them that their relationship with each employee may be related to work outcomes at the team level.

Moreover, this finding also answers the question of whether and how LMX is associated with a relationship beyond the leader-member relationship. In a high-quality LMX relationship, members' and leaders' respect, trust, and influence each other (Graen and Uhl-Bien, 1995). In this process, followers with a high-quality LMX receive more resources, such as support and opportunities from their leader. This experience encourages members to promote high-quality relationships with other colleagues in the same team in order to enjoy more mutual benefits with colleagues on the one hand and to repay the benefits they have received from the leader and maintain high-quality relationships with the leader on the other (Banks et al., 2014). A team with high-quality TMX indicates that the members within the team are in a relatively trustful working

atmosphere, which also encourages members to expand such high-quality relationships to the whole team.

Moderation Effect of RLMX

Drawing on social comparison theory, RLMX represents the results of members' comparison of their own LMX with the average LMX in the team in order to judge whether their LMX standing is better or worse than the average LMX in the team. The existing studies are mainly focused on the outcomes of RLMX such as employees' turnover (Graen et al., 1982), job satisfaction (Hu & Liden, 2013), job performance (Schriesheim et al., 1998 & 2000) and employees' OCB (Henderson et al., 2008; Hu & Liden, 2013). Moreover, research also includes examinations of the mediating (Henderson et al., 2008; Tse et al., 2012) and moderating (Hu & Liden, 2013; Tse et al., 2012) mechanisms between RLMX and certain outcomes.

However, little study has been conducted to examine RLMX itself as a moderator. Researchers have suggested that the results of the social comparison not only influence an individual's behaviour but also influence team formation processes (Festinger, 1954). Considering that RLMX is a result of the comparison, it should have the potential to influence certain outcomes or relationships. Epitropaki and Martin's (2013) study is the only work of RLMX's moderation effect. They found that RLMX moderates the relationship between transformational and transactional leadership perception and employees' choice of soft and hard upward influence tactics. The present study has found that RLMX moderates the relationship between LMX and TMX. This is the first study to investigate the relationship between LMX and TMX under the influence of the individual-within-team level construct, RLMX. This finding shows that individual-level interpersonal relationships (LMX and TMX) do not exist in isolation but are associated with higher level factors such as RLMX at the individual-within-team level. The finding also helps us to have a better understanding of RLMX because social comparison theory suggests that the results of the comparison are related to an individual's

attitudes and behaviours (Greenberg et al., 2007). Therefore, as a construct derives from the social comparison, RLMX in this study shows that it is related to an individual's social relationships.

Negative Relationship between LMX Differentiation and TMX

LMX differentiation refers to the variance of LMX qualities in a team. The main argument concerning LMX differentiation is whether the variance of LMX quality is a good (positive effect) or a bad thing (negative effect) to a team. Researchers who have viewed LMX differentiation as a negative factor do so mainly because of the belief that the differentiation on LMX quality violates the principle of equality (Gooty & Yammarino, 2016; Harris et al., 2014), which causes employees to feel the leader is unjust (Bolino & Turnley, 2009), which leads to negative outcomes. However, some researchers view LMX differentiation as a positive factor in teams. For instance, Liden and colleagues (2006) found that a highly differentiated team can motivate members to improve themselves in order to become a high-quality LMX member to receive more benefits from the leader, while members of a low differentiation team lack motivation as it treats all members similarly.

The present study proposed a negative relationship between LMX differentiation and TMX. This study enriches the literature of LMX by examining the relationship of LMX quality variance in a team with TMX. The results of our study show that the relationship between LMX differentiation and TMX are not considered statistically significant, hence the results do not support the hypothesis. However, the results indicate a trend that LMX differentiation and TMX are negatively related. This, to some extent, is in line with the study by Hooper and Martin (2008) where they found that LMX differentiation may have negative implications for members' relationships. The finding of our study also indicates that an individual's relationship with the team as a whole (TMX) is not related to the variance of LMX quality in the team. This may be because TMX represents an

individual's team identity (Banks et al., 2014). And team identity is a "powerful term" as it implies the definition of a team and represents many workplace behaviours (Albert et al., 2000). Therefore, identity has the characteristic of stability in nature (Gioia, 1998), thus it is not easily to be changed or influenced by outside factors, such as the leader's treatment of their co-workers.

