

**Critical Knowledge Management Factors
and Organizational Performance:**
An Investigation of Chinese Hi –Tech
Enterprises

A thesis submitted for the degree of doctor of
philosophy

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Abstract

This study sets out to explore the critical factors of knowledge management (KM) that impact on the organizational performance of Chinese enterprises. It attempts to investigate the relationships among KM factors including KM strategy, KM enablers (Organizational culture, Organization structure, People, and Technology), KM processes, and organizational performance. The conceptual framework of knowledge management guiding this research is developed from prior research (Alavi, 1997; Davenport, 1999; Lam, 2000; Leonard-Barton, 1995; Nonaka and Takeuchi, 1995; Ramirez and Dickenson, 2006; Zack, 1999). Previous KM research in the Chinese context has focused on the use of object-perspective measures such as number of created ideas or patents. There appears to be a relative neglect of the relationships between those KM factors. This research focused on exploring the relationships between those KM factors and investigating how they impact on organizational performance in the context of an emerging economy – China. This research adopted the mixed-methods (Creswell, 2003) methodological approach, which involved the use of qualitative and quantitative methods in addressing the research questions raised in this study.

The results of this research suggest that organizational culture variables are found to be essential for knowledge creation. In particular, trust is a significant predictor of all knowledge creation processes. The findings of this study confirm that enterprises will be able to obtain strategic benefits of KM through effective knowledge creation processes. The research findings also imply that companies should align their knowledge strategies along with knowledge creation processes. The key to understanding KM in the Chinese context is recognizing the networking nature of the Chinese society which operates on the basis of “Guanxi”. In Chinese enterprises, the socialization and externalization elements are remarkably similar to the Japanese situation that Nonaka and Takeuchi (1995) described, as the Chinese are highly networked, hold tacit knowledge within these networks and are prepared to make this knowledge explicit only within the context of these pre-existing relationships. The departmental focus of Chinese enterprises mean that the combination of

tacit knowledge is not straightforward, while learning-by-doing is important to sustain their development. The research also indicates that internalization is also problematic in Chinese enterprises because of individuals' fear of admitting mistakes. The implication of the findings for knowledge management and research is discussed.

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Glossary of Key Knowledge Management Terms

Absorptive Capacity

Absorptive capacity is the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities and it is a function of the firms prior knowledge (Cohen and Levinthal, 1990). Absorptive capacity plays a critical role in knowledge acquisition and transfer.

Centralization

Centralization refers to the locus of decision authority and control within an organizational entity (Caruana et al., 1998, Ein-Dor and Segev, 1982). The concentration of decision-making authority inevitably reduces creative solutions while the dispersion of power facilitates spontaneity, experimentation, and the freedom of expression, which are the lifeblood of knowledge creation (Graham and Pizzo, 1996).

Collaboration

Collaboration in this research may be defined as the degree to which people in a group actively support and help one another in their work (Hurley and Hult, 1998). Effective knowledge management requires a collaborative culture (Gold et al., 2001; O'Dell and Grayson, 1999). Collaborative interactions such as open dialogue, social interaction, and coactivity can help create organizational knowledge (Nahapiet and Ghoshal, 1998).

Formalization

Under the organizational structure context, Formalization refers to the degree to which decisions and working relationships are governed by formal rules, standard policies, and procedures (Holsapple and Joshi, 2001; Rapert and Wren, 1998).

Learning

Organizational learning can be defined as the degree to which it is encouraged in organizations (Hurley and Hult, 1998). Learning is the acquisition of new knowledge by people who are able and willing to apply that knowledge in making decisions or influencing others (Miller, 1996). Organisational learning comprises three processes (Parboteeah and Jackson, 2007; Yeo, 2005), individual learning, team/group learning and organisational learning.

Organizational Creativity

Organizational creativity is the capability of creating valuable and useful products, services, ideas, procedures or processes by individuals working together in a complex social system (Amabile et al., 1996; Woodman et al., 1993).

KM enablers

KM enablers in this research include KM strategy, Organizational Culture, Organizational Structure, People (T-shaped skills) and Technology

Knowledge Management Process

KM processes normally includes the acquisition, dissemination and integration, and commercialization of knowledge (Gupta and Govindarajan, 2000b). Other researchers also mentioned other processes, for instance, transfer (Zander and Kogut, 1995), sharing (Dombrowski et al., 2007), creation (Becerra-Fernandez and Sabherwal, 2001) and process capability (Gold et al., 2001)

Knowledge Creation Process

Knowledge creation processes are a subset of KM processes. Previous literature has related such processes to knowledge acquisition (Alavi, 1997), capture (Davenport and Prusak, 1998), or construction (Demarest, 1997), allowing a degree of semantic overlap across terms. Nonaka and Tacheuchi

(2005) taxinomise such processes into 4 conceptually distinct constructs: socialization, externalization, combination and internalization. In addition their definition places emphasis to the social processes associated with knowledge creation, which is important for this study. The thesis adopts the definitions by Nonaka and Tacheuchi (2005) for the examination of knowledge creation processes.

KM Strategy

Knowledge management strategies determine how to utilize knowledge resources and capabilities. Knowledge management strategies can be described along two dimensions reflecting their-focus: codification strategy and personalization strategy (Hansen et al. 1999). One dimension refers to explicit knowledge and emphasizes the capability to help create, store, share, and use an organization's explicitly documented knowledge. This strategy is referred to as codification strategy. Another dimension refers to tacit knowledge and emphasizes knowledge sharing via interpersonal interaction. Knowledge can be obtained from experienced and skilled people in this strategy. This strategy is referred to as personalization strategy.

SECI Model

The SECI model explores knowledge creation through the conversion between tacit and explicit knowledge. This knowledge conversion process is made up of four intertwined activity modes; socialization (S), externalization (E), combination (C), and internalization (I) (Nonaka et al., 2000)). This research adapted SECI model

Social Capital

Social capital is defined as networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives (Putnam, 2000). Social capital consists of various knowledge enablers such as organizational

structure and culture. One of the primary focuses of this study is on the relationship between knowledge enablers and knowledge creation processes. This relationship can be justified by social capital theory.

System Thinking

Systems thinking is a unique approach to problem solving, in that it views certain 'problems' as a part of the overall system so focusing on these outcomes will only further develop the undesired element or problem (O'Connor and McDermott, 1997). In this thesis, It can provide systematic mechanisms for how knowledge enablers can improve organizational performance and -for- studying connections between KM processes and organizational performance.

Trust

As one factor of organizational culture, trust can be defined as maintaining reciprocal faith in each other in terms of intention and behaviours (Kreitner and Kinicki, 1992). Trust may facilitate open, substantive, and influential information exchange (Nelson and Coopriker, 1996, O'Dell and Grayson, 1999). When their relationships are high in trust, people are more willing to participate in knowledge exchange and social interactions (Nahapiet and Ghoshal, 1998).

T-Shaped skills

T-shaped skills imply that the capability of individual specialists allows them to have meaningful and synergistic conversations with one another (Madhavan and Grover, 1998). Individuals with T-shaped skills are capable to see the world from two or more different perspectives – knowing one or more discipline in great depth as well as having a broader view of the bigger picture.

Chapter 1

INTRODUCTION

This opening chapter introduces the research background and overall research problem of this study. In providing a context for understanding the study topic, the focus of this research is to delineate an integrative view of KM (Knowledge Management) and provide some understandings for practical managers on how to build effective KM initiatives.

This chapter is structured as follows: Section 1.1 describes the research background. Section 1.2 discusses the research problem and objectives. In section 1.3, the significance of the research is discussed. Finally, section 1.4 explains the organization of this thesis. In this chapter, an outline of the thesis is provided with regards to the overall research problem, research design, research methodology and focal theory, which is to be used in order to synthesize and develop a conceptual framework of KM in the context of China.

1.1 Research Background

1.1.1 Global competition and the knowledge revolution

A major new element in the international environment is the speed of change in producing and disseminating knowledge. Advances in scientific understanding and the codification of knowledge permit engineering new materials at the molecular level and even engineering life forms through biotechnology (Cardinal et. al, 2001). Dynamic networks and new styles of organizations and management create new forms of competition. Wealth is no longer created just by natural resources or production, but by the way products and services are designed and delivered to the market. The power of ideas and brand names —

and the harnessing of knowledge and information to leverage them — are driving the world economy. Keeping up with the competition requires organization to invest in such intangibles as R&D, software, education, training, marketing, distribution, organization, and networks (Dahlman and Aubert, 2001).

This knowledge revolution mirrors past periods of rapid change—those brought by the printing press in the 1500s, the harnessing of steam in the 1800s, the development and expansion of electricity in the early 1900s, and the automobile industry in the 1900s. What is special today is the pervasiveness of changes in almost all technologies, not just ICTs (Information and Communication Technology), and the fact that they are affecting the organization of productive and social activities. One indicator of the acceleration in the creation of knowledge is the number of new patents each year. In the United States the annual number of patents doubled from about 80,000 at the end of the 1980s to nearly 180,000 by the end of the 1990s (Dahlman and Aubert, 2001).

The rapid development and spread of knowledge are creating a more competitive and interdependent world. In industries with low or medium technology, an increase in technical knowledge and associated organizational changes provides an edge in productivity and enables product differentiation, significantly shaping competitiveness and added value. Even such traditional industries as textiles, cement, and steel are using new technical knowledge and information systems to improve the design and quality of products and production processes — and the efficiency of marketing and distribution. In agriculture, greater understanding of plant reproduction and growth, advances in genetic engineering, and better techniques for harvesting, storage, transportation, and distribution are also changing the value and competitiveness of different types of plant and animal products (Dahlman and

Aubert, 2001). And such services as transportation, distribution, finance, insurance, health, and education are becoming more sophisticated, more intensive in knowledge and information. Effective use of high technology (i.e. information technology,) throughout the economy is as equally important as its creation, especially for improving and upgrading products and services.

1.1.2 The growing importance of knowledge

The OECD (Organization for Economic Co-operation and Development) has used the term “knowledge economy” to draw attention to the importance of knowledge in all economic activities. The knowledge economy now accounts on average for roughly half of non-government economic activity in the OECD. Table 1-1 shows the value-added of knowledge-based industries in OECD countries.

Table 1 – 1 Value-added of knowledge-based industries, OECD countries

	Total	High- technology industries	Medium- technology industries	Communi- cation services	Finance, insurance and other business services	Community, social and personal services ^a
EU 1994	47.7	2.5	7.7	2.0	20.2	15.3
Japan 1996	52.1	3.7	8.6	2.0	19.1	18.6
UK 1995	51.4	3.3	7.2	3.2	28.3	9.4
United States 1997	56.1	3.1	6.1	2.9	31.6	12.3
OECD 1993	49.9	9.9 ^b		2.1	23.7	14.1
China 1997	29.7	4.7	6.0	5.0	8.0	6.0

Note: This is based on an OECD classification.

a. Many community and personal services are not that knowledge-intensive, so this category overstates the knowledge economy, particularly in the rough estimates for China.

b. For the OECD average, this includes medium technology industries, and is the average for 22 OECD countries.

Source: For OECD countries, OECD, *Science, Technology and Industry Outlook: 2000 Edition*, Paris, 2000, annex table 2, p. 220. For China, author estimates from China Statistical Bureau, *China Statistical Yearbook*, Beijing: China Statistics Press, 1999.

Various countries have developed—or are starting to develop—strategies to take advantage of the potential of new technologies as shown below. The importance placed on knowledge for international competitiveness can also be

seen by the addition of numerous technology-related variables to international assessments of the competitiveness of countries.

Box 1 – 1 Country knowledge strategies

United Kingdom: Building the Knowledge-driven Economy

(<http://www.dti.gov.uk/comp/competitive/>)

“The UK’s Department of Trade and Industry charts a new strategy to boost competitiveness and prosperity and build a high value economy through stressing science and entrepreneurship, collaborating across companies, and exposing the economy to competition.”

Finland: Quality of Life, Knowledge, and Competitiveness

(<http://www.sitra.fi/tietoyhteiskunta/english/st51/eng206b.htm>)

“To make the best use of the opportunities in the information society, Finland has a vision and strategy to be a forerunner in building an information society based on humane and sustainable development.”

Canada: The Knowledge-Based Economy

(<http://strategis.ic.gc.ca/SSG/it04360e.html>)

“Providing a general introduction to the “knowledge revolution” and the changes that it is expected to have on the Canadian economy, the paper begins with some general ideas on what the knowledge economy is all about and moves on to discuss what Canada could do to be better equipped for a more active role in the shift to a knowledge-based economy.”

Scotland: Towards the Knowledge Economy

(<http://www.scotland.gov.uk/library/documents-w9/knec-00.htm>)

“This official report on Scotland and the knowledge economy, delivered by the Knowledge Economy Task Force of the Scottish Office, provides a detailed overview of the economic and industrial climate in Scotland.”

Malaysia: Building Knowledge Societies

(<http://www.nitc.mimos.my/resources/index.html>)

“Aimed at a better understanding of the various challenges of the information age, this website addresses access, empowerment, and governance in six areas: politics, the economy, society, learning, environment, and technology.”

New Zealand: The Knowledge Economy

(http://www.med.govt.nz/pbt/infotech/knowledge_economy/)

“This report provides general background on what the knowledge economy is all about and how various economies are faring. It concentrates on key issues and on what New Zealand needs to do to successfully find the way forward.”

Knowledge has been regarded as a critical resource in a form that gives rise to competitive advantages (Hoskisson, et al., 1999; Spender, 1996). The management of knowledge is recognition of the strategic value of each of a firm's different stocks of knowledge in different contexts (Sanchez and Heene, 1997). The focus is on a firm's ability to create, transfer, and use the knowledge in order to build sustainable competitive advantage. Knowledge management in a firm thus receives much attention from researchers and practitioners. However, the process of managing knowledge is still not widely researched (De Long and Seemann, 2000). There is no surprise that knowledge is overturning the old rules of strategy and competition as the foundation of industrialized economics has shifted from natural resources to intellectual assets. In response, many managers and management researchers have proclaimed an era of knowledge management. Evidence can be found in a variety of studies on knowledge (Chilton and Bloodgood, 2008; Davenport and Prusak, 1998; Nonaka, 1994; Tuomi, 2000), knowledge processes (Grant, 1996a; Grover and Davenport, 2001; Hogel and Schulze, 2005; Lee, 1999; Lee and Kim, 2001a; Leonard-Barton, 1995; Malhotra, 2000; Nonaka and Takeuchi, 1995; Parboteeah, and Jackson, 2007), intellectual capital (Edvinsson, 1997; Han et al., 2000), and knowledge management

architecture (Alavi, 1997; Demarest, 1997; Wiig et al., 1997). These studies have explored the foundations and disciplines of knowledge management. More researchers continue to downplay how companies can leverage knowledge assets into improved performance.

1.1.3 Knowledge economy and Chinese enterprises

All economies are knowledge-based. What is different today is the degree to which economies depend on the creation, acquisition, distribution, and use of knowledge. The effective use of knowledge is becoming the most important factor for international competitiveness—and for creating wealth and improving social welfare. At a country level, the four pillars of a knowledge-based economy are (Dahlman and Aubert, 2001):

- An economic and institutional regime that provides incentives for the efficient use of existing knowledge and, the creation of new knowledge and entrepreneurship.
- An educated and skilled populace that can create and use knowledge.
- A dynamic information infrastructure that can facilitate the effective communication, dissemination, and processing of information.
- An effective innovation system comprising a network of enterprises, research centres, universities, consultants, and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge and technology.

China's high-priority effort to become a more knowledge-based economy and society means that KM is increasingly important. This means that Chinese enterprises must not only develop high technology, but also encourage the acquisition, creation, dissemination, and effective use of knowledge to leverage economic and social development.

Although, higher technological and innovative capacities seem to be the main success factor for organizations nowadays, Chinese enterprises are in a disadvantageous position. Those enterprises generally face difficulties with acquiring advanced technological knowledge from external sources for three main reasons (Makino and Lau, 1998). First, as compared to developed countries, few industrial clusters exist where knowledge-intensive enterprises operate in close geographical proximity. Enterprises in emerging economies therefore tend to have a disadvantage in access to knowledge spillovers and knowledge workers. Second, in emerging economies few well-developed networks of manufacturing and distribution exist through which enterprises could capitalize on acquired technological knowledge for both production and commercial application in a local market. Third, legal protection of intellectual property is limited in emerging economies, as a result foreign investors make technology transfer difficult (Lau et al., 2002). To overcome these difficulties, it is critical for Chinese enterprises, particularly the most knowledge-intensive ones, to explore the ways to (a) exploit external sources of advanced technological knowledge, (b) to develop cultural and social contexts that facilitate the transfer and dissemination of acquired technology across subunits within an organization, and (c) to turn acquired technology into commercial products or services.

1.1.4 Research problem and gaps

To achieve the goals set out above, enterprises would benefit from reviewing prior literature on how to manage knowledge for the purpose of achieving competitive advantage. This section briefly outlines the main areas of lessons learned in the area of KM – further expanded in chapter two – and the gaps identified in literature which this study addresses.

Prior research has investigated which factors are central for managing knowledge effectively, yet one of the still remaining challenges is to explore the relationships among these factors. Most current empirical research has examined the relationships of KM enablers, processes *or* performance, *in isolation*. For instance, some research has focused on the relationship between enablers and processes (Appleyard, 1996; Dombrowski et al, 2007; Hansen, 1999; Hogel and Schulze, 2005; Lee and Kim, 2001b; Szulanski, 1996; Zander and Kogut, 1995); other studies have explored the relationship between enablers and organizational performance (Becerra-Fernandez and Sabherwal, 2001; Bierly and Chakrabarti, 1996; Drew, 1997; Gold et al., 2001; Jennex and Olfman, 2005; Simonin, 1997). To provide academics with insights and practitioners with guidelines, many researchers have investigated which factors are essential for managing knowledge effectively (Drew, 1997; Gold et al., 2001, Hansen, 1999; Lee and Kim, 2001b; Ramirez and Dickenson, 2006; Simonin, 1997). However, very few researchers and practitioners have yet explored an integrative model of KM to examine how KM enablers and processes impact on organizational performance. Therefore, this study will identify the key KM factors and investigate how they shape KM in enterprises.

Understanding the processes of knowledge creation, acquisition and dissemination would benefit companies more than knowledge itself, because knowledge is not primarily concerned with facts but more related to context-specific characteristics (Teece, 2000). Enablers of knowledge management are the important component of knowledge management research. For instance, Delphi Group (1998) identified organizational culture, information technology, strategy, and knowledge management process as the knowledge enablers that have an impact on knowledge management performance. Although knowledge enablers can enhance a company's capability to manage knowledge, it is still unclear how to use these enablers in a strategic fashion. KM strategies are necessary for facilitating these enablers;

they determine how to use knowledge resources and capabilities (Hansen et al. 1999; Zack 1999a). The competence-based view of competition argues that enterprises must have certain resources and knowledge in order to be innovative (Durand, 1997; Hoopes and Postrel, 1999). The process of KM in high-tech enterprises is therefore focused on developing their competitiveness in an unstable and volatile market. Enterprises have to build up their sustainable competitive advantages through developing and/or acquiring strategic resources. McEvily, Das, and McCabe (2000) suggested that knowledge sharing allows a firm to avoid competence substitution. Oliver (1997) noted that enterprises differ in their selection and variation of resources. This leads to the notion that enterprises have different ways to create knowledge (or to source knowledge) under different institutional environments. Since knowledge is an intangible resource that is valuable and costly to imitate for competitors, the process of creating and commercializing knowledge would be the key to development of competitive advantage. This research intends to examine the relationships between the key KM factors.

Many managers have faced difficulties in employing KM strategy, because it is still unclear how they can improve corporate performance (Davenport and Prusak, 1998; Ekionea and Swain, 2008; Hansen et al., 1999). Despite a great deal of discussion on KM strategies, relatively little convincing empirical evidence is available. This research attempts to find the relationship between KM strategy and KM processes to provide managers with guidance on how to build effective KM initiatives. The fit between processes and strategies is a lynchpin in improving organizational performance. However, implementing knowledge processes within a firm can be very costly and fragile (Soliman and Spooner, 2000). Therefore, knowledge processes should be guided by appropriate knowledge strategies. The KM strategies that enterprises implement have a significant influence on KM processes (Zack, 1999a). Most previous studies fail to incorporate this dynamic interaction (Hansen et al.,

1999; Jordan and Jones, 1997). It is, therefore, essential to identify which knowledge processes represent unique and valuable capabilities for effective KM (Holsapple and Singh, 2001; Zack, 1999b). This study will evaluate the impact of those KM factors on organizational performance.

China has had impressive success in several new industries, particularly high technology and science parks. . As a developing country, China is at the early stage of developing knowledge-based economy. Therefore, critical to most knowledge-intensive business enterprises based in China is how to explore the external sources of advanced technological knowledge, how to develop cultural and social contexts that facilitate both the transfer and dissemination of acquired technology across subunits within an organization, and how to turn acquired technology into commercial products or services. As the biggest developing country in the world, China is a “role model” for other developing countries in terms of economic development. The investigation of Chinese enterprises’ effort and experience of knowledge management will be valuable for those developing countries to guide their KM strategy. Therefore, the context of this research is set in the biggest developing country – China.

To account for the issues presented in this section, the aim and objectives of this research are articulated in the next section.

1.2 Research Aim and Objectives

The primary aim of this research is to develop a KM conceptual framework that explains how KM factors (KM enablers¹, KM processes² and organizational performance) shape the KM in enterprises. For this purpose, this study

¹ KM enablers in this research include KM strategy, Organizational Culture, Organizational Structure, People and Technology

² KM processes normally includes the acquisition, dissemination and integration, and commercialization of knowledge (Gupta and Govindarajan, 2000b)

investigates the relationships among the KM factors. In particular, it examines the impact of KM enablers, processes and organizational creativity on organizational performance. For practitioners, this study explains how to build effective KM initiatives.

Related to this purpose, previous empirical research indicates some research challenges. The first challenge is to explore the relationships of these KM factors. It is also noted that few empirical studies attempt to analyze a process-oriented perspective of knowledge management (Maier and Remus, 2003). Teece (2000) stated that managing knowledge relies on KM process more than knowledge objects. Consequently, the second challenge would be to analyze KM from a process-oriented perspective, for instance, the investigation of the absorptive capacity of Chinese enterprises.

More specifically, in support of the research aim, the research objectives are stated as follows:

- 1) To identify the key variables of each KM factor that shape and constrain KM in enterprises
- 2) To develop a KM conceptual framework that explains the relationships between the identified KM factors
- 3) To evaluate the impact of the factors (KM enablers, KM process, organization creativity) on organizational performance
- 4) To test the application of the above relationships in the Chinese context and reflect on findings

1.3 Significance of the Research

The basic assumptions of this study are that organizational performance will be improved under appropriate KM strategies. An integrative analysis of KM

factors is required for incorporating the previous empirical research model from the KM perspective. In addition, this study attempts to identify how KM enablers can support knowledge acquisition and creation for effective KM. Therefore, this research is significant to both academic researchers and practitioners in KM theory, epistemology and practice.

The context of the empirical study is also a combination in its own. Because knowledge is not primarily concerned with facts but with more context specific characteristics (Teece, 2000), this study provides the insight into processes in the Chinese context, and thus it can provide meaningful implications for academics.

Although many organizations struggle to introduce KM in their organizations, they do not know what is important to KM and how they can improve their organizational performance. In response, a conceptual framework is developed integrating KM enablers, processes, and organizational performance. To provide an understanding of how enterprises can utilize KM enablers and adjust KM processes to sustain their performance. Hence, this study provides practitioners with an understanding of how to establish successful KM initiatives. By indicating the relationships among knowledge creation, organizational creativity, and organizational performance, this study may provide an understanding to how enterprises can adjust knowledge creation processes to sustain their performance. This study enables managers to find which enablers are critical for knowledge creation. The relationship between KM strategy and organizational performance provided by this study will assist those managers in strategic decision making. Therefore, this study can provide deeper understanding and useful suggestions for effective KM strategy.

