



**Informal Networks and Knowledge Sharing in
Organizations——Case Study of GR Group**

TAO Zehua

Thesis submitted as partial requirement for the conferral of the degree of

Doctor of Management

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April 2018



Instituto Universitário de Lisboa

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April 2018

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Abstract

In the era where knowledge and technology have been advancing, knowledge, together with capital and human resources, has become an essential productive factor, playing a vital role in economic growth and enterprise development. Moreover, knowledge-based economic growth relies principally on enterprise knowledge and technological innovation. Nowadays, communication channels have been evolving so rapidly that the types of knowledge sharing have transferred from traditional administrative orders to diversified, multi-channel and informal ways. From the perspective of networks, social platforms and social capital, more attention has been paid to employee behavior in the past few years. Compared to technology and knowledge innovation of the whole organization, growing emphasis has been placed on knowledge sharing of informal networks built by individual employees. As a supplement to formal organization system, informal network is characterized by versatility, background similarity and excellent communicability, defining its positive effect on knowledge sharing and interaction. Consequently, informal network is the key variable in the innovation performance of modern enterprises. Nevertheless, studies on the informal network of knowledge sharing mainly focus on the overall network instead of on network segmentation. Accordingly, knowledge sharing ways and channels is a research gap now. Therefore, it is essential to further delve deeper into informal networks as a closer scrutiny of such topic is of theoretical value and practical significance.

Based on the domestic and international research results, this research goes into depth on connotation, structure and measurement, as well as their relations of four informal networks of knowledge sharing – problem solving, work instruction, emotional support and friendship – and builds a conceptual model of these four networks. From the questionnaire survey and interview in GR Group, an overall

network data of 57 employees were collected and analyzed using UCINET software. The results show that problem solving and work instruction networks, founded on specific work details and professional knowledge, rely more on some key figures and involve a low level of knowledge sharing, which are generally not beneficial to the overall advancement of enterprise knowledge and technology. Meanwhile, emotional support and friendship networks, depending on social capital, have low network density. It is suggested that with scientific instruction and careful guidance, these two networks can become potential knowledge sharing channels and play a positive role in enterprise innovation performance.

This research integrates informal networks and knowledge sharing models into a framework. Some findings have been obtained in quantitative research and data acquisition ways, and furthermore, theoretical progress has also been made. In conclusion, some tactics and suggestions are provided for GR Group and other similar enterprises to inspire and promote knowledge innovation, having profound guiding significance for intra-organizational knowledge sharing.

Keywords: Knowledge Sharing; Informal Networks; Social Network Analysis;

GR Group

JEL: M10; D21

Resumo

Na era em que o conhecimento e a tecnologia avançam, o conhecimento, juntamente com o capital e os recursos humanos, tornaram-se um fator produtivo essencial, desempenhando um papel extraordinariamente vital no crescimento econômico e no desenvolvimento empresarial. Além disso, o crescimento econômico baseado no conhecimento depende principalmente do conhecimento empresarial e da inovação tecnológica. Atualmente, os canais de comunicação estão evoluindo tão rapidamente que os tipos de partilha de conhecimento foram transferidos das formas administrativas tradicionais para formas diversificadas, multicanais e informais. Do ponto de vista de redes, plataformas sociais e capital social, mais atenção tem sido dada ao comportamento dos colaboradores nos últimos anos. Para compreendermos melhor a inovação nas organizações precisamos de estudar a partilha de conhecimento nas redes informais construídas pelos colaboradores. Como complemento aos sistemas formais da organização, a rede informal caracteriza-se pela sua versatilidade, pela comunicabilidade excelente, provocando um efeito positivo na partilha do conhecimento e na interação entre as pessoas. Consequentemente, as redes informais são as variáveis chave no desempenho de inovação das empresas modernas. No entanto, os estudos sobre as redea informais de partilha de conhecimento concentram-se principalmente na rede geral, e não na segmentação da rede.

Com base nos resultados de pesquisas nacionais e internacionais, esta tese aprofunda a conotação, estrutura e mensuração, bem como as relações, das redes informais na partilha de conhecimento para solução de problemas, formação , apoio emocional e adicionalmente , constrói um modelo conceitual com base nas diferentes redes informais existentes nas organizações.. Tendo por base um questionário e

entrevistas realizadas aos 57 colaboradores da empresa GR Group, os dados foram analisados usando o software UCINET. . Os resultados mostram que a rede solução de problemas e formação d, baseada em detalhes de trabalho específicos e conhecimento profissional, depende muito de uma figura-chave e envolv um baixo nível de partilha de conhecimento, não beneficiando muito o avanço geral do conhecimento e da tecnologia da empresa. Por outro lado a rede de apoio emocional e a rede da amizade, que dependem muito do do capital social, têm uma baixa densidade.. Sugere-se que, os gestores devem prestar atenção a estas duas redes para que possam tornar-se canais potencias de partilha de conhecimento e desempenhar um papel positivo na inovação empresarial.

Palavras-chave: Partilha de Conhecimento; Redes Informais; Análise de Redes Sociais; GR Grupo.

JEL: M10; D2

摘要

在知识和技术浪潮不断演进的时代，作为除劳动、资本、资源外另一关键性的生产要素，知识对经济增长和企业发展至关重要。知识经济增长主要依靠企业的知识和技术创新。在传播渠道推陈出新的今天，知识共享的组织形式，已经从传统的行政命令向多元化、多渠道、非正式的方式转变。近年来，随着互联网、社交平台和社会资本对员工个体行为的关注，相比于关注组织整体的技术和知识创造能力，个体之间非正式网络关系下的知识共享日益受到重视。作为正式组织制度的补充，非正式网络所具有的跨功能性、背景相似性、良好的沟通性等特征，决定了它在知识共享和互动中的积极作用。因此，非正式网络是现代企业中影响组织创新绩效的关键变量。然而，有关知识共享非正式网络的研究多将网络整体作为研究对象，不细分网络内涵，因此没有对知识共享的方式和渠道进行研究。因此，对企业间，尤其是国有企业的员工内知识共享属性及优化路径有一定的研究价值。

本文在国内外相关研究成果的基础上，深入探讨了企业员工知识共享行为的非正式网络，研究问题解决、工作指导、情感支持和友谊四种知识共享的非正式网络类型的内涵、结构、测量及其三者间的关系，构建出这四个知识共享网络的概念模型。基于 GR 集团的问卷调查和访谈资料，收集 57 个成员的整体网数据，运用 UCINET 软件进行网络分析。研究结果表明：基于具体工作细节和专业知识的网络和工作指导网络更依赖于个别关键角色（部门负责人或关键信息掌握者），知识共享的程度较弱，不利于组织整体的知识和技术进步；而依赖于社会资本的情感支持和友谊网络密度较小，表明这两种网络可以成为潜在的知识共享渠道，需要加以科学的有意识的引导，能够在提高公司创新绩效上起到积极的促进作用。

本研究将非正式网络和知识共享模整合在一个框架中进行研究，首先在量化研究和数据获取方式上取得了一定的成果，其次在理论上也有所推进。论文的结论给 GR 集团及类似企业提出了激发和提升知识创新的对策建议，对于组织内部知识共享具有重要的指导意义。

关键词：知识共享；非正式网络；社会网络分析；GR 集团

Acknowledgments

At the end of the final draft of this research, I reviewed the entire process of thesis selection, research, drafting, and translation. I suddenly felt that my mentor and team have been around me for more than two years, but I have not been able to reward them even if it is a gratitude with a sense of ritual, I feel very sorry, perhaps before the finalization of this research, to express my gratitude in this form is the best choice now!

First of all, I would like to thank the ISCTE-Business School and the University of Electronic Science and Technology of China for training me, especially Professor Nelson and Professor Ma Jie for their insightful guidance. Prof. Nelson's profound knowledge and rigorous logical thinking deserve our respect. During the study of the subject and the writing of the thesis, I have had a face to face interaction with Prof. Nelson for more than ten times, and he has patiently and meticulously proposed amendments to the thesis, which has benefited me a lot. Moving beyond this will surely become my lifelong memories. Ma Jie's extensive knowledge, heavy theoretical foundation and innovative ideas have given me a taste of the beauty of knowledge. From topic selection to completion of the dissertation, Prof. Ma has insatiably kept close eyes on me, taught me ways, and even personally helped me modify the manuscript, giving me the most important spiritual wealth in my life.

Secondly, I would like to thank every member of the research team of my project. Whether it is case interviews, data collection and collation, or translation, everyone was devoted as if the project was their own and has helped me a lot.

In the course of choosing the topic, this research also received the guidance and support from Prof. Chen Bin from the City University of New York, USA, and hereby thanks!

Due to my limited knowledge accumulation and research capabilities, combined with the limitations of incomplete inductive reasoning in the research process, this

research still has imperfections and flaws. I urge all experts, teachers, and peers to criticize and correct them.

致谢

在本文终稿完成之际，回顾论文的选题、研究、起草和翻译的整个历程，突然才觉得在这两年多时间里，我的导师和团队一直都在我左右，而我却未能回报他们哪怕是一次具有仪式感的谢意，心里很是过意不去，也许在本文正式定稿前，以这种形式表达我内心的感激之情，是目前最好的选择吧！

首先我要感谢里斯本工商管理大学和电子科技大学对我的培养，尤其是 Nelson 教授和马捷教授对我的教育与指导。Nelson 教授渊博的学识和严谨的逻辑思维值得我们尊重。在课题研究和论文撰写期间，曾十多次面对面给我指点，并耐心细致的对论文提出修改意见，令我受益匪浅，感动之余也必将成为我终生的回忆。马捷老师广博的见识、厚重的理论功底和富于创新的思想，让我领略到了知识的美妙。从本文选题到论文完成的全部过程，她一次又一次不厌其烦给我启迪，教我方法，甚至亲自帮我修改稿件，给予了我人生最重要的一笔精神财富。

其次要感谢我课题研究团队的每一位成员，无论是案例访谈、资料收集整理，还是翻译，大家都像对待自己的课题一样投入，给了我很大的帮助。

本文在选题过程中，还得到了美国纽约城市大学陈斌教授的指点和支持，在此一并致谢！

由于本人的知识积淀和研究能力有限，加之研究过程中不完全归纳推理的局限，本文尚有不完善之处和缺陷，恳请各位专家、老师和同行们能批评和修正。

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Chapter 1: Introduction

1.1 Research Background

Since China started its 13th Five-Year (2016-2020) Plan, competition in its domestic market has become increasingly fierce. Companies today compete not only strategically and tactically, but also in terms of product innovations and technologies. They even engage in competition in human resources and new management models. How companies develop their core competitiveness has become a top priority for organizations. Companies' core competitiveness is not confined to what results from technological innovations, but also includes talent-based competitiveness. As a result, modern businesses should pay due attention to the internal talent and knowledge management. The talents are within an organization and subject to its management and control, a study of how to develop a favorable company atmosphere thus holds the key to developing human resources-related core competitiveness. Thanks to technological progress, knowledge is everywhere, which enable employees to access the knowledge they want via different channels anytime and anywhere. Knowledge can become a strategic resource for companies on the market and enable them to respond quickly to market developments and develop strategies and tactics. Within companies, knowledge is likely to affect work efficiency, enthusiasm of employees and personnel stability, thereby influencing companies' core competitiveness. Seen this way, internal knowledge management has become an integral part of day-to-day management of companies.

In an era of knowledge-driven economy, knowledge plays a key role in economic activities. Competition among businesses and businesses' success no longer rely solely on traditional resources, but instead have a growing dependence on knowledge and technology. Intra-Organizational knowledge exchange and sharing has become an important factor of companies' core competitiveness. Hence, knowledge

sharing has gradually drawn attention from both the academia and business circles. It is the employees of companies that shoulder the tasks of sharing knowledge internally. Communication and exchanging among employees allows knowledge to be transferred from one employee to another and ensure efficient flow of relevant information among them; which helps in the objectives of realizing knowledge proliferation and facilitating emergence of new knowledge.

A formal organization is an official establishment, with recognized structure that is based on institutional framework, whereas an informal organization is a network structure that exists along with, but independently of, a formal organization, and is spontaneously built up usually because of the various psychological needs of employees and emotional exchanges among them. Hence, knowledge can be transferred through formal channels of an organization or shared through the hierarchy of a formal organization. Knowledge transmitted through formal channels are authoritative, authentic and effective. Such knowledge has primarily a positive influence on the organization from inside. Meanwhile, relevant theories from behavioral economics posit that interpersonal relationship is a factor not to be overlooked while considering the individual behavior within an organization. Information network within an organization includes social bonds such as leader-member relationship, power relationship and peer relationship developed out of the work relations. These bonds have an impact on employees' behavior in an organization towards job promotion and performance assessment. An informal network carries with it resources, information, as well as the support and other advantages resulting from interpersonal relationships. It helps employees better acquire the needed knowledge, thus accomplishing work targets. All economic behaviors are embedded in a certain informal network. The survival of such a network depends on inter-personal relations and the contents behind such relations, with an emphasis the use information network structure in explaining the behaviors and phenomena of participants. Transfer of information within an organization depends to a large extent on the networked inter-personal relationship, which helps to prove that

informal networks can have a major impact on knowledge sharing.

Knowledge sharing is an extremely complicated behavior within an organization, depending largely on the thinking of individuals. Knowledge sharing will happen when employees deem the knowledge as valuable or beneficial to their own behaviors. Factors affecting knowledge sharing are varied, including personality factors of individuals as well as organizational factors –such as whether the organization is internally open to knowledge transfer and whether it has a culture for such. Some other influencing factors include the extent of trust and intimacy among employees. Research by many scholars find that informal network has a huge influence on knowledge sharing, which makes it of great necessity in studying how informal networks influence knowledge sharing in an organization.

As the dynamic behavior of knowledge sharing has become very complicated, many scholars have begun studying the behavior of knowledge transfer. However, most of the existing research is based on formal network of organizations, with a focus on knowledge transfer and peer-to-peer sharing or linear relationship sharing. And there is relatively few research on the behavior of knowledge sharing in informal network structures. Social network theory since its emergence in the 1980s, has been successful in studies related to the concept of “field” composed of knowledge-sharing objects and believes that knowledge sharing exists, and is shared, in specific relational networks. Social network theory applicable not only in anthropology, psychology, history and linguistics, but also in management science and has had a positive effect in the management science field. Based on its varied applicability this study uses social network theory as the core theoretical backbone to delve deeper into the behavior of knowledge sharing in the networks and come up with the relevant research questions and ideas of this research.

1.2 Significance of the Research

In the day-to-day management of organizations, company managers must not

only take seriously the formal network structure of the organization, but also pay special attention to managing the informal organizational structures. Based on the informal networks, employees can learn from each other, exchange knowledge, and work together across sectors. However, these informal networks can also transmit negative news, negativity, and disrupt an organization's internal knowledge transfer methods and procedures. In a worst case scenario, it can incite opposition to a company's policy plans, disrupt its daily work routine, and challenge the authority of managers. Therefore, managers nowadays should reflect on how to guide the development of informal networks and manage and control such networks, with the view to making them accessible to managers and transfer the positive dealings of the company. Besides, an organizational culture of harmony and friendliness should be developed in order to help employees to share knowledge and to learn and grow; thus, reducing and eliminating the transmission of unfavorable knowledge within the organization and the psychological instability of the staff. As a result, it is theoretically significant for the organization to study its internal informal network structures.

1.2.1 Theoretical Significance

First, previous studies are all peer-to-peer researches on knowledge sharing, while recent ones are trending towards studying knowledge sharing in a specific state, situation or "field". Granovetter (1973) believes that individual behavior is embedded in a concrete and real social network relationship. That is, any individual social activity is embedded in the social network to which it belongs and is influenced by social networks. Therefore, as a social practice activity, knowledge sharing is also bound to exist in the entire specific social network, and to be affected by these network structures.

Second, with the development of social network theory and the advances in research, many renowned scholars at home and abroad have also researched the theory. A careful perusal of past research shows that many of them are focused on the

study of social networks in terms of knowledge sharing, trust and resource acquisition. In other words, most of them stay at the organizational level, while rarely probing into which network structures exist within organizations' internal social network and what effects these structures produce on the behavior of knowledge sharing. Added, there are rare studies which employ social network analysis to solve problems pertaining to actual management of companies. Therefore, it is of great theoretical significance to study the influence of the social network structure within an organization on the basis of knowledge sharing behavior. A research in such direction will pave way for future research and could become a focus of many researchers, experts and scholars.

1.2.2 Practical Significance

First of all, after a long period of development, social theory has begun to shift its focus from the development of individual members' characteristics onto the relationship between people and among departments. Its emphasis is now on the analysis of different modes, including human interaction and structural characteristics on the basis of social connection. Current research tends to study the structure and content of networks or connection relations. These include the density and neutrality of the network structure, and the characteristics of knowledge transferred through the network. The human relationships in the GR Group are very complex, and the different composition of its network structures have a major impact on the company. Therefore, applying social network method to study the informal networks within the GR organization can help to effectively explain such complex behaviors and the phenomenon of employee knowledge sharing.

Moreover, according to the study of social networks, the internal social network of an organization can be categorized into several types depending on the dimensions of each relationship. The most common network structures include trust, emotional, consulting, and intelligence networks. Different network structures and members have different positions in these network structures and have different effects on knowledge sharing. Given that these network structures are regarded as unique

resources in the organization and have a major impact on the organization, it is thus very important to study which network structures exist within the organization, the characteristics of such networks and the impact of the networks on knowledge sharing. After successfully studying these networks, one can be able to easily identify informal networks in the GR Group, and also help management to effectively control such network structures and impose necessary measures in due course. Since it is important for current company management, this research, based on the social network analysis of the GR Group, analyzes and identifies what internal network structures exist in companies, and what impacts they produce on a company's knowledge sharing. Regarding these networks and phenomena, countermeasures and suggestions are proposed for managers, which can help them effectively influence, manage, and control informal networks.

1.3 Research Questions and Objectives

1.3.1 Research Questions

With the evolution of organizational development and information communication methods, the management and collaboration of informal organizations within a company has become an important influencing factor for knowledge sharing, organizational innovation, and even organizational performance.

Over the past 30 years since the introduction of reform and opening-up policies, China's corporate management model has evolved from a traditional vertical administrative style to a more scientific, efficient and diversified management model. In the context of continuous improvement of the modern corporate and regulatory systems, the internal organization and management of companies has also undergone great changes. The cyclical accumulation of knowledge creation, sharing, and iteration make companies gain greater competitiveness, and urge organizations to pay more attention to the dissemination methods and channels of knowledge sharing within the organization. How to promote knowledge sharing has become an important

issue for the internal organization and management of companies.

The GR Group, headquartered in Yibin, has 24 equity companies, 500 employees and has become a diversified group company. As a State-owned enterprise, GR Group's governance model has also undergone an interactive process from a past vertical administrative governance to the current diversified, flat, and networked one. In the process of its long-term development, informal networks have evolved with the constant innovation of information communication and learning methods. Companies are facing new problems of knowledge sharing and innovation, and they need to conduct in-depth discussions from the perspective of internal governance. The thesis probes specifically into the following three questions:

(1) What are the attitudes of the employees of the GR Group towards knowledge sharing?

(2) What types of informal networks do knowledge sharing in GR Group include?

(3) What structures do GR Group's different types of internal knowledge sharing networks have and which employees are the key nodes of the networks?

1.3.2 Research Objectives

Based on organizational theory, knowledge sharing and social networks, this research starts with identifying the types of informal networks within a company and comprehensively analyzing the informal network types, structures, and roles of a company's internal knowledge sharing. Through analyzing the employees' attitudes, employees' behaviors and the results of knowledge sharing in the internal governance of State-owned enterprises, the thesis applies social network's visual and measurement tools to construct an informal network conceptual framework for knowledge sharing, and proposes ways of promoting knowledge sharing based on different types of networks, and to explore specific measures for the internal organization of a company as means to realizing effective knowledge sharing and innovation mechanisms through informal networks.

This thesis uses the GR Group as a case study in investigates the informal network among all employees in the Group headquarters and discusses the network structures, types, and roles of knowledge sharing. It aims to provide a reference on how to achieve effective knowledge sharing by using informal network within the organization.

1.4 Research Methodology

The study uses relevant literature, sorts out research conclusions by scholars at home and abroad, and surveys GR Group and collects data using well-structured questionnaire. After successfully collecting the data, the author uses social network analysis to find out the kinds of social networks prevalent in the GR Group that affect knowledge sharing; the impacts these networks has on the organization internally; and whether such impacts are positive or otherwise. Thus, this study adopts a sound theoretical base and combines it with a case study, by utilizing key research techniques including but not limited to literature review, questionnaire survey and statistical analysis.

1.4.1 Literature research

The Chinese and English literature cited were downloaded from the web database of the University of Electronic Science and Technology of China Library. The author reviews relevant literature on social networks, social network analysis, informal networks and knowledge sharing, and uses such works as the theoretical basis and main references of the thesis.

1.4.2 Survey research

Following the standards of literature on scientific research the questionnaires of this study were well-designed, before being used to conduct surveys and interviews at the GR Group. Face-to-face interviews with members of the GR Group helped to minimize the possible effects of unreliable data as respondents were encouraged to

feel free to express their thoughts and answers to questions asked; this helped to gain reliable data. The data obtained via administering the questionnaires were then analyzed.

1.4.3 Social network analysis

After the questionnaire data is handled, a social network analysis is carried out using UCINET6.2, to measure and determine the kinds of network structures there are in GR Group and the density and centrality of known network structures.

1.5 Literature Review

From the perspective of the internal organization of a business, the author takes the GR Group as a study case and studies the internal informal organization of the Group's headquarters, then probes into its employees' attitudes towards knowledge sharing as well as the types of informal networks and structures of knowledge sharing. The thesis has mainly made the following contributions:

First, it helps to subdivide the informal networks of knowledge sharing in an organization and construct the conceptual frameworks of knowledge sharing networks within a business. Different from traditional researches that see informal networks as one concept and analyze the non-institutional relationship among employees, the thesis has as one of its important value systems to subdivide knowledge sharing, proposes four types of sharing networks(i.e. problem solving, work instruction, emotional support and friendly network) and carries out structural analysis of each network. This analytical approach helps to gain a subtler grasp of the behavioral patterns of employees and explore pathways to improve coordination and smooth out knowledge sharing channels.

Second, the study contributes to quantitative research. Seen from the sample size, responses from the 57 sampled headquartered employees are not enough to carry out traditional statistical analysis. But such data as limited by boundaries make it possible

for overall network analysis. The value of the study lies in the fact that it applies social network analysis to the network research on all employees at GR Group's headquarters, which, as an analytic approach, is the most appropriate in a small sample case. Meanwhile, such quantitative analysis can help grasp the characteristics of network structures, identify the roles of different individuals in the network, thereby providing targeted management suggestions for managers. Beside theoretical research, the study also has practical influence not to be ignored; for example, these researches can become successful business samples, from which developing a family of such companies can learn some important lessons.

Third, the thesis gives a general diagnostics of the case company GR Group, and presents some noteworthy ideas on how to manage organizations effectively and improve innovation performance in the contest of diversifying information transmission methods and knowledge sharing channels.

Lastly, in addition to reforming State-owned enterprises (SOEs), the study also provides some beneficial references for SOEs in choosing their internal management models, and more importantly, an effective governance model that is tailored to the Chinese scenarios and combines formal and informal organization system designs.

1.6 Structure of the Research

The thesis is comprised of five chapters, with the specific contents in the following paragraphs. The logical relationships among chapters are shown in Figure 1-1.

Chapter I, Introduction. This part introduces the research background and significance of the thesis, research questions, objectives and methods, and adds a gist of relevant literature.

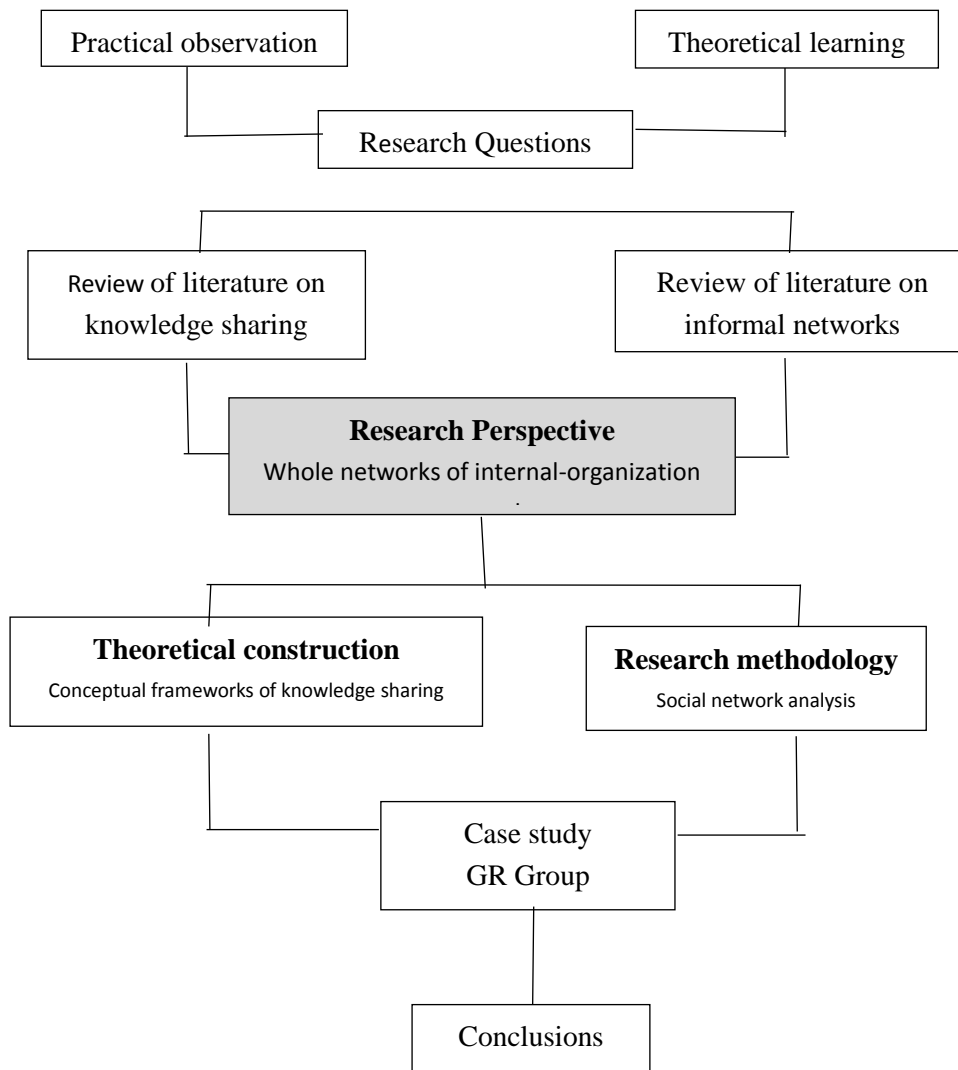


Figure 1-1 Structure Chart of the Thesis

Chapter II, Literature Review. Based on the research approach and contents design, this chapter presents some of the relevant researches, makes comments on existing research conclusions, with the aim to providing a solid theoretical basis for this study.