6.1.3 Discussion on Research Part 3

In the third part of the study, the question of whether a team with many members sharing knowledge or only a few sharing knowledge is more favourable to the team's innovation and general performance was examined. In addition to the members' perspective of team KS, the leaders' perspective of team KS was also used as a different source of data. A leader's rating of team KS is an external source of data which provides a more objective evaluation of the KS in the team. It also helps to minimize common method bias. After dividing the collected 51 teams into four categories, namely: 1) many people share a lot of knowledge; 2) a few people share a lot of knowledge; 3) many people are not sharing knowledge; and 4) a few people are sharing a little knowledge, the significance of the difference in team innovation and performance between these types of teams was examined.

Despite the two different sources of team KS rating (leader's rating and member's rating), the results of both analyses show that a team with many members sharing knowledge is significantly different from a team with a few members sharing knowledge regarding team innovation as well as team performance. Specifically, teams with more people sharing knowledge have higher ratings of innovation and team performance. In addition, the analysis with the leader's rating of team KS adds some more significant differences in team innovation and team performance among the four categories. For instance, a team where a few people share a lot of knowledge is significantly different from

a team where a few people share a little knowledge in terms of team innovation, such that the first set of teams demonstrates higher innovation and performance than the second.

The existing literature of KS mainly focuses on the factors that influence individual KS and the outcomes of KS. However, there has, as yet, been no study concerning whether it is more favourable for everyone in the team to share knowledge, or if a few people sharing knowledge is enough. As the first study that explores the relationship between the knowledge sharing pattern in the team and team outcomes, the result of the current study is an addition to the KS literature. It explores KS in the context of a team and indicates that how team members share their knowledge in the team is positively related to team innovation and performance. Consequently, leaders should be aware of the fact that in order to achieve better team innovation and performance, they should encourage more members in the teams to share knowledge.

The findings of the present study also motivate further research in this direction. For example, further research can take the composition of the team into consideration, such as, whether a team with diversity in people in terms of educational background and working experiences or with similar people is more favourable to team outcomes such as innovation and performance? Such studies explore the teams and knowledge sharing in depth and help to find a pattern of knowledge sharing in teams and a composition of the teams that best facilitates team knowledge sharing.

6.2 Conclusions

To summarize, the present research examines the two basic social relationships in the workplace, LMX and TMX, and their interaction with each other at three different levels, namely the individual level, the individual-within-team level and

the team level. The research also investigates how knowledge sharing is associated with the relationship dynamics in the context of a team, which ultimately leads to team innovation and performance. This research has made some theoretical and methodological contributions.

Firstly, the present study finds that both LMX and TMX have a unique relationship with knowledge sharing at both the individual and team level. This is an addition to the existing LMX and TMX literature which theoretically clarifies the two constructs. This study also explores whether LMX or TMX shows a stronger association with certain workplace outcomes in the presence of each other. The results indicate that the vertical relationship and horizontal relationship are both important not only to individual level outcomes but also to team level outcomes such as team KS.

Secondly, this study enriches our understanding of TMX. TMX was proposed by Seers (1989); however, to date, the number of TMX studies is limited. As there is a lack of empirical study on both LMX and TMX's influence on work outcome (Liao et al., 2010), there is little evidence thus far on the relative contributions of the two constructs for workplace outcomes (Banks et al., 2014). This study answers the call for a better understanding of horizontal relationships (such as TMX) and how they work simultaneously with vertical relationships (such as LMX) (Banks et al., 2014). The study investigates TMX through a multilevel model, namely the individual level, the individual-within-team level and the team level, which enriches our understanding of TMX as a horizontal relationship. The findings show that TMX is responsible for certain work outcomes. Moreover, it is found to have the function of mediating constructs that belong to different levels. TMX is also found to have a relatively stable nature that is not easily influenced by outside factors. Combining these findings, TMX shows the quality of being a promising social exchange relationship in the workplace and, therefore, should not be ignored.