1.4 Organization of the thesis

There are 7 chapters in this thesis which is organized as follows:

The opening chapter of the thesis introduced the research background in order to scope the study and outline the research problems which the study will address.

Chapter 2 reviews the relevant concepts and focal theories in literature, to improve the understanding of knowledge management. The reviewed literature in this chapter helped to inform the theoretical framework and methodology guiding this study.

Build upon Chapter 2, Chapter 3 provides the social-economical context with which this study is set – China. The overriding argument of this chapter is that organizational performance is to some extent, shaped through the knowledge management strategy and processes, but that this takes place within a particular socioeconomic context, influenced by social structures and institutions.

The research design and methodology guiding this study are explained in detail in chapter 4. This research adopted a mixed-method methodology, combining quantitative and qualitative approaches, in order to improve the validity of this study.

Chapter 5 discusses the qualitative findings derived from interviews carried out for this study. The design of these interviews is based on the findings from the literature. It investigates these critical factors by adding depth and breadth of the inquiry results and interpretation. The results from the qualitative study will

strengthen the conceptual framework developed from the literature,

Critical quantitative analysis and assessment of the research results are explained in chapter 6. This study adopted the structured equation model (SEM) method to analyze the data collected from the web-based online survey. According to the model goodness of fit indices, the proposed KM conceptual model is acceptable.

Chapter 7 concludes the research findings, the limitations, and indicates implications for future research. This research contributes to both academic researchers and practitioners in the KM field. It is the first attempt to establish an integrative view of KM, which is in the mainland Chinese origin. By adapting Nonaka and Takeuchi (1995)'s SECI model, the conceptual model developed to examine the KM of Chinese enterprises can be a starting point for further empirical research of KM in the Chinese context. The findings of this research may help practitioners to develop effective KM strategies to sustain growth and performance and provide a clue as to how enterprises can utilize KM enablers and adjust the knowledge creation processes. It will assist enterprises to obtain a greater understanding of the KM environment in developing countries and survive in emerging economies such as China.

Chapter 2

LITERATURE REVIEW

The purpose of this chapter is to discuss relevant concepts and focal theories in literature, to improve the understanding of knowledge management. The reviewed literature in this chapter assisted in informing the theoretical framework and methodology guiding this study. This chapter is structured as follows: Section 2.1 reviews the prior empirical studies on KM including main concepts and theory of knowledge management, which lays the theoretical foundation of this research. Section 2.2 presents the theoretical framework adapted this study, which is built upon systems thinking theory, social capital theory, absorptive capacity theory, and input-process-output model. Those focal theories guide the development of the conceptual framework of this study. Following the theoretical framework, Section 2.3 develops the conceptual framework which describes the relationships between KM factors. Section 2.4 presents the critical observation from the literature review and the challenges of this research. Section 2.5 explains the ten research hypotheses proposed in this study. Finally, Section 2.6 summarizes this chapter.

2.1 Review of Empirical Studies on Knowledge Management

2.1.1 Definition and Classification of Knowledge

The classification of knowledge is the foundation of knowledge management processes. Davenport and Prusak (1998, p.5) have provided the following definition of knowledge:

“Knowledge is a flux of framed experiences, values, contextual information, and expert insight that provides a framework for evaluating and incorporating

new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.”

Due to the plurality of definitions, knowledge has been characterized along different dimensions using various terms (Foss and Mahnke, 2003). Some research classifies knowledge into tacit and explicit on the basis of Polanyi's (1997) classification (Delphi Group, 2006; Ernst and Young, 1998; KPMG, 1998; Nonaka and Takeuchi, 1995). Tacit knowledge is personal, context-specific, and therefore hard to formalize and communicate (Nonaka and Takeuchi, 1995). It is transferred through personal interaction, mental models, technical skills, and experience. Explicit knowledge is easily formalized and expressed (Hippel, 1994; Nonaka and Takeuchi, 1995). It can be facilitated by traditional information processing technologies (Liebowitz and Wilcox, 1997). Examples include video conferencing, groupware, chatting features of the Intranet, and virtual reality technology (Buniyamin and Barber, 2004; Cross and Baird, 2000; Malhotra, 2000; Scott, 1998).

However, some researchers classify knowledge differently. For instance, Leonard-Barton (1995) classified knowledge into scientific, industry-specific, firm-specific knowledge. From scientific to firm-specific knowledge, this knowledge is increasingly less codified and transferable. Pan and Scarbrough (1998) divided knowledge into factual knowledge and behavioural knowledge. Factual knowledge is an accumulation of structured information and is transferable in formalized processes. Behavioural knowledge includes mind structures co-coordinating to social interaction of individuals and organizations. Probst (1998) classified knowledge into individual and collective knowledge. Individual knowledge relies on creativity and on systematic problem solving. Collective knowledge involves the learning dynamics of teams. Table 2 – 1

summarized the classification of knowledge from different researchers.

Table 2 – 1 Knowledge Classification

Researcher	Classification
Bock (2001)	Generality and Analyticity Pattern, Theory, Case, Know-how Representativeness Tacit, Implicit, Explicit
Delphi Group (2006)	Tacit, Explicit
Demarest (1997)	Scientific, Philosophical, Commercial
Ernst and Young (1998)	Tacit, Explicit
Jang and Lee (1998)	Task, Domain
KPMG (1998)	Tacit, Explicit
Leonard-Barton (1995)	Scientific, Industry specific, Firm specific
Chilton and Bloodgood (2008)	Tacit, Explicit
Nonaka and Takeuchi (1995)	Tacit, Explicit
Scarbrough (1998)	Factual, Behavioural
Probst (1998)	Individual, Collective
Ruggle (1997)	Process, Catalogue, Experiential
Schuppel et al. (1998)	Inner/outer, Actual/future, Explicit/implicit, Experience/rationality
Wiig (1995)	Forms Public, Shared expertise, Personal Types Factual, Conceptual, Expectational, Methodological

Therefore, many researchers classify knowledge for their knowledge frameworks as shown in Table 2 – 1. Nonaka and Takeuchi's (1995) classification of knowledge is accepted by most of the researchers in KM field. This study adapted Nonaka and Takeuchi's (1995) research that organizational knowledge can be classified into explicit and tacit knowledge, which lays the foundation of the knowledge framework for this study.

2.1.2 Knowledge Management

Although, managing knowledge is important because knowledge is considered one of the most strategic weapons that can lead to sustained increase in

profits (Parent et al., 2000). It is still unclear how a firm should determine which efforts are appropriate, or which knowledge should be managed. Knowledge management strategies are necessary for determining how to utilize knowledge resources and capabilities.

Over the ages the multifaceted concept of KM has been debated by a number of philosophers and sages (Nonaka, 1994; Radding, 1998). In recent years, many researchers have defined knowledge and knowledge management. Table 2 – 2 summarized the definitions of knowledge and knowledge management.

Table 2 – 2 Definitions of Knowledge and Knowledge Management

Researcher	Knowledge	Knowledge Management
Bock (2001)	Individual's beliefs for solving organizational problems	Management program which manages and diffuses a set of activities of knowledge-resources acquisition, creation, and sharing
Delphi Group (1998)	The information resident in people's minds	The practices and technologies which facilitate the creation and share
Demarest (1997)	The actionable information	The systematic underpinning, observation, instrumentation, and optimization of the firm's knowledge
Ernst and Young (1998)	Thoughts, capabilities and information which can be enhanced and mobilized to value	Development of processes to link knowledge requirement to business strategies as well as to provide access, and representation of knowledge
Leonard-Barton (1995)	Information that is relevant, actionable, and based at least partially on experience	Activities which create a firm capabilities
Nonaka and Takeuchi (1995)	Justified true belief	A knowledge conversion activities for knowledge creation
Pan and Scarbrough (1998)	N/A	Multi-level set of technologies, norms, and practices
Pentland (1995)	The product of an ongoing set of practices embedded in the social and physical structures of organization	N/A

Ruggle (1997)	Fluid mix of contextual information, values, experience, and rules	N/A
Schuppel et al. (1998)	N/A	Question of knowledge production, reproduction, distribution, application
Stein and Zwass (1995)	Collection as concrete experiences	N/A
Spek and Spijervet (1997)	The whole set of insight, experience, and rules	Allowing organization to explicitly enable and enhance the productivity and value
Wiig (1995)	Facts, concepts, judgments, and procedures	A set of distinct and well-defined approaches and processes designed to manage knowledge
Wijnhoven (1998)	Collection of concrete experiences or a set of abstract conceptualizations	N/A

Knowledge management strategies can be described along two dimensions reflecting their focus (Hansen et al. 1999). One strategy refers to explicit knowledge and emphasizes the capability to help create, store, share, and use an organization's explicitly documented knowledge. This strategy stresses codifying and storing organizational knowledge. Normally, knowledge is codified via information technology (Davenport et al. 1998; Scott 1996; Swan et al. 2000) as codified knowledge is more likely to be reused. This strategy is referred to as codification strategy, and is quite effective for sharing explicit knowledge. Hence, knowledge based systems have been introduced in organizations (Liao, 2002).

However, such systems can also be employed for facilitating tacit knowledge. For instance, in case of consulting firms, system strategy can help keep track of individuals with particular expertise and enable a rapid communication (Bloodgood and Salisbury, 2001).

Another dimension refers to tacit knowledge and emphasizes knowledge sharing via interpersonal interaction. The strategy as per this dimension

emphasizes dialogue through social networks including occupational groups and teams (Swan et al 2000). It also stresses sharing through person-to-person contacts (Hansen et al 1999). This strategy attempts to acquire internal and opportunistic knowledge and share it informally (Jordan and Jones 1997). Knowledge can be obtained from experienced and skilled people in this strategy. It can be referred to as personalization (human) human strategy. It would appear that human strategy is utilized for fostering tacit knowledge only. However, human strategy can be employed to sharpen explicit knowledge (Kidd, 1998). For instance, although breaking down a corporate vision into operationalized business or product goals results in explicit knowledge, human strategy such as face-to-face meeting is usually adopted for this session in Japanese firms (Nonaka and Takeuchi, 1995). Table 2 – 3 summarizes the features of Codification and Personalization strategies.

Table 2 – 3 Features of Codification and Personalization Strategies

Strategy	Features
Codification	Emphasizes codified knowledge in knowledge management processes Stress on codifying and storing knowledge via information technology Attempt made to share knowledge formally
Personalization	Emphasizes dialogue through social networks and person-to-person contacts Stress on acquiring knowledge via experienced and skilled people Attempt made to share knowledge informally

The key concepts in KM have been presented in Section 2.1.1 and Section 2.1.2. Based on the understandings of these concepts, previous studies in KM will be reviewed in the next section to assist the construction of the research model for studying KM.

2.1.3 Previous Empirical Studies

Previous empirical studies have investigated the relationships among knowledge management factors. They can be classified into four categories depending on the identification of the relationships; (1) relationships between knowledge enablers, (2) relationships between knowledge enablers and process, (3) relationships between knowledge enablers and organizational performance, and (4) relationships among knowledge enablers, processes, and organizational performance. This comparison can be highlighted as shown in Figure 2 – 1.

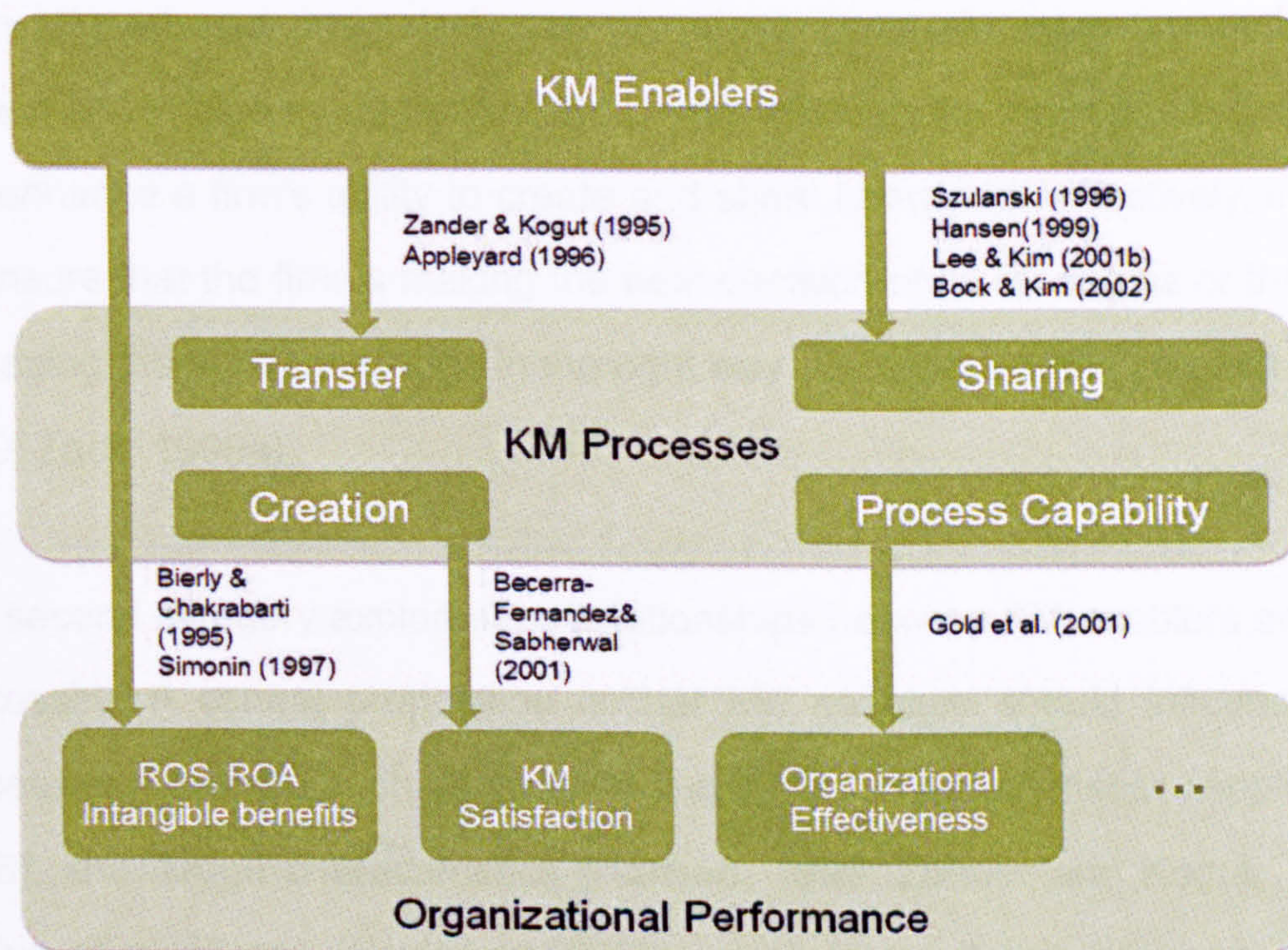


Figure 2 – 1 Research Models for Studying KM

The studies in the first category focus on the relationships among knowledge enablers. Their emphasis is on the examination of the effect of knowledge enablers. To identify this effect, various knowledge enablers have been investigated, such as knowledge management methods, structure, and culture. For instance, Bennett and Gabriel (1999) analyzed a number of knowledge

management methods in view of organizational structure, culture, size, and environment. They noted that firms with a change-friendly culture utilize knowledge management methods more extensively. Lee and Kim (2001b) investigated that the relationship between organizational climate maturity and various knowledge management drivers. They found that managerial drivers such as information technology, reward system, and top management support significantly affect the building of supportive organizational climate for knowledge management. It is not surprising that many researchers have investigated enablers for fostering knowledge (Nonaka et al, 2000; O'Dell and Grayson, 1998; Teece, 2000). Typically, these knowledge enablers are categorized from social and technical perspectives. Knowledge enablers, when aligned and integrated, can provide a comprehensive foundation to support knowledge management. However, although the appropriate enablers can enhance a firm's ability to create and share knowledge effectively, it does not insure that the firm is making the best decision of its resources or that it is managing the right knowledge in the right way (Beckman, 1999; Hansen et al., 1999; Zack, 1999a).

The second category explores the relationships between KM enablers and KM processes. A central proposition is that KM enablers should influence KM processes. Enablers such as national and industry characteristics (Appleyard, 1996), knowledge characteristics (Hansen, 1999; Zander and Kogut, 1995), origins of stickiness (Szulanski, 1996), weak interunit ties (Hansen, 1999), organizational climate (Lee and Kim, 2001b), and reward (Bock and Kim, 2002) are used to test the proposition. Zander and Kogut (1995) proposed that the transfer of organizational capabilities be related to the characteristics of social knowledge; they analyzed the effects of the ease of codifying manufacturing capabilities on its transfer time. They found that codifiability, teachability, and parallel development affect the time to transfer significantly. Appleyard (1996) explored knowledge transfer patterns among various nations and industries. It

was noted that public sources of knowledge play a larger role in knowledge transfer in Japan than in the United States, and that they play a larger role in semiconductors than in steel. Szulanski (1996) investigated the relationship between four origins of stickiness (characteristics of the knowledge transferred, the source, the recipient, and the context in which the transfer takes place) and knowledge transfer. Contrary to the conventional belief that places primary blame on motivational factors, he found that the recipient's lack of absorptive capacity, causal ambiguity, and an arduousness of the relationship between source and recipient were the major impediments to knowledge transfer within firms. Hansen (1999) employed the notion of complex knowledge to explain the role of weak ties in transferring knowledge in a multiunit organization. He found that weak inter-unit ties impede the transfer of complex knowledge. Lee and Kim (2001b) examined the effects of climate maturity on knowledge quality and knowledge sharing. In addition, they investigate the mediating effect of climate maturity. It was noted that mature organizational climate for knowledge management is a critical facilitator of successful knowledge sharing. Bock and Kim (2002) tried to find the determinants of individual's knowledge sharing behaviour on the basis of theory of reasoned action (TRA). Contrary to the conventional belief that reward is positively related to knowledge sharing behaviour, they found that expected rewards discourage the formation of a positive attitude toward knowledge sharing. They also found that the moderating effect of information technology is not significant.

The third category examines the relationships between KM enablers and organizational performance. The purpose of these studies is to sharpen the understanding of the effects of knowledge enablers on organizational performance. Various enablers such as knowledge management strategy (Bierly and Chakrabarti, 1996), collaborative experience, and know-how (Simonin, 1997) have been adopted. Bierly and Chakrabarti (1996) tried to identify how knowledge management strategies affect organizational

performance. They analyzed knowledge strategies of 21 U.S. pharmaceutical companies that had been categorized into explorers, exploiters, loners, and innovators. Innovators and explorers acquired and shared knowledge effectively by combining internal and external learning while loners and exploiters were ineffective learners; this implies that innovators and explorers are more profitable than exploiters and loners. Simonin (1997) tested the relationships among collaborative experience, "know-how", and achievement of organizational performance. He found that "know-how" allow firms to achieve greater organizational benefits. However, collaborative experience alone is not likely to create benefits. The experience of a firm has to be transformed into "know-how" before it could improve organizational performance.

The emphasis of the fourth category is on relationships among KM enablers, KM processes, and organizational performance. The aim of these studies is to identify and assess knowledge management enablers and processes for improving organizational performance (e.g., knowledge satisfaction or organizational effectiveness). Becerra-Fernandez and Sabherwal (2001) proposed a contingency framework including two attributes of the organizational subunit's tasks - process or content orientation, and focused or broad domain - and linked them to Nonaka and Takeuchi's (1995) knowledge creation process. The relationship between knowledge creation process and knowledge satisfaction was also investigated. They argued that socialization is suitable for broad and process-oriented tasks, externalization for focused and content-oriented tasks, combination for broad and content-oriented tasks, and internalization for focused and process-oriented tasks. It was also noted that combination and externalization affect knowledge satisfaction. Hogel and Schulze (2005) summarized 10 KM methods that have the potential to strongly support knowledge creation: Informal Events, Experience Workshops, Communities of Practice, Project Briefings, Expert Interviews, Best Practice

Cases, Knowledge Broker, Experience Reports, Databases and Research Services. Gold et al. (2001) analyzed two relationships: one between infrastructure capabilities and organizational effectiveness, and the other between process capabilities and organizational effectiveness. Infrastructure capabilities include technology, structure, and culture while process capabilities include acquisition, conversion, application, and protection. They reported that both capabilities contribute to the achievement of organizational effectiveness. Table 2 – 4 compares these previous studies and positions the work undertaken in this study in relation to previous literature.

	Study	KM Enablers	KM Processes	Organizational Performance	Findings
Relationship among enablers	Bennet and Gabriel (1999)	Structure, Culture Size, Environment	Informal Events, Experience Workshops, Communities of Practice, Project Briefings, Expert Interviews, Best Practice Cases, Knowledge Broker, Experience Reports, Databases, Research Services		Effect of change-friendly culture on the number of KM methods employed.
	Hogel and Schulze (2005)	KM methods	Transfer (time to transfer)		Deliberate and concerted management of knowledge can offer a great leverage for the improvement of NPD processes in organization
	Zander and Kogut (1995)	Characteristics of social knowledge	Transfer (number of times the respondents provide and receive knowledge in a given period)		Codifiability, teachability, and parallel development have significant effects on the time to transfer.
	Appleyard (1996)	Industry and national characteristics	Transfer(four-stages transfer processes)		Public sources of knowledge are much more prevalent in industry; Public sources of technical knowledge play a larger role in knowledge transfer in Japan than in the United States.
	Szulanski (1996)	Characteristics of the knowledge transferred source, recipient, context	Transfer (percentage of a project's total knowledge that come from other divisions)		Recipient's lack of absorptive capacity, causal ambiguity, and an arduousness of the relationship are the major impediments to knowledge transfer.
	Hansen(1999)	Weak ties (distant and infrequent relationships); Knowledge characteristics	Sharing (perceived quality of shared knowledge, perceived sharing level)		Weak ties impede the transfer of complex knowledge.
Relationship between enablers and processes	Lee and Kim (2001b)	Reward, IT service quality Top management support Climate maturity			Reward and IT service quality are critical management drivers to influence climate maturity and finally lead to high knowledge sharing.
	Bock and Kim (2002)	Expected rewards Expected associations Expected contributions IT usage	Sharing (perceived attitude, intention, and number of times the actual sharing behaviour)		Expected associations and contribution are the major determinants of the knowledge sharing Expected reward and IT usage are not ignorantly related to knowledge sharing.
	Dombrowski et al (2007)	Elements of Innovative Cultures	Sharing (Innovative mission and vision statements, democratic communication, safe spaces, flexibility, collaboration, boundary spanning, incentives, and leadership.)		They identified eight elements of organizational innovative culture: innovative mission and vision statements, democratic communication, safe spaces, flexibility, collaboration, boundary spanning, incentives, and leadership.
	Bierly and Chakrabarti (1995)	KM strategy		ROS ROA	Innovators and explorers are more profitable than exploiters and loners.
Relationship between enablers and performance	Simonin (1997)	Collaborative experience Collaborative know-how		Tangible benefits(ROI, ROA)Intangible benefits	Collaborative know-how allows firms to achieve greater organizational benefits; Collaborative experience alone does not ensure that a firm will benefit from collaboration.
	Jennex and Olfman (2005)	System Quality, Information, Communication, and Knowledge Quality; Knowledge-Specific Service; System Use/User Satisfaction;		Individual Impact and Impact on Collectives of People	KMS success factors were identified from a large number of studies, projects, and KMSs providing a broad view of KMS success.