Chapter III, Research Design. On the basis of the literature reviewed in Chapter II, this chapter proposes the conceptual frameworks used in the thesis, in addition to questionnaire designs, and gives a basic introduction of the adopted network method and relevant indicators.

Chapter IV, Empirical Analysis. Based on the research design developed in Chapter III, the author conducts questionnaire survey and on-site interviews at GR

Group. Through a series of quantitative methods like questionnaire encoding, data conversion, and network analysis, this chapter contains the results from basic analysis of different types of knowledge sharing networks at GR Group.

Chapter V, Research Conclusions and Prospect. This chapter summarizes the findings from Chapter IV, entail research conclusions and proposes feasible recommendations to management. This chapter also points out the limitations of the current study and the possible directions for further study in future.

The thesis carries out research based on a scientific research path of finding problems, analyzing and solving them, and developing a fundamental logic of collaboration.

Chapter 2: Literature Review

Based on the topic analysis made in the introduction, this chapter categorizes and reviews relevant literature serving as the theoretical foundation for the thesis. Domestic and foreign literature on relevant theories related to knowledge sharing, employees' relationship and knowledge sharing, organizational network, and social network are reviewed..

2.1 Theoretical Study of Knowledge Sharing

In the early stage, foreign scholars focused mainly on the definition and classification of knowledge and the connotation of knowledge sharing. With the popularization and development of the Internet, they began to study the knowledge sharing behavior, knowledge sharing motivation and online knowledge sharing. In China, during the early development stage and the growth stage, the studies focused mainly on knowledge sharing mechanism, the basic matters of knowledge sharing, and the obstacles and countermeasures of knowledge sharing. Later, with the development of the Internet and smart terminals, studies of knowledge sharing behavior, mobile social media and knowledge sharing, and knowledge sharing patterns have become the focus of domestic concern in recent years. This thesis will make a review of the following important fields.

2.1.1 Connotation of Knowledge

In 1996, the Organization for Economic Co-operation and Development (OECD) published a research report named *The Knowledge-based Economy*, which indicates that “knowledge continuously upgrades the productivity, and urges the economy to sustainably grow in the long-term”, and the world “has entered the era of knowledge economy”. With the advent of the era of knowledge economy, enterprises, the major economic organization, are attaching more and more importance to knowledge, and

treating it as a key asset. However, scholars have not yet come to a universally agreed definition of knowledge, which serves as the foundation of knowledge studies (Lin, 2005). Davenport and Prusak (1998) introduced the situational factor into the definition of knowledge. With in-depth studies, Chinese scholars gradually attached importance to the classification of knowledge. According to the explicit degree of knowledge, Polanyi (1962) classified knowledge into two types: explicit knowledge and tacit knowledge. Explicit knowledge refers to knowledge that can be separated from situations and individual mental patterns, and clearly expressed by ways of coding, such as languages, books, and databases. Tacit knowledge otherwise is essentially a sense of understanding, an ability to comprehend and reorganize experiences so as to understand and control them. According to the review, most books and articles deal with a number of studies of knowledge sharing, but limited amount of studies of tacit knowledge sharing. Some studies combine the tacit knowledge sharing behavior and the explicit knowledge sharing behavior as a whole.

Moreover, there are many other classifications of knowledge in the academia. For example, the OECD classifies knowledge into four types: Know-what, Know-why, Know-how and Know-who. The current situation of foreign and domestic studies reveals that the definition of knowledge varies with specific topics and objectives (Quinn, Anderson, & Finkelstein, 1996). This thesis deals with the generalized concept of knowledge which includes all explicit and tacit knowledge related to work efficiency, individual competence and team building.

2.1.2 Knowledge Sharing

2.1.2.1 Connotation of Knowledge Sharing

Knowledge sharing is a key indicator in evaluating an organization's knowledge management and learning performance, and remarkably influences the growth of an enterprise's marketing efforts. It plays an increasingly important role in organizations.

Table 2-1 Connotation of Knowledge Sharing

Scholar	Connotation
Nonaka & Takeuch (1995)	By four interaction steps of externalization, combination, internalization and socialization, knowledge sharing converts the form of knowledge, completing its transfer from one party to another.
Davenport & Prusak (1998)	Knowledge sharing can be seen as a knowledge market transaction within a company. Market participants receive corresponding gains from market transactions while paying transaction costs.
Connelly (2012)	Knowledge sharing is a set of behaviors about exchanging information or helping others.
Wang & Noe (2010)	Knowledge sharing means to provide information related to tasks and technologies to help others solve problems and develop new ideas.

Studies of knowledge have progressively developed into the studies of knowledge sharing. However, with different views and perspectives, scholars have not yet come to a uniform understanding of the connotation of knowledge sharing (see table 2-1). Davenport and Prusak (1998) defined knowledge sharing as a voluntary behavior of individuals, whereas Sveiby (1997) made his definition from the perspective of interaction. In order to transfer knowledge effectively, the sender of knowledge must help the recipient to fully understand the meaning of information and transform the information into recipient's own content, so as to develop individual's new ideas and acting ability (Senge, 1997; Wang & Noe, 2010; Lin, Wu, & Lu, 2012). Therefore, the manifestation of knowledge sharing can be regarded as the process of knowledge transfer or the pattern of knowledge sharing. Other scholars focus more on the flow and change of knowledge in the process of knowledge sharing. Hansen (1999) believes that knowledge sharing inevitably involves the in-depth communication of two subjects: knowledge owner and knowledge reconstructor. Nonaka and Takeuchi

(1995) developed the famous SECI model of knowledge sharing, believing that the process of knowledge sharing consists of four steps: externalization, combination, internalization and socialization. In this process, the two parties of knowledge sharing make sufficient interaction to translate tacit knowledge into explicit knowledge, and then convert explicit knowledge into the other party's tacit knowledge, thus completing the transfer of knowledge. (Huang & Zhang, 2006)

2.1.2.2 Motivation of Knowledge Sharing

The process-based perspective of knowledge sharing lays focus on the description and management of the sharing process, but has not given reasonable explanation of how the intention to share knowledge forms. Davenport and Prusak (1998) proposed the perspective of knowledge market, measuring the intention to share knowledge from the knowledge owner's point of view. They believe that there exists the concept of “market” in organizations' knowledge sharing. Knowledge flows through organizations, and it is pushed by the “market forces” which refers to the knowledge-based trading relationship between knowledge demanders and knowledge owners. However, the perspective of knowledge market could not fully explain the knowledge sharing behaviors in real cases, because it is not rare to observe altruistic knowledge sharing behaviors in reality. Some scholars proposed the perspective of social exchange. They believe that the knowledge sharing among individuals is a behavior of exchange, and the behavior is triggered by individual motivations and expectation of return. For example, Granovetter (1985) holds that individual's exchange behavior is often embedded in the structure of social relations.

2.1.2.3 Knowledge Sharing Behaviors

Mahdavi, Yaacob, Din, Heng and Ibrahim (2015) believe that knowledge sharing is a major approach to improving companies' performance. Therefore, their thesis analyzed knowledge sharing behaviors in the middle and small-sized enterprises by individual factors such as trust, interest, attitude, motivation and self-efficacy, and investigated the effects of learning on knowledge sharing behaviors as a moderator variable.

2.1.2.4 Incentives of Knowledge Sharing Behavior

Current studies of employees' knowledge sharing behaviors mainly focus on two

perspectives: extrinsic incentive and intrinsic incentive. Multiple studies have found that economic rewards will stimulate knowledge sharing behaviors positively. However, the effectiveness of economic rewards has not been unanimously confirmed by the scholars. Bouty (2000) believes that sole emphasis on economic rewards is sure to cause the neglect of the social attributes of knowledge sharing behaviors.

Intrinsic incentives come from within the sharing behavior. In the context of knowledge sharing, they refer to certain kind of satisfactions brought by knowledge sharing behavior itself, such as ethics, the fulfillment of self-values, and the sense of self-efficacy (Xie & Xiao, 2007). Empirical studies of Bock, Zmud, Kim, and Lee (2005) and other scholars demonstrate that the sense of dedication to the organization could distinctly boost employees' knowledge sharing behaviors. In addition, the sense of self-efficacy brought by knowledge sharing behaviors is another key factor bearing much attention from scholars. Both extrinsic and intrinsic incentives are widely applied in practice by enterprises, yet scholars have long noticed the importance of incentive choice. Some authors try to choose effective strategy of incentive according to the results. Studies of this type tend to use empirical methods to investigate the relationships between incentives and knowledge sharing behaviors, but neglect the interactions between these two kinds of incentives. Therefore, considerable differences between scholars' conclusions are caused. For example, Bock et al. (2005) and other scholars found that extrinsic incentives have negative effects on knowledge sharing behaviors, whereas intrinsic incentives promote knowledge sharing behaviors, thus suggesting to apply intrinsic incentives more. There are other literatures regarding knowledge sharing behavior as a process of gaming between employees. Enterprises choose the appropriate incentives to adjust employees' expected returns to acquire the ideal result of the game. By establishing an infinitely repeated game model of two persons (Samieh & Wahba, 2007), Tang (2008) investigated the incentive issues of tacit knowledge sharing among enterprise's employees. He believes that the choice between extrinsic and intrinsic incentives should be made based on the employees' current preferences. Noticing the dynamic autoevolution characteristics of knowledge sharing process, Liu, Zhang, Shan, and Liu (2011) and his collaborators applied the evolutionary game to investigate the evolution process of knowledge network in the organization. Their simulation results demonstrate that in formulating incentive strategies, organizations should take into account the

differences between members' knowledge levels.

2.2 Employees' Relationship and Knowledge Sharing Behaviors

2.2.1 Connotation of Employees' Relationship

“Guanxi” (relationships) is recognized as the foundation of the existence and sustainment of human society, and especially that of Chinese society. It plays a significant role in information contact and knowledge sharing among people (Zhang, 2011). The most basic relationships regarded by many scholars as the starting point of relationship studies. Some scholars tried to define the relationships from the perspective of interaction between individuals. Bian (1994) believes that the existence of relationships between two persons can be confirmed as long as one of the following three conditions stands: 1. they have the same status or friends; 2. they have real connections and relatively frequent interactions; 3. they have little direct interaction but only occasional contacts. Individuals seek for benefits through the relationships, therefore they often judge the relationship before taking actions. However, from a more generalized perspective, the relationships can be recognized as self-centered external relations which form a pattern of difference sequence based on the closeness degree of this relationship. According to Fei (1985), “the pattern resembles the spreading ripples pushed away by a stone thrown into the water. Every person is in the center of ripples of his or her own social relations, engaging contacts once touched by ripples of others.” Connecting with other people's relationships, this kind of self-centered pattern forms a tightly-interwoven structure named the network of relationships (Zhang & Wang, 2014).

Some other scholars attach more importance to the differences of interaction norms caused by the differences of intimacy degrees of the relationship. Guided by the pattern of difference sequence and the Chinese customs, Yang (2004) and Jacobs (1980) sorted the relationships into three types: families, acquaintance and strangers. Among them, the relationships with acquaintance are regarded as the major origin of

social resources, therefore becoming the focus of scholars' studies (Granovetter, 1973). Based on their functions, Hwang (1997) classified the relationships into emotional relationships, instrumental relationships and composite relationships.. Instrumental relationships refer to transient and unstable relations, such as relations between strangers who occasionally meet. The meaning of composite relationships is in between these two kinds (Hwang, 1987).

Liang and Meng (2013) believe that individuals with strong relationships have a tendency of direct reciprocity, while individuals with weak relationships have a tendency of indirect reciprocity. The employee relationship is relatively closed, and the interaction between employees is a small-scale interaction, while the social relationship can be infinitely extended (Luo, 2012). People who belong to the same relationship circle tend to adopt the principle of humanism and pursue fairness for those who are not recognized by the same circle of relationships (Bao & Shi, 2008).

2.2.2 Studies on Effects of Employees' Relationships on Knowledge Sharing Behaviors

Scholars generally agreed that employees' relationship is one of the most important factors influencing knowledge sharing behaviors. Based on perspectives of relationship pairs and relationship network, they investigated the effects of employees' relationships on knowledge sharing behaviors.

2.2.2.1 Perspective of Relationship Pairs

Concerning the relationship pairs, scholars focus on the effects of employees' relational nature and strength on knowledge sharing behaviors. They have long recognized the importance of different employee' relationships to knowledge sharing behaviors. Davenport and Prusak (1998) believe that the reciprocal relationship is crucial for employees' willingness to share knowledge. Therefore, employees' preference to reciprocity is the key factor for enterprises to optimize their knowledge sharing mechanisms (Li & Liu, 2014). However, scholars have different conclusions about how the reciprocity influences knowledge sharing behaviors.

Most scholars believe that there is a positive correlation between reciprocity and employees' knowledge sharing behaviors (Chiu, Wang, Shih, & Fan, 2011; Lee & Hong, 2014), whereas Wasko and Faraj (2000) found in their studies that the reciprocity has negative effects on knowledge sharing behaviors. Compared with the reciprocity, the positive effects of trust on knowledge sharing behaviors are confirmed by more scholars (Zaheer, McEvily, & Perrone, 1998; Levin & Cross, 2004). Most of the studies, single dimensional or multi-dimensional, found that trust of all dimensions has positive effects on knowledge sharing behaviors (Xie & Xiao, 2007). If the knowledge recipient places excessive trust in the sender, they can have reasonable doubt towards the usefulness and application range of knowledge, thus misusing or overusing the knowledge.

The effects of tie strength on knowledge sharing behaviors is another focus of the scholars. Some of them found that, as long as the relationships exist, both weak ones and strong ones have positive effects on employees' knowledge sharing behaviors (Chen & Peng, 2014). However, the effects vary in different situations. In his study on knowledge sharing of cross-project teams, Hansen (1999) found that the weak relationships better facilitate the sharing of simple and explicit knowledge, and this feature is even more obvious in the context of network. Bernstein, Bakshy, Burke, and Karrer (2013) found that, in the context of social network, the wide existence of weak relationships can better facilitate users to obtain the learning information. To be specific, weak relationships can increase the possibility of users obtaining the learning information by nearly 10 times, whereas the strong relationships can only increase it by 6 times. Compared with the weak relationships, strong relationships can better facilitate the sharing of complex and tacit knowledge because more emotional communications are made.

2.2.2.2 the Perspective of Relationship Network

Concerning the relationship network, scholars strive to investigate how the knowledge sharing is influenced by the structural features of the network, such as its scale, density, centrality, and structural holes. In their simulation study, Tang (2008)

and his collaborators found that the scale of network will positively stimulate the sharing of knowledge. The same conclusion is also drawn in the simulation study of Cao and Song (2014). However, in their empirical study on online knowledge sharing, Lee and Hong (2014), and other scholars found that there is a negative correlation between the population size and the willingness to spread knowledge. To a certain extent, the inconsistency between the simulation study and the empirical study proves that how the changes of scale influence knowledge sharing needs to be further investigated. The density of the relationship network is another key factor bearing scholars' focuses.

2.3 Social Network Perspective for Organizational Research

2.3.1 Organizational Research Level and Perspective

In the past three decades, social network research in the organizational and inter-organizational contexts has led to the accumulation of a significant stock of knowledge (Borgatti & Cross, 2003; Brass et al., 2004; Parkhe, Wasserman, & Ralston, 2006). The literature is vast and diverse and has an extensive history in a number of fields (such as organizational sociology, political science, organization theory, and strategy) at many different levels of analysis (such as the individual or interpersonal, group, firm, industry, and country). In this thesis we restrict ourselves to the application of social network analysis to the inter-organizational or inter-firm level, which comprises ties between organizations or firms (hereafter used interchangeably), such as strategic alliances, buyer-supplier relationships, director interlocks, investment bank ties, personnel movement links, and cross-patent citation ties.

The logic of the social network perspective applied to the inter-organizational level (hereafter simply the network perspective or approach) is, most fundamentally, that the pattern or structure of ties among organizations and the tie strength and content have a significant bearing on firm behavior and on important firm outcomes such as performance. Put another way, in contrast to the approach taken by fields such as neoclassical economics, where the firm is viewed as an autonomous, even isolated,

entity striving to use its resources to compete with other similarly autonomous and self-reliant entities, the network approach posits that firms access resources and capabilities through their networks of inter firm linkages (Gulati, 1999). As such, the network approach changes the perspective from an autonomous, self-reliant view of organizational action and outcomes to one that is essentially relational. The power of the network approach thus derives not just from increasing the variance explained in firm-level outcomes, but from viewing the world from a structural rather than (or in addition to) an autonomous lens, thus representing a distinct (and arguably more complete) worldview, particularly, in contrast to the neoclassical approach that has had considerable influence in the field.

Of course, network scholars do not claim that network structure is the only, or even the primary determinant of firm-level outcomes—internal organizational capabilities or resources clearly account for a large proportion of the variance in a firm's performance outcomes. At the same time, organizations are both empowered and constrained by their existing patterns of ties. Consequently, taken together, networks both enable and constrain firm behavior, action, and outcomes. Thus, the embedding of the firm in a network of Intra-Organizational relationships sheds additional light on how and why firms act and perform the way they do. Some recent research combines the internal capability view with the structural perspective to explain firm performance (Bell & Zaheer, 2007).

An important but frequently overlooked issue with the structural approach is the somewhat heretical notion that the network perspective does not by itself constitute a theoretical lens. At the extreme, this view argues that the network approach is little more than a methodology. Because network ties can encompass virtually any kind of association between social actors or organizations, the causal processes through which network ties exert their effects on organizational outcomes can be highly varied. All the network approach suggests, at its most fundamental level, is that “structure matters.” But the hows, whys, and wherefores are left to the imagination and creativity of the researcher in decoding and interpreting the pattern of results. In turn, the results are a function of the design choices made by the researcher in the construction of network data. Presenting a convincing explanation as to how and why the chosen network ties act as the pipes that carry the identified content between and among organizations, which then make the chosen outcome come about, is the key

challenge researchers take on when opting for the network approach.

When we examine the literature, two distinct patterns emerge. First, while there is no single theory of inter organizational networks, the research is embedded in multiple yet distinct theoretical approaches (at times intertwined) to explain the phenomenon. The literature on inter organizational networks originally emerged from the interest in the various benefits that relationships provide. Therefore, much of the work has borrowed from traditional theoretical frameworks (such as resource dependency) in order to explain the theoretical mechanisms that link network phenomena to organizational outcomes (often performance). Unfortunately, as a cumulative body of work, this approach has resulted in a lack of coherence and parsimony. Specifically, various traditional theories have been used to explain the same network phenomena. At the same time, we find examples where multiple theories are incorporated into the model without considering (or at least being explicit about) the assumptions underlying these theories. Believing that research should fundamentally distinguish between them, we classify the literature in terms of causal theoretical mechanisms behind the operation of the network.

A second pattern that emerges from the literature is the multiplicity of levels of analysis. We believe it is important to make distinctions between levels of analysis in order to provide a more complete understanding of a set of phenomena that is inherently multilevel. Moreover, a clear understanding of the level at which the research is conducted also helps us investigate the connections across these levels, a focus that has so far been largely neglected. As a result, most research in the field can naturally be categorized by the level of analysis—an approach we adopt as well

2.3.2 Theoretical Mechanisms

The internal-organizational networks literature has been related to a large number of theories, such as social capital (Bourdieu, 1986; Coleman, 1988; Burt, 1992; Lin, 2001), the resource-based view (Gulati, 1999), resource dependence theory (Bonacich, 1987). These theories explore and explain inter organizational network issues. Despite their distinctiveness, it is important to realize that the domains of these theories have significant overlaps. Taking just two of the theories mentioned above as an example, both the relational view and social capital theory argue that networks provide access to resources and capabilities from outside the organization. At the

same time, there are areas in which these theories differ widely in their explanations for the workings of networks. Using the same example, social capital theory has a strong power and control component that may fall outside the boundaries of the relational view, which relies more on trust.

A thorough study of the cumulative body of theories, that is usually based on the traditional thinking of seeing networks as one concept as mentioned earlier and utilized by the field, allows us to identify a set of four general mechanisms that underlie the operation of Intra-Organizational networks. Moreover, these four mechanisms allow a clearer distinction of the operation of networks, which in turn facilitates an understanding of research gaps and future directions. At the same time, they also comprehensively cover the theoretical ground, thus being both collectively exhaustive, to the extent possible, and parsimonious. The four mechanisms are networks as resource access, as a source of trust, as a tool for power and control, and as a signaling mechanism. Each thesis in the Intra-Organizational networks literature uses one, and sometimes more than one, of these theoretical mechanisms.

2.3.2.1 Networks as resource access

Networks are often studied as an important source of resources and capabilities. The resources can originate from the characteristics of the relationships, from the structure of the ego-network itself, or from alters' characteristics (Granovetter, 1973). The most frequently cited resource that networks provide is information. Certain network structures (i.e., networks rich in structural holes) provide more diverse and timelier information than other structures (Burt, 1992).

2.3.2.2 Networks as a source of trust

Networks are also theorized to give rise to trust. Coleman (1988) suggested that higher closure (the extent to which alters are connected to each other) in a network leads to higher overall trust. In the management literature, higher levels of trust are associated with lower transaction costs, which increase the efficiency of Intra-Organizational relationships such as alliances and joint ventures (Beamish & Lupton, 2009).

2.3.2.3 Networks as a source of power and control

Networks are said to both increase and constrain the power of the actors. One explanation for the locus of power in Intra-Organizational relationships derives from

resource dependence theory (Aldrich & Pfeffer, 1976), which suggests that the power of partners over a focal firm increases with the increasing dependence of the firm on the resources of these partners. Beyond, observing power in individual dyads, from a structural perspective, a smaller company can constrain the power of a powerful company by bringing third parties into the network (Bae & Insead, 2004).

2.3.2.4 Networks as signaling mechanisms

Finally, networks also function as signals or “prisms” in the marketplace, meaning that quality of an actor can be inferred from its relationships, particularly when there is no effective way to measure the quality of that actor (Podolny, 1993, 2001). For example, the quality and status of newcomers to an industry can be inferred from their relationships with high-status organizations (Baum, Calabrese, & Silverman, 2000). An alliance with a large pharmaceutical firm may be construed as a sign of quality for a new biotechnology company (Stuart, Hoang, & Hybels, 1999).

2.3.3 Level of analysis

For the second dimension of our organizing framework we identify three levels of analysis in the literature: the dyadic, ego, and whole network levels. A commonly used conceptualization that implies the dyadic level is relational embedding (which refers to the nature of the dyadic ties). Structural embedding corresponds to the ego level and specifically to the position of ego in the overall network. In addition to these levels, recent developments on the overall mathematical properties of networks and the integration of regional clusters literature with social networks literature has led to a focus on whole network as the third level of analysis.

At the dyadic level, researchers focus on the characteristics of the relationship between two linked organizations. The key issue in the dyadic level perspective is to understand the nature of the relationship between the actors in terms of relational characteristics such as tie strength (Granovetter, 1973) or the degree of trust (Zaheer et al., 1998), and how these relational characteristics affect the likelihood of the relationship's renewal, continuation, dissolution, or other outcomes. According to Dyer and Singh (1998), there are four sources of Intra-Organizational competitive advantage, or rents: relation-specific assets, knowledge-sharing routines, complementary resources and capabilities, and effective governance.

Research at the ego level — at a higher level of generalization refers to the degree of the effects that ego's networks have on the performance and behaviors (Zaheer et al, 1998) . More specifically, these effects result from ego's connections, the connections among ego's alters, the characteristics of alters, and the overall structural position of ego within the whole network (Uzzi, 1996). Hence, the locus of attention is not on the characteristics of each relationship, but rather on the structure of relationships surrounding the organization (ego). We first explain the main network concepts at this level—centrality, and structural equivalence—and then discuss the literature that uses these concepts (Uzzi & Lancaster, 2003).

2.3.3.1 Centrality

Social network scholars have defined and developed various mathematical measures to identify the most important or prominent actors in a network (Wasserman & Faust, 1994). Burt (1984) argued that there exist two forms of prominence: centrality and prestige, a central or prestigious actor involves in many ties (in-ties). Hence, the directionality of ties matters in determining some aspects of centrality, as networks may be formed by either directional or unidirectional relationships. In a directional relationship network, centrality measures focus on choices “sent” (“out-ties”), whereas prestige measures focus on choices “received.” For example, in a directional board interlock network, the more central organization will be the one that reports the larger number of “sent” directors (own directors participating in other firms' boards), whereas the most prestigious organization will be the one that is receiving the highest number of other firms' board members. Clearly, this distinction becomes impossible to trace in networks formed by unidirectional relationships.

Nevertheless, both centrality and prestige measures have been frequently used (Brass, Galaskiewicz, Greve, & Tsai, 2004). Two of the more commonly used types of centrality are degree centrality and Bonacich centrality.

Degree centrality is the most basic of all the centrality measures and refers to the number of ties an actor has with other actors. It is a simple count of the number of the actor's relationships. An actor with a high degree of centrality is in direct contact with many other actors, is recognized as a major channel of information, and thus is highly visible and prominent (Wasserman & Faust, 1994).

In addition to computing centrality as the number of direct ties, Bonacich (1972)

considered the centrality of the ego's alters and used a coefficient to account for the fact that alter centrality may change the overall centrality score of ego. The size of the coefficient is based on an eigenvector measure and is a measure of the importance or weight given to the centrality of alters and in turn to their alters. Compared to simple degree centrality, the Bonacich (1987) measure provides a more global representation of ego's centrality in the overall network.

2.3.3.2 Structural equivalence.

Two actors are structurally equivalent “if they have identical ties to and from all other actors in the network” (Wasserman & Faust, 1994). For example, two biotechnology firms are structurally equivalent in the alliance network if they have alliances with exactly the same partners (Burt, 2000, 2001; Lin, 2001). It is important to realize that to be structurally equivalent the two actors do not need to have a direct relationship between them (Burt, 2000, 2001). The concept of structural equivalence has been extended to the related notion of role equivalence, which occurs when the two actors have ties to the same types of alters but not the same alters (Burt, 2001).

2.3.3.3 Whole network level

Recently, network scholars have started focusing on the whole networks. At this level, scholars predominantly investigate the characteristics and behavior of the entire Intra-Organizational network, such as its centralization (Provan, Fish, & Sydow, 2007) or its “smallworldness” (Barabasi, 2002), and examine outcomes at the whole network level. However, recent studies have also begun to investigate the effects of whole networks on individual firms' outcomes. For example, Gilsing, Nooteboom, VanHaverbeke, Duysters, and Den (2008) highlighted the contingency effects that whole network properties create for the relationships between individual firms' ego-network positions and their creation of novelty.