Thirdly, different from existing studies that focus on the antecedents and outcomes of knowledge sharing, this research, for the first time, explores whether the number of the members who share knowledge in teams matters to team innovation and team performance. It enriches the literature of knowledge sharing and innovation as the number of members sharing knowledge in the team is found to be associated with the innovation and performance of the team. It also proposes a future direction for this line of research; for instance, the study on the relationship of the compositions of the team and knowledge sharing that is related to outcomes such as innovation and performance.

Finally, this study makes a methodological contribution by building a multilevel model to examine how social relationships (LMX, TMX, RLMX and LMX differentiation) interact with each other in the team. Previous empirical studies of LMX are mostly single-level with a focus on the individual predictors and outcomes of LMX and ignoring the fact that LMX exists in the context of a team which is multilevel in nature (Uhl-Bien et al., 2012). Realizing the limitation, researchers have a growing interest to examine the differentiation of LMX (e.g., Harris et al., 2014; Tordera & González-Romá, 2013) at the individual-within-team level and team level. The present research contributes to building a multilevel model, which helps to have a fuller understanding of how workplace relationships work in the context of a team and thus a better understanding of LMX theory.

6.3 Implications for Practice

In addition to the theoretical and methodological contributions, the present research also has some practical implications. First of all, this research has shown that social relationships between the leader and the member (LMX) as well as the relationships between the member and their team (TMX) can equally have a

positive association with knowledge sharing. And knowledge sharing is associated with team level work outcomes such as team performance and team innovation. These findings indicate that the relationships that develop amongst a team in the workplace may be advantageous to companies. Managers may wish to seize the opportunity by enhancing the relationships at work which includes encouraging more interaction between leaders and members (Cabrera & Cabrera, 2005), providing places or opportunities for leaders and members to socialize so that members have more chances to interact with each other (Nonaka et al., 2000; Nonaka & Konno, 1998), and building a trustful climate (Gupta, 2008). Companies could also utilize the knowledge of the association between workplace relationships and work outcomes in developing training programmes on mentoring and counselling skills for managers when building and managing teams (Ismail Al-Alawi et al., 2007).

Secondly, the present research has found that team-member relationships mediate the relationship between leader-member relationships and team knowledge sharing. This finding stresses the importance of a member's relationship with the team as a whole. This means that in order to achieve high-level team outcomes, both leaders' relationships with subordinates and employees' relationships with the team should be taken into account when building teams and selecting leaders for teams. It is also important for leaders to realize their relationships with individuals have spill-over effects. Therefore, we suggest that the traditional top-down, one-way management can be transformed into a participative, or collectivistic management model (Yammarino et al., 2012) where members have more chances to interact with the leader and the whole team.

Thirdly, as the results of the present study show, a team with many members sharing knowledge has better innovation and performance capacity than a team with only a few members sharing knowledge. This finding emphasizes the critical

role of knowledge sharing at both the individual and team level. It also helps leaders and members in teams understand the importance of raising individual knowledge to the team level through knowledge sharing in order to have team level outcomes such as team innovation and team performance. In addition, it shows that only a few members sharing knowledge is not as good as the whole team engaged in knowledge sharing. Leaders should consider the relationship when deciding on initiatives to enhance their members' knowledge sharing. This can be achieved through developing their relationships with members. As a result, their subordinates would be willing to share more with the leader and the team, which contributes to improving the frequency of knowledge sharing.

6.4 Limitations

Like any research, there are several limitations to the present research that should be acknowledged.

The first limitation is concerning the sample size. Although the sample size of 223 members and 51 teams for the present study is considered a large-size sample (Mason, 2011), the samples regarding teams are still limited due to the limited access. This is especially the case in research part 3 when the 51 teams in the present research needed to be divided into four categories for comparison. The small number of teams in each of the categories determines that the results of the number of members sharing knowledge in the team on team innovation and team performance are very preliminary. Therefore, on the basis of ensuring the quality of the findings, we should seek to increase the number of teams in order to pursue the accuracy of the research conclusions.

The second limitation lies in the research method. The present research adopts a cross-sectional method to study social relationships on knowledge sharing, therefore no long-term or short-term longitudinal studies were conducted. Thus,

I could not examine the changes in interpersonal relationships over time, which may be associated with members' knowledge sharing behaviour, leader-member relationships, and members' innovation behaviour. Conclusions with regards to causality cannot be made.