Relationship among knowledge enablers, processes, and performance	Becerra-Fernandez and Sabherwal (2001)	Task (process or content orientation; focused or broad domain)	Creation (socialization, externalization, combination, internalization)	KM satisfaction	Socialization is suitable for broad and process-oriented tasks, externalization for focused and content-oriented tasks, combination for broad and content-oriented tasks, and internalization for focused and process-oriented tasks; Combination and externalization affect knowledge satisfaction.
Gold et al. (2001)	Infrastructure capability(technology, structure, culture)	Process capability (acquisition, conversion, application, protection)	Organizational effectiveness	Infrastructure and processes capabilities contribute to the achievement of organizational effectiveness.	
This Research	KM Strategy, Social-perspective(structure, culture, skill) Technical-perspective(IT support)	Creation (socialization, externalization, combination, internalization)	Organizational Creativity Organizational performance	KM strategy, culture and centralization contribute to knowledge creation process. Creation is critical organizational creativity and finally leads to high organizational performance.	

Table 2 – 4 A Comparison of Previous Studies

2.2 Theoretical Framework for this Research

According to section 2.1, the focus of knowledge management is on the development of organizational competencies through effective management of strategic knowledge. Many researchers have emphasized three major factors for managing knowledge: enablers, processes and organizational performance (Beckman, 1999; Demarest, 1997; O'Dell and Grayson, 1999). Knowledge management influencing factors are organizational mechanisms for intentionally and consistently fostering knowledge (Lchijo et al., 1998); they can stimulate knowledge creation, protect knowledge, and facilitate the sharing of knowledge in an organization (Stonehouse and Pemberton, 1999). Appropriate enablers can enhance an organization's ability to manage knowledge (Pan and Scarbrough, 1998). Knowledge processes (knowledge management activities) can be thought of as a structured coordination for the purpose of managing knowledge effectively (Gold et al., 2001). Typically, these processes include activities such as creation, sharing, storage, and usage (Alavi, 1997; Beckman, 1999). From a KM perspective, organizational performance may be measured in terms of organizational learning, profitability or other financial benefits in knowledge management (Davenport, 1999; Simonin, 1997). Without measurable success, passion from employees and managers will vanish (O'Dell and Grayson, 1999).

However, no direct link between knowledge processes and organizational performance is found yet. Although considerable discussion of the relationship was made, few if any companies have thus far been able to establish a causal link between their knowledge management processes and their business performance, regardless of how it is measured (Davenport, 1999). Establishing this relationship will always be difficult. Because many factors influence the determination of the organizational performance, attempts to trace causality to any single factor like knowledge management may be risky. For example, if organizational performance rises, anything from favourable economic

conditions to new products and services to luck can be cited as a reason. To avoid this danger and establish credible links between knowledge management and organizational performance, intermediate outcomes (for example, knowledge worker capability, knowledge satisfaction, or organizational creativity) may be introduced (Davenport, 1999). This incorporation may help to explain how enablers ultimately create business value. Based on this rationale, a theoretical framework is developed for this research. Its theoretical underpinnings are embedded in based on system thinking theory, social capital theory, absorptive capacity theory, expressed through an input-process-output model (see Figure 2 – 2).

The following sections describe how these theories informed the research theoretical framework.

2.2.1 System Thinking Theory

Systems thinking is a unique approach to problem solving, in that it views certain 'problems' as a part of the overall system so focusing on these outcomes will only further develop the undesired element or problem (O'Connor and McDermott, 1997). Systems thinking is a framework that is based on the belief that the component parts of a system will act differently when the systems relationships are removed and it is viewed in isolation. The only way to fully understand why a problem or element occurs and persists is to understand the part in relation to the whole (Capra, 1996). Standing in contrast to Descartes, scientific reductionism and philosophical analysis, it proposes to view systems in a holistic manner. Consistent with systems philosophy, systems thinking concerns an understanding of a system by examining the linkages and interactions between the elements that compose the entirety of the system.

Systems thinking attempts to illustrate that events are separated by distance

and time and that small catalytic events can cause large changes in complex systems. Acknowledging that an improvement in one area of a system can adversely affect another area of the system, it promotes organizational communication at all levels in order to avoid the silo effect. Systems thinking techniques may be used to study any kind of system — natural, scientific, engineered, human, or conceptual.

There is a general recognition among academics that knowledge management is a cross-functional and multifaceted discipline. A variety of components make up knowledge management and the understanding of their interaction are important; a holistic view is very useful (Ndlela and Toit, 2001). To this end, an integrative research model is necessary; i.e., the relationships among knowledge enablers, processes, and organizational performance should be identified within the framework of systems thinking. Systems thinking theory considers problems in their entirety (Capra, 1996; Rubenstein-Montano et al, 2001; Senge, 1990). Problem solving in this way includes pattern finding to enhance understanding of, and responsiveness to, the problem. System thinking theory examines relationships between the various parts of the system. It is championed on the premise that there are emergent properties of systems that do not subsist when systems are decoupled into smaller parts (Senge, 1990).

This theory is better able to describe complex and dynamic characteristics of knowledge management in a systematic fashion. For example, the people (the knowledge people create, share, and use), the culture for knowledge sharing, organizational structure, and the technological infrastructure for knowledge management should be all be considered for effective knowledge management. This approach to knowledge management emphasized the concern raised by Tsoukas (1996) regarding the lack of an integrative framework in organizations to provide a general sense of direction for

knowledge management. Furthermore, systems thinking theory is important for knowledge management because the theory can ensure that the same important components are addressed and compared by knowledge management endeavours (Schlange, 1995). Therefore, the proposed integrative KM framework of this research will be based on system thinking theory (Rubenstein-Montano et al, 2001). It provides systematic mechanisms for how knowledge enablers can improve organizational performance and for studying connections between KM processes and organizational performance.

2.2.2 Social Capital Theory

Social capital refers to connections within and between social networks and it is first used by Hanifan in 1916 (Putnam, 2000) and referred as:

“those tangible substances [that] count for most in the daily lives of people: namely good will, fellowship, sympathy, and social intercourse among the individuals and families who make up a social unit....The individual is helpless socially, if left to himself....If he comes into contact with his neighbour, and they with other neighbours, there will be an accumulation of social capital, which may immediately satisfy his social needs and which may bear a social potentiality sufficient to the substantial improvement of living conditions in the whole community. The community as a whole will benefit by the cooperation of all its parts, while the individual will find in his associations the advantages of the help, the sympathy, and the fellowship of his neighbours.”

Based upon Hanifan's definition, Putnam further defines social capital as "...networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives" (Baron et al. 2000). Although social capital has many different attributes, it can be categorized into three dimensions: the structural, the relational, and the cognitive (Nahapiet and Ghoshal, 1998; Wah et al, 2007). Structural dimension refers to the overall pattern of connections between actors (Burt, 1992). Relational dimension refers to assets created and leveraged through relationships. It includes various facets such as trust, norms, obligations, and identifications (Putnam,

1995; Coleman, 1990; Burt, 1992; Hakansson and Snehota, 1995). Cognitive dimension refers to resources providing shared representations, interpretations, and systems of meaning among parties (Cicourel, 1973; Wah et al, 2007).

Researchers suggested that knowledge will be transferred more efficiently between subunits when the managers of these subunits possess strong social interaction ties, develop trusting relationships, and share common values and norms. Social capital facilitates knowledge transfer in two ways. First, social capital creates a set of higher-order organizing principles that act as mechanisms for codifying knowledge into a common language accessible to a wider group of individuals (Kogut and Zander, 1992). Second, social capital increases the efficiency of the actions of individuals (both transferors and recipients of knowledge) and reduces the probability of opportunism as well as the need for costly monitoring processes, and hence, the costs of transactions (Nahapiet and Ghoshal, 1998). They have suggested that successful development of social capital facilitates creation and transfer of knowledge within a firm (Kostova, 1999; Nonaka and Takeuchi, 1995). It also facilitates the combination and exchange of resources, and, thus, the value-creating activities of the firm (Nahapiet and Ghoshal, 1998; Tsai and Ghoshal, 1998).

Technology will be transferred easily from external sources when managers have social interaction ties or have developed common values and trusting relationships. Dyer and Nobeoka (2000) studied the role of networks at Toyota in creating and maintaining high performance. They found that a strong-tie network has established a variety of institutionalized routines that facilitate multidirectional knowledge flows. Ernst (2000) also studied inter-organizational knowledge outsourcing and argued that it was the competitive edge of Taiwanese firms in the computer industry.

Social capital based on networks of relationships has been found to be effective in enhancing the acquisition, sharing and transfer of knowledge in organizations (Wah, et. al, 2007). Acknowledging the importance of social capital in knowledge management this thesis pays attention to the social aspects of knowledge management processes by highlighting their differences (see Figure 2-1) and investigating these process empirically later on (see sections 5.1, 6.4.2). Social capital facilitates the development of intellectual capital by affecting the conditions necessary for exchange and combination to occur (Nahapiet and Ghoshal, 1998). Intellectual capital refers to knowledge and knowing capability of social collectivity; it means knowledge management processes and its results. (Nahapiet and Ghoshal, 1998). Social capital consists of various knowledge enablers such as organizational structure and culture. One of the primary focuses of this study is on the relationship between knowledge enablers and knowledge creation processes. This relationship can be justified by social capital theory.

2.2.3 Absorptive Capacity Theory

Absorptive capacity is first referred as the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities and it is a function of the firms prior knowledge (Cohen and Levinthal, 1990).

Absorptive capacity plays a critical role in knowledge acquisition and transfer. It is prior related knowledge, including knowledge of the most recent scientific or technological developments that confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends (Cohen and Levinthal, 1990; Todorova and Durisin, 2007; Zahra and George, 2002). Underlying the notion that absorptive capacity is a function of prior related knowledge is the idea that knowledge acquisition is most effective when the target knowledge is related to what is already known, and it is the most difficult

in novel domains (Cohen and Levinthal, 1990). That is, acquisition of new knowledge from external sources tends to be more successful when a company possesses existing knowledge related to the new knowledge being acquired. And, internal transfer of the acquired knowledge tends to be more efficient when the recipient unit of the firm possesses prior knowledge related to the knowledge being transferred. Several researchers (Hamel, 1991; Inkpen, 2000; Lyles and Salk, 1996) have focused on the ability of firms to learn and they have suggested that the effectiveness of learning between organizational units is closely related to Cohen and Levinthal's (1990) notion of absorptive capacity.

This research adopted absorptive capacity theory as one of the focal theories in the theoretical framework (See Figure 2 – 2). The literature suggests that absorptive capacity is able to reduce the barriers to knowledge acquisition and dissemination between and within firms created by organizational embedded factors (Leonard-Barton, 1995). Specifically, tacit and complex knowledge is available with higher social capital, and it can be acquired more easily through higher absorptive capacity. Institutional distance can be reduced through building up social capital. Knowledge dissemination can also be more efficient if the organizational culture of the recipient unit values new knowledge. This kind of organizational culture requires a higher absorptive capacity. Absorptive capacity allows the firm to change to match the dynamics of the market (Zahra & George, 2002; Todorova and Durisin, 2007). Zahra and George (2002) define absorptive capacity as a dynamic capability that consists of a set of organizational routines and processes. Routines and capabilities are the organizational processes that make skills and resources work together (Todorova and Durisin, 2007).

2.2.4 Input-Process-Output Model

The input-process-output model can provide integrative view for relationships

among knowledge components. Knowledge management phenomenon can be conceptualized as a set of three distinct but interrelated components; knowledge enablers, processes, and organizational performance. Knowledge management enablers (e.g., organizational structure and culture) affect organizational performance (e.g., financial and non-financial) through knowledge processes (e.g., creation, sharing, and using). In particular, knowledge management processes can either be dependent variables for knowledge management enablers or independent variables that form antecedents for organizational performance.

The primary research focus is on the relationships between knowledge enablers and organizational performance by elaborating on the significance of knowledge processes as the foundation of organizational advantage (Nahapiet and Ghoshal, 1998). The relationship among these three components is nothing new; it can be found in the input-process-output model by Hackerman and Morris (1978). The input-process-output model is one of the most pervasive of all conceptual devices in business context. The model assumes that the input factors affect output performances through certain kinds of interaction processes. It focuses on how resources (inputs) are converted (processed) into products (outputs).

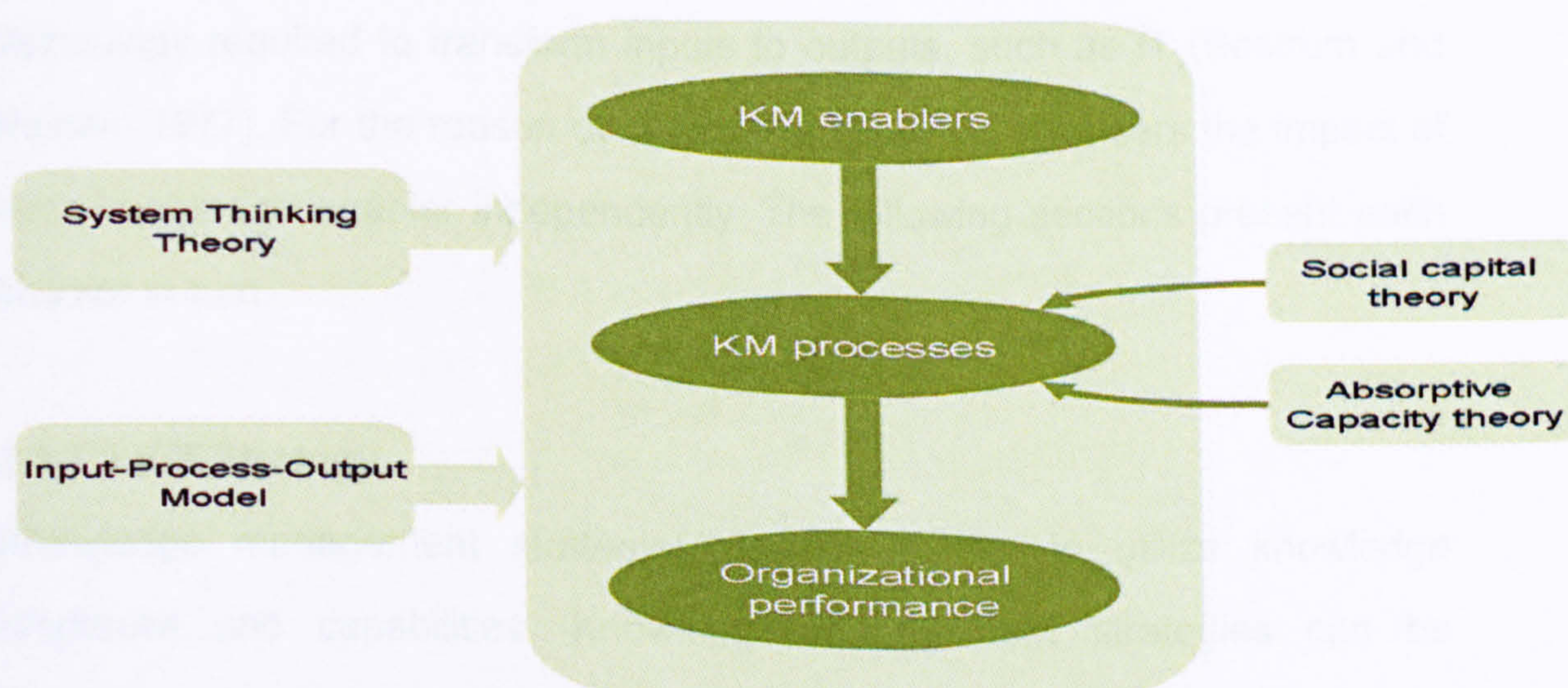


Figure 2 – 2 Theoretical Framework of this study

In summary, the theoretical framework developed for this research has adopted various theories such as systems thinking theory, social capital theory, absorb capacity theory, and input-process-output model. In the next section, the constructs of the framework are presented.

2.3 Conceptual Framework Development

This research draws upon the literature of knowledge management to develop a conceptual framework with key factors that impact on the organizational performance. Therefore, the proposed framework highlights the major factors that can explain a large proportion of the variance in knowledge management.

2.3.1 KM Enablers

A variety of knowledge management enablers have been addressed in the literature (Ichijo et al., 1998; Leonard-Barton, 1995; Sawhney and Prandelli, 2000). Enablers may be addressed according to a socio-technical theory (Pan and Scarbrough, 1998). This theory describes an organization from the social and technical perspectives. The social perspective is concerned with social enablers, the attributes of people (e.g., attitudes, skills, values), the relationships among people, organizational culture, and organizational structure. The technical perspective is concerned with technical enablers, the technology required to transform inputs to outputs, such as IT (Bostrom and Heinen, 1977). For the reason of clarity, this research considers the impact of each knowledge enabler independently. The following sections present each enabler in turn.

2.3.1.1 KM Strategy

Knowledge management strategies determine how to utilize knowledge resources and capabilities. Knowledge management strategies can be described along two dimensions reflecting their focus (Hansen et al. 1999). One dimension refers to explicit knowledge and emphasizes the capability to

help create, store, share, and use an organization's explicitly documented knowledge. The strategy as per this dimension stresses codifying and storing organizational knowledge. Typically, knowledge is codified via information technology (Davenport et al. 1998; Scott 1996; Swan et al. 2000). Codified knowledge is more likely to be reused. Furthermore, this strategy stresses completely specified sets of rules about what to do under every possible set of circumstances (Bohn 1994). This strategy is referred to as codification strategy. Another dimension refers to tacit knowledge and emphasizes knowledge sharing via interpersonal interaction. The strategy as per this dimension emphasizes dialogue through social networks including occupational groups and teams (Swan et al 2000). It also stresses sharing through person-to-person contacts (Hansen et al 1999). This strategy attempts to acquire internal and opportunistic knowledge and share it informally (Jordan and Jones 1997). Knowledge can be obtained from experienced and skilled people in this strategy. This strategy can be referred to as personalization strategy. For this research, we hypothesize that:

H1: Knowledge Management strategy will have a positive effect on the knowledge creation process.

H1a: Codification strategy will have a positive effect on the knowledge creation.

H1b: Personalization strategy will have a positive effect on the knowledge creation.

2.3.1.2 Organizational Culture

Organizational culture has been found to be one of the important determinants of sustained organizational innovativeness and performance, and is essential for successful knowledge management (Davenport et al., 1998; Demarest, 1997; Dombrowski et al, 2007; Gold et al., 2001; McLean, 2005; Usoro and Kuofie, 2006). A survey by Chase (1998) indicates that 80 percent of the people who participated in the survey recognize that culture is the most

important factor for creating a knowledge-based organization. Culture is a basic building block to knowledge management. It must be considered when introducing knowledge management because it affects how an organization accepts and fosters knowledge management initiatives. Dombrowski et al (2007) identified eight elements of organizational innovative culture: innovative mission and vision statements, democratic communication, safe spaces, flexibility, collaboration, boundary spanning, incentives, and leadership.

If knowledge management is to be an integrated aspect of how work gets done in an organization, it must become an integrated aspect of the culture (Ndlela and Toit, 2001). Culture defines not only what knowledge is valued, but also what knowledge must be kept inside the organization for sustained innovative advantage (Long, 1997). Creating a knowledge friendly culture is one of the most critical factors of success for a knowledge management (Mørk et al, 2008; Ndlela and Toit, 2001; Lee and Kim, 2001b; Davenport and Prusak, 1998). Organizations should establish an appropriate culture that encourages people to create and share knowledge within an organization (Holsapple and Joshi, 2001; Leonard-Barton, 1995). This study focuses on *collaboration, trust, and learning* on the basis on the concept of care (Eppler and Sukowski, 2000; Krogh, 1998). Care is a key enabler for organizational relationships (Krogh, 1998). Care characterizes interactions between receivers and providers of knowledge in organizations, and should be understood as a quality of a relationship rather than in terms of roles and functions (Ichijo et al., 1998). When organizational relationships are fostered through care, knowledge can be created and shared.

Collaboration

Collaborative culture encourages all types of innovation. Decreasing barriers of power and decorum by considering collaboration as a form of play is one way of encouraging the type of respectful interactions desired for true

collaborative advances (Dougherty and Takacs, 2004). Regardless of approach, organizations need to have a culture that encourages collaboration among employees, across partners, and with people holding diverse viewpoints (Dombrowski et al, 2007). Collaboration may be defined as the degree to which people in a group actively support and help one another in their work (Hurley and Hult, 1998). Effective knowledge management requires a collaborative culture (Gold et al., 2001; O'Dell and Grayson, 1999).

Collaborative interactions such as open dialogue, social interaction, and coactivity can help create organizational knowledge (Nahapiet and Ghoshal, 1998). Exchanging knowledge among different members is a prerequisite for knowledge creation. Collaborative interactions foster this type of exchange by reducing fear and increasing openness to other members. For example, Zucker et al. (1996) confirmed the significance of collaborative interactions in knowledge creation by examining the biotechnology industry. This shows that collaborative interactions should be encouraged both formally and informally among different members. Collaboration between organizational members also tightens individual differences (Leonard-Barton, 1995). It can help people develop a shared understanding about an organization's external and internal environments through supportive and reflective communication. Without established and aligned shared understanding among organizational members, little knowledge is ever created (Fahey and Prusak, 1998). Hedlund (1994) argued that knowledge creation should be facilitated by the availability of a shared understanding. Not surprisingly, many studies have recognized collaboration as a key enabler for knowledge creation (Krogh, 1998; Nonaka and Takeuchi, 1995; O'Dell and Grayson, 1999). We do not have a priori reason to expect a different relationship.

H2: Collaboration will have a positive effect on the knowledge creation processes.

Trust

Previous research has established that trust is an important condition within any work team since teamwork is dependent on knowledge sharing and knowledge sharing is influenced by the degree of trust that exists between people (Chowdhury, 2005; Politis, 2003). Trust can be defined as maintaining reciprocal faith in each other in terms of intention and behaviours (Kreitner and Kinicki, 1992). Trust may facilitate open, substantive, and influential information exchange (Nelson and Coopriider, 1996, O'Dell and Grayson, 1999). When their relationships are high in trust, people are more willing to participate in knowledge exchange and social interactions (Nahapiet and Ghoshal, 1998). People seek advice from trusted colleagues to sharpen their understanding of the problems. Szulanski (1996) empirically found that the lack of trust among employees is one of the key barriers against knowledge transfer.

The investment of trust among organizational members can be thought of as a leap of knowledge transfer (Nelson and Coopriider, 1996). The increase in knowledge transfer brought on by mutual trust results in knowledge creation. The exchange of knowledge is not amenable to enforcement by contract, and thus gives rise to a high level of risk and uncertainty. The presence of a high level of trust can reduce this risk (Nelson and Coopriider, 1996; Roberts, 2000; Scott, 2000, Ribièrè and Tuggle, 2005). By alleviating the fear of risk and uncertainty, trust encourages a climate conducive to better knowledge creation. Trust is critical in a cross-functional or inter-organizational team because withholding information because of a lack of trust can be especially harmful to knowledge articulation, internalization, and reflection (Hedlund, 1994). Distrust leads people to hide or hoard their knowledge (Jarvenpaa and Staples, 2000). In a distrusted environment, knowledge will not be created, or will be created in a restrictive manner. Therefore, facilitating trust among cross-functional or inter-organizational team members is important for the foundation of creation

(Ichijo et al., 1998; Lubit, 2001; Nelson and Coopriider, 1996; Scott, 2000). It could be expected that this relationship holds true: ***H3: Trust will have a positive effect on the knowledge creation processes.***

Learning

Learning is the acquisition of new knowledge by people who are able and willing to apply that knowledge in making decisions or influencing others (Miller, 1996). Organisational learning comprises three processes (Parboteeah and Jackson, 2007; Yeo, 2005), individual learning, team/group learning and organisational learning. Learning can be defined as the degree to which it is encouraged in organizations (Hurley and Hult, 1998). The emphasis on individual learning infuses an organization with new knowledge (Damanpour, 1991; Hurley and Hult, 1998). Through the emphasis on learning and development, organizations can help individuals play a more active role in learning and discover something new about problems. Kanevsky and Housel (1998) insisted that the amount of time spent learning is positively related with the amount of knowledge. Intellectual organizations seem to develop a deeply ingrained learning culture (Quinn et al., 1996). For successful knowledge creation, individuals should be encouraged to ask questions (Ndlela and Toit, 2001). Knowledge creation capacity is increased by various learning means such as education, training, and mentoring (Narasimha, 2000; Swieringa and Wierdsma, 1992). For example, Krogh (1998) proposed training programs as a means for knowledge creation. It is important to provide training to complement and supplement employees' existing knowledge. Swap et al., (2001) highlight mentoring as a key means in creating organizational knowledge. Intense mentoring enables professionals to obtain a higher level of knowledge.