An early thesis that focused on the whole network mapped out the strategic “blocks” in the global auto industry, as determined by the Intra-Organizational linkages among all the companies in the industry (Nohria & GarciaPont, 1991). Also, the success of some regions is explained by the prevalence of Intra-Organizational networks. For example, Saxenian (1994) compared Silicon Valley with Boston's Route 128 and argued that the success of Silicon Valley came from the extensive interpersonal networks that linked organizations to one another. These networks

allowed firms in Silicon Valley to tap into information and resources of other firms and benefited the whole region, whereas companies along Route 128 jealously protected their information, hurting the region's performance as a whole. As well, research on knowledge spillovers suggests that networks as a whole embody the mechanisms that drive spillovers within and across regions (Almeida & Kogut, 1999). Recently, scholars have started to point to the complex relationships among geography, networks, and regional performance (Bell & Zaheer, 2007)—a fruitful research area since the mechanisms behind the causes and consequences of geographical agglomeration clearly lie within the domain of Intra-Organizational networks.

The research stream on the “small-world” property of networks was initiated by the cutting-edge work in mathematics and physics that formalized networks' mathematical properties (Albert & Barabasi, 2001; Barabasi, 2002; Watts, 1999). Small-world networks are characterized by clusters of locally dense cliques (a high clustering coefficient), connected via a few bridging ties (or a low average of the shortest path distances in the network) (Watts, 1999). Recent simulations have suggested that by following two simple rules we can understand the emergence of small-world networks: (a) the network keeps growing as nodes are added to it, and (b) new actors are keen to form ties with existing actors in the network, in proportion to incumbents' existing ties (“preferential attachment”) (Barabasi, 2002) showed that a model of network emergence can be explained by two factors: the propensity of actors to form teams made up of links incumbents in the network, and the propensity of actors to form teams made up of links to their past collaborators in the network.

In the management literature, research suggests that small-world networks enhance firms' and groups of firms' innovativeness (Fleming, King, & Juda, 2007; Uzzi & Spiro, 2005; Verspagen & Duysters, 2004) as a result of more effective knowledge transfer across them (Schilling & Phelps, 2007). These and other noteworthy studies (Baum et al., 2000; Davis, Yoo, & Baker, 2003) represent important strides in our understanding of the emergence and implications of whole network properties.

2.4 Social Network Theories

2.4.1 What Is Social Network

Generally speaking, "Network" consists of nodes and relationships among these nodes. "Social network" consists of social actors and relationships among them. Two nodes and a line connecting them form the smallest network unit—dyad. These dyads can comprise a complex network.

Social network is a social structure made of relationships generated during sharing and exchanging resources among actors in the same entity, which can facilitate interactive learning and new knowledge generation. Since the rise of social network study in the 1990s, social network has seen great development. In recent years, scholars at home and abroad use social network analysis methods to analyze issues in fields including management and economics. For example, social network research is used to analyze organization and transaction governance issues. Wenger & Snyder (2000) argue that an informal network is a community in an organization for sharing knowledge and exchanging emotions. Members are grouped to exchange work-related information, values, ideas, and experience to improve their efficiency. Informal community can meet the needs of members and benefit the organization in generating and sharing knowledge through frequent interaction. Both formal and informal network are important. This thesis analyzes the knowledge-sharing mechanism in GH Group based on informal networks.

Informal network research conducted by foreign scholars: many of the characteristics of the informal networks are difficult to measure, foreign study mostly focuses on the structural analysis, the way of knowledge acquisition, and transfer and application process (Huber, 1991), Research on knowledge transfer by informal exchange and interaction between members in an organization is relatively few, whereas most of researchers focus on abstract concepts of knowledge transfer, with few systematic empirical results.

Informal network research conducted by Chinese scholars: Zhang and Zhu (2003) proposes that tacit knowledge is mainly generated through informal networks and uses social capital theories to show that tacit knowledge is transferred on the informal networks. Ying and Shen (2009) draws an empirical conclusion through the

questionnaire that trust, communication quality, interaction between individuals, and network scale play a direct role in promoting tacit knowledge transfer. Domestic research are mainly about effect and function of informal networks on knowledge (tacit) sharing, and knowledge transfer mechanism, as well as effect of informal networks on individual and team innovation.

2.4.2 Embedding Theory

Based on neoclassical economics, Granovetter (1985) first puts forward embedded social management theory in the 1980s after he proposed the idea of weak ties. The theory elaborates on effects of social networks on economic activities. He argues that economic relations between individuals or firms are embedded in actual social networks. An individual or firm makes decisions based on both economic, and social factors such as social customs and culture, and background. Therefore, economic development is influenced by social relationships. Granovetter (1985) attaches great importance to the role of trust. If there is no trust between two parties, they need to pay high expenses for supervision. Trust, as a kind of social relationships, is embedded in the economic field and can effectively reduce the transaction costs.

Firstly, Granovetter (1985) expresses skepticism over the theories of “under-socialization” and “over-socialization”. The so-called “under-socialization” is a personal preference, indicating that people have no social connections or characteristics, or they have extremely weak social relations. That is, in its essence, the research logic of Williamson's Transaction Cost School, which believes that everyone has their own preferences, and that they make decisions under the guidance of price and other factors to pursue maximum benefits. The theory of “over-socialization” holds that people fill a variety of social roles apart from the rational economic person, which means they are greatly influenced by socialization. It also believes people have low subjective initiative, and that their behavior is determined by social environment, social values and social roles. From this perspective, it is particularly important to study the influence of social roles on people’s behavior. When explaining Organizational Convergence, the Institutionalism School focuses on the fact that the same system leads to the same behavior of different organizations or individuals; in this case, individual differences have been ignored, and constitute no important explanatory factor. In this sense, the degree of

socialization does not cause differences in individual behavior. Granovetter (1985) argues that both of these two orientations are problematic, and proposes another explanatory logic which explains people's economic behavior in reality from the social relationship they have. In other words, people's behavior differs because of their distinct social networks. That is the basic idea of Granovetter (1985).

Economists believe that people are selfish. In order to maximize their own interests, people can do many things that harm others. Granovetter (1985) poses the following question: if people are so selfishly speculative, why do we not observe so many mistrust phenomena and speculative behavior in our daily lives? For example, under normal circumstances, we assume that the seller will not deceive us when we are shopping. The reason for that is, as explained by economists, the incentive mechanism—if the seller deceives customers, his/her loss will be even greater once the reputation is ruined. It is therefore these reputation systems that encourage sellers to be in good faith. To explain this phenomenon from the perspective of the Institutionalism School, we can suggest that the socialization process and institutional constraints make the behavior of these merchants meet social expectations. However, Granovetter (1985) believes that the above two explanations are unsatisfactory and argues that the question should be explained from the perspective of social relations. To cite an example, if there is an accidental fire in a public place, people will flee from the danger without caring about others; whereas if a family catches fire, it is no doubt that the family members will take the collective action of helping each other out. Why is people's behavior towards fire inconsistent in these two scenarios?

First, it is not persuasive to analyze the question from the perspective of an economic person. The reason is that fire will lead to extremely serious consequences, and that it is not appropriate to analyze behavior inconsistency from direct economic loss, compensation, etc. Second, the role of ethics fails to work properly. If the code of ethics that people should help each other when in danger has become their internalized actions, the behavioral results should be consistent at the cinema and at home. However, the facts prove that this is not the case. According to Granowetter (1985), the social relations people are in can bring about different behavior. Economic activities are embedded in specific social relationships, and are branded with a “socialization” imprint. As a result, the understanding of social relationships is essential for comprehending people's behavior.

In that way, which mechanism leads to different behavior in different networks? Why are the restrictions on people different in different networks? Behavior maximization and its efficiency mechanism are the basic logic of rational people. Similarly, institutional theory expresses the logic of legality and its constraints on human behavior. However, what is the logic of the relationship network? One of the possible explanations is the network relationship has different constraints on human behavior. The closeness difference of network relationships will result in different behavior, and diverse network locations and network structures will lead to different internalization processes, which is also the cause of different behavior. Economics can also adopt the network to explain people's behavior, for instance, an orderly evacuation in a family is due to blood-based incentives.

Another explanation is the network may impose restrictions on human behavior. For example, two individuals in the same network may establish disparate relationships because of inconsistent network locations; in this case, information exchange will be affected and their thinking and judgment will be constrained. Consequently, different networks can lead to inconsistencies in the flow of information to each other, and the same reason can be applied to different locations in the network. In terms of the structure, the network has a certain influence on the flow of information, and the information determines human behavior to a large extent. Although the role is a rational economic person, the behavior will be widely divergent for the restrictions the network imposes vary with individuals.

The phenomenon of people's behavior towards fires at the cinema and at home is very interesting and induces us to think. It can be explained from different explanatory logics. From the explanatory logic of the Institutionalism School, for instance, we can discuss the divergence in the "reasonable" nature of people's behavior in these two different scenarios. The formation of structure is the process of human-human interaction that may lead to socialization. In these two different scenarios, different positioning will be influenced by different social norms, thereby generating diverse results. The role of information mentioned above is also an attempt

to provide an explanation from the perspective of information. From Granovetter's (1985) point of view, the differences in people's relationships result in their behavior differences, which is his most valuable thought. If we discuss this issue merely from the point of view of rules, Granovetter's (1985) thought will be bypassed, and this issue is no longer the question he raised. We can trace down the train of thought of the Relationship Network School to see if there is a self-justified explanation in its theoretical framework. In my opinion, to get to the bottom of theories is a major driving force for theoretical progress.

The current questions are: what factors (mechanisms) enable us to say that a certain structure leads to a certain behavior, and why it is easy to think out the influence of different network structures on a certain behavior in the framework of Social Network Theory? It is very simple to explain: that human behavior is influenced to a certain degree by people's place in the structure is the basic viewpoint of sociology. A person is a social person. On the one hand, the social person is a culturally defined person; and on the other, the social person is defined in terms of structure. But why must the same structurally defined social persons have the same behavior? This is not a self-evident reason. We can give a simple example. In the process of European capitalist transition from 18th century to 19th century, middle-class intellectuals emerged in Germany and France. According to the perspective of the Network School, whereas their status in the social structure was the same—the structural position similarity, the behavior of the middle class in these two countries was completely different. The French middle class was tied up with the upper class and the royal family, regarding themselves as the attendants of the royal family; however, the German middle class was pushed out, and their behavior was often against the royal family. In this way, although their structure is the same, their behavior is not. In consequence, the assertion that the structure leads to people's behavior is not an undoubted reason, but an issue in need of explanation.

Granovetter (1985) tries to explain this problem from the angle of relationship network. Although there has been progress in the research on that issue, its

explanation cannot be fully accepted. If you delve into the reasons, it is clear that Granovetter's (1985) explanation is more rational. For example, Granovetter (1985) explains the reasons why the two sides with higher mutual trust can obtain more valuable information: 1. this information is cheap; 2. we believe in our own information, which is richer, more detailed and more accurate; 3. those who have contacted with each other will, from a long term, adhere to integrity in order to obtain mutual benefits; 4. the gradual emergence of social factors in the regular exchange of interests may refuse to undermine the interests of both sides so as to deepen mutual trust, which often contradicts simple economic motives.

Markides and Williamson (2007) comments that apart from the fourth point, the other three points were proposed by the Transaction Cost School. That is to say, the first three points are all acceptable to the School of Economics. The fourth point is that long-term economic relations will induce social relations and thus restrict people's behavior. Unlike the School of Economics, I am harsher here than Williamson. In my opinion, Granovetter's (1985) explanation is still very untenable and cannot withstand scrutiny, because after careful thought, we can explain these issues from other theoretical logics. Looking back upon above four points, the first and second are evidently associated with the logic of economics. The third point proposes keeping promises to make profits in future contacts, which, to tell the truth, is not always tenable from the logic of games. This is a controversial issue in economics. The fourth point which is somewhat similar to the discourse of the Institutionalism School emphasizes the role of social expectations. From my perspective, Granovetter (1985) has put forward a very good question, but he has not given a satisfactory answer in the framework of Social Network Theory. Or, he has given several answers, some of which are very similar to other theoretical logics.

Granovetter's (1985) article focuses on theoretical explanation. This research idea, in the empirical study, puts forward a series of operational problems that researchers need to address, e.g., how to make the concept applied to operation and become something measurable. For example, we have to define what trust is, what

speculation is, what under-socialization is and so on. After this idea was proposed, a great research space has been opened up and a train of research topics have been put forward.

2.4.3 Structural Holes

Burt (1992) first proposes the concept of structural holes in the book *Structural Holes: The Social Structure of Competition*. This study is to discover and analyze characteristics and status of social network structure in the process of analyzing interpersonal network structure. Social network structure will bring benefits and return to individual behavior in the organization's network. "Structure hole" refers to such a gap existing in a social network. A structural hole exists between two actors (B and C) when they are connected to the same other actor (A) but are not connected to each other (see Figure 2-1). This theory can explain the reason why some individuals in an organization can be promoted by using power. Structure holes show that the person, who is at dominant position in the structure, can have a good control of two or more people, and even groups. People those are at advantageous position in the structure, have access to more resources and easy to grasp more information, and the status of them may be higher. Thus, he argues that structural holes can provide an opportunity for them to gain access to "information interests" and 'control interests', and hence have a competitive advantage over other members in the network. There are two criteria for determining structural holes: cohesion and reciprocity.

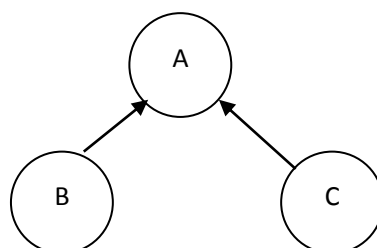


Figure 2-1 Structure Holes

Source: Sorted out by Luo. (2010).

Burt (2000) thinks that the network is a very interesting existence. As a kind of network, social network not only includes the technical problems attached to the network itself, but also has the attributes of the society. We can consider social network a type of capital through which organizations can gain profits, enhance efficiency, and improve the environment. It is therefore very important to guide people to acquire this social capital. In the field of economy, capital needs to be obtained, which will inevitably incur cost, and then returns can be achieved in the process. Apart from being the social capital, the social network is also a social tool. There are many nodes in the social network, namely many people who build this social network either through formal or informal communication. The social network can thus transmit information. For this reason, Burt brings forward the functions and roles of the social network: 1. information accessibility of the social network. People can acquire information and knowledge in the social network that can hardly be obtained by those not in the network; 2. Information transmission of the social network. The social network is a tool that can transmit information; and the content, mode, and speed of information transmitted by different social networks are different. Hence, it is essential to reasonably use the social network to transmit information in related fields and organizations so as to gain information needed. For instance, when various disciplines at US universities are recruiting, the recruitment advertisement says that there is no limit to the research direction or the scope of research, whereas in fact it is all cut and dried. As a result, people in a network can access to clearer information and know how to face recruitment; 3. Recommendation of the social network. People in the social network are more or less related to each other. Others know your situation and you also know theirs. In the process, a trust relationship may be established. When you need help, members established relationship with you can give you help and recommendations for greater opportunities and capital.

In addition, it should be noted that the social network can help individuals solve problems, control the overall situation, gain the resources to negotiate with others, and thus have more say and status in the negotiation process. In this case, the competitive

advantage of the social network is highlighted, which differs from the social network mentioned above as social capital because it is still a competitive backing. As a member of the network, the network is your solid backing. The network exists because of many members, and members must also obtain information in the network. For example, when negotiating with outsiders, if you have a solid social network backing, you will have greater say and more confidence that can make you prevail over them in the negotiations. On this basis, you may gain more resources and greater status. These situations can be observed in our daily lives.

The social network is social capital. In economics, social capital requires investment, because there is no capital without investment. The fastest way to obtain capital is to increase efficiency. Organizations must consider how to increase the efficiency of establishing social networks in their work. This is the basic idea of structural holes. In terms of efficiency, Burt (1992) points out the concepts of efficiency and performance. He believes that repetition will reduce efficiency. If a person's social network is repetitive, the information he obtains will be similar or even the same. If you are in a social network that is all related to learning, then all the information you get is also related to learning, and you cannot get any information about entertainment, life, sports, etc. At this level, the efficiency is reduced. The second concept is performance. In a social network, instead of communicating with all members in the social network to establish relationships, you only need to establish contact with members of key nodes. The reason is that members of key nodes have most or all information in the entire organization, as long as you are connected with key information members, you can obtain all the information of the organization. At the same time, the members of key nodes can also help you to get in touch with other members, through whom you can establish relationships with people in or even outside the network to gain information. This is the so-called Structural Holes Theory.

The so-called structural hole is that in the entire social network, there is no duplicate node or information. All people, all nodes and all information are independent, so that the most efficient network structure can be achieved and most of

the information can be obtained. In other words, the more independent a person's position is in the network, the better. The more independent a person's position, he/she will inevitably cast about to seek information sources and contacts. In this process, he will have more resources; and when his resources are fed back to other members, a large network of contacts will be reached. If this is the case for every member of the network, the greater the amount of information in the network will be, and the higher the work efficiency.

Another very significant concept in the network is relationship intensity. When someone studies the trade between countries, trade volume can be used to measure its intensity. In addition, we can also consider the relationship between information sources. If your information source has a lot of relationships, whereas you personally have no network relationship, your bargaining power and control will be greatly reduced. More structural holes indicate more non-repetitive information sources. The more structural holes your opponent has, the less your advantages are. The stronger the relationship between your opponent and others, the lower your own autonomy will be. For that reason, rather than the personal network, respective networks in organizations are more important and thus the object of our concern. After Burt put forward these concepts, there are many operational instructions in Chapter 2. How to measure structural holes, or how to measure the autonomy of status, is a very critical issue in practical research. It can be noted that every scholar has a different understanding of the Structural Holes Theory and the thought of social network. Everyone has different ideas. Granovetter (1985) pays attention to the pros and cons of the social network structure, including restrictions on the behavior of the members in organizations and the ability to shape the individual's behavioral habits. It can be said that he attaches more importance to the influence of social networks on members in organizations. Burt regards social network as a kind of social capital and a tool to emphasize the influence of network structure on the information acquisition of members in organizations, with the focus on the degree of personal return to the network. He deems that social networks are more valuable to people engaged in

economic industries. Business is a very complicated industry, in which social relations are very complicated. Social networks can provide more information and opportunities for businessmen and therefore become more attractive. This is inseparable from Burt's school and industry.

2.4.4 Social Network Analysis Methods

Similar to the social network theory, social network analysis (SNA) is a quantitative analysis method developed by sociologists and anthropologists based on mathematical methods, metrology, and social psychology. SNA methods are widely used and play an important role in management, psychology, and history.

SNA, a key branch of sociology, has a long history. In the early days, experts liked to study and discuss social network topics such as sensitive politics. With the emergence of network concepts, such as centrality and density, the social network analysis has found great development and gradually become an influential social network research paradigm. As the theory of social network analysis is maturing, software, such as SNAFU, UCINET and SIENA, emerges to help analyze the data of social network, with UCINET6.0 being the most commonly used one. The software plays an importance role in facilitating the social network analysis methods.

Researches of the whole network focus predominantly on density and structure, such as the centrality, clique, and the core - half edge - edge structure analysis. Density research at whole network level refers to the linkage closeness between network members. Centrality analysis aims to quantify the "importance" or "influence" (in a variety of senses) of a particular node (or group) within a network. Common indicators of measuring "centrality" include degree centrality, betweenness centrality, and closeness centrality, etc. (Marsden, 2004)

In recent years, SNA in China has attracted the attention of scholars from various fields. Scholars in different fields and experts, including professors from prestigious universities, such as Tsinghua University and Harbin institute of technology have begun SNA research. These universities also set up a social committee dedicated to

SNA research. The committee serves as a platform for both Chinese and foreign scholars to exchange ideas, facilitating SNA development to some extent.

2.4.5 Utilitarian Thinking on Social Network

The main representative of the utilitarian thinking on social network is Coleman (1988). This idea focuses on the individual's ability to obtain social status through the use of social networks. From the angle of rational choice, the research on the utilization and profitability of people's relationship networks is conducted through the study upon the core of the relationship network—people. From the perspective of biology, we can see that a group's growth is attributable to its distinctive features. For instance, a certain family with certain structures can make use of certain resources, say, some agreements with the royal family, to get protection and development while other rival families are in decline. From this point of view, it is the individual who uses the network, and it is the network that provides the individual with favorable conditions.

Lin (2001) is another key researcher on this thinking. He has studied the importance of social resources in people's rights, status, and reputation over a long time. Lin (2001) has proposed the Social Capital Theory to carry out this research. His empirical research covers extensively the labor market in Chinese society as well as the promotion of Chinese employees. Based on the theoretical thinking of Lin and Bian (1991), with the Chinese society as his research background, has done a lot of research on people's development and utilization of social networks for job promotion and enterprise growth. The research conducted by Lin and Bian (1991) have already been introduced to the sociology community in China, so I will not go into details. Burt is also a vital proponent of this research thinking. His book *Structure Holes* published in 1992 enables him to take a big step forward in this area of research.

Chapter 3: Research Design and Methods

3.1 Basic Principles

3.1.1 Principle of Effectiveness

Milgrom and Roberts (1992) has summarized a series of principles proposed by the economic incentive research in a unified theoretical framework. In this theoretical framework, the factors need considering include: (i) under what conditions should we provide or weaken the incentive intensity; (ii) the relationship between incentives and the attitude to risks; (iii) the incentives in multiple objectives; (iv) the relationship between incentives and information, etc. For technical details of these discussions, readers are invited to read Milgrom and Roberts' publication (1992). We discuss the basic principles of these incentives and the significance of applying them.

The first principle, the principle of effective information, is based on the premise that when entrusting incentives to the agent during the design of contract, the principal should select indicators of effective information which are less likely to generate errors. The reason is intuitive as we only use indicators (i.e., effective information) that actually help to measure the performance of the agent instead of using information that has a lot of noises. For example, the efforts of a branch manager has little to do with the performance of a branch that is located in a business district, where people hustle and bustle and patronize buying goods and services, as it is relatively easy to get customers and increase sales volume of such branch. In such a scenario, using sales volume is not good indicator of rewarding the branch manager because information on sales cannot accurately reflect the manager's efforts.

We can further consider how to use information in incentive designs. Supposing that there are two pieces of information about the objective environment, (i) X as a random factor of the objective environment that the manager cannot control, and is not related to personal effort but to performance; and (ii) Y is another piece of

information such as additional information of the objective environment like the average sales volume in this industry. In such case, under what circumstances should the additional information Y be used?

First, if X and Y are irrelevant and there is no direct relationship between them, then Y should not be used because the primary purpose of using it is to have more accurate measurement of X. It is not necessary to use an indicator that is incapable to give a more precise grasp of the impact of the objective environment (i.e., it is irrelevant to X itself).

Second, assuming that X and Y are positively correlated. What does “positively correlated” mean? To cite as an example, take a salesperson in a car dealership. Variable X is an objective factor the salesperson cannot control, say, the popularity of this dealership. Assuming Y is the period of economic growth and in the current period there are many buyers, and more people need to go to high-profile companies to buy cars, then these two factors are positively correlated. What should one do when he or she want to use the new information (Y) to decide on an incentive plan? The dealership should reduce their compensation to me. The reason is the positive correlation means that my performance is positively affected by factor Y rather than the result of my efforts. If these two pieces of information are negatively correlated, we can use the same theory to dive into it.

As a widely known example, there are two options to designing the examination system: one is to grade according to “absolute performance”, that is, a first option is to have a standard answer and then use this criterion to distinguish between good and bad; the other is to grade according to “relative performance”, that is, to distinguish good and bad according to the relative level of students’ examination papers. Which option provides better incentives? A major advantage of the “relative performance” option is it helps us to control environmental factors and highlight students’ “performance” to provide incentives. If there are no "excellent" results in the exam in accordance with “absolute performance”, there may be problems with the teacher's teaching, and it may be because that the exam is too difficult or too partial. These

environments have nothing to do with the degree of students' efforts. Hence, if the "absolute performance" is used to grade, one will provide wrong incentives. This is the same for the considerations on job evaluation and the setting of work target. If during an economic downturn, the car salesperson cannot achieve the target of the previous year no matter how hard he or she tries, in this case, using relative standards makes it easier to measure the degree of the employee's efforts and to solve the problem of effective information.

Another related question that needs to be answered is under what circumstances should one or more indicators be used to measure employees' performance? If one indicator can accurately measure the performance of employees, there is no need to waste resources on other indicators. On the contrary, if one indicator cannot reflect employees' performance, then using multiple indicators can provide appropriate incentives. For instance, a student's grade in a class usually depends on several indicators including scores from mid-term exams, final exams, group activities, etc. If the grade of a course only depends on the final exam, the influence of exogenous factors may be very great, such as the temperature on the exam day is too high or too low. But when a variety of indicators are used for performance evaluation, the impact of the objective environment gets smaller on the average, thus spreading the risk. This principle is thus very close to reality.

Even so, it is problematic to use multiple indicators especially when such determinants are inconsistent, which gives room for subjective explanation. Comparing the admission standards of universities in China and the United States, it is evident that the Chinese university admission strictly follows the criterion of the general exam score (though it has been slightly flexible in recent years as it is now possible to recommend someone for admission to a university). On the contrary the United States university admission system takes into account a number of factors including but not limited to the general exam score (for SAT and GPA of usual performance), extra-curricular activities and recommendation letters from teachers. In general, multiple indicators are more comprehensive and accurate in measuring a

student's ability. However, it may be difficult to assess these indicators (e.g. comparing the usual performance of different schools), and subjective factors may play a large role. Consequently, it may be the last resort to rely on the general exam results to be incentives.

3.1.2 Principle of Incentive Intensity

The second principle we need to take into consideration is under what conditions should incentive intensity be increased or otherwise. It is laudable to imagine that various organizational rewards in reality have different incentive intensities. In the dual relationship between the head office manager and the branch mentioned above, a fixed salary remuneration is arguably the weakest incentive intensity, and the ownership of the branch has the strongest incentive intensity. The question as to: why do different organizations adopt different forms? what principles can guide in adopting a particular form must be answered. In answering such questions the following four factors must be considered.

First, the relationship between employees' efforts and output must be considered. If the relationship between the two is weak, that is, the employees' efforts and output are not related to each other, there should not be a high level of incentive. For example, there is a close connection between various tasks in a production line and if a considerable incentive is given to only one of the links, and the incentives to other links have not been changed, the surplus output of this link can only be accumulated in the former group and does not contribute to the output of the entire product line. Many manufacturers have a repair department, but they only repair machines in the workshop when the machines malfunction. It is thus meaningless to increase the incentive intensity for the repair department without considering the relationship between their work and the workshop.

Second, in addition to observing the relationship between effort and output the accuracy of performance measurement must also be considered. If measure the performance of a job can be measured very accurately, the incentive intensity should

increase; conversely, if the measurement is not accurate, increasing the incentive intensity will lead to inappropriate behavior. For instance, university research professors engaged in research consider the academic articles they publish as important parts of their work. Nevertheless, academic articles may be of high or low quality and are sometimes difficult to judge in the short run. If the promotion mechanism of university professors emphasizes the number of articles published, but their quality cannot be measured, then increasing the incentive intensity can only induce academic researchers to turn out in large quantity without any regard to quality.