The third limitation is concerning common method variance. This research maximizes the control over the problem of common method variance as much as possible. For instance in research part 2, member's rating of LMX and TMX were used as predictors at the individual level while leader's rating of Team KS was used as the outcome variable at the team level in order to avoid the common source of the rater. However, this study measured the variables with the same method; therefore, the generalization of conclusions from the research may be limited. Future research can be improved through procedural remedies and statistical remedies. For example, procedural remedies such as obtaining predictor and outcome variables from different sources; balancing the positive and negative items, etc. Statistical remedies such as testing the magnitude of common method bias in the data to ensure the data is not driven by common method bias (Podsakoff et al., 2012).

The final limitation lies in the computation of the construct of RLMX. There has yet to be a commonly established method to calculate RLMX. The most used method to calculate RLMX, which is the method applied in the present research, is computed from LMX. We calculated RLMX by subtracting the mean LMX score in a team from the individual's LMX score. However, LMX is self-rated by individuals, and they lack a unified standard while rating LMXs. Therefore, every individual's perspective of LMX is different from each other. The accuracy of RLMX computed from LMX is thus potentially flawed.

6.5 Suggestions for Future Research

The majority of LMX research is from the follower's perspective. However, as the leader is the one who generates the exchange relationship, it might be more precise to investigate the relationship of LMX with work outcomes from the leader's perspective. In addition, as leaders and members often view the relationship differently (Epitropaki and Martin, 2015), the dual-perspective of both leader and member could be applied in future research to investigate whether LMX from the two parties is associated with work-related outcomes differently, and, if so, why the difference might exist. This is especially the case for LMX differentiation as, so far, none of the existing studies on LMX differentiation is computed from the leader's perspective of LMX, despite the fact that leaders are supposed to be the ones who generate the difference of LMX quality. It would, therefore, be desirable to examine LMX differentiation from the leader's perspective. It is also meaningful to the LMX literature to examine whether there would be any difference on outcome variables when LMX differentiation is rated by leaders as well as by members.

Previous LMX research has mainly focused on the individual level. Recently, research has been extended to include team or group level, as in the case of the present study. However, very few LMX studies have included individual level, team level, and organizational level. Therefore, it would be desirable to undertake research with all the three levels in order to have a fuller picture of how social relationships are working in a more complete and more close-to-reality context.

The one-to-one or one-to-many vertical relationship between leader and member is not necessarily the only exchange relationship in the real world. The existing LMX theory ignores the more complicated interpersonal exchange relationships that exist in the organization. For instance, an organization may have members, team leaders, middle-level management and top management. A

member may have exchange relationships with a middle-level manager or even a top-level manager directly. Therefore, it would be desirable if future LMX studies can be extended to cross-level exchange relationships so that potential predictors may be found to certain outcomes which can enrich the existing literature.

Culture may play a role in LMX and work outcomes. In a meta-analysis by Rockstuhl and colleagues (2012) based in 282 independent studies from 23 countries, they found that in the Western contexts relationships between LMX and OCB, justice, job satisfaction, turnover intention, and the trust to leaders are stronger than those in Asian contexts. However, culture does not affect relationships between LMX and performance, commitment, and transformational leadership. Their findings indicate that in Asian context, members' work outcomes may not only be affected by their sensitive relationships with the leaders, but also be affected by the culture characterised with collective interests and role obligations (Rockstuhl et al., 2012). Future research can be conducted with data collected from both China and Western countries so that the results of LMX on work outcomes from different countries can be compared in order to study the role that culture plays.

The present study uses ordinary organizations for empirical analysis, which may neglect some important environmental factors or the nature of the organization, which may be critically related to social exchange relationships. For instance, Scott and Bruce's (1994) sample is low in task interdependence, therefore members have a vague or even zero concept of TMX, which may be the reason they failed to empirically find the relationship between TMX and individual innovation though, theoretically, the relationship is founded. Therefore, it would be desirable for future research to focus on a particular industry or organization, such as family firm, or organization in its start-up stage or multi-culture

organization, in order to investigate the relationships among individuals, leaders, and organizations in different organizational contexts.