The mere presence of traditional training and development activities may not be sufficient. Organizations that are serious about knowledge creation need to

support a continuous learning environment (Ndlela and Toit, 2001; Nevies et al., 1995). Several researchers (Hamel, 1991; Inkpen, 2000; Lyles and Salk, 1996) have focused on the ability of firms to learn and they have suggested that the effectiveness of learning between organizational units is closely related to Cohen and Levinthal's (1990) notion of absorptive capacity. Learning should happen at all levels of the organization structure. Individuals must be encouraged to ask questions, to challenge and to learn. This continuous learning opens up the possibility of achieving scale in knowledge creation. Nucor, one of the most innovative steel companies in the U.S., built a Knowledge Creation Foundation by investing in continuous and multifunctional training programs. (Gupta and Govindarajan, 2000). Hence, we hypothesize:

H4: Learning will have a positive effect on the knowledge creation.

2.3.1.3 Organizational Structure

The organizational structure within an organization may encourage or inhibit knowledge management (Gold et al., 2001; Hedlund, 1994; Nonaka and Takeuchi, 1995). For example, Ichijo et al. (1998) insisted that firms should maintain consistency between their structures and how they intend to put their knowledge to use. Organizations' structures should be organized so that they are close to the context for knowledge creation and are able to act for knowledge creation. It is important that organizational structure is designed for flexibility so that it encourages creating and sharing knowledge across boundaries within the organization. Many researchers have proposed organizational structure for effective knowledge management on the basis of flexibility. Modular organizational design (Sanchez and Mahoney, 1996) and hypertext organization (Nonaka and Takeuchi, 1995) are good examples. Our study focuses on two key structural factors such as *centralization and formalization* (Menon and Varadarajan, 1992). They are recognized as key variables underlying structure. Moreover, their effects on knowledge

management within organizations are widely recognized to be potent (Eppler and Sukowski, 2000; Jarvenpaa and Staples, 2000; Lubit, 2001; Riggins and Rhee, 1999). The section below explains the relationship between these factors and KM.

Centralization

Centralization refers to the locus of decision authority and control within an organizational entity (Caruana et al., 1998, Ein-Dor and Segev, 1982). The concentration of decision-making authority inevitably reduces creative solutions while the dispersion of power facilitates spontaneity, experimentation, and the freedom of expression, which are the lifeblood of knowledge creation (Graham and Pizzo, 1996). Therefore, many researchers proposed that a centralized organizational structure makes it harder to create knowledge (Starbuck, 1992; Stonehouse and Pemberton, 1999; Teece, 2000). For example, Zaltman (1986) noted that more knowledge is created in a less centralized organizational structures. Moreover, centralized structure hinders interdepartmental communication and frequent sharing of ideas (Woodman et al., 1993) due to time-consuming communication channels (Bennett and Gabriel, 1999); it also causes distortion and discontinuousness of ideas (Stonehouse and Pemberton, 1999). Without a constant flow of communication and ideas, knowledge creation does not occur. A decentralized organizational structure has been found to facilitate an environment where employees participate in knowledge building process more spontaneously (Hopper, 1990). Participatory work environments foster knowledge creation by motivating organizational members' involvement. Therefore, decreased centralization in the form of locus of authority can lead to increased utilization and creation of knowledge. For these reasons, some researchers argued that knowledge-centric firms should downplay the concentration of decision-making authority (Starbuck, 1992; Szulanski, 1996).

It would be realistic to posit that when an organization is rigidly centralized, knowledge creation is low (Menon and Varadarajan, 1992). Hence we propose the fifth hypothesis:

H5: Centralization will have a negative effect on the knowledge creation.

Formalization

Formalization refers to the degree to which decisions and working relationships are governed by formal rules, standard policies, and procedures (Holsapple and Joshi, 2001; Rapert and Wren, 1998). Knowledge creation requires flexibility and less emphasis on work rules (Bennett and Grbriel, 1999; Hedlund, 1994; Ichijo et al., 1998; Lusch, et al., 1998; Wilkstrom and Norman, 1994). The range of new ideas seems to be restricted when strict formal rules dominate an organization. Flexibility can accommodate better ways of doing things (Graham and Pizzo, 1996). Therefore, the increased flexibility in an organizational structure can result in increased creation of knowledge. Knowledge creation also requires variation (Wilkstrom and Norman, 1994). In order to be more adaptable when unforeseen problems arise, an organization may accommodate variation in process and structure. This adaptability provides more options and allows rich stimulation and interpretation (Nevis et al., 1995). Low formalization permits openness and variation, which encourage new ideas and behaviors (Damanpour, 1991; Pierce and Delbecq, 1977). Knowledge creation is also likely to be encouraged through unhindered communications and interactions (Bennett and Grbriel, 1999). Formality stifles the communication and interaction necessary to create knowledge. Lack of formal structure enables organizational members to communicate and interact with one another to get easy access to knowledge and its flow (Jarvenpaa and Staples, 2000). Hence, we hypothesize:

H6: Formalization will have a negative effect on the knowledge creation.

2.3.1.4 People

People are at the heart of creating organizational knowledge (Chase, 1998; Holsapple and Joshi, 2001; Ndlela and Toit, 2001). In particular, people are seen as important enablers when trying to implement a knowledge management program (Ndlela and Toit, 2001). One adage states that knowledge management is ten percent technology and 90 percent people (Zack, 1999c); i.e., the people component is one of the most important enablers. It is people who create and share knowledge. Organizations should make their people understand the importance of knowledge management. Therefore, managing people who can and are willing to create and share knowledge is important (O'Dell and Grayson, 1999). Knowledge and competence can be acquired by admitting new people with desirable skills (Stonehouse and Pemberton, 1999). The skills embodied in employees are the dimension most often associated with knowledge management (Leonard-Barton, 1995). In particular, T-shaped skills embodied in employees are most often associated with core capability (Johannessen et al., 1999; Leonard-Barton, 1995) for the reasons described below.

T-Shaped skills

T-shaped skills imply that the capability of individual specialists allows them to have meaningful and synergistic conversations with one another (Madhavan and Grover, 1998). Individuals with T-shaped skills are capable to see the world from two or more different perspectives – knowing one or more discipline in great depth as well as having a broader view of the bigger picture. T-shaped skills imply that skills are both deep (represented by the vertical part of the “T”) and broad (represented by the horizontal part of the “T”); i.e., their possessors can explore particular knowledge domains and their various applications in particular products (Leonard-Barton, 1995). Hence, individuals with T-shaped skills are those who are: not only experts in specific technical areas but also

intimately acquainted with the potential systematic impact of their particular tasks. On the one hand, a typical example can be a ceramic materials engineer, who has deep knowledge of his/her discipline but also knows how their discipline interacts with others, such as polymer processing (Iansiti, 1993, p. 139)

The proposition that knowledge springs from the interaction of different knowledge sets has found acceptance in literature on knowledge (Simon, 1985), new product development (Madhavan and Grover, 1998), and complexity theory (Kaufman, 1995). People with T-shaped skills are extremely valuable for creating knowledge because they can integrate diverse knowledge sets (Leonard-Barton, 1995). They have the ability both to combine theoretical and practical knowledge and to see how their branch of knowledge interacts with other branches. Therefore, they can expand their competence across several functional branch areas, and thus create new knowledge (Johannessen, et al., 1999). Madhavan and Grover (1998) argue that the horizontal stroke of the T-shaped skills set enables organizational members to meaningfully interact with one another; without these skills, such interaction would be hampered. Therefore, we hypothesize that:

H7: The presence of the organizational members with T-shaped skills will have a positive effect on the knowledge creation.

2.3.1.5 Technology

Technology contributes to knowledge creation (Gold et al., 2001). This technology infrastructure includes information technology and its capabilities (Scott, 1998; Zack, 1999c). Information technology (IT) (such as intranet, email, groupware) is widely employed to connect people with reusable codified knowledge, and it facilitates conversations. Through IT, previously fragmented

flows of knowledge can be integrated (Gold et al., 2001). Although leading theorists have warned about investments in information technology, at the expense of investments in human capital (Sveiby, 1997), investments in IT seem to be unavoidable to scale up knowledge management projects (Borghoff and Pareschi, 1997). Sophisticated knowledge management systems pay off because of their ability to reuse knowledge (Buniyamin and Barber, 2004; Davenport et al., 1998; Hansen et al., 1999; Markus, 2001; Weiser and Morrison, 1998). IT also enables to manage knowledge effectively and for an organization to see its full benefits (Ndlela and Toit, 2001). IT determines how knowledge is used and accessed (Leonard-Barton, 1995). Therefore, the availability of IT is essential for effective knowledge management. Hence, this study focuses on information technology availability (Stonehouse and Pemberton, 1999). An organization should invest in a comprehensive infrastructure that can support the various types of knowledge activities (Gold et al., 2001). Currently, little empirical research has been conducted on the impact of information technology available on knowledge management (Gottschalk, 2000).

IT Support

Information technology support means the degree to which knowledge management is supported by the use of information technologies (Gold et al., 2001). Many researchers have found that information technology is a crucial element for knowledge creation and transfer (Davenport and Prusak, 1998; Gold et al., 2001; Gottschalk, 2000; Gupta and Govindarajan, 2000). Information technology affects knowledge in a variety of ways. First, information technology facilitates rapid collection, storage and exchange of data on a scale not practicable in the past, thereby assisting knowledge creation and the sharing process (Robert, 2000). It helps employees have easy access to the required knowledge (Ndlela and Toit, 2001). Second, a well-developed technology integrates fragmented flows of information and

knowledge (Gold et al., 2001). This integration can eliminate barriers to communication among departments in organization. Third, information technology fosters all processes of knowledge creation and is not limited to the transfer of explicit knowledge (Bolisani and Scarso, 1999; Raven and Prasser, 1996; Riggins and Rhee, 1999; Scott, 1998). For instance, InfoTEST's Enhanced Product Realization (ERP) project employs electronic whiteboarding and videoconferencing to enhance exchanges of tacit knowledge (Riggins and Rhee, 1999). Information technology upholds collaborative works, communication, searching and accessing, and systematic storing (Gold et al., 2001; Ndlela and Toit, 2001; Roberts, 2000). The current technology can support creation and sharing of knowledge in a cost cutting way (Coleman, 1999). It may be built with knowledge-oriented tools such as Lotus Notes and the World Wide Web-based intranet. Another possible technology infrastructure is desktop computing and communication. A capable, networked PC on every desk, or in every briefcase, with standardized personal productivity tools and software may help exchange knowledge (Davenport et al., 1998). Thus, it can be suggested that knowledge management is more likely to succeed if a broader technology infrastructure is adopted.

H8: IT support will have a positive effect on the knowledge creation.

2.3.2 KM Creation Processes

There are several ways to conceptualize the knowledge management processes. Normally, it includes the acquisition, dissemination and integration, and commercialization of knowledge (Gupta and Govindarajan, 2000b). From a life-cycle view, De Long and Seemann (2000) suggested that the credibility of knowledge management has to go through the stages of appreciation, articulation, adoption, and commercialization. Further, the Minnesota Innovation Studies focused on common elements in the innovation process,

namely, the initiation period, the developmental period, and the implementation and termination period (Van de Ven, Polley, Garud, and Venkataraman, 1999). These periods primarily correspond to the knowledge creation and sharing stages. Hogel and Schulze (2005) summarized 10 KM methods that have the potential to strongly support knowledge creation: Informal Events, Experience Workshops, Communities of Practice, Project Briefings, Expert Interviews, Best Practice Cases, Knowledge Broker, Experience Reports, Databases and Research Services. Alavi (1997) also considered six processes such as acquisition, indexing, filtering, linking, distribution, and application. Choo (1996) divided knowledge management into sense-making, knowledge creation, and decision-making. These processes are often concurrent and not always in a linear sequence (Beckman, 1999).

Among these processes, creation-related activities (for example, acquisition (Alavi, 1997), capture (Davenport and Prusak, 1998), or construction (Demarest, 1997)) become important because knowledge creation is a strategic weapon in today's global marketplace (Parent et al., 2000); increasingly, it seems that knowledge creation is gaining much attention as a potential source of competitive advantage (Nonaka et al., 1994; Parent et al., 2000). Knowledge creation is a continuous process whereby individuals and groups within a firm and between firms share tacit and explicit knowledge (Nonaka and Takeuchi, 1995). Although a great deal has been discussed about the importance of knowledge creation, there is relatively little empirical evidence (Raven and Prasser, 1996). Therefore, the emphasis of this study is on knowledge creation processes.

To explore knowledge creation processes, this study adopts the SECI model by Nonaka and Takeuchi (1995) for the following reasons. First, their work has become widely accepted (Scharmer, 2000); it has been used in many research areas such as organizational learning, joint ventures, new product

development, and information technology (Becerra-Fernandez and Sabherwal, 2001; Kidd, 1998; Scharmer, 2000; Scott, 1998). Second, this model includes not only knowledge creation but also knowledge transfer. Nonaka and Takeuchi described knowledge transfer as a process of both internalization and externalization (Venzin et al., 1998). The transfer of existing knowledge and the creation of new knowledge are important, and both of them should be considered in knowledge management (Krogh and Grand, 2000). Figure 2-3 shows these four knowledge creation processes according to the SECI model by Nonaka et al. (2000).

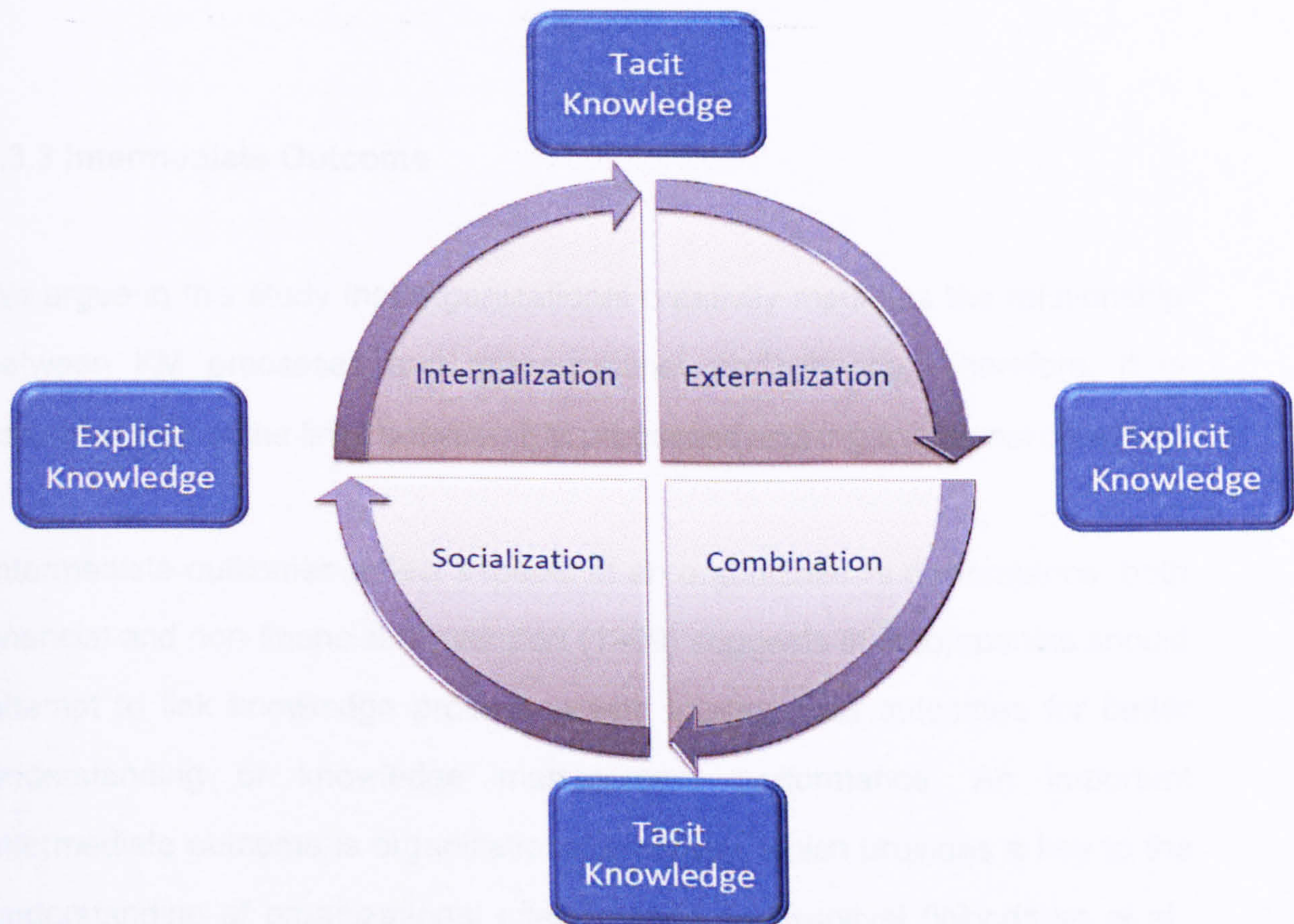


Figure 2 – 3 Knowledge Creation Process

The SECI model explores knowledge creation through the conversion between tacit and explicit knowledge. This knowledge conversion process is made up of four intertwined activity modes; socialization (S), externalization (E), combination (C), and internalization (I). Socialization relies on people to share

knowledge through more traditional means such as direct person-to-person contacts, and fosters new tacit knowledge such as shared mental models and technical skills. Externalization codifies tacit knowledge into explicit concepts. Combination converts explicit knowledge into more systematic sets by combining key pieces. Internalization embodies explicit knowledge into tacit knowledge. High usages of interactive creation modes mean that the manager believes that the organization has many processes in place to support creation modes. For example, if a manager reports a high level of socialization, this means that the manager believes that the organization has many processes in place to support socialization.

2.3.3 Intermediate Outcome

We argue in this study that organizational creativity mediates the relationship between KM processes and organizational performance. Therefore, it is natural to look at the links between KM processes and organizational creativity.

Intermediate outcomes reflect aspects of an organization's performance, both financial and non-financial. Davenport (1999) suggests that companies should attempt to link knowledge processes with intermediate outcomes for better understanding of knowledge management performance. An important intermediate outcome is organizational creativity, which provides a key to the understanding of organizational effectiveness and survival (Woodman et al., 1993).

Organizational creativity is the capability of creating valuable and useful products, services, ideas, procedures or processes by individuals working together in a complex social system (Amabile et al., 1996; Woodman et al., 1993). Knowledge plays an important role in the ability of the organization to

be creative (Vicari and Troilo, 2000; Woodman et al., 1993). Thus, organizations with more and better knowledge sharing and a creating mechanism are more intelligent (Glynn, 1996). Organizational creativity also connects and rearranges knowledge to create new, often surprising ideas that others judge to be useful (Koh, 2000). Creativity is not necessarily related to the *amount* of knowledge that an employee possesses, but rather to *the way in which* knowledge is created and shared (Amabile, 1988). The processes of knowledge creation unleash organizational creativity. Several studies have investigated the impact of knowledge creation on organizational creativity. For example, Koh (2000) insisted that knowledge creation is positively correlated with organization creativity. Naturally, organizational creativity has a strong link with knowledge creation (Vicari and Troilo, 2000).

Our study incorporates organizational creativity because it is the seed of all innovation (Amabile et al., 1996) and at the very heart of knowledge management (Gurteen, 1998). Organizational creativity transforms knowledge into business value. Neglecting organizational creativity can quickly undermine a business. The relationship between knowledge creation and organizational creativity has received relatively little attention despite its high potential (Vicari and Troilo, 2000). Furthermore, investigating the relationship is more interesting for a country like China, which will be seen as having remarkable talents and capacities in terms of creativity, while it is rated lower in terms of the creation and diffusion of knowledge (Ramirez and Dickenson, 2006).

Therefore, it can be hypothesized that:

H9: Knowledge creation process will have a positive effect on organizational creativity.

2.3.4 Organizational Performance

Measuring organizational performance is not a trivial task because it strongly

affects the behaviour of managers and employees. The ultimate test of any business is whether it leads to measurable improvements in organizational performance. In the area of organizational performance, knowledge management's achievement has been relatively light (Davenport, 1999). Most managers have used financial measures such as cost, return on investment, or return on sales. These measures may be appropriate in a stable environment, but fail to predict a firm's future performance in the ever-changing knowledge era (Knight, 1999).

Within KM literature, methods for measuring organizational performance can be categorized into four groups: financial measures (Bierly and Chakrabarti, 1996), intellectual capital (Han et al, 2000; Roos and Roos, 1997; Sveiby, 1997), tangible and intangible benefits (Simonin, 1997), and balanced scorecard (Kaplan and Norton, 2000; Kight, 1999). Financial measures are traditional method for organizational performance. To measure the performance of knowledge management, Bierly and Chakrabarti (1996) use financial measure such as return on sales (ROS) and return on assets (ROA). Intellectual capital rapidly becomes a very important measure for companies. A systematic approach to visualize and measure intellectual capital is increasingly valuable to companies regardless of industrial, size, age, ownership and geographical dimensions (Han et al., 2000; Ross and Roos, 1997). Jennex and Olfman (2005) identified System Quality, Information, Communication, and Knowledge Quality, Knowledge-Specific Service, System Use/User Satisfaction, Individual Impact and Impact on Collectives of People as the KMS success factors. Tangible and intangible benefits also become a useful method for measuring knowledge management outcomes. Tangible benefits refer to the benefits that are strategic and financial, for example, generating additional profits, improving market share, and sustaining competitive advantages. Intangible benefits refer to the benefits which are learning or increasing knowledge assets such as learning specific skills and

competencies (Simonin, 1997). Finally, the balanced scorecard method includes financial measures and operational measures such as customer satisfaction, internal processes, and the organization's innovation and improvement activities (Kaplan and Norton, 1992).

For this research, organizational performance are assessed by the use of global output measures such as market share, profitability, growth rate, innovativeness, successfulness, and the size of business in comparison with key competitors (Deshpande et al., 1993; Drew, 1997). In a knowledge-based economy, organizational creativity represents a dramatic organizational change. Robinson and Stern (1997) insisted that the tangible result of corporate creativity is organizational change. Without creativity, organizations may fail to adapt to changing internal and external conditions (Quinn et al., 1996), and thus lose their knowledge advantage. Typically, the goals of organizational change include the various aspects of organizational performance such as organizational effectiveness, survival, improvement, or innovation. Thus, organizational performance can be thought of as the output of a process that encourages creativity (Sawhney and Prandelli, 2000). Shani et al. (2000) found a positive relationship between performance and creativity through the field study of Seagate Corporation. Quinn et al. (1996) argued, in a study of Arthur Anderson Worldwide, that motivated creativity gives more value to a firm by leveraging intellectual assets. Similarly, Davenport (1999) suggested improvements in creativity might lead to better organizational performance. This study hypothesizes that: ***H10: Organizational creativity will have a positive effect on organizational performance.***

In sum, the conceptual framework for this research is developed as shown in Figure 2 – 4.