In American universities, in order to encourage teachers to lecture seriously, students should give a written evaluation of the quality of teaching at the end of a semester and such evaluation from students becomes an important part of teachers' performance assessment. However, the quality of teaching is a difficult task to measure. The very difficult courses for the students may be also very rewarding, but owing to the tough content of the course, students have to put in considerable effort and thus become very stressed; they then will not be satisfied and their evaluation of the course may not be high. Some students think courses that are interesting and fun are good and preferred ones. Nowadays there is a word "edutainment" in education in the United States, a compound word of "education" and "entertainment", demonstrating that having classes has become an entertainment activity. The teachers struggle to make the class more interesting and to satisfy the requirements of the students but ignore the substance of teaching. Rather than teaching in class, entertainment has become the main purpose. Such a consequence is in large part due to the inaccuracy of measurement.

Third, the individual's ability to withstand risks is an equally key factor. It is often seen or heard daily of people being fined for doing wrong. It is rumored that some television stations in China have a system in which if an announcer utters a wrong word in broadcasting, he or she is fined a few yuan. Despite such checks yet everyone's ability to take risks are not the equal, and such should be taken into

account when designing the incentive intensity. If the incentive intensity exceeds people's risk-taking ability, for example, if it is stipulated that the stock market commentators in the news media should compensate for the losses caused by providing wrong information, then the news media cannot attract people who are suitable for such jobs because they as humans have a tendency to avoiding risks.

Fourth, is the response degree of individuals or work nature to incentives? The sensitivity of different individuals to different jobs are different. For example, a mail clerk's job is to receive and dispatch, give calls and other routine work. Even if the incentive intensity for the person or the job is increased, his response is still limited, so it is not rational to increase the incentive intensity.

3.1.3 Principle of Supervision Intensity

The problem of inconsistency between organizational goals and employees' goals in the principal-agent relationship must be resolved. Supervision and incentives are two mechanisms that has a complementary relationship. As an example, "high-paying honesty" is an incentive mechanism that encourages government officials to have integrity and always work in public interest, whereas the investigation of bribery by disciplinary inspection agencies is a reflection of the supervision mechanism. However, supervision also has a direct impact on incentives. As stated above, one's performance is usually the result of personal efforts and the impact of random events in the environment. A supervision mechanism is in fact a way to reduce the influence of random factors. The more careful one observes (supervises), the more one understand the effects of random variables, and the better the distinctive the relations between random variables and personal efforts can be explained. In this way, incentives to individual efforts can be offered more accurately instead of encouraging random factors. Yet supervision is costly. If everybody is supervised by a police officer, the crime rate will be greatly reduced, but the supervision costs will be unbearable. This is why there is the need to understand the principle behind designing supervision intensity.

The key to designing a comprehensive supervision intensity is the measurement of work performance. In other words, if we want to increase the supervision intensity, we must first define the criteria for how good or bad the performance is. If schools want to improve teaching quality and attempt to increase supervision intensity, efforts must be made to first measure the teaching quality. Citibank once tried to implement a "Balanced Assessment Card" system by designing a set of indicators to allow everyone not only to focus on profits, but also on other organizational goals, such as customer relations, teamwork and so forth. But many problems arose in the implementation process. In the past, employees only had a clear indicator that can be accurately measured – profitability. However, under the new system, the measurement of many indicators is not strict and requires the subjective evaluation of superiors, that is, the superiors should evaluate your teamwork spirit and whether you care about the long-term interests of the company. When assessment relies more and more on subjective evaluation, we have to increasingly strive to build good relationships with superiors. In that case, improving supervision intensity plays a counterproductive role. In this sense, it is not difficult to understand that, if one blindly increases the supervision intensity (through enhancing the power of discipline inspection) instead of putting in efforts on measuring the standards of conducts in violation of the laws and disciplines, and the result is often half as effective as expected and even counterproductive.

3.1.4 Principle of Balanced Incentives

A member in an organization usually performs several tasks. University professors not only need to lecture, but also to undertake research; a manager may manage two or three projects at the same time; a town head must take charge of public grain purchase, social security, family planning and so on. Another is the request of a superior department: the head of a lower department has to be responsible for multiple tasks, meaning the head needs to pay attention to many things at the same time. Here we are confronted with a common organizational problem of people usually not paying the same attention to everything, that is, they cannot attend to one thing

without neglecting the other.

The “principle of balanced incentives” as proposed herein is if employees are asked to pay the same attention to several things, the incentive intensity on these things must be the same. Otherwise, one should not expect employees to allocate equal attention according to our requirements. For instance, the professors’ job in American universities includes lecturing and research. In many research universities, professors spend most of their time on research; and for a long time, students complain that professors do not take lecturing seriously. The university administration repeatedly emphasizes the quality of lecturing but deliver little results. Why such a phenomenon? One has to look only at the university's incentive distribution mechanism to explain this situation. In research universities, the basic criterion for professor evaluation is not the lecturing quality, but the research results. As a result, there is a saying among young lecturers that “bad lecturing may hurt you (unable to acquire academic tenure), but good lecturing will not help you.” Such an incentive system undoubtedly lures professors into devoting themselves more to their research works. One may ask why, then, does the university only verbally emphasize the lecturing quality, but not changing the system of incentive distribution? From the university’s point of view, the prestige of a university does not depend on the level of lecturing, but on the research and popularity of professors. As a consequence, this kind of incentive system is also logical and reasonable for universities. It can be thus told that in the case of multiple tasks, an organization must provide balanced incentives for employees to enable them to distribute balanced effort to these tasks.

3.2 Research Design: Conceptual Framework

3.2.1 Basic Conceptual Model

From the late 1970s to the early 1980s, a large number of scholars in both economics and sociology studied the labor market and the organization's internal labor market and put forward theoretical frameworks based on their research findings.

Their basic idea is that while the past sociological research focused on the relationship between individuals or between individuals and society stratification, the present research pays attention to the relationship of individuals in the organization. There is a matching process between an individual in the society and the position of social stratification, that is, how a person in a social structure fits into a position in an organizational structure. This process is linked to the hierarchy within the organization. When discussing an individual's position in the social stratification, we should consider what his position in the organization is and what the (mutual) matching process between his position and the organization is.

Kalleberg and Sorenson (1979) proposed that the organization has two modes: openness mode and closeness mode. Openness refers to manifestation of organization in which people flow freely. Closeness refers to the formation of monopolies within organizations, which imposes strict restrictions on the movement of people. For example, in the U.S. society, labor unions have a large influence in the automotive industry. They force employers to hire labor union members, and the rules for the increase of workers' wages are based on agreements reached by the unions and capitalists. Thus, such an organization is not open. This is different from the organization in economics. Organizations in a competitive market are not closed but are free to flow. Whether or not an organization adopts an open or closed system depends on the bargaining between employers and employees.

On the basis, economists proposed two research topics: (i) control of work content, i.e. autonomy of work; (ii) control of job opportunities (whether jobs can be secured). When considering the matching process between individuals and organizations, the researcher has to pay attention to the autonomy of the work. The internal structure of the organization has a great influence on opportunities that individuals may meet. Many large companies have established fast and slow tracks within the organization. When new employees are hired, they are assigned to different tracks. In the fast track, employees are promoted quickly, while those in the slow track draw little attention. The organization's internal structure and personnel policies

have largely stipulated the opportunities for people's life. Fast and slow tracks have much influence on individuals' career.

The internal structure of each organization is different, so as the authoritative relationship between individuals. Organizational sociologists have long noticed the phenomenon that there is an alternative relationship between hierarchy and specialization. High level of specialization means large number of scientific and technical personnel, requiring no hierarchy. The relations in statistics are obvious. When there are many researchers within an organization, no matter what kind of organization it is, its hierarchy is usually loose.

A network in an organization is of significance to provide information and resources, and it offers workers sense of belonging. Proponents of this perspective believe that the network can be divided into four different types (as shown in Table 3-1). The first is Work Advice network. Work provides many opportunities to meet various people and get advice for solving work-related problems. The second network can provide strategic information and resources to serve individuals' own interests, which is the type of network that Burt emphasizes. The third network is "buy-in", referring to the relationship that is most helpful to one's promotion, have the greatest impact on the person and his/her future development. It can be called "intra-circle relationship".

The issue that the network cares about is not resource. An employee may not get any resources from others, but when he establishes the network relationship with others colleagues, both could have mutual recognition and common expectation and appreciation. This type of network is a repetitive one because only such networks can build a strong sense of identity. The fourth network is social support. Sociologists think that social support is important, but it is not an issue that they discuss.

Table 3-1 Network Types

Network Form	Network Content	
	Resource	Recognition
Between Positions	Work Advice	Intra-circle Relations (Buy-in)
Interpersonal	Strategic Information (Burt)	Social Support

Source: Sorted out by Luo. (2010)

Their research topic is the relations between opportunity for promotion and the four different networks. We first consider how the network is measured. This is an important step, and some basic operational practices have been formed in social network research.

1. The scale of the network means how much network relationship between ego and others, usually measured by count.
2. The density of the network refers to the network relationship between other people (alter).
3. The persistence of the network refers to the length of time since the establishment of network relationship.

According to Burt, the scale of the network is positively related to promotion. It means that more networks and more information are more favorable to promotion. Burt (1992) believes that the density of the network is negatively related to promotion. When a network is closed (forming small groups), it is difficult for one to negotiate with others, which is unfavorable for promotion.

Podolny and James (1997) have different opinions. They believe that under certain conditions, network density and promotion are also positively related, that is, in the network of buy-in, the two are positively related. This is because the small group has an important influence on people's promotion opportunities. The stronger

relationship between an employee and them means the formation of strong social expectation and social recognition, which therefore can increase the employee's chances of being promoted. This is different from Burt's structural hole perspective, because the idea of structural holes does not consider a positively related factor.

Podolny and James (1997) validated their proposition in an empirical research. They found that in the strategic information network, Burt's point of view is correct. But in the network of intra-circle relations, the opposite is true. A more intimate network between individuals with others is more helpful for promotion. Thus, the results of such statistical analysis are not particularly clear and inconclusive. However, the ideas they put forward are important. It is an idea that is closely related to sociology in that an interacting and closely linked group has an influence on an individual's social status. This thesis does delve deeper the details their empirical work.

Existing studies tend to analyze the impacts of knowledge sharing, enterprise performance and innovation, paying more attention to the organizational layer and less to the subdivision and deconstruction of informal networks. This research focuses on the dual layer transformed from the individual and organizational layers; i.e. the interaction pattern within organizations. The structural-relational theory makes it possible to introduce a social network perspective into this research. A network is full of individuals and connections among individuals. By means of social network analysis (SNA), it is possible to track existence of formal and informal relationships, or employee relationships within organizations (Cross & Parker, 2004). Social network analysis can help identify the structural features of the relationships among members of two previously disparate organizations and lead to successful management in the future (Durland, 2005).

Along this structural-relational approach, knowledge sharing is divided into four different types of inter-organizational networks in this research: problem solving, instruction, friendship and social emotional support (see Figure 3-1). The reason as to why these network connections are to be investigated is that such are exchanges

commonly seen in organizational settings. They display the different forms of networks and reflect the different natures of exchanges between individuals and organizations. These four types of network relationships can be classified into two kinds of continuum: formal network and informal network, both of which are fundamental for the expression network. The formal network contains formally determined relationships between superiors and inferiors, including people from different functional departments connecting with each other to accomplish a particular task. The informal network, however, is "a more descriptive mode of association, that is, the content of the relationship can be job related, or socially related, or even both" (Ibarra 1993). The essence of the relationships between individuals in network lies in the transition from fundamental connection to expressive connection. A fundamental connection includes the exchange of job related resources, information, expertise, and career guidance and planning; while the expressive connection covers the mutual exchange of friendship, trust, social and emotional support (Ibarra, 1993). Based on these two dimensions, we have created a framework of inter-organizational network comprising the following four knowledge contributions.

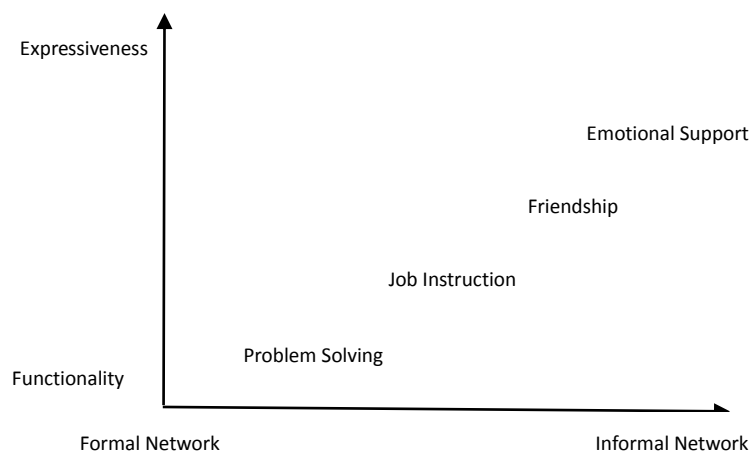


Figure 3-1 Structure of Knowledge Network.

Problem Solving Network: The problem-solving network refers to the fundamental connection between organizational members who seek for information and advice to address challenging difficulties encountered in work (Cross & Parker, 2004). These job connections are channels through which staff members can obtain

resources such as information, assistance and instruction to accomplish challenging tasks. A problem-solving network may not strictly adhere to formally established working relationships. As stated by the information-seeking theory, people are more likely to seek job-related information or advice from whom they consider reliable (Borgatti & Cross, 2003; Morrison, 2002; Nebus, 2006).

Job Instruction Network: We define the instruction network in the middle of a formal-informal and fundamental-expressive network in that it integrates fundamental and expressive elements together. Kram and Isabella (1985) has identified two main functions of instruction namely career function and social psychological function. Career function contains sponsorship, exposure and visibility, coaching, production, and challenging assignments; whereas social psychological function includes role models, acceptance and determination, and counseling and friendship. It is of tremendous importance to research into the instruction relationship within an organization because it can facilitate staff to make adjustments during times of hard work or stress (Siegel, 2000).

Friendship Network: As one of expressive functions, it indicates that social networks can help to develop friendships. The friendship network is even less informal for it demonstrates more personal choices and propensities. People have more discretion over choosing like-minded friends. Many courses of social network come into being in the circle of friends. Friendships are merely of value in deciding who can be trusted, who tends to cooperate, and who is more likely to collide with (Krackhardt, 1992).

Emotional Support Network: This is the most informal network that has the expressive function of facilitating to tackle crises in personal life. Individual networks may be derive from different people or institutions. The emotional support for individuals probably comes from spouses, parents, children, siblings, friends, neighbors, colleagues, as well as a variety of professional and work organizations. Relatively few researches have investigated social support networks in organizations.

The social support theory believes that, the motivations of individuals in quest of

emotional support stem most likely from those they think sharing the same source of stress with them (Cohen, Underwood & Gottlieb, 2000). As revealed by literature, the vital impetus of helping behaviors is to perceive interpersonal similarities between providers and recipients of support. Supporting behaviors often occur within strong and similar ties (Brief & Motowidlo, 1986). Homogeneity has already been studied in terms of similar age, gender, education, prestige, social class, institutional basis of research, and career as well. All types of networks, discussed separately though, are by no means mutually exclusive, which is very much like a variety of networks that connect two people within one organizational setting. For example, an instruction connection may arise out of a formal job network and then promote the development of an informal network relationship. The occurrence of multiple mutual exchanges is due to versatility, which is the structural feature of a bivalent relationship when two groups are involved in more than one relationship (Wasserman & Faust, 1994). Multiple relationships signify strong ties that enjoy highly reliable trust because both sides have the opportunity to know about one another in different situations (Ibarra, 1995).

3.2.2 Selection of Research Methods

This research mainly discusses the influence of informal network structure on the behavior of knowledge sharing within organizations. After a careful perusal of literature, we break up the knowledge network into four specific networks depicting the knowledge network: problem solving network, job instruction network, friendship network and emotional support network. Due to the complexity of social network, the design of the questionnaire during the research process is different from other researches. There are generally two methods to study social network. One is the "holistic network" method that surveys each node and its relationship in a bounded social network, thus measuring the network resources of each node and the structural characteristics of the entire network. However, since it is hard to define most of the network boundaries and necessary to measure all the relationships of each node in the network, the measurement becomes more difficult as the network size increases.

Hence, there are some defects in the holistic network method. The other is the "individual-centered network" method. With individuals as the center of the network, this type of network studies on network relationships spreading out of the network center, of which the measurement results are the social capital of individuals. This method normally consists of two approaches – nomination generation approach and location generation approach.

The nominal generation approach is one of the common approaches to social network analysis. In simple terms, it allows members within an organization to, based on what the questionnaire studies on, write out the names, personalities and characteristics of other members in the requested social network, as well as the form of network relationships that exist among these members. However, this approach also has its drawbacks. For instance, the boundary of the network is blurry and not easy to define. In addition to that, the people being investigated often write out those close to them and are inclined to neglect those not close to them. Consequently, this approach cannot measure the weak connections and therefore undermine the accuracy of the research.

The other approach to social network analysis is location generation approach, which builds on measuring the social resources owned by members of the social network. Specifically speaking, first, a member fills in the form the job types, positions and other scales of his/her own social resources (members). Then, the member surveyed has to speak out the characteristics of those members he/she filled in the form, in line with which those members will be included in different categories in the social network. In the end, the total score will be calculated and added up according to certain score ratio. The score indicator can reveal the social network resources owned by the member. Yet, this approach can only be used to measure the social capital owned by individuals or to know about the specific social network of the object investigated.

As this case study aims to explore the holistic network and needs direct nomination, this research employs the nomination generation approach to generate

network relationships and combines with data encoding process to generate network data. The questionnaire in this research utilizes the Likert subscale approach to survey.

The informal network defined by this research comprises members in an organization who share common interests or feel strong emotional attachment. They are colleagues at work, but privately they often go shopping, watch movies, and dine together, and so on. Such an informal network can cement the relationships among members of the organization and facilitate information sharing within the organization. At present, with the advancement of science and technology and changes of in times, the way of information sharing within organizations has also undergone tremendous changes, which is primarily attributable to the changing communication tools and chatting software. Exchanges and sharing is basically realized through telephone, e-mail, WeChat, QQ, MOMO and other chatting tools; besides, the information on knowledge, current affairs, humanities and natural sciences are generally provided by friends circle, Weibo, Renren and other sections. These unofficial, informal patterns of information sharing change the methods people employ to access information and have far-reaching consequences. Now that there is no hierarchical relationship in the informal network structure, which is different from the formal network structure, it is more valuable and meaningful to study the impact of informal network on information sharing.

This research centers mainly upon two informal networks, namely the emotional network and the consulting network. Furthermore, the research perspective of informal network is composed of two levels, i.e. the attribute of members' social network (centrality) and the attribute of organizational network structure (density).

Combined with the afore-mentioned analysis, the scale of this study has to accomplish the following three tasks:

First, this study has to reveal the basic characteristics of employees in the GR group and analyze the status quo of the informal organization links among them through the questionnaire.

Second, by means of questionnaire analysis and the application of the fundamental conceptual framework of network types proposed above, this study should explore and analyze the knowledge sharing and emotional exchanges among employees in the GR group through informal organizational networks and depict the four network types as well.

Third, through the questionnaire and use of integrated social network tools, this study needs to discuss the network density and centrality of the informal network structure within GR group.

3.3 Research Design: Data Collection

3.3.1 Questionnaire Design

According to the above-mentioned definitions of relevant concepts and the influence of informal network structure on information sharing, it can be concluded that a higher informal network density can promote information sharing within organizations, and that a higher informal network centrality can also promote information sharing within organizations. In line with these two conclusions, it is pivotal to consult relevant literature about how scholars design questionnaires and refer to related scales designed by them. Though introduced into this research through theoretical analysis, the scales have been properly pruned due to some limitations of this research. After interviews and discussions conducted with leaders and employees in enterprises as well as experts and scholars in relevant fields, some contents of the questionnaire did undergo appropriate modification to make the scale closer to the content studied. Besides, at an academic conference led by the supervisor, all terms in the scales were duly elucidated and discussed, and the initial template of the questionnaire was finalized with reference to various opinions. Eventually, a small sample were used as trial testing set to test the credibility of the initial scale and to correct and solve the problems observed.

3.3.2 Data Source

Based on the theories and design ideas of some foreign scholars, the scale of the questionnaire design adopted in this study followed relatively mature foreign scale after analysis. In accordance with the actual situation of GR group, appropriate changes have been made to produce a questionnaire scale applicable to the research and survey of GR group. The scale is composed of two parts: the first part is the basic personal information of enterprises; and the second is the scale related to informal network measurement. The latter employs the form of five-point Likert scale but makes certain modifications because this research intends to design informal network structures and work out their density and centrality in organizations through the questionnaire. In the questionnaire used a scale of 1 to 5, was used with each number respectively standing for "seldom", "sometimes", "often", "usually" and "always". The five-point scales vary for different questions, but they are designed in accordance with the density and centrality of the informal network structure. At the same time, this research also refers to the questioning methods taken by foreign scholars like Brass et al. (2004), which allow employees within the organization to list corresponding employees by the contents of the questionnaire.

Consequently, this questionnaire comprises a two-dimensional scale with some employees listing the names of other employees in the vertical direction and the five-point scales from 1 to 5 in the horizontal direction.

3.4 Research Methods: Network Depicting

3.4.1 Network Density

In the social network analysis, the most basic depicting method for measurement is density. General social network analysis measures the network density in informal organizations. As a result, the network density in social network analysis is of enormous significance. Below are the definitions and concepts used in this study.

3.4.1.1 The Definition of Density

Density refers to the degree of connection between connecting points in the network structure, that is, how the connection points are distributed in the network. In a network with greater density, the points are distributed more intensively, and the connection lines between points are also denser; by contrast, the points in a network with lesser densities are relatively sparse, and so are the connection lines. This research makes use of the concept of network density to survey and depict the density of informal networks in the GR group.

3.4.1.2 Density Measurement and Related Issues.

In this thesis, D (or density), is an indicator measuring how tight the network structure within an organization is, and is represented by the ratio of the number of connected networks among members in an actual network structure to the maximum number of connected networks in that structure (see Formula 3-1). In equation 3-1, i and j denote two members in the network structure, the value of X_{ij} is either 0 or 1 which signifies whether member j admits to be related to member i, and N represents the number of actors in the entire network (also referred to as number of nodes). The value of density is usually in the range of 0-1. If the network density is close to 1, then all members in the network structure are in close contact with each other; on the contrary, when the network density is close to 0, all members in the network structure have none or few contacts with each other.

$$D = \frac{\sum \sum_{i=1, j=1} X_{ij}}{\frac{Max(X_{ij})}{N(N-1)}} \quad (3-1)$$

Density can reflect the degree of connection between nodes. For instance, supposing that there are two organizations, A and B. If the numbers of nodes (the total number of employees) in both organizations are the same and the density of organization A is 0.8 and that of organization B is 0.3 based on the above formula, then it can be interpreted that the relationship between employees in Organization A is closer than that in Organization B.

3.4.2 Network Centrality

Centrality is a crucial indicator for the position of an individual structure, which is commonly used to evaluate the significance of a person, the superiority or privilege of his/her position, and his/her social prestige. There are three forms of centrality: degree centrality, closeness centrality, and betweenness centrality.

3.4.2.1 Degree Centrality.

Degree centrality and betweenness centrality are the two most important indicators of individual structure in a group network. Degree centrality is the most commonly used indicator for measuring who is the principal central figure in a group. Such a person enjoys the highest social status in a sociological sense and holds the greatest power in the sense of organizational behavior. A person with high degree centrality occupies a preeminent position in the group.

The formulae for measuring degree centrality are as follows: the first formula is the absolute value and the second is the standardized value. The first is total number of a person's relationships; and the second is a division of the total number by the maximum number of relationships in the network in order to do a comparison between different networks. They are non-directional formulae and are estimated as:

$$C_D(n_i) = d(n_i) = \sum_j X_{ij} = \sum_j X_{ji}$$

$$C'_D = \frac{d(n_i)}{g-1} \quad (3-2)$$

The results of equation 3-2 is a numerical value of either 0 or 1, and X_{ij} represents whether actor j admits to be related to actor i, g is the number of members in a network. In social network, degree centrality measures the total number of a person's relationships. Given that the number of nodes varies with graphs, for instance, there are more members and relationships in a large social network, the possible maximum number of relationships of a certain node in the social network should be divided into the total number in the standardization process, namely g-1.

The formula for group degree centrality is:

$$C_D = \frac{\sum_{i=1}^g [C_D(n^*) - C_D(n_i)]}{\max \sum_{i=1}^g [C_D(n^*) - C_D(n_i)]} \quad (3-3)$$

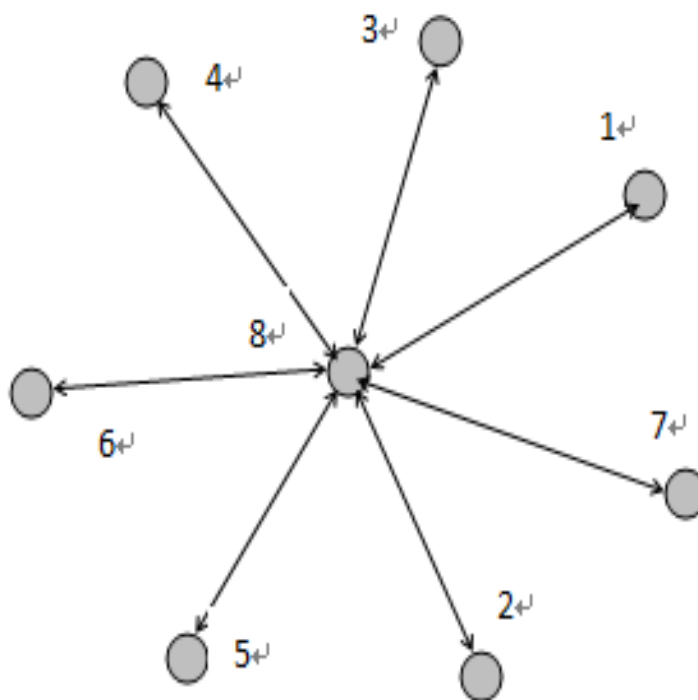


Figure 3-2 Star-Shaped Social Network

As Figure 3-2 shows. In a star-shaped social network, each node is connected to a central node and not connected to other nodes. The central node has the highest degree of centrality, and communication between the nodes needs to pass through the central node. The central node functions as a bridge. Has absolute control.

In equation 3-3 $C_D(n^*)$ stands for the greatest degree centrality in $C(n)$. The sum of the differences between it and other $C_D(n^*)$ s is group centrality. The denominator is the possible maximum value. This is an indicator for the overall structure of the network. The formula also means the differences in degree centrality between someone having the highest degree centrality and other people in a graph. The greater the difference is, the higher the group degree centrality, indicating that the rights of this group are overly concentrated and that one person is of special importance. The

star-shaped graph depicts a figure that shows a group with the highest group degree centrality (Figure 3-1).