As a construct derived from LMX, TMX has received little attention from researchers. However, depending on the measurement strategy, TMX can be viewed as an individual level construct which is rated by individuals or a team level construct termed as work unit TMX which is calculated by taking the average from members' TMX score in the team (Liu et al., 2011a). Therefore, TMX has the potential to mediate variables in between individual and team level. The present study found the mediation effect of TMX between the relationship of LMX and Team KS. It would be desirable for future study to explore the mediation effect or moderation effect of TMX between other variables in order to enrich LMX and TMX literature.

This research focuses on knowledge sharing among members within the team, however, with the diversification of information sources, members within the team may have the chance to interact with people from outside the team, and they also have the chance to share knowledge with individuals who are not in the same team. Therefore, it would be desirable to study the influencing mechanisms and the outcomes of external knowledge sharing and compare those with knowledge sharing within the team.

The present study explored the relationship between knowledge sharing pattern and team innovation and performance; specifically, whether it is more favourable for everyone in the team to share knowledge or a few people sharing knowledge is enough. Further research may be conducted in this line such as the relationship among the compositions of the team, knowledge sharing, and team outcomes. Specifically, whether a diversity of people or similar people in the team is more favourable to knowledge sharing which ultimately leads to team outcomes.

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APPENDIX. VARIABLE MEASURES

LMX measure (member)

- I like my supervisor very much as a person.
- My supervisor is the kind of person one would like to have as a friend.
- My supervisor is a lot of fun to work with.
- My supervisor defends my work actions to a superior, even without complete knowledge of the issue in question.
- My supervisor would come to my defense if I were “attacked” by others.
- My supervisor would defend me to others in the organization if I made an honest mistake.
- I do work for my supervisor that goes beyond what is specified in my job description.
- I am willing to apply extra efforts, beyond those normally required, to meet my supervisor’s work goals.
- I do not mind working my hardest for my supervisor.
- I am impressed with my supervisor’s knowledge of his/her job.
- I respect my supervisor’s knowledge of and competence on the job.
- I admire my supervisor’s professional skills.

TMX measure (member)

- How often do you make suggestions about better work methods to other team members?
- Do other members of your team usually let you know when you do something that makes their jobs easier (or harder)?
- How often do you let other team members know when they have done something that makes your job easier (or harder)?
- How well do other members of your team recognize your potential?
- How well do other members of your team understand your problems and needs?
- How flexible are you about switching job responsibilities to make things easier for other team members?
- In busy situations, how often do you ask others for help? (reworded)

- In busy situations, how often do you volunteer your efforts to help others on your team?
- How willing are you to help finish work that had been assigned to others?
- How willing are other members of your team to help finish work that was assigned to you?

Individual KS measure (member)

- When I have learned something new, I tell my colleagues about it.
- I share information I have with my colleagues.
- I think it is important that my colleagues know what I am doing.
- I regularly tell my colleagues what I am doing.
- When I need certain knowledge, I ask my colleagues about it.
- I like to be informed of what my colleagues know.
- I ask my colleagues about their abilities when I need to learn something.
- When a colleague is good at something, I ask them to teach me how to do it.

Team KS measure (member & leader)

- People in this team keep their best ideas to themselves (reverse coded).
- People in this team are willing to share knowledge/ideas with others.
- People in this team share their ideas openly.
- People in this team with expert knowledge are willing to help others in this team.
- This team is good at using the knowledge/ideas of employees.

Team Innovation (leader)

- Team members often implement new ideas to improve the quality of our work.

  (This question has been adjusted to better suit the research context. Original: Team members often implement new ideas to improve the quality of our products and services.)

- This team gives little consideration to new and alternative methods and procedures for doing their work. (reverse coded)
- Team members often produce new services, methods, or procedures.
- This is an innovative team.

Team Performance (leader)

- The efficiency of team operations.
- The amount of work the team produces.
- The team's adherence to schedules.
- The team's adherence to budgets.
- The quality of work the team produces.
- Effectiveness of the team's interactions with people outside of the team.
- The team's ability to meet the goals of the project.
- The team could have done its work faster with the same level of quality.
- The team met the goals as quickly as possible.