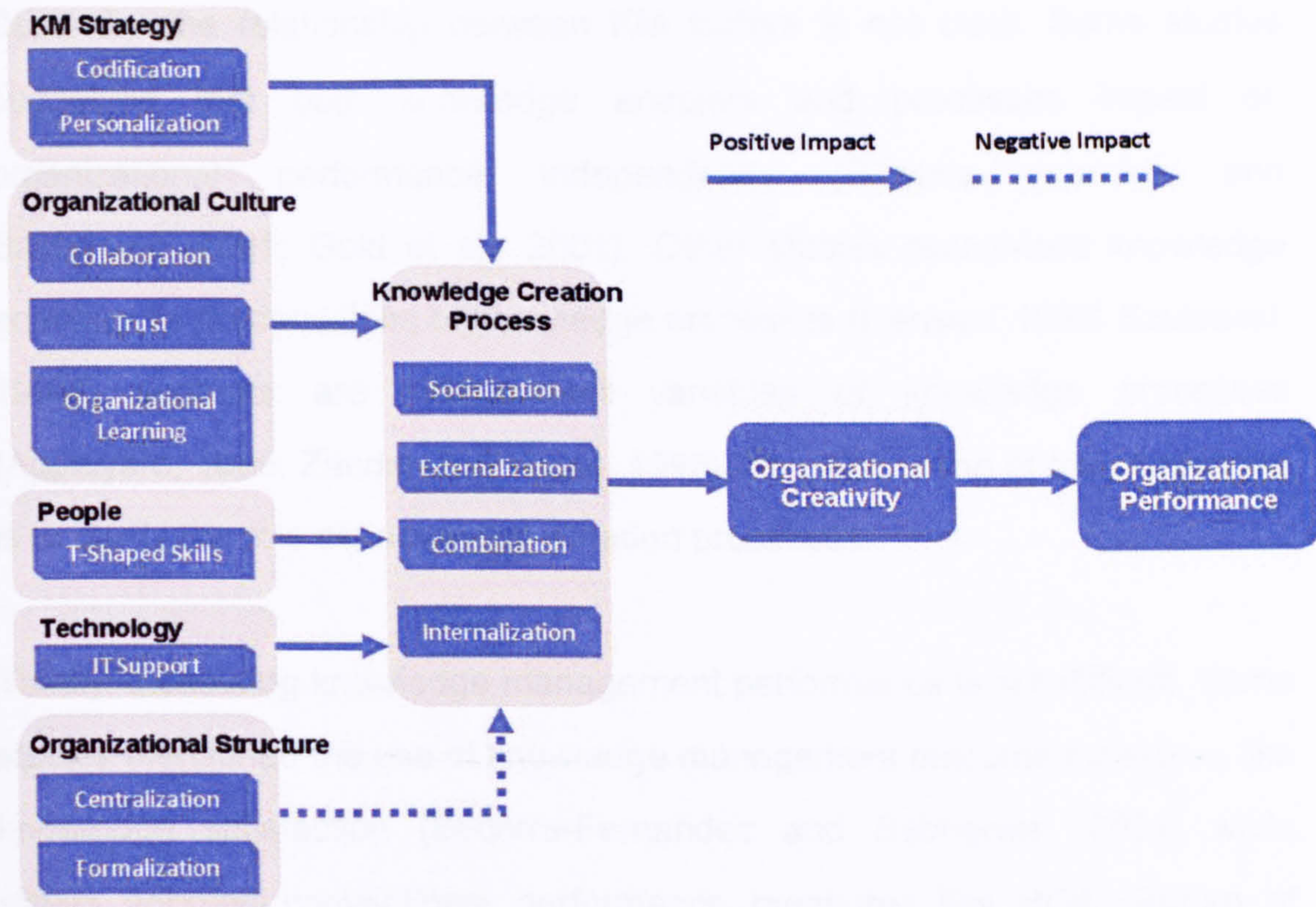


Figure 2 – 4 Conceptual Framework of this Study

2.4 Critical Observation from Literature Review

Critical review of previous KM literature yields some key observations beyond their existing presentation in previous sections.

Firstly, an integrative model is not available. Section 2.3.1, 2.3.2, 2.3.3, 2.3.4 suggest that although some studies investigate the relationships among knowledge enablers, processes, or organizational performance (Becerra-Fernandez and Sabherwal, 2001; Gold et al., 2001), the relationships between KM factors need to be explored. This study is driven by the assumption that if managers understand these relationships, it is more likely for them to improve their firms' performance.

Secondly, the relationship between KM factors is not clear. Some studies suggested that both knowledge enablers and processes impact on organizational performance independently (Becerra-Fernandez and Sabherwal, 2001; Gold et al., 2001). Other studies recognized knowledge enablers as preconditions of knowledge processes (Hansen, 1999; Szulanski, 1996); enablers are independent variables of knowledge processes (Appleyard, 1996; Zander and Kogut, 1995). Therefore, one of the challenges is to clarify the role of knowledge creation processes.

Thirdly, measuring knowledge management performance is still difficult. Some studies mentioned the use of knowledge management outcome measures like knowledge satisfaction (Becerra-Fernandez and Sabherwal, 2001) while others adopted conventional performance measures like ROA (Return of Assets) (Bierly and Chakrabarti, 1996; Simonin, 1997) or organizational effectiveness (Gold et al., 2001). It appears that the former studies (KM outcome measures) take the relationship between knowledge management outcome and organizational performance for granted although the relationship has not been validated. The results of the latter studies (conventional performance measures) should be carefully examined because the direct relationship between knowledge creation processes and organizational performance has not been validated yet (Davenport, 1999).

Finally, the knowledge transfer or sharing process has been studied extensively (Appleyard, 1996; Bock and Kim, 2002; Hansen, 1999; Lee and Kim, 2001b; Szulanski, 1996; Zander and Kogut, 1995) while the other processes such as creation or utilization have received relatively little attention. In particular, some researchers suggested that knowledge creation is most critical for an organization's long term success (Fahey and Prusak, 1998). Moreover, knowledge transfer has been assessed by the use of object-perspective measures such as time to transfer (Zander and Kogut,

1995), number of times of knowledge transfer (Appleyard, 1996), percentage of transferred knowledge (Hansen, 1999), or perceived quality of shared knowledge and level. Recently, some researchers have tried to measure knowledge processes (Becerra-Fernandez and Sabherwal, 2001; Gold et al., 2001) or behaviours. For instance, Becerra-Fernandez and Sabherwal (2001) measured the capacity for knowledge creation by Nonaka's knowledge creation model, not by the use of creation output such as the number of created ideas or patents. Bock and Kim (2002) measured the sharing behaviour process by using attitude, intention, and actual behaviour.

2.5 Research Hypotheses

Based upon the review of previous literature, the following ten research hypotheses are developed for this study these are aggregated below and represented pictorially in Figure 2 – 5:

H1a: Codification Knowledge Management strategy will have a positive effect on the knowledge creation.

H1b: Personalization Knowledge Management strategy will have a positive effect on the knowledge creation.

H2: Collaboration will have a positive effect on the knowledge creation.

H3: Trust will have a positive effect on the knowledge creation.

H4: Learning will have a positive effect on the knowledge creation.

H5: Centralization will have a negative effect on the knowledge creation.

H6: Formalization will have a negative effect on the knowledge creation.

H7: The presence of the organizational members with T-shaped skills will have a positive effect on the knowledge creation.

H8: IT support will have a positive effect on the knowledge creation.

H9: Knowledge creation process will have a positive effect on organizational creativity.

H10: Organizational creativity will have a positive effect on organizational performance.

The hypothesized model designed for this research is shown as Figure 2 – 5 below:

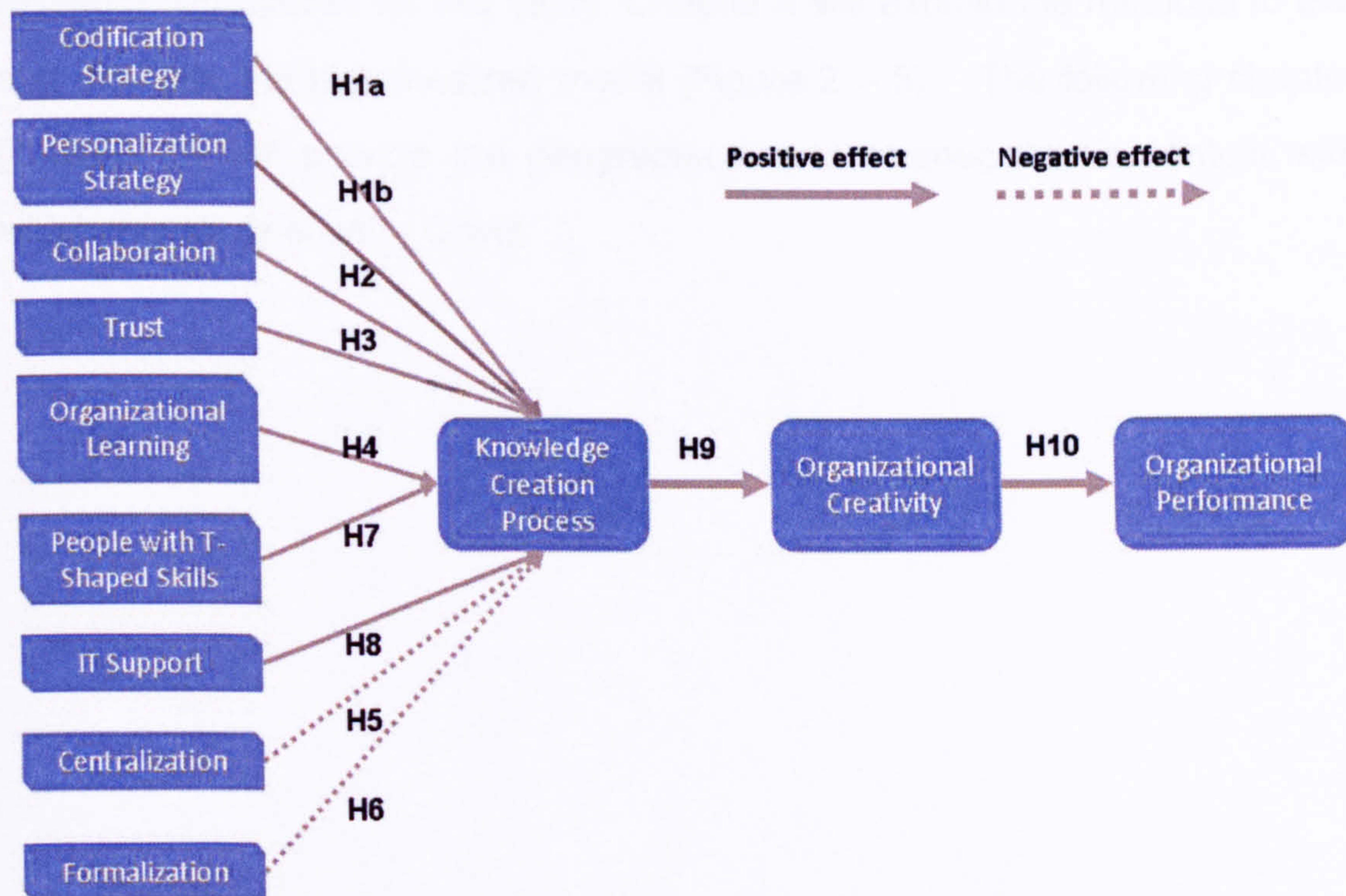


Figure 2 – 5 Hypothesized Research Model

2.6 Summary

This chapter reviewed the prior empirical studies in KM and discussed relevant concepts and theories from the KM literature in order to improve the general understanding of knowledge management. Key KM factors (KM strategy, organizational culture, organizational structure, people, and technology) that impact on organizational performance were identified. According to the literature, KM strategy variables (codification strategy, personalization strategy), Culture variables (collaboration, trust, and learning), people variable

(T-shaped skills) and technology variables (IT support) are directly related to organizational performance, while organizational structure variables (centralization and formalization) are inversely related. Informed by system thinking theory, social capital theory, absorptive capacity theory and it laid the foundations for the conceptual framework (Figure 2 – 4) encompassing ten research hypotheses for this study. Chapter 4 will explain the methods to test and evaluate the hypothesized model (Figure 2 – 5). The following chapter (Chapter 3) will provide the geographical and socioeconomic context with which this study is set – China.

Chapter 3

RESEARCH CONTEXT

The purpose of this chapter is to provide the socioeconomic context within which this study took place. The overriding argument of this chapter is that KM processes, which mediate the relationship between KM enablers and organizational outcomes, are determined by the socioeconomic context, and influenced by social structures and institutions. Hence, this chapter highlights the impact of the Chinese context on KM. This chapter is organised as follows: Section 3.1 presents an overview of the Chinese economy. Section 3.2 presents a bird's eye view of using knowledge for China's development; Section 3.3 discusses KM in China; Section 3.4 explains knowledge disparities across China. Finally, section 3.5 summarizes the issues discussed in this chapter.

3.1 Overview of Chinese Economy

For a large part of the last two millennia, China was the world's largest and most advanced economy. Then it missed the Industrial Revolution and stagnated. Only after opening to the outside world in 1979 was China's economic performance again impressive. Over the past 2,000 years China's share of global GDP hovered around 25% until the late 1700s. In 1820 China accounted for 33% of global GDP. Then from 1820 to 1950 it suffered great internal strife and foreign exploitation. Its GDP collapsed—as it increased elsewhere. As a result China's share of global GDP fell to just 5% in 1950. China's per capita income also led the Western Europe until about the 12th century and world until the 18th century. Then other parts of the world caught up and roared by. Outside of China, the codification and exploitation of

scientific and technical knowledge and the development of economic incentives and institutions were stimulating the creation and effective dissemination and use of knowledge.

What happened in China? It had developed some radical innovations—printing, paper-making, gunpowder, compass, shipping, calculus. But many of them are more as curiosities or amusements, not for commercial exploitation. In the 16th century, the age of sea exploration, China had larger and more technologically advanced ships than the Portuguese or the Dutch. But it used them for seven voyages of global exploration to Asia and Africa—and then deactivated them. It had a well established bureaucracy based on a meritocratic civil service. But its institutional and economic regime did not systematically exploit knowledge—causing the country to fall into stagnation. China also closed itself from most interaction with the rest of the world and did not benefit from the many advances that took place outside its borders. Then, after reaching its nadir in the early 1950s, China began to grow faster than the world average—particularly since the late 1970s, after major reforms and opening to the world. It is now on a path to convergence.

With China's entry into the World Trade Organization (WTO), past speculations about China as a world economic power in the 21st century has become a reality few would dispute anymore. With more than 25 percent of the world's population, China is a market that promises exciting opportunities for all multinational corporations. In the past 20 years, its GDP has increased more than tenfold (Ahlstrom, Bruton, and Lui, 2000), and its economic growth has been sustained at 8 percent every year (The Economist, 2001). The Economist forecasts that if China continues on the path of a market-based economy and adheres to its commitment to the World Trade Organization, by 2020, it will have grown to the size of the United States economy today. The National Bureau of Statistics of China (NBS) announced that GDP grew by 10.7 percent

to reach 20.94 trillion yuan (\$2.68 trillion) in January, 2007.

China has been restructuring to integrate into the global economy that rapid creation and dissemination of knowledge makes the international environment very demanding. To transform from a planned regime to a market-based economy, China's reforms introduced in ownership and management of the enterprise sector, with the township and village enterprises benefiting more than state-owned enterprises from less state hands-on activity (Dahlman and Aubert, 2001). These reforms have significantly improved enterprise productivity and performance. However, there is still a long way to go to catch up with developed countries.

3.2 China's Knowledge Revolution

3.2.1 Using knowledge for China's development

China is still a developing country and has much to gain by catching up with global knowledge. Its average level of technology and productivity is still far behind the world leaders in almost every area. And within its boundaries are very wide dispersions of productivity and technologies. Some firms are close to world leaders (i.e. Lenovo), but many are using technologies that are centuries old. China now needs to strengthen the domestic diffusion of technology to raise its average productivity to best domestic practice and best domestic practice to best international practice. That would give a far bigger boost to its economy than investing a lot in domestic R&D. China must continue to harness the knowledge revolution (Dahlman and Aubert, 2001). This means tapping global knowledge through trade, technology transfer, foreign education, direct foreign investment, and access to data and knowledge on the internet.

For China, seizing the 21st century to position itself for the knowledge

revolution mainly means opening more to the outside world. It also means strengthening China's ability to use knowledge more effectively across the board. And it means investing in education and training, in the new infrastructure for information and communication technologies, and in domestic R&D. In a speech introducing China's 11th five-year plan for national economic and social development, President Hu Jintao outlined China's impressive achievements during the last five-year plan (2001-2005) which focused on economic development. He also pointed that the central of the next five-year plan (2006-2010) will be using science and technology to construct a harmonious society. One of the challenges in this report is how to make more effective use of knowledge.

Box 3.1 Highlights of China's 11th Five-Year Plan (2006-2010)

(<http://www.china.org.cn/english/features/guideline/156529.htm>)

The 11th Five-Year Plan is the first drafted by the Communist Party of China (CPC) Central Committee headed by President [Hu Jintao](#), the first after the objective of building a well-off society was set, and the first after central government decided to further improve the socialist market economic system. The importance of using poorer people's quality of life as a starting point and building service-oriented governance has been highlighted, as has seeking fair and harmonious development of the whole of society.

The government began to prepare for drafting the plan in 2003, earlier than in previous years. As with previous plans since reform and opening-up, this plan emphasizes development and adopts a scientific concept of development. A harmonious society is the objective, while scientific development is the method to reach it. Scientific development relies on advanced science and technology to realize high-quality and high-efficient development, and seeks sustainable development to build a harmonious society.

The scientific concept of development means China has to change from over-reliance on a cheap labor force, funds and natural resources to well-educated workers and improvement of science and technology, a development mode that not only values quantity and speed but also high quality and energy-saving.

Build new socialist rural areas, optimize and upgrade industrial structures, promote concordant development of regions, build a conservation-minded and environment-friendly society, further system reform and enhance opening-up, efficiently practice strategies to invigorate China through science and education and through human resource development, and give impetus to constructing a socialist harmonious society.

As one of the biggest developing countries, the achievement of China's economy will have a huge impact on other developing countries in terms of knowledge sharing. The stories of success and failure in Chinese enterprises will be useful lessons for those countries to develop and adjust their KM strategy.

3.2.2 High Technology Enterprises in China

Most of the Chinese high technology enterprises today are located in the national high technology zones. High technology zones are the major carrier of China's high technology industrialization. The 15-year evolution of national high technology zones in China is a course of fulfillment of the concept of scientific development and active exploration for a unique Chinese route towards new industrialization. It is a course of vigorous implementation of the strategy of "revitalizing China through science and education", energetic fostering of an innovative start-up environment and continuous promotion of enterprises' capability of independent innovation targeting at a stronger high technology industry; It is also a course of continuous expansion of the opening-to-the outside policy and introduction and transformation of advanced technologies and management experiences from the international world. (Ministry of Science & Technology, 2007)

According to Ministry of Science and Technology of China (2007), the total number of enterprises settled in national high technology zones had reached 37,635 by the end of 2004, including 26,000 authorized as high technology enterprises, 2,554 enterprises with an business revenue of more than 100 million RMB (£6.7 million) and up to 6,276 foreign-invested enterprises (including those involving investment from Hong Kong, Macao and Taiwan), with 4.4 million employees by the end of the year. Continuous efforts are made

in keeping the fast economic growth and increasing the strength and scope of high technology enterprises. To promote the capabilities of independent innovation, the national high technology zones have provided those enterprises closer cooperation between the industries, universities and research institutes, and optimized the innovative start-up environment and agglomeration of the various types of innovation resources. To enable the knowledge flow smoothly and accelerate the innovation processes of these high technology enterprises, masses of human resources with innovative concepts and capabilities have converged into these national high technology zones.

3.3 KM in Chinese Enterprises

China has a rapidly growing stock of scientific knowledge that parallels its social and economic development over the past 25 years. Chinese enterprises have acquired knowledge from a variety of domestic and foreign sources while also beginning to create knowledge of their own (Ramirez and Dickenson, 2006). Huge flows of foreign investment capital into the Chinese economy since the early 1980s have been accompanied by the parallel flow of knowledge into the country. Much of it has come from the public domain or through authorized transfers as a result of joint-venture agreements or licensing arrangements in a range of industries. This section reviews the KM in Chinese enterprises context in terms of strategy, culture and structure.

3.3.1 KM Strategy

Codification is essential to knowledge processing in U.S. business and society. On the contrary, consistent with their cultural traditions, the Chinese prefer informal and implicit forms of communication, preferring to transfer knowledge

through interpersonal contact rather than through formal and/or written means (Martinsons and Westwood, 1997). Explicit knowledge is comparatively rare in China due to the strong cultural preference for personal social and economic relationships. The prevalence of this tacit knowledge, or how to do things, has frustrated the government's effort to systematically develop nationwide knowledge bases. Information systems designed to capture reusable and transferable knowledge are also rare, as are data warehouses and intranets for enabling widespread access to organization-specific knowledge. Despite the increasingly widespread application of IT across China, personal interaction remains the preferred form of knowledge transfer. Therefore, the KM strategies Chinese enterprises developed are more focused on tacit knowledge (experience) and informal discussions (experience exchange meetings). The examination of the KM strategy developed in Chinese firms will be extremely valuable for managers in China to adjust their strategy.

3.3.2 KM Culture

There are several Chinese cultural traditions that have effects on the development of organizational culture in Chinese enterprises. The group has been reinforced since 1949, including areas of decision making, team work, reward, and group cohesiveness (Wang, 1994). During the recent economic reform, group approach has been more encouraged as one of the Chinese characteristics of management practice with the new emphasis of team responsibility. Harmony relationships among team members have been again emphasized. Good relationships across and within organizational levels are crucial to a successful management. Team approach has been especially effective in quality management, which is characterized as "expert mass joint quality control". With regard to this approach, interpersonal relationship in teams is vital. Team behaviour is not only affected by the organizational and structural contingencies, but also shaped by the characteristics of team

members. As one of the significant characteristics, high team compatibility will encourage team members to share information and psychological resources and exchange ideas with other members.

Knowledge throughout the Chinese society is shared primarily with fellow in-group members. But business innovation and coordination can be hindered by in-group rivalries, as well as by the few opportunities (such as quality circles) and incentives (such as suggestion bonuses) employees are offered to share their knowledge. Chinese employees in some privately owned firms are positive to changes in performance evaluations and rewards. Other enterprises, for instance, Lenovo, the largest IT enterprise in China (www.lenovo.com), and Yum! China, a quick-service restaurant operator (www.yum.com), have developed a knowledge-sharing ethos through systematic efforts to recruit, select, and socialize their workers. A focus on selecting and socializing individual workers tends to be more effective in China than in the U.S., whereas the development of a supportive company culture is more difficult due to the strong respect for tradition and hierarchical structure in Chinese society (Chow et. al., 2000).

Fu's (2000) work on the relationships among face, guanxi, renqing, and interpersonal trust in Chinese social interaction is useful in managing interpersonal relationships in Chinese enterprises. Personal relationships and the human side of management are still much more important in China than in the West. Chinese culture can be characterized as "relationship - oriented" (Huang, 2000). Hwang pointed out that Chinese culture and Confucian tradition emphasize authority, order, harmony, loyalty, and personal relationships. Three central characteristics of Confucianism that affect Chinese society are relationship orientation, norms of interaction patterns and problems and criticism. Chinese people believe that "friendship is conducive to business success".