The group centrality of the star-shaped network among non-directional graphs is $(g-1)(g-2)$, which is the denominator. At this point, the formula (for non-directional graphs) becomes:

$$C_D = \frac{\sum_{i=1}^g [C_D(n^*) - C_D(n_i)]}{[(g-1)(g-2)]} \quad (3-4)$$

3.4.2.2 Closeness Centrality

Closeness centrality uses distance to calculate the centrality degree of a node. In other words, the closer the distance is, the higher the centrality; and the farther the distance is, the lower the centrality. The formula is:

$$C_i(n_i) = \left[\sum_{j=1}^g d(n_i, n_j) \right]^{-1} \quad (3-5)$$

where $d(n_i, n_j)$ stands for the distance between n_i and n_j , $C_i(n_i)$ is the reciprocal value of the sum of distances between node n_i and other nodes. The smaller it is, the farther the distance. It must be noted that based on its definition the person closer to the edge is less important, and vice versa.

However, this indicator is very demanding for it takes a fully connected graph to calculate closeness centrality. Otherwise, some people may not be able to reach others and there would be no distance at all. The more isolated some people are, the smaller the total sum of distances is. The requirements of directional graphs are much more stringent as all nodes in the entire graph must be strongly related to each other. This indicator is in general rarely put into use not only owing to these extremely strict requirements, but because this indicator is highly correlated with the degree centrality, that is, those with high degree centrality often enjoy high closeness centrality.

3.4.3 The Concept of Betweenness Centrality

The indicator of betweenness (for measuring how high the betweenness is) measures a person's ability to be an intermediary. If a person occupying a crucial position on the shortcut between other two people refuses media, then those two are unable to communicate with each other. The more positions he/she occupies, the higher his/her betweenness (intermediation) is, and more people have to contact others through him.

When a network is severely divided into several separate components, it is exactly a structural hole between two networks as proposed by the sociologist and business administrator Ronald Burt. If a person becomes a medium between two separate components, the person is a cut point commonly known as bridge, which is the communication line rather than the node in a scientific sense. In network analysis, the reason why the concept of bridge is so valued is that the person used as the bridge is of crucial importance when two separate large groups need to exchange information and opinions or to coordinate their actions. It is of high betweenness if one is able to interpose in the interaction and exchanges between two groups of people. In Burt's(1992) theory of structural hole, the person with high intermediation has access to information flow and business opportunities, thus controlling the two connecting groups and reaping intermediary benefits. In the social network analysis, betweenness is the indicator for measuring the extent of a person used as the bridge.

The formula for betweenness is:

$$C_B(n_i) = \sum_{j < k} (n_{ij}) / g_{jk} \quad (3-6)$$

Standardized formula (for non-directional graphs):

$$C_B(n_i) = 2 \sum_{j < k} g_{jk}(n_i) / g_{jk} (g-1) (g-2) \quad (3-7)$$

(For directional graphs)

$$C_B(n_i) = \sum_{j < k} g_{jk}(n_i) / g_{jk} (g-1) (g-2) \quad (3-8)$$

Where g_{jk} is the number of shortcuts through which actor i can reach actor k (geodesic, that is, a route to the destination taken by the least number of people), $g_{jk}(n_i)$ represents the number of shortcuts that actor i is on and through which actor j can

reach actor k , and g is the number of people in this network. The formulae can be put in pictorial form as depicted in Figure 3-3.

In Figure 3-3, there are two shortcuts from 1 to 6. When n_i is 4, there is one shortcut from 1 to 6 that passes through 4, which can be counted as $1/2$; conversely, it is also $1/2$ from 6 to 1. The two shortcuts from 3 to 6 and 2 to 6 must go through 4, so it is 2; and in turn, it is also 2 from 6 to 2 and 6 to 3. In addition, there are also two shortcuts from 5 to 2 and 5 to 3 which respectively passes through 4 and 1, and vice versa. Consequently, $g_{jk}(4)$ is totaled up to 6. The standardization needs to be divide by $(g-1)(g-2)$ into 20 hence $C_B(n_i)=3/10$. The most shortcuts tend to pass a cut point, and therefore the "bridge" has the highest betweenness. Taking node 3 in Graph 10 as an example, there are a total of 32 shortcuts passing through 3, from 1 or 2 to 7, 8, 4, 5, 6 and then backwards from 7, 8, 4, 5, 6 to 1 or 2. It is much higher than all other nodes, thus reaping the greatest intermediary benefits as Burt (1992) said.

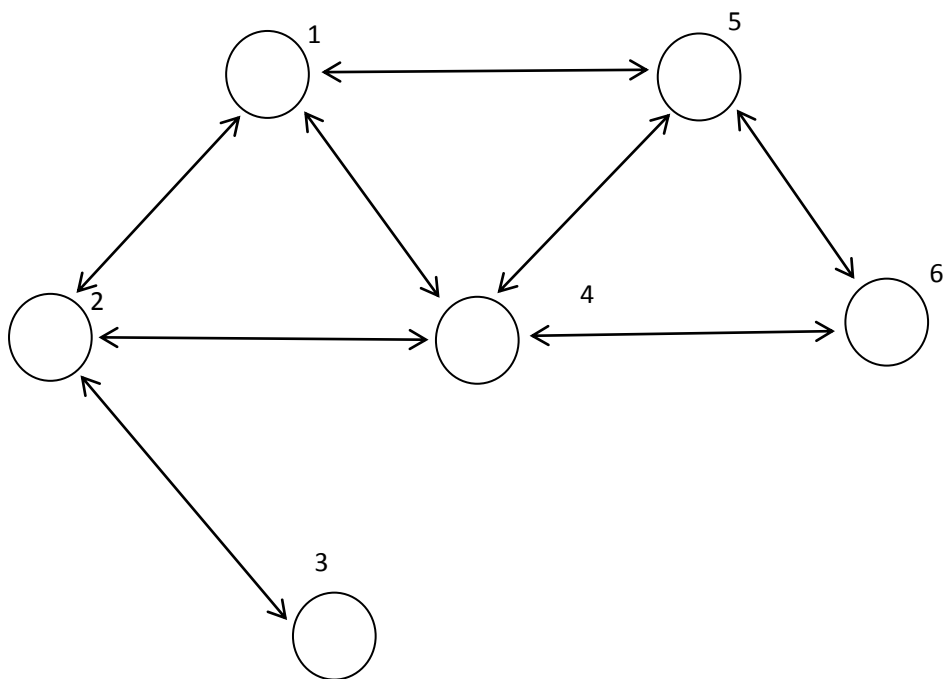


Figure 3-3 Social Network: Example 1

Source: Sorted out by Luo. (2010).

The formula for group betweenness (intermediation) is:

$$C_B = \frac{2 \sum_{i=1}^g [C_B(n^*) - C_B(n_i)]}{[(g-1)(g-2)]} \quad (3-9)$$

Group betweenness centrality is also an indicator for the overall structure of a network. The formula reveals the difference in betweenness centrality between the person with the highest intermediation and others in a graph. The greater the difference between him/her and others is, the higher the value of group intermediation, implying that several smaller groups separated from this group relies too much on the intermediary and that the intermediary is of particular significance. It is also a star-shaped graph that enjoys the highest group betweenness centrality. This indicator can measure the kernel bridge in organizations. The higher the value there is, the more likely that the information is monopolized by the minority in the organization. A higher indicator manifests that someone can easily manipulate information and interests and that the organization is in a worse situation in most cases.

As shown in Figure 3-4, in this social network, two condensed subgroups are formed. Within the respective condensed subgroups, the nodes in the network can successfully communicate, but they cannot communicate with each other in another condensed subgroup. Node communication, because there is no node belonging to two cohesive subgroups, that is, there is no intermediary node to realize node intercommunication between two groups, the density of two condensed subgroups is not high, and the nodes in the network communicate infrequently.

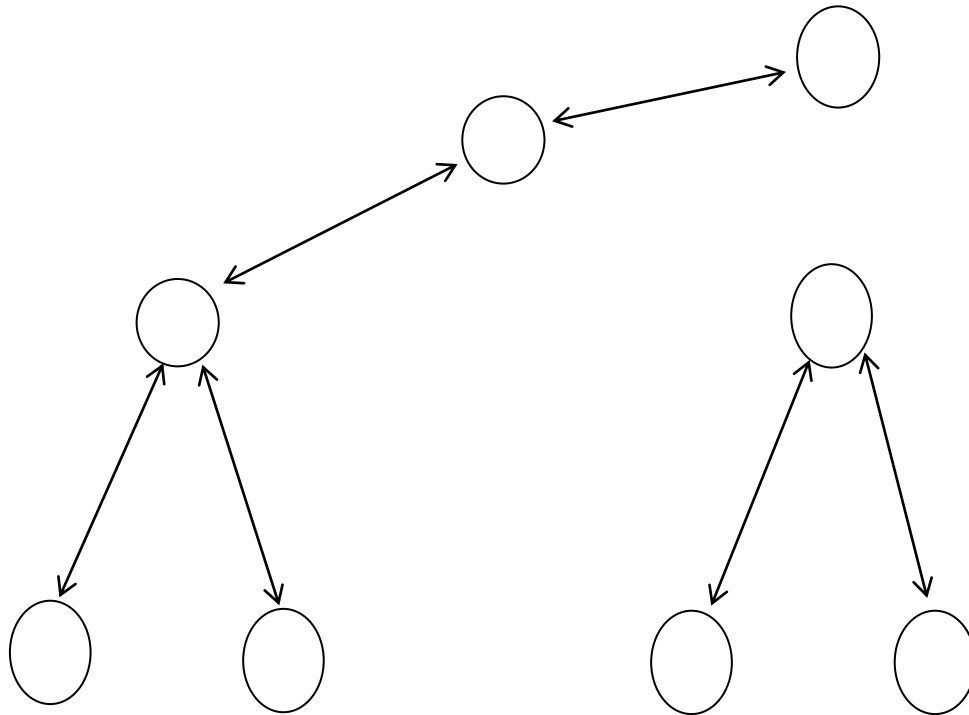


Figure 3-4 Social Network: Example 2

Source: Sorted out by Luo. (2010).

3.4.4 Positions of Some “Bridges”

On one hand, a bridge can help realize the benefits Burt alluded — including information benefits and manipulation benefits; but on the other, a bridge will be placed in between two groups and subject to action constraints (as Burt put forward). (1992) Accordingly, the autonomy of free actions will vary with different bridges introduced and such are discussed below.

Coordinator: In a group, the coordinator is generally the intermediary and is of vital importance. A higher intermediation enables the coordinator to access information flow and control the interests of both parties, but he/she is subject to the norms of this group. As shown in Figure 3-5.

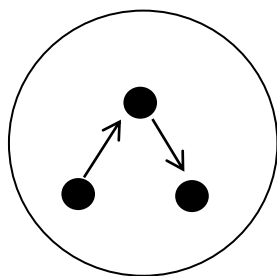


Figure 3-5 Coordinator

Source: Sorted out by Luo. (2010).

Broker: Compared with the coordinator, the broker enjoys more freedom in actions because he/she belongs to another group and therefore is not subject to the norms of this group. As shown in Figure 3-6.

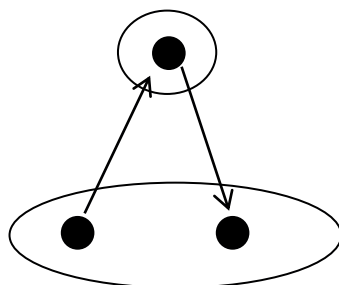


Figure 3-6 Broker

Source: Sorted out by Luo. (2010).

Gatekeeper: The gatekeeper is a prominent channel in a group that connects with the outside world and controls the external information of this group. As Figure 3-7 shows Gate Keeper social network.

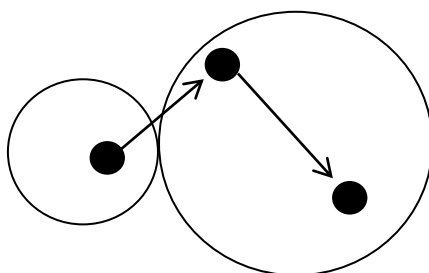


Figure 3-7 Gate Keeper

Source: Sorted out by Luo. (2010).

Spokesman: The spokesman is the external representative of a group controlling the threshold of external coordination. As Figure 3-8 shows the Spokesman Social

network.

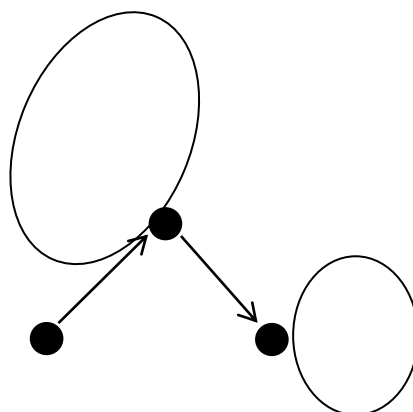


Figure 3-8 Spokesman

Source: Sorted out by Luo. (2010).

Liaison Officer: Since the liaison officer is not restricted to the norms of any groups, he/she has the utmost degree of freedom and is the one who can control both groups. As Figure 3-9 shows the Liaison Officer social network.

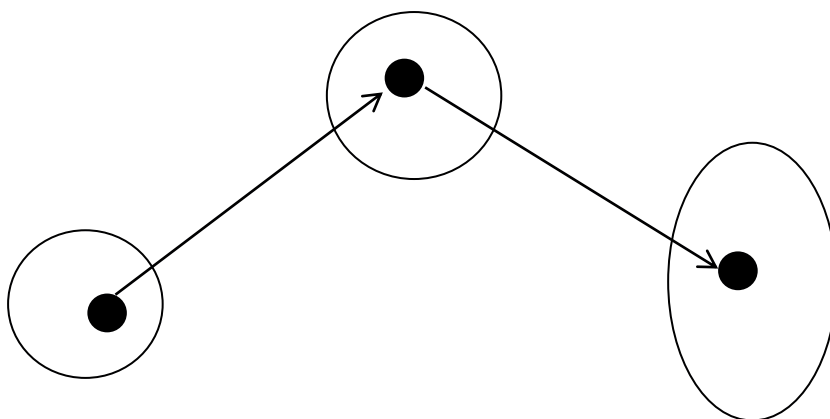


Figure 3-9 Liaison Officer

Source: Sorted out by Luo. (2010)..

Simmel Joint: As shown in Figure 3-10. This is a concept developed by the renowned sociologist Simmel. This concept means that the two networks connected through a bridge deem the bridge as one of their own and asks him/her to represent their own interests and to comply with their norms. Consequently, the bridge has no freedom and finds it difficult to please both sides. As an old Chinese saying goes: "Inside and outside the mirror, pigs are humans never", which is why someone in a

dilemma is called “pig”, for which the academic name is exactly "Simmel joint". (1950).

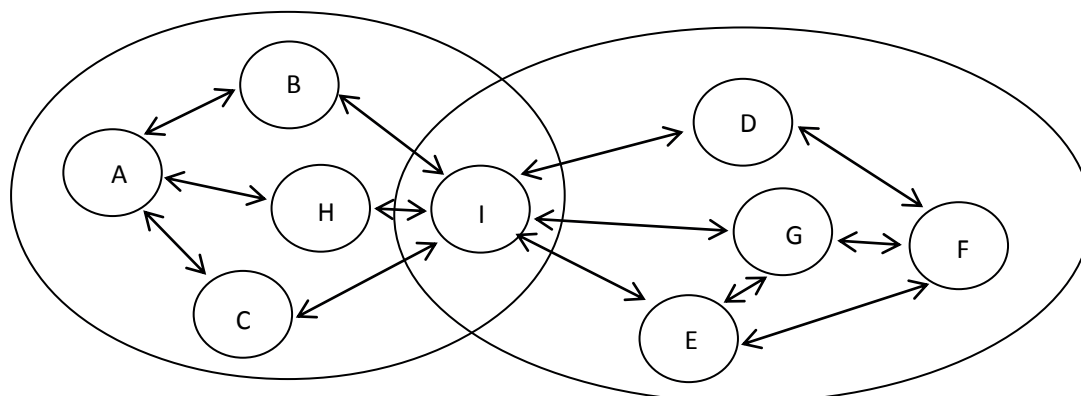


Figure 3-10 Simmel Joint

Source: Sorted out by Luo. (2010).

The important feature of Simmel's (1950) association is the duality of individuals and groups. People are group animals, seeking to integrate into a certain group. When we are integrated into the group, we are subject to the constraints imposed by groups. This is the basic relation between groups and individuals, forming social networks. Therefore, research on individuals often needs to start from their respective groups from the perspective of social networks. In fact, when individuals enter a group, forming a network of relationships, they are no longer just nodes in the social network, but carry more relationships into the group's network. Thus, individuals within a group produce more intersections and connections with each other. The later generally consider network is merely the reaction of relationships among individuals within the group and is a general description of the relationship network. In Simmel's association, an individual not only participates in the group but also participates in other groups at the same time. That is to say, the individual is not only related to individuals in a certain group but also to individuals in multiple groups. So, individuals have multiple group attributes. It confirms the dual nature of individual and group of Simmel's association. Ronald Breiger published an article that quantifies the ideas of Simmel. He proposed that the interaction of two planes of space represented the duality of Simmel's thoughts. The plane is represented as a group

relationship, and the intersection of straight lines is viewed as the overlap and intersection of relationships. This also shows that individuals' connections is made more of the connection between different groups of networks, not just the connections between individuals. This is the first idea of Simmel. (1950).

Continuing thinking along this line of thought, one cannot help but think of the idea that: When individuals participate in multiple groups and multiple groups attributes cross and overlap, then understanding the individuals' relationship network requires a clear understanding of how many individual groups the individuals participate in, what kind of characteristics and attributes of each group has, and what role the individuals play in various groups? In other words, how individuals' social network is defined, formed, and developed can be understood through observing different groups. Another focus of Simmel's (1950) thought is the relations between freedom and restraint. People are free, but when they are in a group, they are subject to various constraints or restrictions. At the same time, they are affected and restricted by social networks. The network has imposed restrictions and their norms on human behavior. It must be noted that need to be clear that an individual's choice to enter a group means that the group is attractive to him/her. The individual wants to be able to express personality in the group and is also clearly faced with a series of constraints. The more groups that the individual participates in, the more opportunities for personalities to be displayed, and the more constraints are imposed on them. Therefore, freedom and restraint need to be viewed in a dialectical manner. Freedom and restraint have duality and can be transformed into each other. Simmel (1950) believes that freedom is based on a certain social relationship that if individuals do not participate in any group, they cannot show personality. When individuals participate in groups, they are bound on the one hand, and on the other hand, they get greater sense of freedom because of the sense of community belongingness. As Simmel (1950) puts it, "There is a reciprocal relation between subjectivity and objectivity. When a person has a relation with a social organization, he/she is constrained by the organization. Subjective identification facilitates the constitution of an objective

group, but since the mode of his/her participation is different from others, the individual regains his/he personality. Therefore, multiple organizational participations create new subjective components. Subjective and objective also have a reciprocal relation. When a person comes into contact with a social organization, he/she will be constrained by the organization, and at the same time show individuality and expanded freedom. In general, the participation in multiple groups creates a new subjective ingredient. In medieval Denmark, the guild reached an agreement with the royal family. It required that any problems that arise within the guild were the responsibility of the guild itself and it could try or hear it. The royal family gave this power to the guild. As a result, as a member of the guild, if anyone violated any procedure, discipline, or rules, he/she would be tried within the guild. For example, if members of the guild violate the competition rules, they can only be resolved within the guild, rather than national laws. Simmel (1950) used this example to illustrate that when using rules, members of the guild actually lost some of their freedom. In other words, they could only resolve their disputes with other people through the internal rules of the guild, rather than national laws. If the guild is taken as a network of relationships, it has restricted the members. But on the other hand, because of the rules of the guild, members of the guild achieve certain independence. Such independence means that the king and other forces cannot intervene in the internal affairs of the guild, and the king cannot revise the rules of the guild. For a long time, people used the relations between country and society to explain the historical origins of particularly high professionalism in European countries. In modern society, many specialized groups still retain these characteristics. For example, the Sociological Society of the United States determines its own rules within the academic community and sanctions academic issues that violate the rules of the society. Various academic groups operate independently and play a catalytic role in the professionalization process.

Burt (1992) further developed this idea and modeled the dual issues of the network and individuals. He suggested that if freedom is the development of personal

characteristics, this concept does not mean that it lacks relations with others, or has nothing to do with others, but refers to a unique and specific relationship with others; a good definition of freedom. That is to say, freedom is not to do whatever you want but that you have a social relationship that is different from that of others, so that your personality is different from others and it shows your freedom and personality.

From the perspective of social network theory, the task is to understand people's social behavior through the concrete structure of social relations. First of all, people's network of relations involves concrete people with names. In the study of relationship networks, the description of specific social relationship is generally a matrix-like graph. Each specific person in the network occupies one line or column with his/her own characteristic and name. For example, the relationship between Person A and Person B in the network is not the same, thus such description must identify people.

In the institutional school, no special concern is shown for individuals in the institution. The institutional school is concerned with the impact of the environment on the organization, and there is no particularly large relationship between a specific organization or individual and the entire theory. However, the relationship network must be related to specific people and it refers to the relationship between specific people. In a research on human behavior through specific networks of relationships, there is the need to first address the social structure or network structure in which people are located. Second, a vivid description of the position of an individual in the network and what his/her position in the network must be clearly specified. Finally, the interaction between locations in the network must also be considered. These three aspects are usually the basic elements of the study from the perspective of social networks.

According to the dual nature of Simmel's (1950) individuals and groups, it is known that individuals' participation in a group will bring into the attributes of the other groups involved. Therefore, one issue that deserves attention is the network relationship in the current group and attributes of other groups brought in, which has important research significance.

For example, when a company's senior executive quit the company and enters another company that is similar to the original work area, they bring with them the former company's customer relationship network and the employee's social network to the new company, which will affect the new company. Therefore, it may be new to study from this perspective.

John Padgett (1987), a professor of political science at the University of Chicago, studied how Florence became the birthplace of the capitalist economy from the perspective of the network of relationships. During the transition from medieval ages to capitalism, the establishment of the textile industry in Florence was completed almost overnight. At the time, there were textile industries in many other places, but all of them were hand-worked workshops. But in Florence, many of the first-generation entrepreneurs are members of the large family. The family is a network, while people from outside the family work at the bank and belong to the banking profession. In this way, through the mutual connection and full integration of the family network and the professional network of bankers, the accumulation and utilization of various types of resources have given opportunities for the development of institutional innovation. The capitalist economic system, thus, emerged.

Simmel (1950) thought that the structure exists objectively, mainly to study the impact of organizational structure on behavior. The idea is to study behaviors and relationships from two perspectives, namely, structural and network perspectives. For example, Blau (1964) studied the model that the characteristics of social groups influenced interpersonal relationships. However, this idea does not show much interest in the utilitarian nature of the network and the subjective initiative of the people.

Harrison C. White (1976) was one of the founders of contemporary social network theory. He was very active in the 1970s and trained a large number of students. White (1981) believed that the market is a kind of social structure, which is produced by the mutual observing of each other's behaviors among enterprises and is constantly renewed by mutual observation. In White's view, there is no major link

between market supply and consumer behavior, which is the result of interactions among companies (1992). In 1992, White published the book *Identity and Control*, which proposed a grand theoretical framework for studying social phenomena from the perspective of social networks. Breiger (2000), Padgett (1987) and others developed their ideas from this line of thought.

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Chapter 4: Field Work: Case Study of GR Group

According to the theoretical analysis, literature review as well as the framework in Chapter 3, this chapter entails an empirical analysis of GR Company with the responses gathered from respondents. With semi-structured questionnaires, in-depth interviews and follow-up research, the informal network of GR Company is thoroughly analyzed to help study the structural characteristics as well as the role members in different networks play and their contribution to the smooth functioning of the network. In general, the functioning mechanism of the 4 networks in knowledge sharing is testified to support the conclusion of this thesis.

4.1 Background Introduction and Research Significance

4.1.1 History and current condition of the development of Chinese enterprises

4.1.1.1 Historical evolution

In China, corporations funded by the government are called “state-owned enterprises”. State-owned enterprises, most of which are funded by the central government, account for a large proportion in China’s economy. Developing state-owned enterprises is not only an important part of Chinese economic reform but also an important task of the construction of the Chinese market economy.

Since 1978 when China launched the economic reform, the country has focused on economic construction and the economy has gradually been transformed from planned to market economy. In order to ease the financial burden and activate the market, the Chinese government has gone through the path from reforming the franchise of state-owned enterprises to the ownership and property rights of them. The government and enterprises are separated as specified in the reform since 1984. In 1987, contracting system was adopted by many enterprises, which to some extent empowered many entrepreneurs and inspired their creativity. However, the problem of

the fusion of tax and interest in the distribution system was not resolved. From 1992 to 2003, the Chinese government, focusing on the ownership of state-owned enterprises, undertook a large-scale integration which dealt with large companies. The aim of the reform was to transform and improve the operation of enterprises and a modern enterprise system was proposed to build a business framework with clear property, specific rights and responsibilities and scientifically managed by separate governments and enterprises. Since then, state-owned enterprises have been playing a significant role in China in a virtuous circle.

It is easy to conclude that the development and reform of Chinese enterprises have been successful. The growth of state-owned enterprises has pushed forward China's progress in politics, economics, culture and social affairs.

4.1.1.2 Development status

The Chinese government's managing technique for state-owned enterprises has transformed from "managing their assets" to "managing their capital" and from managing their affairs to their asset-preservation and appreciation. The government is improving the modern enterprises system and the regulatory system. When classified according to their quality and function, state-owned enterprises are divided into 3 groups namely functional enterprises, charitable enterprises and competitive enterprises and are managed differently. The aim of the state-owned enterprise reform is to construct a management system in 2020 which meets the requirements of the market economy, perfect the structure of state-owned enterprises and cultivate a large number of backbone business companies with great advantage in innovation and international competition. It is estimated that there are about 130 state-owned central enterprises which are funded and managed by the Chinese central government and about 50,000 state-owned local enterprises funded by local governments. Those enterprises are the main force in the Chinese modernization. They not only function as an amplifier of state-owned capital, but also preserve and appreciate the state-owned assets. Meanwhile, they have made significant contribution in global competition, technique innovation, environment protection, making industry standard and

shouldering social responsibility.

4.1.2 Introduction to GR Group

4.1.2.1 A brief introduction

GR Group is the abbreviation of Sichuan Gloport Group. It is a large state-owned local enterprise funded by China Sichuan Yibin municipal government with registered capital of RMB1.1 billion and total capital RMB20.5 billion as at Dec 2017. As a functional enterprise, its dealings includes project financing and investment management, construction of municipal infrastructure and public facilities, real estate development and operation and land consolidation, tourism development and management, investment promotion services and property management, etc.

The headquarters of GR Group is located in the market operating platform of a national economic development zone established by Yibin municipal government, Yibin Lingang Economic Zone. It is responsible for the capital operation of Lingang development zone and the development of the industry. Following the requirement of “the government leads, the market operates and the enterprise manages”, the group is devoted to the investment promotion and operation of the economic zone in a number of fields including real estate, finance, energy, cultural tourism, construction, property management, and investment services. Currently the group owns 24 holding companies and staff of 500 people. While actively diversifying its business, GR Group assists the Yibin municipal government in cooperation with social capital and takes the lead in PPP Project.

The core value of GR Group is “being brilliant is a habit”. It aspires to the innovative spirit that “nothing is impossible”. Embracing a large number of outstanding employees with the ability to innovate, the group recorded an income of RMB10 billion in 2017 and at a profit RMB1.5 billion.

4.1.2.2 Managing and organizing structure

The GR Group implements the general manager responsibility system under the leadership of the board of directors. The group has set up a board of directors, a board

of supervisors, and a management team to make strategic decisions, each of which is responsible for coordination and effective checks and balances of the group.

Currently the headquarters is composed of 11 departments, namely Office of Supervisors and Directors, Office of General Manager's Office, Strategic Development Department, Financing Business Department, Investment Management Department, Project Assets Department, Capital Finance Department, Human Resources Department, Supervision and Audit Department, General Administration Department and PPP Business Department. GR Group owns 24 holding enterprises including Gangteng Real Estate, Zhonggang Energy, Guanggang Culture and Tourism, Gangxin Funding and Lingang Construction, etc. The organizational structure of the group is shown in Figure. 4-1 and the enterprises of GR Group are shown in Figure. 4-2.

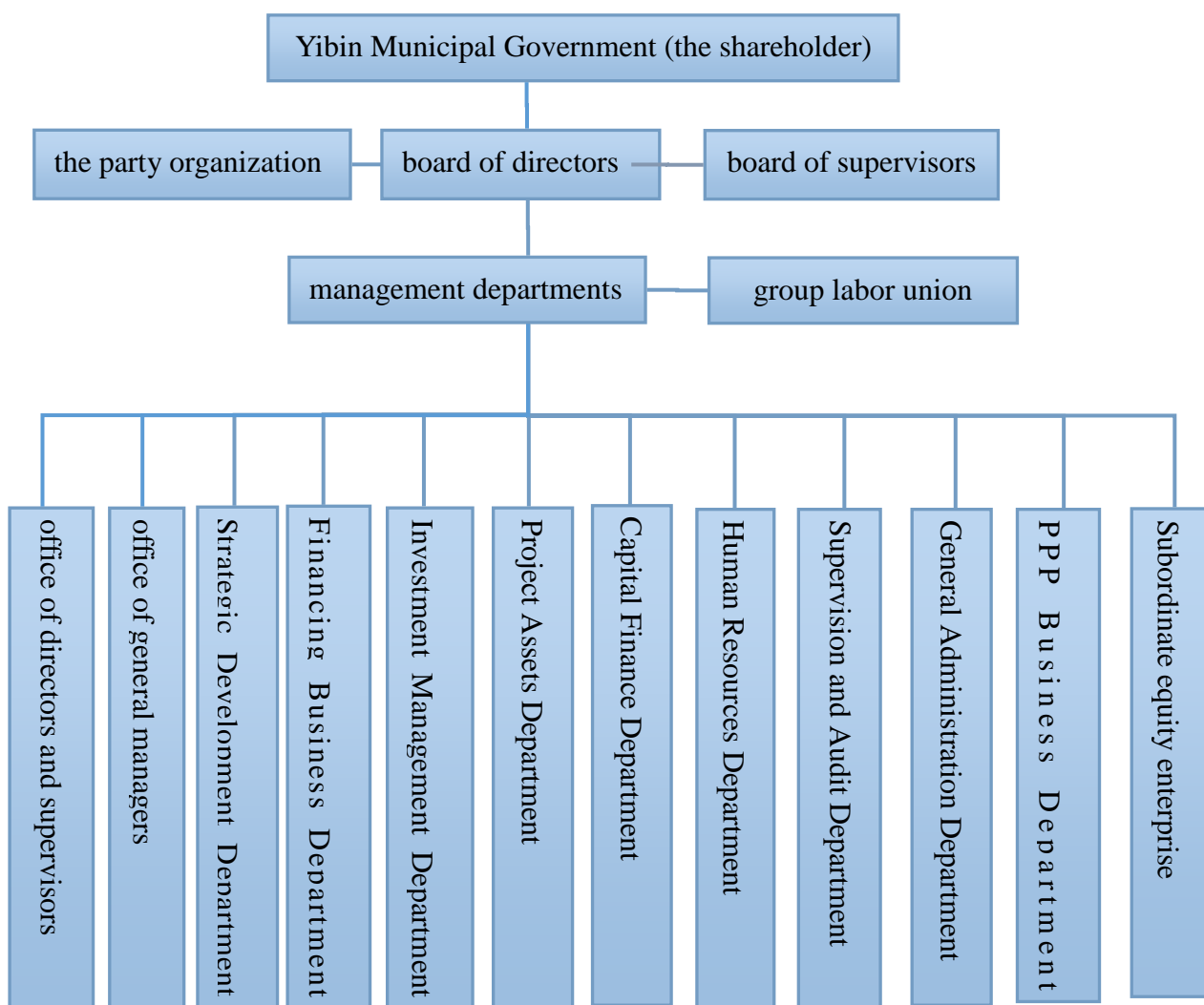


Figure 4-1 Group Organization Structure

Source: provide by GR Group

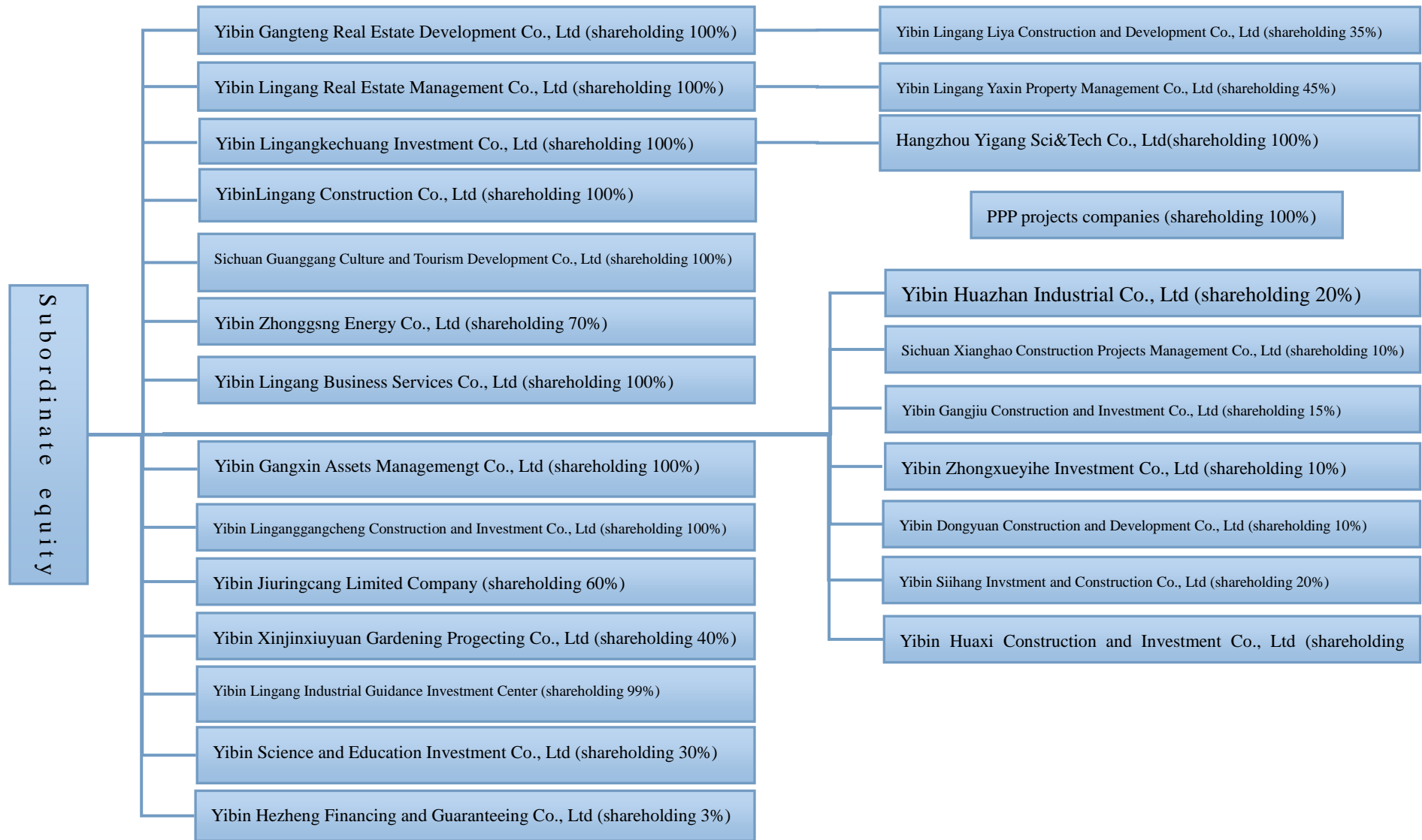


Figure 4-2 General Situation of Holding Enterprise

Source: provided by GR group

4.1.3 Significance of studying GR Group

GR Group is a large government-owned group. It is profit-oriented, service-oriented and is directed by policies. The group has the feature of both a state-owned and a private corporation. As for its employee relationship, there is a complex state in which the formal organizational structure and the informal employee relations are intertwined. Meanwhile, the employees, with their various social capital and social relations, make the informal relationship in the group more complex than that of a private group as informal organizations and relations like nepotism can impose an important influence on the decision-making of a group. Besides, such informal relations and organizations are playing a significant role in the behavior of knowledge sharing. Studying the knowledge sharing in state-owned enterprises, to a large extent can help understand how informal relations influence managing efficiency, knowledge and experience sharing and further influence the performance of the enterprise and its staff as well as their working attitude. In the study, the informal relation in the enterprise is combed, which is helpful for directors to better manage the staff, for spreading and sharing knowledge and information to accelerate its process of innovation and development. Therefore, studying the informal relation network is of both theoretical and practical significance. It provides references for enterprises to know how informal network influences the behavior of an organization and how to conduct innovative actions. Added, it offers a possible direction for enterprises to better employ and direct the healthy development of its informal network.

This study, based on the future development goal of the enterprise, conducts a research on the informal network within GR Group and figures out how it affects knowledge sharing. The future GR Group will be faced with larger market and a more complex environment, which means that informal network will be a more influential motivation or limitation. Thus, knowing the structural feature, role expectation and

influence of informal network in GR Group is the aim of this research.

In order to obtain statistics on the knowledge sharing network of GR Group, this thesis collects relevant data by combining semi-structural questionnaire and in-depth interview. The research was conducted at the headquarters of GR Group, which is located in Yibin, Sichuan Province. The number of employees at the headquarters is 57. Considering the objectives of this study, the thesis focuses on the overall network in which 57 employees are taken to 57 nodes. This number makes the overall network analysis feasible. Data for the study are from individual interviews and questionnaire which is in relation to network of selected respondents. Nomination is one of the two methods of designing questionnaires in a social network study. According to the requirements of the research, the interviewees are asked to write down the names, personal characteristics and interrelationship of people in their social network. However, there are disadvantages in using a nomination method. First, the network is not specific enough. But as this thesis adopts overall network analysis, this disadvantage can be avoided. Second, interviewees are likely to write down the details of people close to them, which means that weak relations are easily ignored and this may affect the accuracy of the research. In this research, an interview is added to questionnaire to reduce the effect unrepresented weak relationships.

There are in total 57 people at GR Group. All 57 employees were contacted and data from them were gathered through questionnaires and face to face interviews. It must be noted that, 12 people from the higher managing level were interviewed through face to face. To ensure its effectiveness, the research was divided into 3 phases.

Step 1: Questionnaire designing (July-October, 2016). The questionnaire was designed on the basis of the existing research and measuring scales. After a logical analysis conducted in conferences with expert and enterprise conferences, the variables were revised to ensure the reliability and validity.

Step 2: Pre-research (January 15-20, 2017). Before the formal research, this study conducted a pre-research in which 15 employees were chosen randomly to

complete the questionnaire and the interview. In the mock interview, the researchers initially surveyed the company's basic organizational profile, including the organizational structure, arrangement of departments, department managers, company employees, etc. and found out that the problems in the two sections and added some questions relevant to the organizational structure of GR Group. After the pre-research, the 2 sections are revised 5 times with the help of the executive manager (Mr. Zhao) and the final version of the questionnaire and the interview was drafted.

Step 3: Formal research (April 10-14, 2017). To ensure the reliability of the data, the respondents are divided into 3 groups to separately interview directors of departments (including Market Department and Human Resources Department), general managers and some high-level managers. The interview was about their work content, colleague assessment, and their definition of informal network. The interview was conducted in a relaxing atmosphere and no violation of privacy was not encouraged. The researchers committed that professionalism and assured respondents any response given in the interview will be confidential and is for academic use only. As for their work, taking the important projects in the past year as an example, the high-level managers are asked to describe the process of the project, problems occurred in implementing it as well as the solutions to the problems. Added, the interviewees were asked to name 3 persons with whom they communicate with the most, tell where they found the key information and with whose help or suggestions they overcome the obstacles. After 12 in-depth interviews, it was found that the high-level managers prefer getting information from colleagues to that from knowledge management database in the corporation and the internet. They posited that key information and important suggestions can be accessed from their colleagues. As for colleague assessment, taking the assessment and performance of staff in the past 3 months as an example, this research found the differences among the assessment within the department, between departments and in the democratic setting as well as factors causing these differences. As for defining informal relations, communication through QQ, WeChat, e-mail and telephone were also surveyed

besides formal organizational communication.

Finally, it is necessary to point out that enough time were provided for employees of GR Group to finish the questionnaire and all of them were interviewed in the absence of others to minimize the possible problems that could occur during the survey in order to ensure the authenticity, sufficiency, objectivity, integrity and accuracy.

4.2 Organizational structure of GR Group employees

This thesis focuses on the informal relation among people in an organization. Therefore, the staff structure and their cognition should be studied first to see the basic features and cognitive degree of them.

4.2.1 Staff structure

The number of the employees is 57 among which 36 are males, accounting for 63% and 21 are females, accounting for 37% (see Table 4-1). As males are more than the females, the equality of obtaining information and promotion may be affected. Small groups may be formed under such circumstance, which will be an obstacle for sharing information.

A total of 15 people accounting for 26.32% in this cooperation are between the ages of 31 and 35 years. Other employees are averagely in the other age range. Most of them are between 26 and 35 years old, which means that most of the employees are young and the atmosphere in this corporation is lively in which there will be more informal relation and communication.

Age of admission includes one's age when employed by a department and the age when the respondent got employed by the GR Group corporation. Working time refers to the length of time in years that respondents have worked in the said department. As is shown in Table 4-1, most of the staff (i.e. 46 persons) have been working in their respective departments for 0-2 years. The second is people who have

worked in their department for 3-5 years; this group accounted for 24.56%. Making a comparison between the two above, it is easy to tell that there is frequent staff shuffling among the departments. Most of the employees confirmed that they have worked in more than 2 departments in which they did not stay for long. Most of the employees know staff from more than 2 other departments.

Table 4-1 Basic Information of The Staff Structure

Item	Type	Number	Percentage
Gender	Male	36	63.0%
	Female	21	37.0%
	In total	57	100.0%
Age	20-25	7	12.3%
	26-35	24	42.1%
	Over 35	26	45.6%
	In total	57	100.0%
Working time	0-2 year(s)	46	80.7%
	3-10 years	9	15.8%
	More than 10 years	2	3.5%
	In total	57	100.0%
Education background	College and below	18	32.0%
	Bachelor degree	18	31.0%
	Master degree and above	21	37.0%
	In total	57	100.0%
Position	Low level manager	37	64.9%
	Middle and high-level manager	19	33.3%
	Chairman and general manager	1	1.8%
	In total	57	100.0%

Source: based on data from staffs of GR Group

In general, the educational background of employees in GR Group is averagely distributed in all levels and most people (accounting for 32%) have a master degree. The number of people with bachelor degree equals to that of people with college education. Large number of people with master degree means that senior intellectuals is common in the corporation, making it a well-educated team.

There is 1 chairman and general managers, 4 high level managers (including the chairman of the labor union), 15 middle level managers and 37 low level managers,

which fits the principle of pyramid.

4.2.2 Employees' attitude to knowledge sharing

According to Rational Behavior Theory, active attitude towards a certain behavior will cause more effort in it (Fishbein et al 1975). Based on this theory, Wing and Lai proposed a basic model of people's attitude to knowledge sharing (shown in Figure. 4-3). This research, guided by the model, firstly conducted a survey on all the staff to see how they attend and support knowledge sharing.

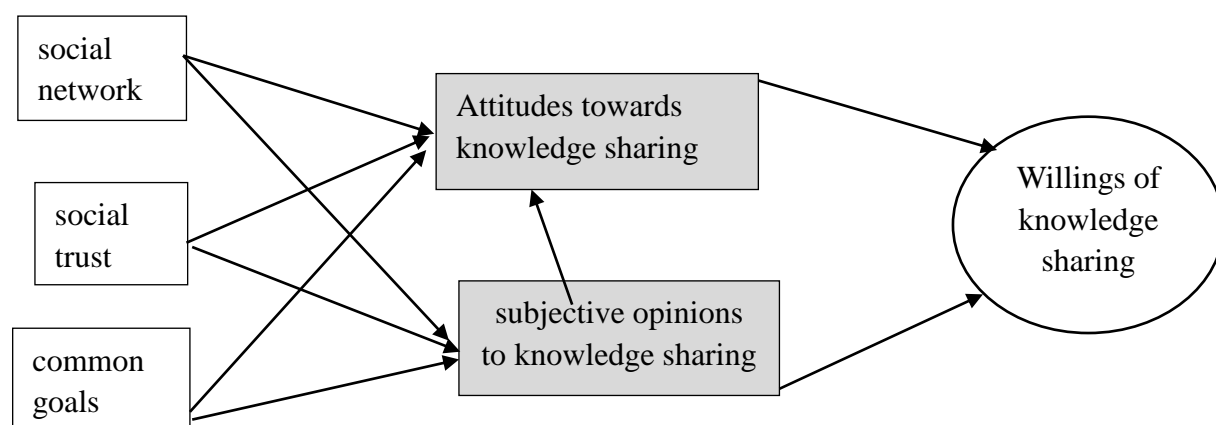


Figure 4-3 Model of Factors Deciding Knowledge Sharing Among Staff in A Corporation

In the modern era, creating, sharing and updating knowledge is more and more important. Knowledge as used here entails both explicit knowledge and tacit knowledge. Tacit knowledge refers to experience, skills and key working points gained through long term exploration and practice, which is not easy to get for everyone. How to realize the transformation between explicit knowledge and tacit knowledge is the focus of corporations and the most critical section is knowledge sharing in which employees communicate, interact, study directly or indirectly on formal occasions like working conferences, seminars and studying meetings, and informal occasions like corporation dinner parties, birthday parties and group outings. The knowledge sharing network of GR Group is studied in this thesis. On the basis of theories in the last chapter, the attitude of staff in GR Group towards knowledge

sharing and the 4 types of knowledge sharing network are analyzed to find the factors that promote or limit knowledge sharing and innovation. In this way, the knowledge sharing efficiency of the corporation can be improved and the competitiveness of it can be increased.

The survey on the attitude of staff and their opinion on knowledge sharing includes 4 parts, namely common goal and agreement, attitude towards knowledge sharing, subject rules about knowledge and future plan on knowledge sharing. As is shown in the Figure 4-4, the horizontal axis shows the degree of one's agreement with the opinion. Besides the information shown in Figure 4-4, there are other options, namely "totally disagree" and "strongly disagree" but such are absent on the figure because no one chose those options. The vertical axis shows the number of people that selected a particular option. There are in total 57 people surveyed of which 53 are valid. It is obvious that many people chose "strongly agree" for most opinions which means that the staff have a positive attitude to knowledge. As for problems and ideas in their job, the employees have the same opinion and the same goal, which provides a profitable environment for knowledge.

First of all, employees have a high degree of agreement in the corporation (shown in Fig. 4-4a). GR Group is a state-owned enterprise guided by a core aim. Meanwhile, it has strong executive force in spreading and sharing its goal, which is helpful for pushing forward knowledge sharing. This is a common feature of corporations of this kind.



Figure 4-4 Employees' Cognition of Common Goals

Notes: SG1. I have the same opinion with my colleagues on what is important in my job; SG2. My colleagues and I have the same aspiration and expectation in our work; SG3. My colleagues and I are keen on pursuing the aim and mandate of the corporation.

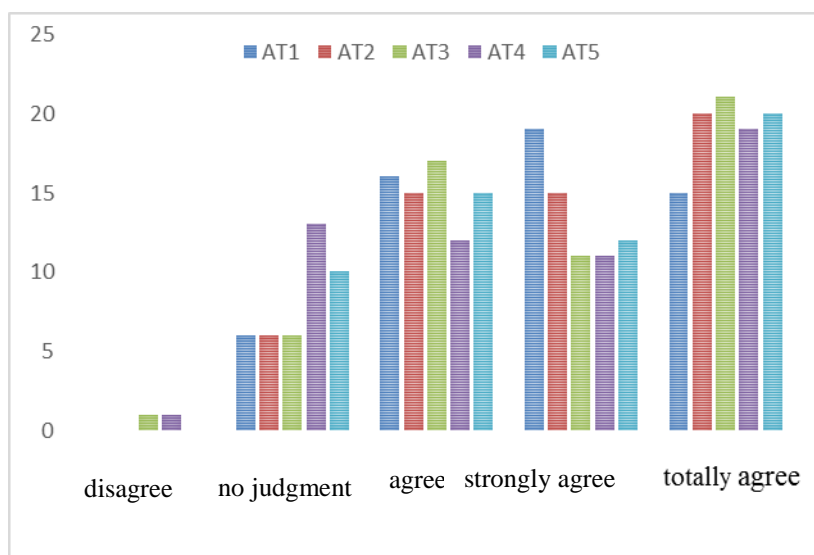


Figure 4-5 Employees' Cognition of Knowledge Sharing

Notes: AT1. It's always good to share my knowledge with colleagues; AT2. It's beneficial to share my knowledge with my colleagues; AT3. It's always a pleasure to share my knowledge with my colleagues; AT4. It's worthwhile for me to share knowledge with my colleagues; AT5. It's wise to share my knowledge with colleagues.

Secondly, as depicted in Figure 4-5, most employees agree that it is beneficial and pleasant to share knowledge with colleagues and have a common opinion that knowledge sharing is always beneficial. It enhances not only the fellowship but also the relationship among colleagues. This shows the colleagues' support to knowledge, which is the foundation of the inspiration for achieving the same goal.

Thirdly, Figure 4-6 shows that all staff of this corporation including the general manager, department managers and employees highly agree with the idea of knowledge sharing. Results from the study shows that knowledge sharing is well welcome between fellow employees and between levels of managers, which provides a suitable environment for knowledge sharing to realize.

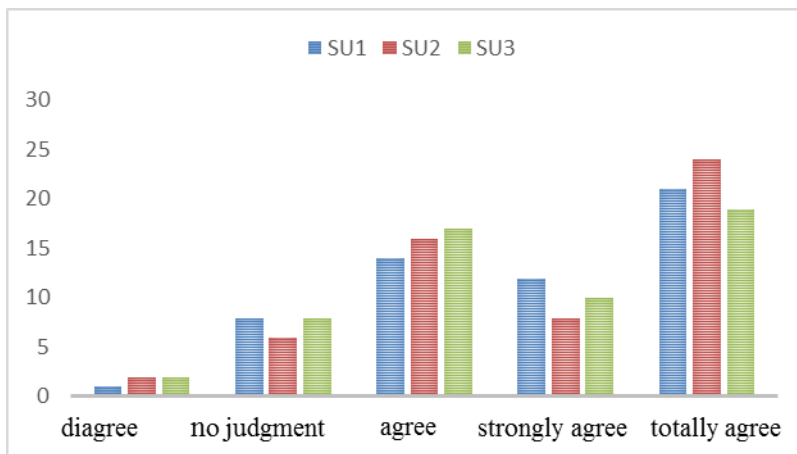


Figure 4-6 Subjective Principals of Knowledge

Notes: SU1. The chairman always believes that I should share my knowledge with others in the corporation. SU2. The department managers always believe that I should share my knowledge with others in the corporation. SU3. My colleagues always believe that I should share my knowledge with others in the corporation.

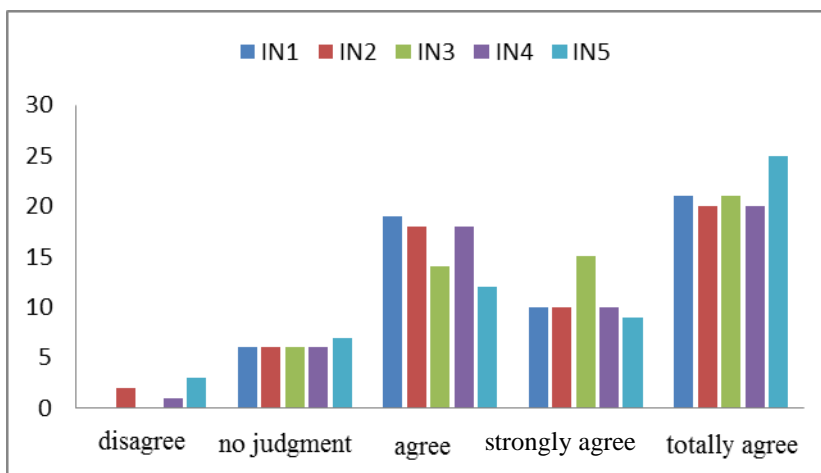


Figure 4-7 Employees' Plan on Knowledge Sharing

Notes: IN1. I am going to share my working report and official documents with my colleagues more frequently in the future. IN2. I will always share my working method and procedure with my colleagues. IN3. I will always share my experience and skills with my colleagues. IN4. I will share my resources my knowledge is asked by colleagues. IN5. I will try more effective ways to share my professional knowledge gained from education and training with my colleagues.

Finally, the research moves from the inner inspiration to specific actions of

knowledge. Figure 4-7 depicts employees' action of knowledge. The 5 questions are related to their plans on knowledge, including sharing skills and the sources of knowledge. Most employees agree with the questions. However, as those questions are all assumptions, employees will make reasonable decisions according to the condition they are in before they take action.

4.3 Basic Structure of Informal Network

4.3.1 Generation of the network

Analyzing the data through social network analysis requires relational data matrix which is usually based on model data. Every unit in the matrix shows the relationship between the row objects and the column objects. For example, the 5 network-related questions in the questionnaire involves the network relation among employees in terms of problem solving, working guidance, friendship and emotional support (see Table. 4-2).