3.3.3 Organizational Structure

Generally, Chinese enterprises structure follows centralized top-down model. All the decisions have to be made or agreed by the top of the pyramid structure. This centralized structure has worked extremely effectively in Chinese less complicated manufacture factories. Due to the efficiency of the Chinese firms and low cost of labour, China is now the “world factory”. However, the centralized structure might have negative impact on organizations creativity. Without proper new product development system and innovation strategy, Chinese firms today are struggling to absorb new and advanced technology from developed countries. Academic researchers and Chinese government have introduced policies focusing on new technology and innovation development (China’s 11th Five-Year Plan, March 8th, 2006).

However, Chinese decision-making by corporate managers, as well as by government officials, is comparatively implicit, relying on analogical and correlative thinking, rather than on rational and analytic thinking (Nisbett, 2003). This difficulty in interpreting messages and communication in the Chinese enterprises has impeded economic modernization and constrained technological innovation in China. It will be necessary to investigate how the organizational structure of Chinese enterprises impact on KM and production innovation.

3.4 Knowledge Disparities across China

China is huge, with large and diverse provinces. The largest of them have more than 100 million inhabitants, more populous than even the largest European countries. They differ greatly in natural and human resource endowments, and in economic performance and welfare indicators. Parts of such prosperous areas as Beijing, Shanghai, and Tianjin are very much like

first-world countries. Parts of the poorest provinces appear to be several centuries behind in their technology and living standards.

The differences between the 31 Chinese provinces are daunting with regards to knowledge (Table 3 – 1). Knowledge was measured by indicators of R&D inputs (expenditure and personnel), R&D outputs (publication and patents), Foreign Direct Investment (FDI) (to gauge foreign inputs), education (primary, secondary, and tertiary enrolments), and information (newspaper subscriptions, telephone users, and Internet users).

Table 3 – 1 Vast differences in knowledge across Chinese provinces

	Eastern Region	Middle Region	Western Region
High ($I \geq 150$)	Beijing (606.1) Shanghai (529.0) Tianjin (283.7) Guangdong (212.7) Fujian (156.5) Jiangsu (154.6)		
Above average ($150 > I \geq 100$)	Hai'nan (127.6) Liaoning (126.7) Zhejiang (122.7)		
Below average ($100 > I \geq 75$)	Shandong (82.1) Hebei (75.7)	Jilin (99.5) Hubei (92.2) Heilongjiang (84.6)	Shaann'xi (88.1)
Low ($I < 75$)	Guangxi (50.9)	Hu'nan (69.7) Shanxi (64.3) Henan (63.7) Jiangxi (61.0) An'hui (57.7) Inner Mongolia (56.6)	Xinjiang (65.9) Chongqing (63.7) Gansu (58.3) Ningxia (54.7) Sichuan (51.5) Yun'nan (48.8) Qinghai (44.2) Guizhou (38.3) Tibet (32.0)

Source: Hu Angang and Yizhi Xiong, *China's Regional Gaps in Knowledge Development: Characteristics, Causes, and Countermeasures*, Tsinghua University, 2000, p. 12.

It appears that Beijing and Shanghai, the most knowledge-intensive areas in China, have knowledge intensities 6.1 and 5.3 times the national average, respectively. Overall the eastern coastal region has a much higher knowledge level than the Middle and Western regions. Guizhou province reaches only 32% of the national average. Provinces with low knowledge intensity tend to have rich natural resource endowments. This advantage, together with isolation and

a closed outlook, may have driven them away from modern development policies.

3.5 Summary

The reviewed literature in the chapter suggests that China is still at the early stage of constructing a knowledge-based economy. Although China's economic growth is high, the main economic achievements are mainly in labour-incentive sectors (such as textiles). The high technology and advanced manufacturing sectors in China are less developed comparing to developed countries, which might be an obstacle to sustain the rapid economic growth for China.

China has had impressive success in several new industries, particularly high technology and science parks. However, these success remains in coastal cities, such as Beijing, Shanghai, and Shenzhen. Beijing has a strong information technology industry (Zhongguancun Science Park). Shanghai focuses on exploiting an advanced biotechnology base and building the Pudong Bio Science and Technology Park. Shenzhen has a strong manufacturing base (i.e. Huawei, Zhongxin). However, there is a huge knowledge disparity across China, which significantly affected the economy as a whole.

The processes of knowledge acquisition, dissemination and utilization in Chinese enterprises are less developed comparing to developed countries. As a developing country, China is at the early stage of developing knowledge-based economy. Therefore, critical to most knowledge-intensive business enterprises based in China is how to explore the external sources of advanced technological knowledge, how to develop cultural and social

contexts that facilitate both the transfer and dissemination of acquired technology across subunits within an organization, and how to turn acquired technology into commercial products or services. As the biggest developing country in the world, China is a "role model" for other developing countries in terms of economic development. The investigation of Chinese enterprises' effort and experience of knowledge management will be valuable for those developing countries to guide their KM strategy. Enterprises from developed countries can also benefit from this study when they outsource some of their business processes to developing countries. It will help them to get a better understanding of KM environment in developing countries, for instance, China.

CHAPTER 4

RESEARCH METHODOLOGY

This chapter discusses the research methodology followed in this study. The structure of this chapter is organized as follows: Section 4.1 describes the philosophical orientation of this research which is approached by using mixed methods (Qualitative and Quantitative methods). Section 4.2 presents the methodology for this study. The empirical study adopted a mixed methods (Creswell, 2003) approach. Section 4.3 explains the qualitative approach, and section 4.4 presents the quantitative approach to familiarize readers with data collection and data analysis methods on which results were based. Finally, Section 4.5 summarizes this chapter.

4.1 Philosophical Orientation of this Study

The philosophical orientation of this study is the pragmatic research philosophy, deriving from the work of Pierce, James, Mead and Dewey (Cherryholmes, 1992). This research philosophy has received support from contemporary scholars (e.g. Cherryholmes, 1992; Creswell, 2003). The pragmatic research philosophy employs the thinking of both positivism and phenomenologism. Positivism assumes that social reality is independent of human perception, existing regardless of our awareness of it. This approach holds that there are facts about the social world that can be collected and analysed independently of the people, from which the facts were obtained (May, 1997). In contrast to the positivist paradigm, phenomenology is concerned with understanding human behaviour from the participant's own frame of reference. It assumes that social reality is in our minds, and, therefore, the act of investigating reality is viewed as having an effect on that reality. It follows that considerable regard

is paid to the subjective state of the individual (Hussey and Hussey, 1997). Focusing on the meaning that research subjects attach to social phenomena is a characteristic of the phenomenological approach.

While acknowledging the importance of the pragmatic research philosophy to the understanding of knowledge claims, Creswell (2003, p.11) stated that this philosophy is still developing in form and substance and 'knowledge claims arise out of actions, situations, and consequences rather than antecedent conditions (as in positivism)'. Research in the positivist tradition commonly, but by no means exclusively, seeks to quantify variables of interest. The quality of research is assessed in terms of its reliability, validity and rigour with which quantitative analysis is conducted (Guba and Lincoln, 1994). The positivist approach seeks the facts or causes of social phenomena, with little regard to the subjective state of the individual (Hussey and Hussey, 1997). Positivists generally assume that reality is objectively given and can be described by measurable properties, which are independent of the observer, or researcher, and his or her instruments. The essence of phenomenological approach is that attitudes and behaviour are determined by their social setting, that is, they are 'socially constructed', and hence it follows that the researcher should seek to understand and explain phenomena in a particular localised setting, rather than seek universal laws that attempt to explain them free of any context. Creswell (2003) further mentioned that the pragmatic researcher is sensitive to the social, historical, and political context from which inquiry begins and considers morality, ethics, and issues of social justice to be important throughout the research process. He concludes that pragmatism is not committed to any one system of philosophy, which means that truth is 'what works for now'. It may not reflect reality, but it should to the extent that it can.

Pragmatism applies a practical approach, integrating different perspectives to help collect and interpret data. The positivist philosophy is normally associated

with a quantitative research approach. Quantitative research seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements' (Burrell and Morgan, 1979). This approach is concerned with testing hypotheses derived from theory and/or being able to estimate the size of a phenomenon of interest. Thus, quantitative methodology is appropriate when collecting data related to the frequency of occurrence of a phenomenon or variable, and it is also useful when testing the existence of relationships between variables of interest based on hypotheses derived from theory or making inferences about the quality of specific attributes in a population based on measurements derived from a sample. Phenomenological philosophy is normally associated with a qualitative research approach. A qualitative approach involves examining and reflecting on perceptions in order to gain an understanding of social and human activities (Hussey and Hussey, 1997). Crossley and Vulliamy (1997) claim that qualitative methodology 'provides descriptions and accounts of the process and social interactions in natural settings, usually based upon a combination of observation and interviewing of participants in order to understand their perspectives. Culture, meanings, and processes are emphasised, rather than variables, outcomes, and products. Instead of testing pre-conceived hypotheses, much qualitative research aims to avoid the imposition of a precious and possibly inappropriate, frame of reference on the subjects of the research'.

Howe (1988) states that the pragmatic research philosophy falls in between the two opposing research philosophy (positivism and phenomenology) and involves the use of whatever philosophical and/or methodological approach that best suits a particular research problem. He points out that pragmatism is appealing for three main reasons:

- It gives us a paradigm that philosophy embraces the use of mixed methods and mixed model design

- It eschews the use of metaphysical concepts (truth and reality) that have caused much endless discussion and debate
- It prevents a very practical and applied research philosophy.

Essentially, the pragmatic research philosophy emphasises the practical problems experienced by people, the research questions posited, and the consequences of inquiry. It is normally associated with the triangulation research approaches. Hussey and Hussey (1997) define triangulation as the use of different research approaches, methods and techniques in the same study. They state that the main reason underpinning the use of triangulation in research is the notion that it can offer a broader and often complementary view of the research problem or issue and overcome the potential bias and sterility of a single method approach.

Following the above thoughts, this study avoided the use of a single research method. It is based on the belief that qualitative and quantitative research methods can be employed in a way that complement each other and thereby lead to a better understanding of the research problem being explored. Therefore, this study is not rooted solely in either of the two main philosophical stances.

The following section discusses the research design in detail.

4.2 Research Design

Research design can be conceived as an overall strategy which guides the data collection and analysis of a project, and is the framework or plan for a study (Churchill, 1995). In this research, the key KM factors and hypothesized relationships between them can be identified via thorough literature review

(Chapter 2 and Chapter 3). The main objective of this study is to determine the relationships among KM factors. Given the structured nature of the research problem and objectives and that sufficient evidence is available to formulate hypotheses for testing, it is deemed that a quantitative survey can be used to measure the characteristics of elements or sample members. However, due to the lack of literature, the variables of each KM factor in the context of Chinese enterprises need to be investigated and explored through qualitative study. This study adopted a mixed methods (Creswell, 2003) approach which contains two stages: a qualitative study and a quantitative study. After a thorough literature review in knowledge management and relevant fields, and comparing and evaluating the previous studies, a research hypothesized model is proposed. Base on the hypothesized model (see Figure 2 – 5), a qualitative approach (using semi-structured interviews) is conducted to assist the measures development of the constructs. Following the qualitative study, quantitative survey is then developed and performed to provide the empirical validation of proposed research model after the qualitative case analysis. The following sections describe the qualitative and quantitative approaches in detail. Figure 4 -1 shows the design of the research.

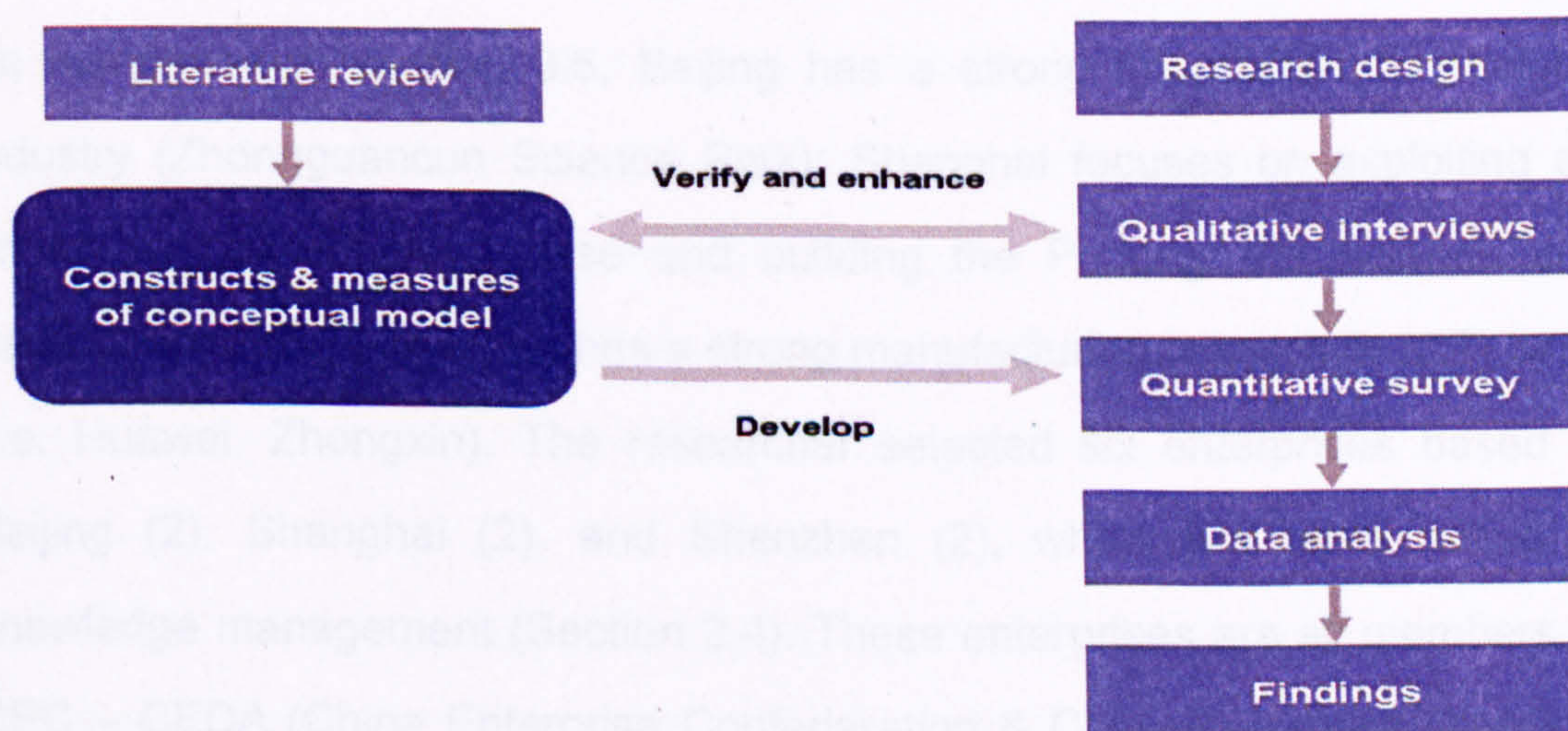


Figure 4 -1 Research Design

4.3 Qualitative Approach

To enhance the conceptual framework and increase the validity of this research, the researcher conducted a qualitative study (Robson, 1993) to inform the main quantitative study design. By identifying the variables of the KM enablers and developing measures of these constructs appropriate for the Chinese context, the qualitative study comprised semi-structured interviews (Rubin and Rubin, 1995), which allow a deeper insight of the topics of interest, while allowing topics of importance to emerge. The topics of interest were organizational culture, organizational structure, people, and technology in Chinese enterprises. During the process of the qualitative study, other topics of interest emerged. These will be discussed in details at section 5.1.

The following sections present sampling, data collection and data analysis issues.

4.3.1 Qualitative Sample

As mentioned in section 3.5, Beijing has a strong information technology industry (Zhongguancun Science Park); Shanghai focuses on exploiting an advanced biotechnology base and building the Pudong Bio Science and Technology Park; Shenzhen has a strong manufacturing (especially ICT) base (i.e. Huawei, Zhongxin). The researcher selected six enterprises based in Beijing (2), Shanghai (2), and Shenzhen (2), which are more active in knowledge management (Section 3.4). These enterprises are all members of CEC – CEDA (China Enterprise Confederation & China Enterprise Directors Association). Moreover, the three cities represent North China (Beijing), East China (Shanghai), and South China (Shenzhen) so that the data collected from those cities are more generalisable. The six Chinese enterprises are in the

ICT and medicine industries, which are representative of a relatively more active group in innovation and knowledge management. The top managers (6) (including the Chairman and CEO of those companies), middle managers (12) and knowledge workers (6) of each enterprise were interviewed. Interviews from top management to knowledge workers enabled the researcher to investigate the KM from different angles in Chinese enterprises and avoid information bias. Overall, 24 interviews were carried out in Beijing, Shanghai, and Shenzhen are conducted between February and November in 2006. All the interviewees were knowledge workers involved in the knowledge management processes. Most were directly involved in the design and implementation of the establishment of their company's knowledge management model.

4.3.2 Qualitative Data Collection

Following other recent qualitative studies on the knowledge management (e. g. Child and Tse, 2001; Matias and Dickenson, 2006; Lam, 2007) that utilised small sample size, detailed in-depth information from a relatively small sample was collected. Due to the size and complexity of the ICT and medicine industry in China, thousands of participants would be needed if a fully representative sample were to be achieved. However, this is not realistic in the timeframe and finance allowed for this study. Interviews are particularly useful for getting the story behind a participant's experiences.

Qualitative data was collected in two phases. First, secondary data was collected. Then, semi-structured interviews were conducted in order to pursue in-depth understandings of the KM in Chinese enterprises.

4.3.2.1 Observation data collection

From February 2006 to July 2006, the researcher has been collecting and reviewing observation data from the six selected Chinese enterprises. These company-specific documents composed company websites, annual reports, newsletters, strategic reports, press articles, and a recent review of the company history. These materials were obtained through close contact established by the researcher with managers/shareholders from those enterprises. This preliminary information collection informed the researcher about the organizational structure, culture, people (knowledge workers and managers), technology, KM processes, organizational creativity and performance. It also gave the researcher an overall understanding of the company (human resource, products and service) to develop rapport with interviewees swiftly.

4.3.2.2 Semi-structured interviews

In semi-structured interviews, interviewer can pursue in-depth information around the topic (McNamara, 1999). The interview programme was not purely based upon the relatively rigid pre-determined questions and prompts. The open-ended, discursive nature of the interviews permitted an iterative process of refinement, whereby lines of thought identified by earlier interviewees could be taken up and presented to later interviewees (Beardsworth and Keil, 1992). Each interview commenced with an introduction about the researcher's personal background, the aims of the research, and issues of confidentiality. The interviews were all conducted in meeting rooms or private offices and lasted between 30-60 minutes. Apart from their knowledge and views on the questions asked, the interviewees were encouraged to elaborate on the process and complexities of the knowledge management experienced inside

their companies.

The interviews were designed to facilitate memory recall. An interview protocol was adapted from Wengraf (2001) to guide the interviews. A sample of the interview protocol used in this study is attached as Appendix 1.

To facilitate the process of analysis, some interviews were recorded (with the permission of the interviewees) and transcribed verbatim. In addition to recording, careful notes were made during the interviews. After each interview, a *contact summary form* (Miles and Huberman, 1994) was adapted to summarise the main the themes, concepts, issues or questions arising from the interview. The use of this form allowed for adjustments to the interview protocol, as new themes emerged while data was collected. A sample of the contact summary form is attached as appendix 3.

Overall, the interviews consisted of key questions, probes and follow-ups (Rubin and Rubin, 1995). The main questions created a framework for the interview; they were designed to address the specific research questions for each KM factors and to link what is asked in individual interviews to the overall design of the interview. The probes were used to clarify and complete the answers, making them understandable and signalling to the interviewees the expected level of depth. The purpose of the follow-up questions was to pursue newly discovered avenues, elaborate the context of answers, explore the implications of what was said and to test and modify emerging themes. Therefore, the adapted structure of the interview will assist to develop and enhance the conceptual framework (Figure 2.4).

4.3.3 Qualitative data analysis procedure

Data from interviews was transcribed throughout the interview period and for two months afterwards. Listening to the audio file recorded from the interviews provided an overall sense of the effect of each conversation. This allowed for an understanding of each interview as a whole before reducing it to discrete segments for analysis.

After post-interview transcription, individual interview documents were returned to each interview respondent. These were hand delivered in person to ensure confidentiality. Interview respondents were provided with the opportunity to review their statements and return any comments relating to misrepresentation of their views. This was completed approximately three months after the interviewing phases and during the very early stages of coding. No amendments were required by interviewees.

During the initial reading of the transcripts, notes were taken regarding the knowledge management factors that impact on organizational performance of those Chinese enterprises. Themes that emerged in these initial readings were helpful in providing future directions for organising a framework for approaching a deeper level of the data reduction and analysis.

In organising and managing the data analysis process, the decision was made to analyze the content of each interview under four separate themes:

- Company and interviewee personal background
- Knowledge management processes
- Knowledge management environment
- Factors that affect the performance of the company in the context of knowledge management

The split of the interview became obvious to organise the data during the initial reading of the transcripts. The conversation on company (case) background reflected the motives that enabled the knowledge management in those enterprises. Interviewees' personal background and experience in the firm reflected the knowledge management strategy on knowledge workers. Answers to knowledge management processes provided a view of how knowledge is absorbed and managed in Chinese companies. Answers to questions relating to the knowledge management environment questions, informed the researcher about the organizational culture and norms with regards to knowledge management. Answers about the KM factors reflected how these factors influenced organizational creativity and organizational performance.

Once the data was clustered under the four themes, the coding process began. In order to do this, the researcher adopted the ground theory approach (Glasser and Strauss, 1967). The approach aims to avoid contaminating existing theoretical frameworks by discovering theories, concepts, hypotheses, and propositions that are 'grounded' in the collected field data. Emphasis is on generating theory rather than verifying it and, more particularly, generating theory that will be relevant to the research being undertaken. The application of the grounded theory approach evolved through four different phases shown below:

- Identifying critical instances: this stage involved highlighting key passages of transcripts
- Open coding: this stage involved identifying, naming, categorising, and describing phenomena found in the text. It was necessary to carefully work through all transcripts and to divide the data into meaningful categories. These categories were based on a theme or variable that isolated information given by the interviewee. The units of coding were

individual statements given by the interviewees regarding the knowledge management strategy, processes and culture as well as the factors affect the knowledge creativity in those enterprises. Each statement in the interview data was individually coded and built into common themes. If at least two cases were found that resembled each other and that could not be fitted into the existing categories, new categories were created. At this stage, patterns were discovered involving both commonalities and differences in those enterprises' KM strategy and KM processes.

- Axial coding: this stage involves refining the initial list of categories, deleting and then amalgamating some. It was necessary to make connections between the categories and to define their properties. To do so, some categories emerged with high frequency. These were in turn connected to many of the other emerging categories.
- Selective coding: at this stage, a few different categories were chosen as core categories. Thereafter, all the other smaller categories were related to the core ones. The essential idea was to develop a framework around which everything else is dropped. The framework developed here identified the measures of the conceptual framework (Figure 5 – 4) generated from literature.

4.3.4 Validity

Internal validity in qualitative research is concerned with the accuracy of the information and whether it matches reality (Merriam, 1988). From this perspective, relying on a single interviewee's coding is highly problematic and creates significant problems for assessing the reliability and validity of the data. On the other hand, external validity, or generalisation, is the judgement that the study's results can be generalized to a larger population (Lee, 1998). One way

to enhance the internal validity of a qualitative study is to invite other researchers to examine the audit trail of the key decisions made during the research process and to validate their accuracy and usefulness. Therefore, decisions about data collection and data analysis were reviewed with two colleagues in Brunel University and with the researcher's supervisor during the course of this research. The reliability of the categories developed in the data analysis was further measured by having others read the interview transcripts to see if they would classify them in the same way. By this criterion, the results were considered to be reliable by two independent readers, both familiar with this research and with experiences in applying qualitative coding procedures, agreed with most of the coding and themes. The identified differences were adjusted and resolved based upon the feedback from other experienced researchers in the KM field.