The responses from the questionnaire survey were coded according to the answer options selected by the employees. First, the value of diagonal sections in the 4 relational matrixes are 0. Secondly, all the 4 matrixes are directional asymmetric matrixes. If employee A mentions employee B, the value of this element is 1; or if employee B mentions employee A.

Using S1S5 and S5S1 as examples the values of S1S5 is 0, which means that S1 is the one filling the questionnaire from whose point of view he/she does not have much communication with S5 on career and work; the value of S5S1 is 4, which means that S5 believes that he/she communicates with S1 a lot on career and work. This shows that the communication between S1 and S5 is not equal and no close relation has been established between them. Thus, they are not in each other's core communication circle.

Table 4-2 Type of Knowledge Sharing Network and Relevant Questions

	Question	Type of knowledge sharing network
Question 1	Who will you talk about your information and suggestions about personally career and development (such as ways of promotion and department transfer).	Problem solving network A
Question 2	Which colleague have given you information and suggestions about career and development?	Problem solving network B
Question 3	Who will you discuss with when you encounter with problems at work?	Working guidance network
Question 4	Have you been in problems like working stress, personal relations, and sentimental status? Did you communicate with others and ask for help and support when you are in social problems or negative emotions? Who have you ever communicated with in seeking for psychological help or emotional support from?	Friendship network
Question 5	In the past 6 months, who in this corporation do you view as your friends? Friends refer to those with whom you would like to spend your time with. For example, you may invited or be invited to each other's house, drink tea or coffee or have dinner together, go outing, watch shows and movies, and hang out in the bar.	Emotional support network

Table 4-3 Relational Matrix of Knowledge Sharing Network

	S1	S2	S3	S4	S5	S6	S7	S8
S1	0	0	0	1	0	0	0	0
S2	0	0	0	1	0	1	0	1
S3	1	0	0	1	1	1	1	1
S4	1	0	1	0	0	1	0	0
S5	4	0	0	0	0	0	0	0
S6	0	0	0	0	0	0	0	0
S7	1	0	1	0	0	0	0	0
S8	0	0	0	0	1	0	0	0

This thesis analyzes knowledge sharing network through UCINET, a social

network analyzing software. It firstly put the 57 members in line to form a 57*57 matrix. The values in the matrix represent the network relations between individuals. As the 57*57 matrix is too large, only a part of it is shown in this thesis (Table 4-3).

4.3.2 Visible structure of a knowledge sharing network

After successfully collecting data through the questionnaires and interviews, we form a statistics matrix and draw 4 knowledge sharing networks utilizing the Netdraw function of the UCINET software. These four knowledge sharing networks are problem solving network (Figure 4-8 and Figure 4-9), working guidance network (Figure 4-10), friendship network (Figure 4-11) and emotional support network (Figure 4-12). Among these four relational graphs, Figure 4-8 is a bidirectional one describing the information communication and suggestions among colleagues; Figure 4-9 is unidirectional as it is based on individuals who give out information and suggestions. As is shown in the network below, the arrowheads show the directions of nomination. The directions of the arrowheads are divided into inwards and outwards ones. The inward arrows point to oneself, which means that he/she is mentioned by other respondents. And the outwards ones point to others, which means he/she mentions other colleagues.

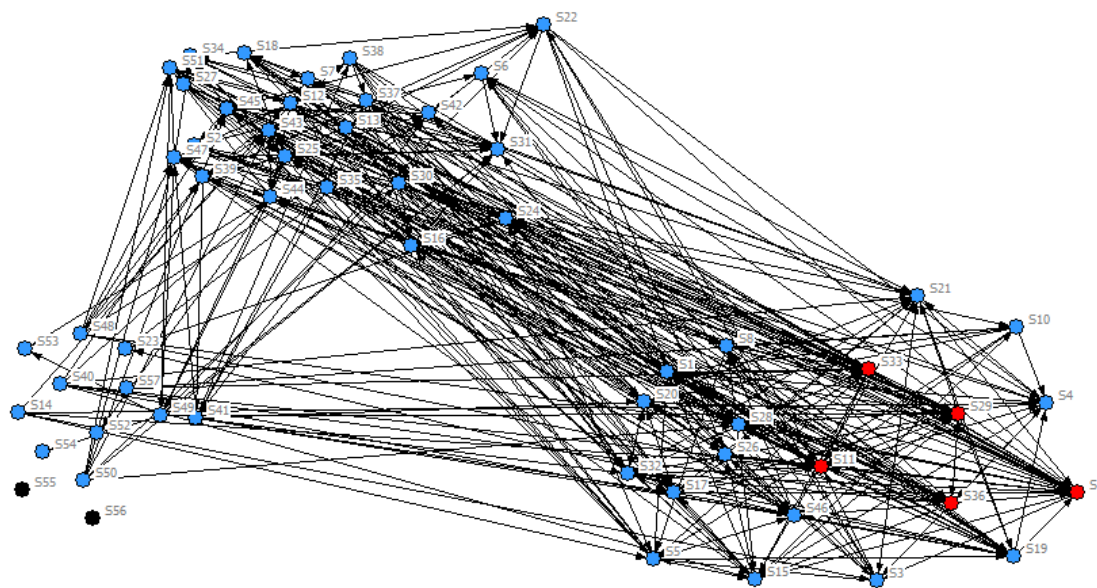


Figure 4-8 Problem Solving Network a

Source: Sorted out by Ucinet 6

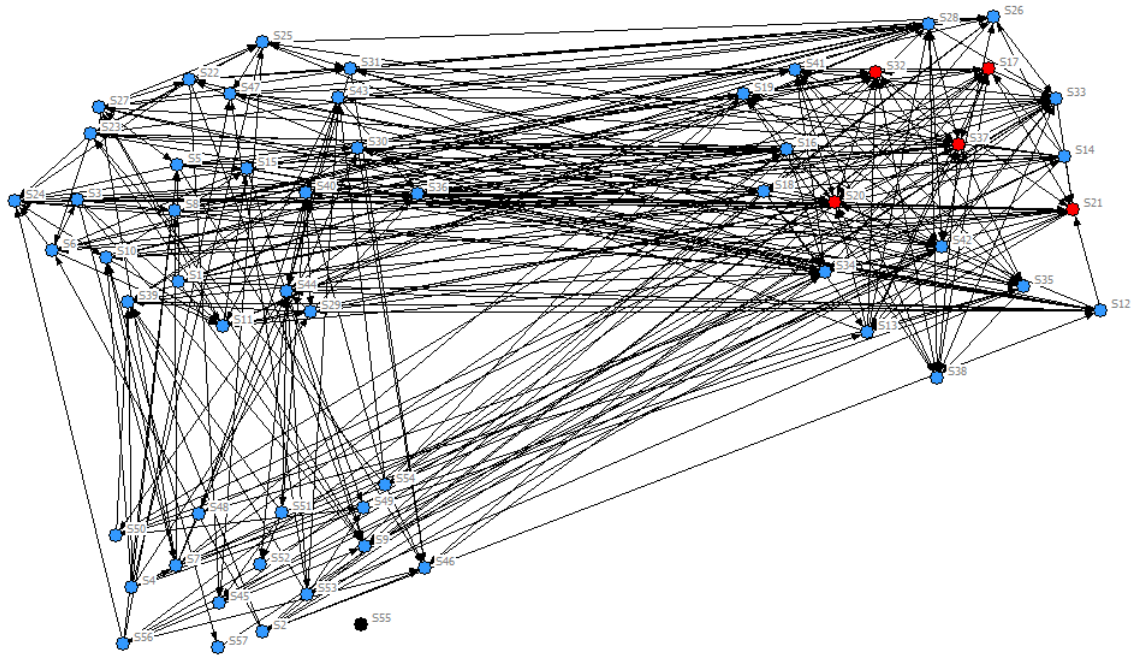


Figure 4-9 Problem Solving Network b

Source: Sorted out by Ucinet 6

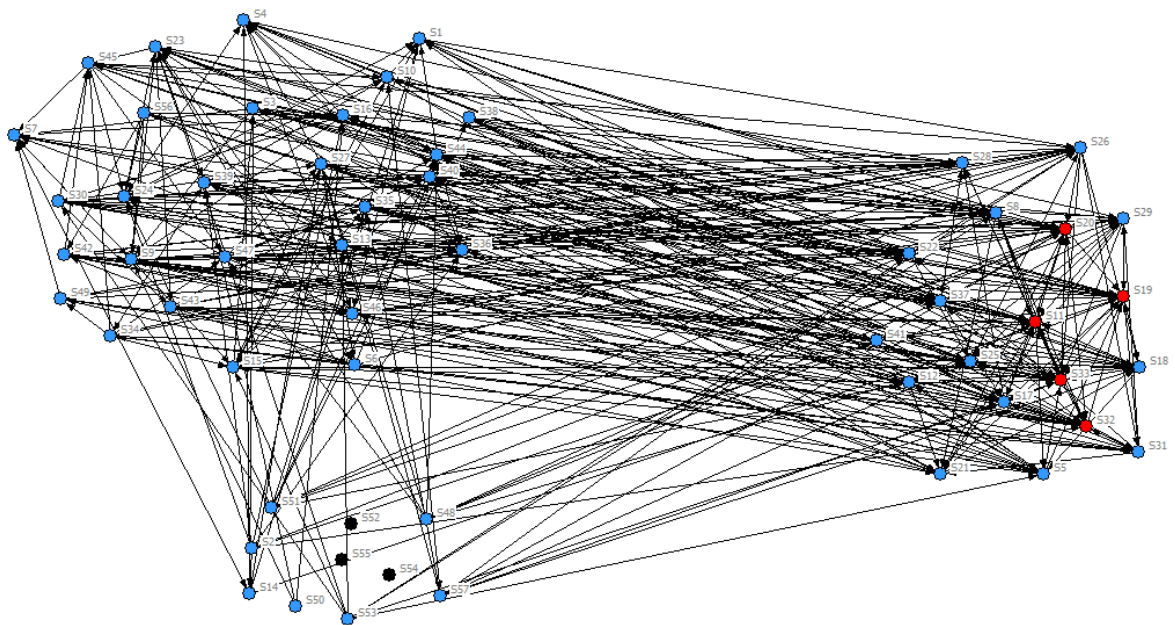


Figure 4-10 Working Guidance Network

Source: Sorted out by Ucinet 6

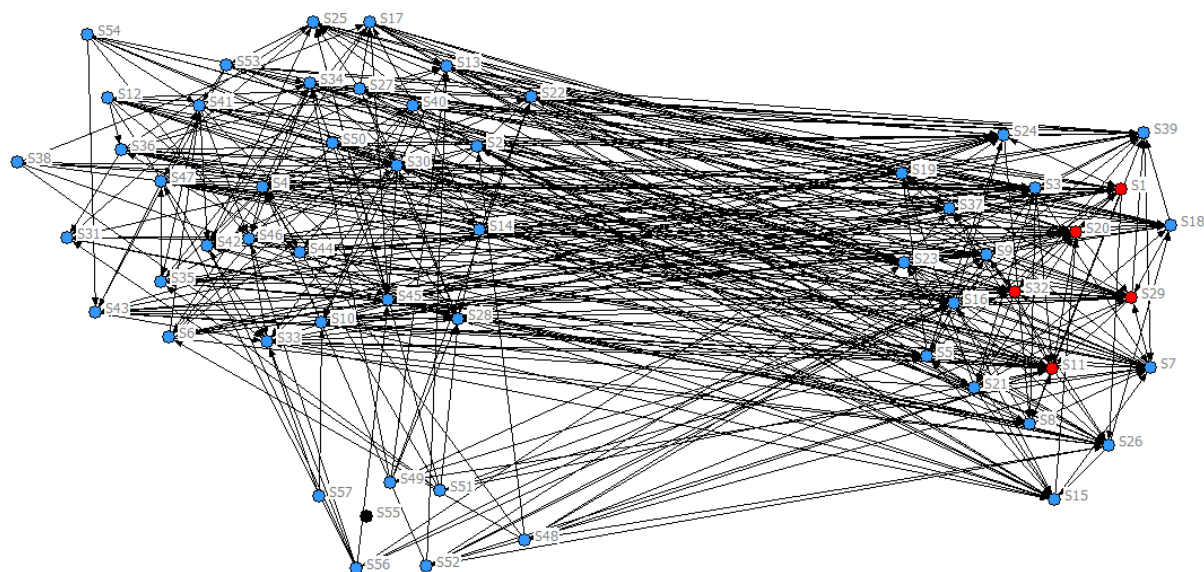


Figure 4-11 Friendship Network

Source: Sorted out by Ucinet 6

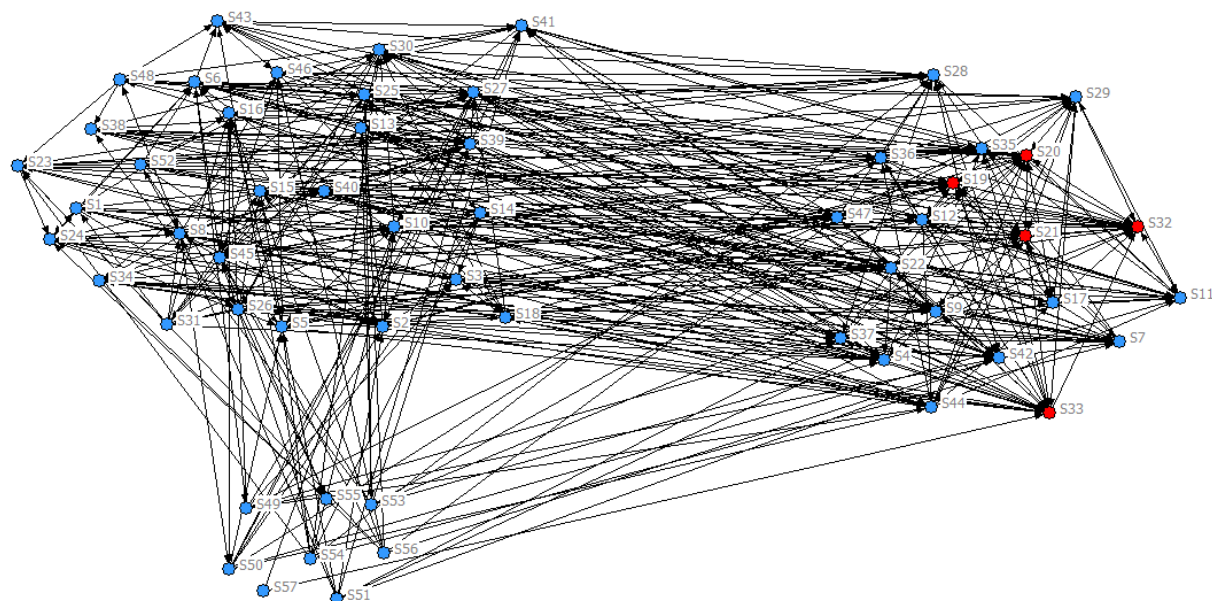


Figure 4-12 Emotional Support Network

Notes: nodes with many ties are marked red; nodes with no tie are marked black; other nodes are marked blue.

Source: Sorted out by Ucinet 6

In the Figures, the round nodes represent individuals in the organization and the direction of arrows represents the direction of nomination. Nodes are marked by 3

colors:

(1) The red nodes represent the top 5 ones with the most ties with others, or employees in touch with many members of this organization. Such individuals either enjoy great popularity or being in a special position which requires frequent ties with others. In the visible structure of problem solving network A (Figure 4-8), S9, S11, S29, S36 and S33 have the most ties; in the visible structure of problem solving network B (Figure 4-9), S20, S37, S32, S21 and S17 have the most ties; in working guidance network (Figure 4-10), S20, S37, S32, S21 and S17 have the most ties; in friendship network (Figure 4-11), S11, S20, S32, S29 and S1 have the most ties; and in emotional support network (Figure 4-12), S19, S32, S33, S20 and S21 have the most ties.

The results show that among the 4 networks, S32, S11 and S20 have the most ties. The departments they belong to are Investment Management Department, General Administration Department and Investment Management Department for S32, S11 and S20 respectively. These three departments are the core functional parts of the corporation and all S32, S11 and S20 are heads of their respective departments. They hold a variety of resources and information and have lots of ties with employees. Their resources and information provide them with advantage of making ties with others. It is expected that those who have more information, knowledge and resources are more likely to accumulate more social capital. Through the interview it was discovered that S20 is a senior employee with rich working and social experience; S32 is well-acquainted with techniques and talents, and with outstanding education background and professional skills. The three employees receive a lot respect from other employees who communicate with them on problems in work and life.

(2) The black nodes are the so-called separated nodes. Those employees seldom connect with others, neither do others connect with them too. According to the survey, most of them are expatriates of the corporation who have only very formal ties with the headquarters. In the 5 networks, S55 is identified as eye-catching. When asked to name some colleagues, he refused. In the first 4 networks, he was never mentioned

but in the last one, he was nominated 3 times, which means that 3 colleagues believe that S55 could provide them with emotional support. However, the 3 of them never see S55 as their friend and this is an unequal relationship. In their point of view, S55 offers them psychological comfort when they are sad but never offers help at work.

(3) Most of the employees occupied the blue nodes. Their ties with colleagues are neither too frequent nor too rare. In fact, all the 4 kinds of networks are divided into 3 parts: nodes at the upper right are the top 20 ones with the most ties; the lower left holds the most nodes with 10 or less ties; and the other nodes are at the upper left. By analyzing the network data it was found that in the 2 networks related to problem solving, there are many nodes at the lower left. And in other networks there are not many. This shows that many people are forgotten or separated in problem solving. Employees tend to ask some certain colleagues for advice.

It was also found that, with the development of the internet, most of the interviewees (i.e. 56%) chose QQ and WeChat as their way of communication. As for some work-related details, some (i.e. 26%) may choose phone call. In this traditional state-owned enterprise, e-mail is the least used medium of communication (7%). While dealing with important problems, employees choose to communicate face to face (11%).

4.4 Analysis on Informal Network Index

4.4.1 Analysis on the density of knowledge network

Density of a network is the ratio of actual number of ties and its theoretical maximum. The ratio is between 0 and 1. The larger the density (close to 1), the closer the member of the organization. And in this way, the organization imposes greater influence in the attitude and behavior of its members. Closely connected networks can provide a variety of social resources for individuals in the network such as information about job promotion, working experience, dating information and social information. The density is calculated with Ucinet 6.0 and the results are presented in

Table 4-4.

Table 4-4 Density of Knowledge Network

	Density	No. of Ties
1.problem solving network A	0.218	695
2. problem solving network B	0.181	577
3. working guidance network	0.281	897
4.friendship network	0.287	915
5.emotional support network	0.261	832

Source: Sorted out by Ucinet 6

The density of the networks is 0.218, 0.181, 0.281, 0.287 and 0.261 for problem solving network A, problem solving network B, working guidance network, friendship network and emotional support network respectively; and their corresponding number of ties are 695, 577, 897, 915 and 832. The real maximum, as is shown in the research by scholars, is 0.5. Based on the results, it is evident that there is large difference among the density of the 4 kinds of networks and among the numbers of ties of each network. Among the 4 kinds, problem solving network registered the fewest ties. In the other 3 kinds, there are large number of ties and small distance between them.

The analysis shows that as problem solving network involves professional and technical knowledge, employees tend to ask certain colleagues for help rather than ask widely for suggestions. As a result, although a few employees have large number of ties, there are less ties in problem solving network in general. In the other 3 kinds of networks (i.e., working guidance network, friendship network and emotional support network), with ties on work, personal feelings and individual relationship, many small groups within a department or among friends were identified, which results in the large number of ties. On the average, however, the number of ties per capita is 12.19, 10.12, 15.74, 16.05 and 14.60. In other words, every member has 12.19, 10.12, 15.74,

16.05 and 14.60 ties with others. Such facts show that there is not many informal ties among employees of GR Group, and its knowledge sharing network is sparse. Based on the sum and average values, the density of knowledge sharing network is low with some codes separated, which may be the main reason for the low density. As expatriates, they work outside of the corporation on the long run and have few ties with other employees. Thus, it arguably not necessary to calculate their network density. Compared with that in other networks, the average number of ties in friendship network is larger and members are more closely related to each other. Meanwhile, the average number of ties in problem solving network is the smallest and members are the least closely related to each other.

4.4.2 General centralization of knowledge sharing network

The general centralization of knowledge sharing network was calculated with the matrix data and through Ucient 6.0 in three steps: (1) Network, (2) Centralization, and (3) Degree. The result is shown in Table 4-5.

Table 4-5 Top 5 Centralization in the Knowledge Sharing Network

Network Centralization (Outdegree)	Network Centralization (Indegree)
10.108%	10.472%
10.861%	7.589%
7.350%	9.168%
9.235%	10.325%
3.627%	3.476%

Source: Sorted out by Ucinet 6.

As is shown in Table 4-5 the centralization value of the top 5 in the knowledge sharing network, the centralization based on the 5 questions are different with the largest 10.861% and the smallest 3.627% and the central density is low. According to extant literature, after numerous debates, experiments and calculation, many scholars concluded that the maximum of the real centralization is 50%. As a result, the general centralization in the GR Group corporation is low, which means that members in the

knowledge sharing network are not close and are without frequent knowledge sharing and communication.

4.4.3 Intermediary centralization of knowledge sharing network

As is described previously, the member with the highest intermediary centralization is the key to the network structure. It can be demonstrated that their advantaged location affects and controls the information communication in the organization. This thesis, by studying the intermediary centralization of the knowledge sharing network of GR Group, makes sure to uncover which members are at the key location of the network and which ones are at the margin. The results from such analysis can provide insights, suggestions and recommendations for managers. The intermediary centralization value ranges from 0 to 1. If the information communication of individuals is not limited by any nodes, the intermediary centralization is 0; if the intermediary centralization is 1, this member is at the advantaged location of the knowledge sharing network and is of great significance. This employee can somehow control the communication and transfer of information within the network. In other words, the larger the intermediary centralization, the stronger its control.

The intermediary centralization values in Table 4-6 and Table 4-7 were calculated using the following Ucient steps: (1) Network, (2) Centrality, (3) Freeman Betweenness, and (4) Node Betweenness. It was found by analyzing the intermediary centralization values of the kinds of network that the intermediary centralization values of S11, S19 and S44 are relatively high. This means that no matter the kind of network they are in, be it work or emotion networks, these 3 nodes have strong control on information. As the ones occupying key positions in the network, they are well abled. If they refuse to connect, the nodes at both side of them will fail to communicate; thus, these 3 nodes are at the important locations in the network. It is found in the survey that S11 and S44 are employees of General Administration Department and S44 is the director of this department. General Administration

Department is responsible for the daily administrative work, as well as human resources and law affairs. They need to supervise the decision making, job allocation and other important tasks and give the feedback in time. Meanwhile, they should design the corporation’s plan, conduct research, development ties with and keep in touch with other organizations on behalf of the corporation, which requires wide connection with members inside and outside the corporation. Employees of General Administration Department are in charge of both the transferring of various information and messages and supervising the implementation of decisions and information; thus, they hold large amount of information. Respondent S19 is an employee of Strategic Development Department, has been working in the GR Group corporation for 5 years and has been in many other departments. With strong working ability and a humorous, easygoing personality, S19 gets along well with most of the employees.

Table 4-6 Intermediary Entralization of Pobleml Solving Network

Problem solving network A		Problem solving network B	
Nodes	Intermediary centralization	nodes	Intermediary centralization
S11	6.957	S44	8.822
S44	6.765	S20	8.170
S29	6.211	S21	6.783
S28	6.198	S34	6.137
S19	4.505	S33	5.983
S9	4.017	S19	4.908
S20	3.861	S42	4.248
S15	3.696	S28	3.793

Source: Sorted out by Ucinet 6

Table 4-7 Intermediary Centralization of 3 Kinds of Networks

Working guidance network		Friendship network		Emotional support network	
Nodes	Intermediary centralization	Nodes	Intermediary centralization	Nodes	Intermediary centralization
S19	5.087	S25	5.320	S24	4.524
S11	4.371	S19	4.624	S11	4.197
S33	3.613	S33	4.350	S4	3.944
S23	3.376	S6	4.184	S3	3.482
S15	3.302	S8	3.932	S39	3.337
S25	3.113	S45	3.770	S9	3.002
S9	3.109	S32	3.207	S25	2.964
S22	2.954	S3	3.155	S1	2.915

Source: Sorted out by Ucinet 6

It is found that the intermediary centralization of problem solving network is high compared to the other 3 kinds of networks, whose intermediary centralization is relatively low. Among them, the intermediary centralization of the emotional support network is the lowest. The low intermediary centralization of working guidance network reflects that there is no severe technical monopoly in GR Group. The technology is not accumulated in and handled by a single person. The provider of key knowledge has no strong control on the circulation of technological knowledge and information and communication of this kind of knowledge does not necessarily pass through the knowledge provider, but through various paths. The intermediary centralization of emotional support network is the lowest, which shows that there is no one or some certain “emotion therapists” in this group and employees seek for emotional support or comfort from a widely ranged group.

4.5 Network Analysis Findings

4.5.1 Explanation logic of a social network theory: status = information

4.5.1.1 Statement of problems

Investment banking is the leader of the U.S. financial community, playing a decisive role. An important product of investment banks is to help companies raise funds and go public on the stock market. One of the main contents of these business activities is the investment bank's assessment and appraisal of the listed company's capabilities. Once the listing conditions of these companies are fulfilled, these investment banks will take the lead to pull in other bank partners to subscribe to the shares of the listed company (original shares) for their respective customers. A distinctive feature of the U.S. investment banking industry is that it has a stable and well-known reputation for hierarchy. For example, when a company goes public or issues new shares, a large investment bank will lead other bank partners to subscribe to its shares. These activities are regularly published in industry magazines and are called tombstone advertisements. The arrangement of banks in these advertisements are carried out according to a strict hierarchical system similar to the age sequence of seats on tombstones. The seating sequence of these banks is a manifestation of the banking reputation for hierarchy. Some key question that arise are, how is this hierarchical system established? And what is its significance? The sociologist, Joel Podolny and James (1997), studied this phenomenon in a 1993 paper and concluded that social network status as a social mechanism was introduced to explain the bank's reputation system.

4.5.1.2 Explanation logic of social relationship network

It can be argued that there are various problems and difficulties with regard to information in the financial industry. For example, many listed companies do not have a molded product and production scale. For general investors, it is difficult for them to know the potential of these listed companies. There is a high degree of information

asymmetry (the listed company holds more information about the business than the investors), and uncertain future behavior (the company's future development status is unknown). One of the means to solve this difficulty is the signal mechanism discussed above; investors need some reliable signals to help them distinguish the quality of different listed companies; listed companies also need some kind of signal to provide information about the high quality of products of their companies.

Podolny and James (1997) suggested that the position of a company in a network between companies is such an important signal. Information on other companies a particular company deals with is often a sign to measure its status and importance. For example, a high-tech company's product is used by Microsoft, which shows that the company's products are of high quality. If a company's product accessories use products from other high-profile companies (for example, Microsoft's software and Intel's drives are used in computers), customers can also speculate on the quality of the products. Similarly, a high-status investment bank has a good reputation for assessing standards, auditing capabilities and practical experience. If it gives affirmative approval to the status and potential prospects of listed companies or projects, such could provides "high-quality products" signal, which solves the difficulty of information asymmetry between listed companies and investors. Therefore, once the shares of a listed company have the sponsorship by these large investment banks, investors will rush to subscribe.