4.4 Quantitative Approach

Quantitative survey methodology was chosen to test the KM conceptual framework (See Figure 2 – 4) developed from the literature and qualitative study. Surveys provide quick, inexpensive, efficient, and accurate means of assessing information about the population (Zikmund, 2000). There is an important distinction between surveys and survey research. While a survey is a means of gathering information about the characteristics, actions, or opinions of a large group of people, referred as a population, a survey research is conducted to advance scientific knowledge (Pinsonneault and Kramer, 1993). Therefore, most of research to enhance the existing knowledge about certain objects and phenomena are the survey research, not surveys. Surveys conducted for research purposes have three distinct characteristics (Fowler, 1993). First, the purpose of survey is to produce quantitative descriptions of some aspects of studied population. Second, the main way of

collecting information is by asking people structured and predefined questions. Third, information is generally collected about a fraction of the study population but it is collected in such a way as to be able to generalize the findings to the population. Survey research is the most appropriate when

- 1) The central questions of interest about the phenomena are "what is happening?" and "how and why is it happening?"
- 2) Control of the independent and dependent variables is not possible or not desirable,
- 3) The phenomena of interest must be studied in their natural setting
- 4) The phenomena of interest occur in current time or the recent past (Creswell, 1994; Pinsonneault and Kraemer, 1993).

In developing measures and testing theories in survey research, correspondence between theoretical constructs and their measures should be formally ascertained. Bagozzi (1980) proposed six criteria for survey research: theoretical meaningfulness of concepts, observational meaningfulness of concepts, internal consistency of operationalizations, convergent validity, discriminant validity, and nomological validity.

- Firstly, *theoretical meaningfulness of concepts* refers to the nature and internal consistency of the language used to represent the concepts. To achieve it, theoretical constructs must capture the characteristics and quality of language used to represent the theoretical concepts.
- Secondly, *observational meaningfulness of concepts* refers to the relationship between theoretical constructs and their operationalizations. To achieve this criterion, measures must be clear, specific, unambiguous and related to theoretical constructs. Therefore, these two criteria of validity involve semantic issues, not statistical tests.
- Thirdly, *the internal consistency of operationalizations* refers to the degree of homogeneity of indicators purporting to measure the same theoretical

construct. It requires more than one observational variable for each theoretical construct (Nachmias and Nachmias, 1987). The most commonly used statistic of internal consistency is the Cronbach's alpha (Cronbach, 1951).

- Fourthly, *convergent validity* refers to the degree to which two or more measures of the same theoretical construct are in agreement (Kerlinger, 1986). This criterion is that the correlation between measures of the theoretical construct should be different to encourage further investigation.
- Fifthly, *discriminate validity* refers to the degree to which one theoretical construct differs from another (Kerlinger, 1986). For discriminate validity, a measure should correlate with all measures of the same theoretical construct more highly than it does with any measure of another theoretical construct.
- Finally, *nomological validity* refers to the degree of to which predictions from a formal theoretical network containing the concepts under scrutiny are confirmed (Campbell, 1960). Once a theory has been found empirically valid, it can be interpreted as whether one is consistent with a wider body of theory and whether it contributes to that theory.

To test the theories, this study will adopt Bagozzi's (1980) model. More details will be explained in section 4.4.3.

According to Dillman (1978) and Fowler (1993), there are four key elements in the conduct of surveys, and these can be used to assess the quality of survey research. These elements include research design, sampling procedures, data collection methods, and data analysis methods.

- A research design is the plan and structure of investigation so conceived as to obtain answers to research questions (Cooper and Emory, 1995). Depending on the problem or question the researcher

addresses, an appropriate research design should be selected such as the time dimension, control of variables, and degree of problem crystallization.

- Sampling is concerned with drawing individuals or entities from a population in such a way as to permit generalization about the phenomena of interest from the sample to the population while data collection describes the specifics of gathering the data (Pinsonneault and Kraemer, 1993). The researcher explicitly defines the target population being studied and the sampling methods used such as the size of sample, probability or non-probability sample.
- Regardless of the unit of analysis, the units of collection in survey research are usually individual (Fowler, 1993). The choice of data collection method, for example, mail questionnaire, telephone interviews, face-to-face interview, is significant because it affects the quality and cost of data collected.
- Another key element of survey research to assess the quality of research is the data analysis method (Cooper and Emory, 1995). Once data have been collected by a survey, no matter what the methods, they almost invariably must be translated into a form appropriate for analysis by computer. It includes data handling, preliminary analysis, statistical test, computer programs, and other technical information.

4.4.1 Data sample

The researcher selected data sample from listed companies from ICT and Medicine industry in the China Enterprise Confederation (<http://www.cec-ceda.org.cn/english/>). As stated in Section 4.3.1, the reason of selecting the companies in those two industries is that they are more active in knowledge management and product innovation comparing to other industries.

The survey respondents are the managers and knowledge workers (Drucker, 1959) in the selected companies. The knowledge workers in this study include middle managers and employees from R&D departments of the selected Chinese companies, who played key roles in managing knowledge. According to Nonaka and Takeuchi (1995), top management clarifies the vision for a company while front-line workers down in the trenches look at reality. The gap between vision and reality is narrowed by middle managers who arbitrate between top management and front-line through creating middle range business and product concepts. Middle managers are positioned at the intersection of the vertical and horizontal flows of knowledge. Employees in R&D departments are typical knowledge workers, who develop and use knowledge in their workplace.

4.4.2 Survey Design

4.4.2.1 Types of Survey

To generate primary data from respondents, several methods can be used to collect primary data. The choice of a method depends upon the purpose of the study and the resources available. The most common methods for data generation are observation techniques, personal interviews, telephone interviews, postal survey, and electronic survey (email survey and web-based survey). Observation is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place. This method allows the recording of an object, event or behaviour when it occurs. The most difference between this method and the all other remaining methods is the sampling units in the observation are passive and don't communicate or directly interact with the investigator. However, in the other methods, the respondents are playing an active role in the data generation process

(Parasuraman, 1986). These data generation methods are considered most appropriate in this study because of the nature of variable that will be measured and the time constraints.

- Personal interviews are often associated with favourable response rates, useful for collecting in-depth information, more appropriate for complex situations, questions during the interview can be explained and the information can be supplemented. However, there are a number of limitations for applying this method such as being time-consuming and expensive, the quality of data depends upon the quality of interaction between the interviewer and the interviewee, offering less assuring of anonymity to the respondent, also the interviewer bias in the framing of questions and the interpretation of responses is always possible (Smith, 2003; Sekaran, 2000).
- Telephone interviews, in contrast to personal interviews, are relatively cheap, reasonably reliable in concealing respondent identity, provide rapid data generation, require low level of administrative support and can be used to elicit data from a geographically dispersed sample. However, there are a number of limitations that can detract from the appeal of telephone interviews such as problems in communicating and interpreting complex or detailed information, the short duration of the interview, the constraint upon the sample size to telephone holders only and the low threshold of control exercised by the interviewer (Kerling, 1986; Tull and Hawkins, 1990).
- The postal survey offers greater anonymity, less expensive than personal interview, requires low level of administrative requirements, possessing a high degree of accessibility, ensuring no source of interviewers bias, and tolerant of respondents completing the questionnaire at their convenience. However, questionnaires are notorious for their low response rates, lack of opportunity to clarify issues, a response can not be supplemented with other information,

and the response to a question may be influenced by the response to other questions (Seale, 2004; Saunders et al, 1997; Fowler, 2002).

- Electronic surveys provide the ability to conduct large-scale data collection by others than organizations at the centre of power in society (Couper, 2000). The technology provides an inexpensive mechanism for conducting surveys online instead of through the postal mail (Sheehan & Hoy, 1999; Weible & Wallace, 1998) and one in which costs per response decrease instead of increase significantly as sample size increases (Watt, 1999). Electronic surveys are becoming increasingly common (Lazar, J & Preece, J., 1999), and research comparing electronic vs. postal surveys is starting to confirm that electronic survey content results may be no different than postal survey content results, yet provide strong advantages of speedy distribution and response cycles (Yun & Trumbo, 2000; Swoboda, et al., 1997).

Two forms of electronic surveys have emerged in the last fifteen years. Email survey dates back to 1986 (Kiesler & Sproull, 1986); Web-based survey, started about 1994 (Kehoe & Pitkow, 1996). There are several fundamental differences between emails and Web-based surveys. First is database technology. Web-based surveys provide the ability to automatically verify and store survey responses using database technology and an HTML (hypertext markup language) user interface. Email surveys and responses must be manually transferred and entered into storage whether embedded directly within an email message or attached as a word processed document. Second, email allows researchers to directly communicate with prospective respondents. Web-based surveys do not provide this affordance of direct communication.

According to Dillman (2000) the main reasons for extensive use of online

survey methods are:

- There is the much lower cost for completing them;
- Procedures for online surveys are often deemed simple enough that individuals and organizations conduct their own rather relying on survey research organization

Web-based surveys have the advantage of low cost and quick distribution. Additionally, Web-based surveys provide the ability to transfer survey responses directly into a database, eliminating transcription errors and preventing survey alteration by the survey respondent. Initially technical issues inhibited the use of Web-based surveys, but new software and Internet related technology appear to be mitigating many of the technical limitations (Smith, 1997; Kehoe & Pitkow, 1996; McCoy & Marks, 2001). The Web-based survey designer has a wide range of textual options, format control and graphics sophistication not attainable with email surveys. The advantages include links, clicks, defaults and menus (Preece et al, 2002). Links provide the ability to directly reference definitions or examples at multiple points in the survey. Clicks eliminate the need for textual data entry for all coded questions. Defaults, hidden or displayed, reduce non-response to questions. Menus, drop-down or displayed, provide an economical way to display many response options without cluttering the survey screen.

Following consideration of the reasons supporting each of the data generation methods examined above, the researcher decided to select the web-based survey method for this study. The reasons behind choosing the web-based questionnaire refer to a number of key issues in this research, which are presented in Table 4 – 1.

Table 4– 1 **Reasons to choose web-based survey**

Key Issues	Reasons
Response	<ul style="list-style-type: none"> • Whilst many postal questionnaire surveys have yielded low response rates (Saunders et al, 1997), Dillman, (2000) determined that each aspect of the survey process could encourage good response • All the information requested in all parts of the questionnaire doesn't include any sensitive or confidential information which could affect the responses of the sample units. • Most of the similar empirical studies in knowledge management have adopted a questionnaire survey method which gives the indication that good response rates are achieved (Zarraga et al., 2003).
Sampling	<ul style="list-style-type: none"> • It was more desirable to choose a large sample from companies in China in order to elicit data from a critical mass of respondents. • According to the first issue which favours the distribution of the questionnaire for all types of enterprises, this decision will lead to a large sample and accrue a number of benefits that are related to strengthening the external validity and generality of the research findings to other contexts.
Research Constraints	<ul style="list-style-type: none"> • The constraints of time and cost were particularly apparent to the researcher. Consequently, due consideration had to be given to these constraints in the selection of a data generation method. Therefore, the web-based questionnaire survey was considered to be reasonably substantial and preference of these constraints is taken into consideration.
Methodological Issues	<ul style="list-style-type: none"> • Constructs and variables depicted in this study have been clearly defined within the relevant literature and each one of them is reasonably developed by way of measurement. Therefore, the clarity of the data generation instrument could lead to selecting the questionnaire method. • This study requires a self-administered respondent approach because there is no necessity to consider a direct control over the physical data generation activity. • Ensure that there is no investigator bias with a questionnaire. In spite of having a different kind of bias related to the web-based questionnaire, the scale of this problem could be measured by a test for non-response bias.

4.4.2.2 Survey Procedure

Obtaining significant response rate with conventional postal surveys has always been a challenge. This situation has not changed for Web-based surveys. The presentation of the survey through single email containing both a

“cover letter” and the survey is likely to cause a strong negative reaction (Witmer et al, 1999; Mehta & Sivadas, 1995; Sheehan, 2001; Cho & LaRose, 1999). Follow-up reminder emails after the first publication also appear to spike participation (Smith, 1997; Sheehan & Hoy, 1999). More sophisticated approaches integrate online and offline contacts (Yun and Trumbo, 2000).

To maximize the response rate and reduce all types of error, Total Design Method (TDM) proposed by Dillman (2000) was proposed to construct a survey system of procedures and techniques. According to Dillman (2000), questionnaires are most likely to be responded if the perceived benefits of doing so will out weight the perceived costs of responding. The major strength of the TDM is that meticulously following the prescribed procedures consistently produces high response rates for all survey population. TDM is theoretically driven, removing emphasis from individual techniques and stressing how elements fit together. This approach is placed not on a particular technique such as personalization or follow-ups, but on how these procedures can be combined to influence questionnaire recipients positively.

When designing online surveys using TDM, Dillman (2000) recommended:

- Ordering questions to assure that interesting ones related to the topic described in the cover letter come first;
- Use graphical design and numerous question-writing principles to ease the task of reading and answering questions;
- Printing the questionnaire in a booklet format with interesting cover;
- Use of photo reduction of regular sized type to make pages seem smaller and easier to complete.
- When sending a questionnaire to recipients, consider the use of three carefully spaced mailings
 - A follow-up two weeks after the original mailing

- A first replacement questionnaire and cover letter informing the recipient the questionnaire has not yet been received four weeks after the original mailing;
- A second replacement questionnaire and cover letter seven weeks after the first mailing.

Researchers (Dillman, 2000; Schwarz and Sudman, 1996) have developed numerous procedures for survey pre-testing. Dillman (2000) suggests a multi-stage testing process that integrates testing techniques and can be applied to either paper or electronic surveys (See Table 4 – 2).

Table 4 – 2 A Survey Pilot Process (Adapted from Dillman, 2000)

Stage 1	State 2	Stage 3	Stage 4
Survey by knowledgeable colleagues to ensure question completeness, efficiency, relevancy and format appropriateness	Observation and “think loud” protocols, test respondents complete survey. This is followed with retrospective interviews.	Small pilot study that emulates all the procedures proposed by the main study.	Last check by non-researchers for typos and errors inadvertently introduced during the last revision process

Following Dillman’s (2000) four stage piloting process, the researcher constructed two versions (Chinese and English) draft survey questionnaires using word processor and developed the online prototype, which went through two rounds of review with researchers (Chinese and English) in Brunel University to ensure question completeness, efficiency, relevancy and format completeness. Following that, the researcher used “think out loud” protocols with retrospective interviews to ask some people who are not involved in the research to complete the survey. These cognitive pretests resulted in language simplification on the invitation and survey questions, changes in sequencing, and feedback on the look and feel of the survey. After the prototype was

- A first replacement questionnaire and cover letter informing the recipient the questionnaire has not yet been received four weeks after the original mailing;
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updated once more, an invitation to review the survey was sent to the interviewees attended the case studies. 20 people completed the survey and 10 people provided feedback to varying degrees of detail. This pre-testing produced an array of technical testing changes to privacy and confidentiality language and requirements, numerous recommendations for question wording, inconsistencies among questions and elimination of several questions. After the survey is updated again according to the recommendations from those interviewees in Chinese companies, the main survey is active online (www.brunel.ac.uk/~cbpgwwc/kmsurvey.htm) since March 1st, 2007.

After 2 weeks since the first round of massive emailing, the researcher started the first follow-up. While sending follow-up questionnaire, the cover letter was adjusted, and explained more on the study's social usefulness, the reason why respondent is important, and the confidentiality of the data. The second follow-up questionnaire started on April 2nd. Accompanied with the main web-based survey, the researcher also contacted the respondents with more than 500 telephone calls and 30 personal visits to the companies to maximize the survey response from the first questionnaire follow-up.

The procedure of the online web-base survey for this research is shown in Figure 4-2.

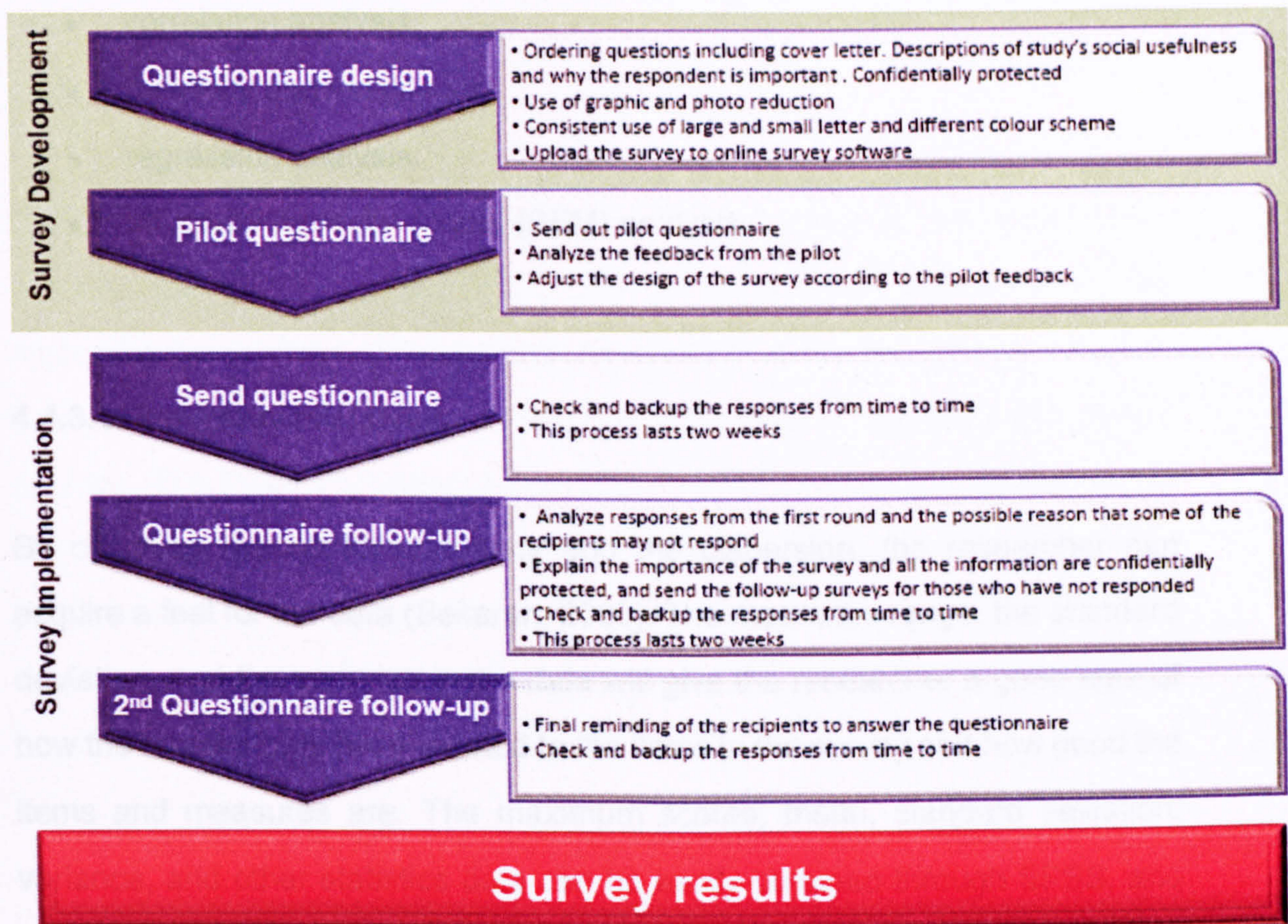


Figure 4-2 Online Web-based Survey Procedure (adapted from Dillman (2000))

4.4.3 Data Analysis Methods

In this section, the researcher presents the methodology adopted for the data analysis of this study. SPSS (Version 13.0) and AMOS (Version 6.0) statistical software packages are chosen to carry out the statistical analysis. As stated in section 4.3.4, this research adapted Bagozzi's (1980) data analysis model, various statistical techniques are selected in this study according to the nature of data and the research design of the study. A summary of the techniques used for data analysis in this study are listed below:

- descriptive statistics
- factor analysis

- correlation analysis
- reliability and validity test
- regression analysis
- structural equation model (SEM) analysis

4.4.3.1 Descriptive Analysis

By checking the central tendency and the dispersion, the researcher can acquire a feel for the data (Sekaran, 2000). The mean, the range, the standard deviation, and the variance in the data will give the researcher a good idea of how the respondents have reacted to the items in the survey and how good the items and measures are. The maximum scores, mean, standard deviation, variance, and other statistics data can be easily obtained through SPSS, and these will indicate whether the responses range satisfactorily over the scale. In addition to the frequency distributions, the means and standard deviations, it is helpful to know the dependent and independent variables in the study are related to each other.

4.4.3.2 Factor Analysis

The main applications of factor analytic techniques are: (1) to reduce the number of variables and (2) to detect structure in the relationships between variables, that is to classify variables. As a data reduction method, factor analysis is used as a tool in attempts to reduce a large set of variables to a more meaningful, smaller set of variables (Stevens, 1996). To increase the goodness of the collected data, this research applied factor analysis to reduce unnecessary variables.

4.4.3.3 Correlation Analysis

Correlation analysis helps in measuring the strength of the relationship between two variables (Boyd et al, 1989). A correlation coefficient (r) is the most effective method of evaluating the strength of the relationship between the variables. This correlation coefficient is a quantitative technique of bivariate analysis. The Pearson product-moment correlation coefficient is calculated for the variable relationships within each of the appropriate constructs. The purpose of conducting correlation analysis is to examine the strength of relationships within each construct and to determine whether it is appropriate to proceed toward subsequent analysis.

4.4.3.4 Reliability and Validity Test

To test the goodness of the data, the researcher will test the reliability (Cronbach's alpha) and validity (convergent and discriminant validity) of the data. The reliability of a measure is established by testing for both consistency and stability. Cronbach's alpha is a reliability coefficient that indicates how well the items in a set are positively correlated to one another. The closer Cronbach's alpha is to 1, the higher the internal consistency reliability. As subtypes of construct validity, convergent and discriminant validity refer to the degree to which inferences can legitimately be made from the operationalizations in a study to the theoretical constructs on which those operationalizations were based. Evaluation of construct validity requires examining the correlation of the measure being evaluated with variables that are known to be related to the construct purportedly measured by the instrument being evaluated or for which there are theoretical grounds for expecting it to be related (Campbell & Fiske, 1959). Correlations that fit the

expected pattern contribute evidence of construct validity.

4.4.3.5 Regression Analysis

The researcher has adopted regression analysis to test the hypotheses. Regression analysis has been the dominant technique in quantitative research for decades. It is a way of predicting some kind of outcome from one or more predictor variables. Simple regression seeks to predict an outcome variable from a single predictor variable whereas multiple regression seeks to predict an outcome from several predictors (Field, 2005). This study uses simple regression. The regression line is the straight line that best fits the data. Furthermore, the regression line is described algebraically by the regression equation that expresses the relationship between the two variables. In fact, any straight line can be defined by two things: (1) the slope or gradient of the line (usually denoted by β_1), and (2) the point at which the line crosses the vertical axis of the graph (known as the intercept of the line β_0). The general model can be expressed in an equation as follows:

$$Y_i = (\beta_0 + \beta_1 X_i) + \varepsilon_i$$

Where Y_i is the outcome that we want to predict and X_i is the participant's score on the predictor variable. β_1 is the gradient of the straight line fitted to the data and β_0 is the intercept of that line. These parameters β_1 and β_0 are known as regression coefficients. There is a residual term, ε_i , which represents the difference between the score predicted by the line for participant i and the score that participant i actually obtained. Furthermore, the gradient of the line demonstrates the nature of the relationship. A line that has a gradient with a positive value describes a positive relationship, whereas, a line with a negative gradient describes a negative relationship.