Podolny's (1993) theory is based on the logic of social network theory. The basic idea is that in a society or industry, there is often a stable social hierarchy that everyone recognizes. Different companies establish relationships with high-status companies to signal the quality of their products. Since a company's commitment to high-quality products is often not directly observable, these practices associated with high-status companies indirectly signal the quality of the product. We can often observe similar phenomena in our daily lives. Many companies at the time of advertising always want to emphasize that their products are exported to all parts of the world, or their products use new technologies invented by certain famous

manufacturers. These practices are all about establishing a connection with other socially recognized hierarchies in order to signal "high quality" products. These methods of pursuing status and sending signals reinforce the stability and importance of social network structure and hierarchical status. In a market competition, the social network status of a company reflects the well-recognized hierarchical system in the same field and has an important signal function.

Therefore, social relationship network and people's position in such network have become an advantage of market competition. First, the network status of an organization increases its popularity and thus reduced advertising costs. For example, famous universities do not need to invest heavily in publicity, but it has ample sources of students and scholars. Second, the high status of an organization makes people willing to have relationships with them, promotes its resource exchanges with other organizations, and thus enhances its competitive advantage. The competitive advantage based on this status has strengthened and stabilized a hierarchy in an industry.

Podolny (1993) did an empirical study to test the proposition that network status can improve a company's market competitive advantage. He analyzed the differences in the fees of different investment banks in providing underwriting securities, that is, the difference between the price that a listed company sells to investment banks and the post-listing price. According to the above theory, different social network statuses provide different competitive advantages for different organizations (such as investment banks). If this proposition is established, we should observe such an empirical phenomenon that the price difference between charges and the bank's network status is proportional; that is, high-status banks can get more profits from the same services. According to the rank of each investment bank in "tombstone" advertising, Podolny (2001) calculated the ranking system between the investment banks and the status sequence of each bank, and then used a statistical analysis method to examine the relations between the bank's status and order and the price difference. The result of this study is consistent with Podolny's empirical proposition. Since then, Podolny (2001) has also applied this idea to research and explain the

influence of social network status on the competitive advantage of different organizations in other industrial fields (including wine manufacturing and transport).

In general, the results show that the density and the intermediary centralization of problem solving network, working guidance network, friendship network and emotional support network is not high, which shows that the informal network in GR Group is not closely related and the informal knowledge sharing relationship is not firm. A fixed knowledge sharing paths have are yet to be realized and put into practice. Some of the employees are at the key position in the network with many connections with others. Others have only a few ties with colleagues. In other words, these several employees are important structural poles of the network, by which all the knowledge information communication is controlled. In conclusion, as for how to improve the inner communication and knowledge sharing, several suggestions are proposed:

(1) It is imperative to correctly recognize and guide the potential relationship network and key figures in it. The relationship network in any organization should undergo a procedure of birth, growing and improving. The managers should recognize the birth of the network and provide necessary support and guidance to sustain it. As a starting step, management should communicate face to face with employees on a regular basis to know their social work, their lives and their needs, help them realize activities with great encouragement on spreading knowledge. They should encourage employees to attend more knowledge sharing activities and involve more people in those activities. Secondly, the managers should provide a clear “map of knowledge” for employees in line with the knowledge database of this organization through such means as asking for help and discussing problems as such can help establish good relationship. After all, a good relationship could guarantee that work will run more smoothly. Thirdly, managers should recognize the key players in the network. Those employees, located at the key position, function as the bridge through whom one can reach others. Compared to other employees, they have greater control and influence in communication. Hence, the managers should inspire and guide them to learn and communicate well.

(2) The general density of problem solving network is relatively low but its intermediary centralization is high. This means that some employees are of great importance in the problem solving of others. Most of the employees cause problems rather than solve them which explain the reason why the general density is low. Managers should hold technique sharing meetings to lower the intermediary centralization of the problem causers and spread knowledge to other employees.

(3) In working guidance network, members with high intermediary centralization are easy to group. Such small groups are exclusive to others and information is spread within the group it. The result of employees grouping might be marginalization and separation of some employees, which causes harm to the harmony and steadiness of the corporation. Managers should pay special attention to those key employees who are outstanding and praise them materially to enhance the collective consciousness of all members. In this way, the cohesion among members are strengthened and the small groups open up to others for more communication.

(4) Friendship network is a network feature with social circles of employees. The existence of friends is of positive influence to one's daily work and life. Results from this thesis show that the intermediary centralization of friendship network of GR Group is low; which means that among employees social circles, friendship relation are equal and no outstanding figure exist.

(5) The high intermediary centralization of emotional support network means high cohesion. In a standard corporation, colleagues and friends support each other when one is in trouble a harmonious social relation is helpful for work in such a case. With good interpersonal relationship, employees are more willing to provide emotional and working support, which is beneficial to the sharing of information and resources. Therefore, the corporation should encourage interpersonal communication and interaction among employees to enhance their fellowship and understanding and strengthen their sense of belonging.

(6) It is laudable to keep shuffling of employees and resources reasonable and bearable levels. A reasonable shuffling of employees among different position is

helpful for mutual understanding and improvement of social communication network. It is also helpful to lower the cost of searching for knowledge and enhance the effect of knowledge sharing. Added, employees, by shuffling from one position to another, can get a better understanding about the corporation and strengthen their friendship. They will especially benefit from learning from colleagues with much knowledge and experience. Besides, the strategic and knowledge alliance between corporations enlarge the communication among employees, enable them to learn from other corporations and improve their ability of innovation. This is helpful for preventing the homogenization of the concept of network members due to the closure of the network and for realizing the benefits due from knowledge sharing.

4.6 Findings

This chapter includes the descriptive and social network analysis of responses from the questionnaires administered. The descriptive analysis deals with basic information including gender, age of entering the corporation, knowledge about the organizational structure of the corporation as well as employees' attitude towards knowledge sharing, etc. in order to have a clearer understanding about the employees and the knowledge sharing condition of GR Group. This is followed by an analysis on the density and the intermediary centralization of 4 kinds of networks depicted by the employees' behaviors on knowledge sharing. The results show that the density of the 4 kinds of networks is not high, which means that the colleague relationship, working guidance relationship, friendship relationship and emotional support relationship in daily affairs of employees are loose, which is in line with results from the intermediary centralization analysis. GR Group should take actions to enhance the communication and fellowship among its employees to improve the downturn in knowledge sharing.

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Chapter 5: Conclusions and Implications

The thesis conducts an in-depth research on the subject of informal networks within enterprises with reference to relevant research at home and abroad. Specifically, it discusses the concept and basic structure of informal networks and proposes its constituent elements with theoretical justifications. Based on theories of organizational behavior, social network and informal organization, this research makes a structural analysis of informal network within an organization, putting forward four sub-networks for problem solving, work guiding, friendship and emotional support.

The thesis mainly follows a case study approach with the GR Group as the case corporation. The research results presented herein were obtained by processing first-hand and second-hand data from respondents. The GR Group is a major local state-owned enterprise funded by the government of Yibin, in Sichuan Province of China. It is a functional enterprise, serving on a market-oriented operation platform of the Yibin Lingang Economic and Technological Development Zone (herein referred to as the Lingang Development Zone), a state-level economic development zone established by the government of Yibin. Thus, it is a market entity in charge of the operation of capital and industrial development of the Lingang Development Zone. It fully participates in investment, development, construction and operation of the Lingang Development Zone in accordance with the general idea that an enterprise should operate by abiding by rules of the market under leadership of governments. As at the time of drafting this report, the GR Group has 500 employees in 24 holding companies.

In order to acquire data on network relations of knowledge sharing within GR Group, the paper collects relevant data by combining semi-structured questionnaire surveys and in-depth interviews. In the pursuit of the research, a total of 57 employees of the GR Group headquarter in Yibin were interviewed. Based on the research objectives and the case study, the paper conducts knowledge sharing-related research

with all 57 employees as 57 network nodes. It conducts a network analysis of the survey data of the 57 nodes, portraying the GR Group employees' structural features of informal network in the organization.

Social network research method refers to research to research that studies the relations of a group of actors. The actors can be people, community, group, country, etc. and the phenomenon or data reflected by their relational models as the focus of network research. Social network research and analysis originated in the field of sociology, which has been widely used in research fields such as management, economics and psychology. It has achieved much success in many disciplines as a quantitative research method.

Based on the results, this thesis first proposes sub-networks for problem solving, work guiding, friendship and emotional support with help of the social network research method and the Ucinet analysis tool. Then it continues to make an analysis of features of an internal informal organization such as network members, methods of networking or establishing connections and the strength of a network link. The structural indicators of each sub-network are also extracted to depict the basic structural pattern of the informal network within the GR Group.

5.1 Conclusions

From the in-depth analysis presented in the study, it is conclusive that the attitude of employees of GR Group to knowledge sharing is a positive one. Out of the 57 people surveyed, more than three-fourths selected 'agree', 'strongly agree' or 'totally agree' to the assertion on employees cognition of common goals which makes it obvious that the staff have a positive attitude to knowledge sharing. Added, other questions relating to employees' thoughts of knowledge sharing and their plans on knowledge sharing equally achieved significantly high responses in favor of 'agree', 'strongly agree' and 'totally agree'. In their quest to improve communication, smoothening the flow of information among themselves, and extending a hand to one

another when necessary, the employees of GR Group have created four key informal networks namely network for problem solving (A and B), working guidance, friendship and emotional support. It was realized that respondents S09, S11 and S33 play key role in the informal network and are pivotal to the control of information and knowledge sharing in the network. Based on the findings, the following conclusions are made.

5.1.1 Employees' attitudes to knowledge sharing affect the behavior of knowledge sharing.

According to the behavioral incentive theory, employees' attitudes to knowledge sharing determine the company's behavior of knowledge sharing. Based on the research, the GR Group employees follow the general law of the incentive theory in knowledge sharing, and they have a high degree of recognition in both the subjective sense of sharing and the shared knowledge of other people. The unity in attitudes allow employees to participate much in knowledge sharing, which is conducive to building a unified group and key to realization of corporate goals.

5.1.2 Network leaders in the informal network.

There are always one or several knowledge providers and mediators in an organization that play an important role in knowledge sharing of an organization and control the circulation and sharing of knowledge. This study finds S09, S11 and S33 as key leaders of information in the GR Group case. They are absolutely the core sources of knowledge in the four sub-networks identified, are assets of the departments of administration, human resources or project, and hold seniority and high positions. The organization should attach great importance to their knowledge and skills and strive to spread the knowledge and skills to other employees to prevent the loss of organizational knowledge caused by the loss of core sources of knowledge.

If the sources of knowledge are too few or too concentrated in several key knowledge providers in an organization, it is detrimental to the circulation and sharing

of knowledge. The inadequacy of channels for information exchange and sharing with other members across departments hinders the formation of an efficient network structure. If one or more key knowledge providers leave, it will adversely affect the supply of knowledge in the company. Thus, the company should facilitate the conversion of implicit knowledge to explicit knowledge by organizing seminars and sharing sessions to promote the absorption of knowledge.

5.1.3 Dispatched personnel become isolated in the network

In many cases, there are several isolated nodes in an organization. These isolated nodes are rarely mentioned by other nodes and less connected to other nodes. According to the survey results, these isolated nodes are mostly dispatched personnel overseas for a long time. They do not maintain enough connection with other employees and knowledge sharing cannot be effectively circulated among such detached employees. However, they are the links between the company and its subsidiary companies, so they may be undiscovered potential sources of knowledge, with unique external knowledge. These external sources of knowledge may be important input channels for new information and innovations within the organization. The organization should enhance communication and connection with these employees through various flexible ways, so that they can participate more in knowledge exchange and sharing. By so doing, channels for knowledge exchange in the network will be continuously increased and the shortest link between nodes will be realized to the best levels.

5.1.4 Employees in key positions are important nodes in the problem-solving network

While the overall density of the GR Group problem-solving network is lower than that of other networks, the value of betweenness centrality of the problem-solving network is higher than that of other networks. It indicates that some employees play a crucial role in problem solving for others, and most employees are

problem inquirers rather than solvers, resulting in a low overall density. The organizational manager may hold technical sharing sessions to reduce the problem from inquirers' betweenness centrality and push knowledge to flow to other employees.

5.1.5 Employees with high centrality of work-guiding network tend to form small groups

People in small groups often exclude other people and exchange information within their groups, causing other employees to be marginalized and isolated, which is not conducive to the harmony and stability of the company. Company managers should give special attention to the outstanding and core members and provide them continuous affirmation and rewards in kind or otherwise, so as to strengthen their collective consciousness, increase their sense of belonging and cohesion, and promote their openness to and exchanges with other employees.

5.1.6 Employees' informal network is reflected in friendship network

Friendship network is the network with the most closed relations in the circle of friends. Friends play a positive role in daily work and life. Results from analysis conducted in this research shows that the GR Group friendship network has a low value for betweenness centrality, and it indicates that the relationship among friends in each circle within the GR Group is equal; i.e., without prominent leaders.

5.1.7 Members with high centrality of emotional-support network has more cohesiveness

In the company, employees may feel harmonious relationship with the support of colleagues or friends when they encounter problems or difficulties, which is beneficial to work. With favorable relationships, employees are more likely to support others in both emotion and work-related matters, facilitating exchanges and sharing of information sources. Thus, the company should encourage employees to communicate

and interact with each other, because it is helpful to enhance emotions among members, deepen understanding and improve their belongingness to the company.

5.2 Suggestions to Management

5.2.1 Value informal networks and use internal social networks effectively

The research results show that the social network and its sub-network structure both have a positive effect on knowledge sharing of networks within an enterprise, and it is necessary to make optimum use of the social network structure manage scientifically of the networks within an enterprise. The enterprise can manage and control these existing informal networks, allowing them to evolve in a direction that is conducive to the goals of the enterprise, and it can also use their characteristics to transfer and share information that is beneficial to the enterprise through informal networks. The density and centrality of the informal network within the organization may be increased to play active roles in the realization of members' objectives hence the general wellbeing of employees. The influence of key nodes in the informal network can be used to improve the sharing of information and knowledge within the organization and break the barrier to unfavorable cross-department cooperation.

For example, by analyzing the roles in informal networks, members with similar characteristics can be assigned to heterogeneous teams, thereby enhancing the frequency of knowledge sharing between small groups or sub-networks. In addition, informal networks within the company can guide and invite employees to participate in interactions and exchanges by organizing parties and other informal activities. Valuable projects can be developed to attract members with the same interests to form relatively stable teams to increase the depth of knowledge interaction.

5.2.2 Encourage and support the establishment and development of learning organizations

Through the construction of a learning organization, members of a company continue to be cultivated in the process of learning and knowledge sharing. From the results of this study, it is discovered that most corporate consultations exist within the

department, thus forming various small groups. The cross-department exchange of information is weak, which means little inter-sector cooperation. Enterprises should establish learning organizations to deal with barriers of knowledge sharing in the organization. In this way, the barriers can be eliminated, and the breakage of enterprise knowledge sharing resulting from the loss of members with high centrality can be reduced. For those isolated members, they will be integrated into the learning organization to share and exchange knowledge, which help members acquire new knowledge and talents for development of the organization. A learning organization can significantly deal with the barriers to knowledge sharing and greatly increase the density of network structure. It can also strengthen and boost morale of the members within the organization and stimulate their enthusiasm for learning.

5.2.3 Enterprises can establish talent competition mechanisms within the organization

Enterprises can strengthen promotion and elimination mechanism through talent competition, which helps eliminate unsuitable employees and attract excellent talents.

There are many problems in the state-owned enterprises' human resources incentive packages, some of which are as follows: (1) the assessment methods are single and biased. Many state-owned enterprises fail to combine multiple assessment methods in the process of evaluating the members of their organizations. Employees' daily performance is neglected, and sometimes the assessment just caters for leaders' thinking, ignoring the needs of the other members within the organization; (2) quantitative assessment techniques are ignored. Some state-owned enterprises only focus on qualitative assessment, but do not quantify the criteria for the assessment which breeds free-riders; (3) the result of assessments are not taken seriously. Some employees with poor performance in assessment are promoted smoothly and obtain many bonuses. Assessments in many companies are not competent or practical, nor do they fulfill the intended role of serving as incentives; (4) the salary structure is unreasonable and an ineffective incentive tool. The performance of many employees is not linked to the performance of the company, which means that a company's loss

does not affect the salary and bonus of employees. As a result, without pressure, employees do not work hard. To change the situation, specific quantitative assessment indicators should be applied as a condition for promotion, and it may lead employees to work with motivation and passion. Companies should establish a learning assessment system to encourage members to learn and share knowledge and information. Measures should be taken to encourage employees to work in cross-department cooperation and break the department limit for performance assessment to guarantee the cooperation between departments in a unified system.

5.2.4 Maintain reasonable flow of employees and dynamic flow of network resources

The reasonable flow of key knowledge providers and mediators within multiple departments is conducive to employees' understanding of different departments, establishing new connection and increasing the spread of knowledge. In addition, the strategic or knowledge alliances formed between organizations can expand the mobility of employees, allow employees to learn knowledge of other enterprises and enhance their capability of innovation, thus preventing the homogenization of network members' ideas due to the closure of networks and helping realize knowledge sharing.

5.2.5 Improve the trust mechanism within an organization

In essence, knowledge sharing is the transfer from private to public domain. It is necessary to maintain the balance of interests among different individuals within the organization. Only by doing so can knowledge sharing be realized, and trust within the organization is key to achieving and maintaining balance. The GR Group case study in the paper shows that the informal network between employees within the corporation is a network with certain organizational dependencies based on the characteristics of state-owned enterprises. Therefore, a sound trust mechanism is of great significance for knowledge sharing of informal networks within a company.

The paper proposes the following suggestions on how to build a trust mechanism. First is establish a scientific management mechanism. Within the GR Group, in different levels and departments, the form of knowledge sharing of informal networks

should be standardized to fully tolerate and guarantee the time and resources from employees, especially those from different departments, to participate in knowledge sharing. Moreover, special management or organizational bodies may be built to coordinate and support informal knowledge sharing.

Second is to establish a sound management system. In its headquarters, the GR Group can establish a management system for rationally dispatching informal networks, so as to guarantee the fairness, openness and security of exchanges. Meanwhile, corresponding punishment measures should be launched to prevent and intercept the disruption of false news that is not conducive to knowledge sharing, so as to maintain the credibility of the platform.

Third, establishing an ample mechanism for resource allocation will be instrumental in building trust mechanism. With the advancement of science and technology and the Internet, the GR Group's most important task is to develop and apply platforms of data analysis, and optimization and conduct real-time feedback through online and offline knowledge sharing platforms to promote the efficiency of knowledge exchange and obtain achievements.

Finally, it is necessary to ensure employees efficient environment and opportunities by reviewing and reporting the evaluation and correction of the operation of informal network platforms from time to time.

5.3 Research Limitations

This thesis is based on existing theory to build a basic conceptual model, which is verified by a case study of the GR Group. The design of the scale refers to items in the questionnaire in accordance with existing literature. A large number of basic methods and tools for social network analysis have been applied in the coding and data conversion of questionnaires. The research basically describes the basic features and network structure of the GR Group's informal network and discusses how knowledge sharing can be conducted in an informal network. This can be adopted in

knowledge transfer, sharing and innovation within the state-owned enterprise. However, due to the limit of time and the researcher's own knowledge reserves, there are still some problems in the study. First, the representativeness of the case is limited. This research selects GR Group in Yibin, Sichuan Province for research. Due to regional restrictions, results in the case study only represent enterprises with similar characteristics and cannot portray the network structure and characteristics of knowledge sharing in informal networks of all enterprises. Second, objectivity in the data is limited. In this study, a total of 57 people from the GR Group participated in the questionnaire survey. The individual's understanding and cognitive level, authenticity, and confidentiality affect the results filled in the questionnaire, so the objectivity and accuracy of the data are limited. At the same time, the environmental disturbances on the respondents may affect the truthfulness of the answers. In order to avoid conflict between individuals and the company or other employees, some respondents many deliberately evade the problems, thus affecting the final analysis results. Finally, the data size is limited. This research only surveyed the 57 employees of the GR Group headquarters, hence the research method of overall network was adopted. If one could conduct individual network research on all employees in the Group, not only can the scale of data could be duly expanded, but also analyze the status and role of individuals in the network more meticulously, so as to further study the way that informal networks influence knowledge sharing.

5.4 Research Prospect

(1) The study on knowledge sharing among employees of state-owned enterprises is only an informal structure response at a certain point of time. It is a static, a time-point depiction of social relations that occurred in the past and ignores time intervals. Since social network is dynamic, and the network structure and location of nodes may change due to the departure or increase of nodes, the individual and overall network may change along with them. It needs further study on the influence of such changes on knowledge management in the advent of such

happenings.

(2) In theory, it is possible to take into account other factors such as personality traits that describe personal characteristics. Because the individual's structural position and network form are the result of the interaction between the individual and the organization's environment, even if they are at the same position in the organization, the behavioral characteristics would be different. This cannot be explained by the structural position, but the explanation based on the difference of personal characteristics may be a good choice.

(3) Indicators in research methods of the social network can be expanded, such as condensed subgroup analysis, correlation analysis and QAP regression analysis, which will supplement and enrich the current analysis of the network organization.

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⁴ This page is deliberately left blank.

Appendix: Questionnaire

This questionnaire aims to collect data for an academic work only. The aim is to gain understanding about your opinion towards knowledge sharing practices within the organization. The researcher would be grateful if you could assist him by taking a few minutes to answer the questions that follow. Answers provided shall be treated with utmost confidentiality.

Thank you.

Part A. Basic information About You

A1. Name:

A2. What is your gender? ①male; ②female

A3. What is your age?

under 30 years; ②31- 39 years; ③40- 49 years; ④50 years and above

A4. Which department do you currently work in?

A5. How long have you been working in this department?

① Within one year; ②1- 3 years; ③3- 5 years; ④more than 5 years

A6. What is your highest educational qualification?

①master degree or above; ②bachelor degree; ③college degree holder; ④high school or below.

A7. How long have you been working with this company?

within 1 year 1; ②1- 3 years; ③3- 5 years; ④ more than 5 years

Part B. Different network ways

Most of the questions seek responses by requiring you to tick the appropriate numerical number. Other questions request that you provide your own answers. You are kindly required

to answer the questions appropriately and, where applicable tick or circle the appropriate numerical number that best reflects your opinions on the issues or responses to the questions.

B1. In the company, whom will you communicate with about work related knowledge?

Serial number	Name/Name tag	How do you choose to communicate with your organizational members? (multiple choice) 1 = Meet without appointment 2 = Meet with appointment 3 = phone calls 4 = by text messages 5 = by Wechat 6 = by QQ	How often do you interact or communicate 1 = More than once every month 2 = Once a month 3 = Once every half month 4 = Once a week 5 = Many times in one week
1			
2			
3			
4			
5			

B2. In this company, you have provided vital information and advice about the development of career and business to some organizational members. Who are they?

Serial number	Name/Name tag	How do you provide information and advices to your colleagues? (multiple choice) 1 = Meet without appointment 2 = Meet with appointment 3 = phone calls 4 = by text messages 5 = by Wechat 6 = by QQ	How often do you interact or communicate? 1 = More than once every month 2 = Once a month 3 = Once every half month 4 = Once a week 5 = Many times in one week
1			
2			
3			
4			
5			

B3. In this company, you have received vital information and advice about the development of career and business from some organizational members. Who are they?

Serial number	Name/Name tag	How do you received information and advices from your colleagues? (multiple choice)	How often do you interact or communicate?

		1 = Meet without appointment 2 = Meet with appointment 3 = phone calls 4 = by text messages 5 = by Wechat 6 = by QQ	1 = More than once every month 2 = Once a month 3 = Once every half month 4 = Once a week 5 = Many times in one week
1			
2			
3			
4			
5			

B4(a). So far, have you encountered some problems relating to work place pressure, interpersonal conflict and emotional stress?

Yes_____ No_____

B4(b). When you are facing any of these kinds of problems above, you would like to communicate and share with the people around, hoping that they can support you with good ideas. You want to communicate with your organizational members for mental or emotional help and support. Who do you think these people can offer you good support?

Serial number	Name/Name tag	How do you communicate with your colleagues for mental or emotional help and support? (multiple choice) 1 = Meet without appointment 2 = Meet with appointment 3 = phone calls 4 = by text messages 5 = by Wechat 6 = by QQ	How often do you interact or communicate? 1 = More than once every month 2 = Once a month 3 = Once every half month 4 = Once a week 5 = Many times in one week
1			
2			
3			
4			
5			

B5. In the past six months, you treat some of your organizational members as your friend, you want to stay with them, and always participate with them in some informal social events. For instance, you will go to their house, or go together to eat, picnic, concert, show, film, bar,

coffee and so on. Who are they?

Serial number	Name/Name tag	How do you communicate with your friends from the company? (multiple choice) 1 = Meet without appointment 2 = Meet with appointment 3 = phone calls 4 = by text messages 5 = by Wechat 6 = by QQ	How often do you interact or communicate? 1 = More than once every month 2 = Once a month 3 = Once every half month 4 = Once a week 5 = Many times in one week
1			
2			
3			
4			
5			

PART C. Knowledge sharing

Constructs	Items	1	2	3	4	5
Shared goals	SG1.My organizational members and I always agree on what is important at work. SG2.My organizational members and I always share the same ambitions and vision at work. SG3. My organizational members and I are always enthusiastic about pursuing the collective goals and missions of the whole organization.					
Attitude toward knowledge sharing	AT1.Sharing of my knowledge with organizational members is always good. AT2.Sharing of my knowledge with organizational members is always beneficial. AT3.Sharing of my knowledge with organizational members is always an enjoyable experience. AT4. Sharing of my knowledge with organizational members is always valuable to me. AT5.Sharing of my knowledge with organizational members is always a wise move.					
Subjective norm about knowledge sharing	SU1.My chief executive officer (CEO) always thinks that I should share my knowledge with other members in the organization. SU2.My boss always thinks that I should share my knowledge with other members in the organization. SU3.My colleagues always think that I should share my knowledge with other members in the organization.					
Intention to shared knowledge	IN1.I will share my work reports and official documents with my organizational members more frequently in the future ^{#1} . IN2.I will always share my manuals, methodologies and models with my organizational members in the future ^{#1} . IN3.I will always share my experience or know-how from work with my organizational members in the future ^{#2} . IN4.I will always share my know-where or know-whom at the request of my organizational members ^{#2} . IN5.I will always try to share my expertise obtained from					

	education and training with my organizational members in a more effective way ^{#2} .	
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Thank you for your cooperation. Please be assured once again that this information will be treated with the utmost confidentiality and that no identifying data will be used at any stage or in any form. Your time and contribution to this study is greatly appreciated.