4.4.3.6 SEM Model Testing

It is natural to for the researcher to consider multiple regression analysis for the model testing according the structure of the conceptual model of this study (See Figure 2-1). However, the concept model contains a variable (organizational creativity) which is a dependent variable in some equations and becomes an independent variable in another equation (organizational creativity becomes independent when analysing the organizational performance). This kind of variable is also named as mediator variable (Gerdin and Greve, 2004). To solve this problem and increase the sophistication of regression analysis is to use path analysis. Path analysis involves the analysis of sets of relations between variables, so that the dependent variable in one equation becomes an independent variable in another equation. It is a method for studying the direct and indirect effects of independent variables on dependent variables (Wright, 1960). However, path analysis also has some restrictions. As multiple regression analysis, path analysis assumes unidirectional flow of relations between variables (Maruyama, 1998). It means that reciprocal relations between variables cannot be distinguished. Further more, traditional path analysis does not formally adjust the coefficient of each independent variable for estimated measurement error.

Structural equation modelling (SEM) is a statistical modelling technique that allows the simultaneous analysis of a series of structural equations. It is particularly useful when a dependent variable in one equation becomes an independent variable in another equation (mediator variable) (Hair et al., 1998; Kaplan, 2000; Smith and Langfield-Smith, 2004). SEM has been widely applied in the confirmatory analysis rather than exploratory analysis. It provides the step in relaxing some restrictions of both multiple regression analysis and path analysis. According to Smith and Langfield-Smith (2004), SEM has several advantages over multiple regression and path analysis:

- SEM allows a range of relations between variables to be recognized in the analysis compared to multiple regression analysis, and those relations can be recursive or non-recursive. Thus, SEM provides the researcher with an opportunity to adopt a more holistic approach to model building. As with multiple regression and path analysis, the level of prediction and explanation can still be assessed, and hypothesis can be tested through the assessment of the significance of path coefficients. However, the judicious use of a range of measures of fit can provide the researcher with a basis for evaluating the overall model.
- The ability to account for the effects of estimated measurement error of latent variables is a major difference between SEM and both path analysis and multiple regression analysis. This is particularly relevant to the research when composite measures are used to measure constructs. The use of interaction terms in multiple regression analysis may increase this problem. Interaction terms in multiple regression may encompass significant measurement error, particularly when used with composite variables. This can lead to bias in the estimation of coefficients of interaction terms, and can undermine significance tests (Jaccard and Wan, 1996).

A structural equation modeling technique, Partial Least Squares (PLS), was chosen for analyzing the research model (Wold, 1985). PLS is a technique that uses a combination of principal components analysis, path analysis, and regression to simultaneously evaluate theory and data (Pedhazur, 1982; Wold, 1985). The path coefficients in a PLS structural model are standardized regression coefficients, while the loadings can be interpreted as factor loadings. PLS is ideally suited to the early stages of theory development and testing - as is the case here - and has been used by a growing number of researchers from a variety of disciplines (e.g. Birkinshaw et al., 1995; Higgins

et al., 1992). A detailed discussion of the implementation of PLS in an information systems context is provided by Barclay et al. (1995), who also compare PLS and LISREL.

The explanatory power of the model is tested by examining the size, sign, and statistical significance of the path coefficients between constructs in the model. The statistics for the paths are generated using a jack-knifing technique (Fornell and Barclay, 1983). The predictive capacity of a PLS model can also be evaluated by examining the variance explained (i.e. R^2) in the dependent (or endogenous) constructs. The objective of a PLS analysis is to explain variance in the endogenous constructs, rather than to replicate the observed covariance matrix as is the case with covariance structure techniques (such as LISREL). However, one consequence of using a variance-minimization objective is the absence of overall fit statistics for PLS models (Hulland, 1999).

Based on the characteristics and advantages comparing to multiple regression and path analysis, SEM fits better into this research model analysis requirements.

The summary of the survey method is presented in Table 4 – 3.

Table 4 – 3 Summary of Survey Method for this study

Procedures	Contents	
1. Research Design		
1) Survey type	Cross-sectional and web-based survey, causal and statistical study	
2) Mix of research methods	A single research method	
3) Unit of analysis	Chinese Enterprise	
4) Respondents	Knowledge workers and managers in Chinese enterprises	
5) Research hypotheses	10 hypothesis related to knowledge management enablers, processes, creativity, and organizational performance	
6) Design for data analysis	Multiple Regression, Structured Equation Model	
2. Sampling Procedures	Pilot survey	Main survey

1) Type of sampling	Nonprobability sampling	Probability sampling
2) Criterion	Nonsystematic selection	Systematic selection
3) Sample size	Convenience sample 30 knowledge worker	131 organizations (556 knowledge workers, including 147 managers)
4) Survey type	Online web-based survey	Online web-based survey
4. Data Collections	Pilot Survey	Main Survey
1) Pre-test of questions	With middle manager	Through the pilot survey
2) Response rate	31/50=62%	556/2500=22.3%
3) Mix of data collections	Single methods	Single methods
4. Data Analysis	Pilot Survey	Main Survey
1) Testing method	Multiple Regression	Multiple Regression, SEM
2) Level of Significant	P-value (0.01, 0.05, 0.1)	P-value (0.01, 0.05, 0.1)
3) Analysis tool	SPSS 13.0	SPSS 13.0 + AMOS 6.0

4.5 Summary

The purpose of this chapter is to explain the research philosophy and research methodology adopted in addressing the aims of this study. This chapter presented a justification of the mixed method (Qualitative and Quantitative) approach in order to achieve the research objectives. It provided the details of the data sampling, data collection, and data analysis methods. The next chapter will focus on the findings from the qualitative study and the development of the web-based online survey.

Chapter 5

QUALITATIVE DATA: Findings and Analysis

This chapter presents the qualitative data findings and analysis. As stated in Chapter 4, the qualitative investigation involved collecting data through observations and semi-structured interviews with knowledge workers in China in order to identify the variables of the KM enablers and develop measures of these constructs appropriate for the Chinese context. This chapter is organized as follows: Section 5.1 describes the seven knowledge management enablers identified within the interviews with knowledge workers in China; Section 5.2 presents how qualitative findings were utilised to inform the subsequent quantitative data collection (survey) and analysis. The variables and indicators (questionnaire items) were developed in this section for the quantitative study which will be analysed in Chapter 6. This chapter emphasises the relation of the qualitative data with the conclusions of other researchers in the KM field. The implications of these results for the KM field will be presented in Chapter 7.

5.1 Findings from KM Enablers in Chinese Enterprises

To enhance the conceptual framework and increase the validity of this research, the researcher conducted a qualitative study to inform the main quantitative survey design. By identifying the variables of the KM enablers and developing measures of these constructs appropriate for the Chinese context, the qualitative study comprised semi-structured interviews that enable a deeper insight of the topics of interest, while allowing topics of importance to emerge. This section discusses the findings on the knowledge management enablers of Chinese enterprises as perceived by organizational culture,

organizational structure, people, and technology. As stated in section 2.3.1, knowledge management enablers can be addressed according to a socio-technical theory (Pan and Scarbrough, 1998), which describes an organization from the social and technical perspectives. The social perspective is concerned with the attributes of people (e.g., attitudes, skills, values), the relationships among people, and organizational structure. The technical perspective is concerned with technology required to transform inputs to outputs (Bostrom and Heinen, 1977). Organizational culture, organizational structure, and people are social enablers; information technology is a technical enabler. Table 5 – 1 presents the background of interviewees (6 directors, 12 middle managers, and 6 knowledge workers from R&D departments of these enterprises). The findings from the 24 semi-structured interviews revealed the existence of seven common KM enablers in Chinese enterprises. The seven enablers are collaboration, trust, organizational learning, organization centralization, organization formalization, T-shaped skills, and IT support. Build upon the conceptual framework of this study, the conclusions from the qualitative findings will assist defining the measures of the survey constructs.

Table 5 – 1 Interviewees Background Information

Case	Industry	City	Number of total employees	Number of employees in R&D	Turnover (million)	Company established year	Legal basis of your organization	Number of years in your current employment	Age	Sex	Job	Highest qualification
1	ICT	Beijing	2000	300	12,000	1990	A co-operative enterprise	10	47	Male	Director	Undergraduate
2								6	36	Male	Middle manager	Undergraduate
3								4	34	Female	Middle manager	Master
4								2	28	Male	Knowledge worker	Master
5	ICT	Beijing	2200	200	13,000	1990	A co-operative enterprise	12	52	Male	Director	Undergraduate
6	*							6	32	Male	Middle manager	Undergraduate
7								5	29	Male	Middle manager	Master
8								1	25	Male	Knowledge worker	Master
9	Medicine	Shanghai	200	30	1,000	1996	A co-operative enterprise	9	53	Female	Director	Master
10								6	40	Male	Middle manager	Undergraduate
11								5	35	Male	Middle manager	Undergraduate
12								3	28	Male	Knowledge worker	Master
13	Medicine	Shanghai	25	5	240	1965	Private owned enterprise	6	48	Male	Director	Master
14								4	39	Female	Middle manager	Undergraduate
15								5	36	Male	Middle manager	Master
16								2	26	Female	Knowledge worker	Undergraduate
17	ICT	Shenzhen	300	15	2,000	1998	Private owned enterprise	8	46	Male	Director	Undergraduate

18									5	40	Male	Middle manager	Master
19									6	35	Female	Middle manager	Master
20									2	26	Male	Knowledge worker	Undergraduate
21	ICT	Shenzhen	1000	80	8,000	2000		A co-operative enterprise	2	46	Male	Director	PhD
22									4	38	Male	Middle manager	Undergraduate
23									5	40	Female	Middle manager	Undergraduate
24									1	27	Male	Knowledge worker	Master

5.1.1 Collaboration

As stated in section 2.3.1.2, effective knowledge management requires a collaborative culture (Gold et al., 2001; O'Dell and Grayson, 1999). Exchanging knowledge among different members is a prerequisite for knowledge creation. Data obtained from the interviews suggest that employees in Chinese enterprises have been introduced to the concept and certain practices of teamwork, and these employees generally identify with their functional department (e.g., manufacturing, marketing, or sales) or their work section in the factory as their primary work group. Thus, the Chinese enterprises are at the beginning stage of a teaming process. As one of the knowledge workers pointed out:

"In our company, we have a culture of helping and supporting each other. If someone has a problem with his/her task, others will help to give advice on that problem. Employees are very nice to each other. Our department often organize some games and activities to develop collaborative culture. I think this is good to build up good relationships between employees by having fun together and working together. I feel that the performance of some recent projects is improved after the change of management strategy on collaborative culture. ... However, it is difficult for us (non-managers) to communicate freely with our manager in our company. There is a gap between us that we can never across. Sometimes, it delayed the progress of some projects. Respecting your manager is our tradition...." (Case 12)

The quote reflects the inherent value of collectivism in China and the assumption that a collectivist orientation would necessarily lead to group formation and activity in terms of teamwork. According the managers (Case 1, 5, 9, 13, 17, 21), Chinese employees' belief in and understanding of collectivism might have weakened or changed to such an extent that they do

not view it in direct relationship with preference for teamwork. The results suggest that Chinese associate the collectivist value with the more pragmatic importance of cooperation in the workplace such as sharing information and maintaining communication. It is only until they are willing to cooperate that they prefer to work in teams. Cultural value has become less important than critical work-related attitudes in fostering teamwork orientation in Chinese enterprises.

On the other hand, the rigid social hierarchy emphasized by Confucianist principles (section 3.3.2) could prevent fully autonomous and flexible teamwork, so that the very elements of Chinese culture that create and sustain group attachment and group conformity also maintain top-down control, which contravenes the principle and practice of true teamwork. As one of the managers told us:

“.... I think the teamwork in our company is great. Once our top management team made the decision for a project, everyone works hard to finish the project. ... Of course, some problems will pop up as usual. When this happens, they have to report to one of us (the top management team). We will make decision for the best....” (Case 9)

Chinese companies' centralized top-down control has strong negative impact on the teamwork. “Lots of decisions in our projects are normally made by people with power, not us, even though we know those decisions are wrong. Sometimes, the wrong decision making cost us lots of money. However, we can not argue with those decision makers for the goodness of the project itself. We fear that it might make our manager loose face....” One knowledge worker (Case 12) stated. According to Walder (1986), during Maoist China, the Confucian cultural and social traditions were reinforced by the Communist ideology and politicized system of workplace control, which also made workers

politically, economically, and socially dependent on the state-owned enterprise. These factors led to risk aversion, fictionalization of the workforce, mistrust for co-workers, and personalized favouritism, which contradict Western teamwork norms of risk-taking and responsibility. Therefore, if these Confucians and Communist ideologies persist, they will create strong barriers to teamwork.

In sum, the studies from the 6 Chinese enterprises suggest that traditional Chinese culture may well have competing influences on teamwork today. On the one hand, the collectivist orientation of Chinese culture may promote such crucial aspects of teamwork as a common purpose, task interdependence, and group orientation. The importance of relationships in this collectivist society would also suppress individual interests for the good of work groups (teams). Moreover, traditional Chinese Confucian culture and society feature strong vertical relationships of filial piety, paternalism, and hierarchy, and strong pressures for conformity, maintenance of face, and social control. These vertical relationships would promote teamwork if teams are formed by managerial authority and have strong appointed leaders. Therefore, traditional Chinese values may facilitate teamwork.

Relating to the quantitative survey development, this study will examine the collaboration factor by looking at **the degree to which people in a group actively support and help one another in their work** in Chinese enterprises.

5.1.2 Trust

As one of the most vital enablers of KM, trust may facilitate open, substantive, and influential information exchange (Nelson and Coopriider, 1996, O'Dell and Grayson, 1999). In section 2.3.1.2, it is mentioned that when their relationships are high in trust, people are more willing to participate in knowledge exchange

and social interactions (Nahapiet and Ghoshal, 1998). According to the findings from the interviews, all participants expressed that trust is one of the most important factors in their companies. Some of them (Case 1, 5, 9, 13, 17, 21) pointed out that loyalty to the company and their colleagues trumps everything in their companies and is the key for the success.

A project manager from Case11 told us, " The employees in our company trust each other, which is very important I think. In fact, we have to rely on each other most of the time. For instance, the skills of the team members in our department vary. Different member is expert at different area and their experiences are different as well. Therefore, we have to have reciprocal faith with each other in our product development. Building upon trust, exchanging ideas become possible. Inexperienced members gain new experiences, knowledge is shared and sustained within our company. Sometimes, new idea and knowledge are sparked from the knowledge sharing....." (Case 11)

As a dynamic factor, trust in Chinese enterprises is always changing with the organizational change. As pointed out by a manager from a R&D department.

"Our company has invested lots of money on recruiting highly skilled knowledge workers. To keep them, we offered very high salary and good working conditions to them. However, some of them still left our company for higher salary and took the company research results away with them, which is a big loss to our company. There is a trust issue here. At the beginning of the contract, we trust each other. Their loyalty to our company change as time goes by. We have noticed this issue and trying to adjust our management strategy to solve this problem caused by trust. Our company now has enhanced the management system by evaluating employees' performance regularly; pushing them to share their knowledge and experience in the work and so that others will be able to absorb the knowledge and become

knowledge assets of our company; distributing the job tasks to avoid one person in charge of everything for the task; and trying to keep those employees who want to resign and the investigating the reason..... ”

(Case 2)

A number of interviewees (Case 1, 4, 5, 9, 13, 17, 21) pointed that there are many factors impacting on employees' trust to an organization in China (i.e. from the employees themselves, from the company, from the society, or from the government policy). The researcher angled from the company perspective that the degree of trust is affected by how the company treat their employees.

A knowledge worker from a R&D department (Case 4) told us “...our company is always trying to improve our working conditions and helping us to take care of our family. ...I like the working environment in my department that everyone is trying to help each other in and out of work. We always have a common goal in our department – the success of each project....our company is fair to everyone that our job performance is evaluated regularly and good performance means that I have chance to be promoted... I feel very lucky to work for my company and I will do my best in my job to let them keep me. ”

Drawing from the interview data, the trust between employees and between employees and employers in Chinese enterprises is an important factor that impact on the knowledge sharing and creativity. Chinese enterprises in the high-tech industry are developing their own Chinese style strategy to improve the loyalty of their employees. Better working conditions and trying to provide assistance for the employees' life outside the company have developed their trust of the company. The top management team also invites the core knowledge workers (scientists and engineers) to take part in the decision making process of the company and take the suggestions and advice from them. By introducing job performance measurement system, employees are

encouraged to work for their common goal in a trusted environment. The loyalty of employees is also improved by helping them in the personal career development.

Regarding the development of the quantitative survey, this study will examine the trust factor by investigating **the degree of reciprocal faith in others' intentions, behaviour, and skills toward organizational goals** in Chinese enterprises.

5.1.3 Organizational learning

As stated in section 2.3.1.2, organizational learning is the acquisition of new knowledge by people who are able and willing to apply that knowledge in making decisions or influencing others (Miller, 1996). Through the emphasis on learning and development, organizations can help individuals play a more active role in learning and discover something new about problems. Dierkes and Zhang (2001) divided organizational learning into two patterns: guided learning and self-generative learning. The interviews of this study suggest that there are significant differences in the structure of Chinese companies that are relevant for organizational learning. Enterprises of the "guided learning" type (Case 1, 5, 9) have hardly gone through any structural shifts. The "manager in charge", usually at the top of a state-owned enterprise in China, is responsible for the initiation of organizational learning processes. By contrast, companies of the "self-generative" type (Case 13, 17, 21) of learning have shifted to a "board of directors" and they have set up subsidiaries so that a number of people may take responsibility for the process of organizational learning. With growing consciousness of market competition, managers of these enterprises also acknowledge the great significance of marketing and sales divisions, which triggered them to encourage more learning activities

within their companies.

Great differences also become apparent between the forms of internal communication within companies of both learning types. Enterprises of the "guided learning" type show predominantly one-sided channels of communication. Some of the managers of these enterprises considered this form adequate to cope with problems of adaptation. (Case 1, 5) ; the others tended to describe this form of communication as a factor blocking organizational learning (Case 9). Companies of the "self-generative" learning type (Case 13, 17, 21) exhibited diverse forms of communication. Here oral communication taking place in meetings has become the predominant form of communication, leaving behind the traditional forms such as written statements or company newspapers. One manager described the significance of bottom-up communication as follows: "This grassroots mode of information transmission linked with operation greatly strengthened our capability of responding to environmental changes." (Case 13) Some respondents (Case 13, 17, 21), particularly those from enterprises of the "self-generative learning" type, not only mentioned significant shifts in the structure of the organization but also changes in culture, which they thought had been important for the process of organizational learning.

Within the context of being conscious about the market economy and dealing with the new situation of competition, Chinese managers emphasize the centrality of a change of mental maps to manage the process of adaptation. This change becomes visible in a shift from older, less educated to younger, well-educated employees and from steady and earnest employees to employees who are ready to explore. Trust is also an important factor during this shift (See Section 5.1.2). Some of the enterprises in the sample (Case 1, 5) have already gone through this shift. Respondents described how employees had changed their mental maps in keeping with the changes in

their environment. One manager (Case 9) reported great deficits regarding the change of mental maps among the management (only in enterprises of the guides learning type) and among other employees. They believed that this is a blocking factor in the process of organizational transformation. Respondents repeatedly noted the interdependence of individual and organizational learning.

Another dimension of the connection between individual and organizational learning becomes visible in the term "collective wisdom," which was used by the interviewees (Case 1, 5, 9, 13, 17, 21) to emphasize the meaning of commonly shared knowledge and processes of learning within the firm. They believe that the dynamic of decision-making processes is partly driven by "collective wisdom" and partly by "individual talent." As becomes apparent in the following quotation, some managers (Case 9) find that one characteristic excludes the other: "The recognition is formed by collective wisdom rather than any individual talent." Individual achievements are in some cases also viewed as complementary to collective achievement. "Individual talent" is considered a decisive factor for the development of the organization and consequently of organizational learning.

Among the factors the Chinese respondents believe are blocking organizational learning are the state administration and individual employees. Employees in some state-owned enterprises have shown resistance when moving toward a joint venture with a foreign partner "Some old workers regarded the event as betraying our nation. Even in the management level opinions were not in harmony" (Case 10). In this company state support for this strategic move was perceived as decisive for success: "Without the support of the Chief Administration, the project would have failed." Overcoming learning barriers is part of the process of organizational learning. Some respondents mentioned cases of entrepreneurial managers who had initially had to

overcome resistance by state authorities, but later got their support when they were convinced by the success of the company. "As long as the ideas do not violate the law, I won't let them slip, I am to grasp any opportunity. They said that I was despotic, giving no respect to my superior leaders. Whereas by the success of my work, my style of handling affairs was gradually understood by people." (Case 11)

Most of the managers in the interviews considered it important to learn from other organizations and other individuals. Foreign companies with experience in market economies serve as role models and help to define the direction of change. All respondents expressed the importance of these role models regardless of the type of ownership. Moreover, managers of enterprises that were joint ventures with foreign companies interpreted their experience in dealing with their foreign partners as an impetus for learning.

Concerned with the quantitative survey development, this study will examine the organizational learning factor by looking at **the degree of opportunity, variety, satisfaction, and encouragement for learning and development in Chinese enterprises.**

5.1.4 Organization Structure

As mentioned in section 2.3.1.3, the organizational structure within an organization may encourage or inhibit knowledge management (Gold et al., 2001; Hedlund, 1994; Nonaka and Takeuchi, 1995). The data from the interviews suggest that private owned Chinese enterprises are more centralized and less formalized than the state counterparts. With the impact of more than two thousand years of Confucianism, Chinese enterprises are normally centralized. According to some of our interviewees (Case 13, 16, 20), decision-making in these Chinese enterprises are very centralized that normal

non-management employees never have chance to take part in the decision-making process. This is normal particularly in private owned enterprises.

According to Graham and Pizzo (1996), the concentration of decision-making authority inevitably reduces creative solutions while the dispersion of power facilitates spontaneity, experimentation, and the freedom of expression, which are the lifeblood of knowledge creation. Therefore, a centralized organizational structure makes it harder to create knowledge (Starbuck, 1992; Stonehouse and Pemberton, 1999; Teece, 2000). This is confirmed in this study as well.

“..... when it comes to the decision making, what normally happens is that the management people will inform their decision orally or by our internal newspapers. If there is some problem or issue pop up in our work, we have to report to our line manager. And he will raise the problem to higher management that the problem often stays unsolved. It is unusual for us to talk to the general manager directly that our line manager might loose his face....”
(Case 20) A member of software development team in a software company told the researcher. It is tradition in Chinese enterprises that people with power are normally respected by normal employees that it is difficult to talk to each other like a friend between managers and employees. Based on the interview data, it can be concluded that the centralized environment in Chinese enterprises has made the communication between employees and managers difficult. The gap between them disabled them to exchange ideas and share knowledge instantly and freely. Without a constant flow of communication and ideas sharing, the knowledge creation did not occur.

According to the literature on formalization (stated in section 2.3.1.3), low degree of formalization will improve the flexibility of decision making and increase the knowledge sharing of the organization. Knowledge creation

requires flexibility and less emphasis on work rules (Bennett and Grbriel, 1999; Hedlund, 1994; Ichijo et al., 1998; Lusch, et al., 1998; Wilkstrom and Norman, 1994). However, our interviewee data obtained from these Chinese enterprises tells a different story. One director from a private owned firm in ICT industry pointed that "Because the scale of our firm is relatively small, the business process and company structure are not very formal comparing to big state owned enterprises. We don't have formal regulations on the production procedures (software) that brought us massive loss. The software developers used to design the product in an ungoverned environment, which caused lots of repeating work and the delay of projects. We definitely need disciplines to control the performance of our projects..." (Case 17)

Apparently the lack of formalization in small sized Chinese high-tech enterprises affected their performance. This implies that the structure of small Chinese enterprises is normally not formal which caused the low performance. Because of the less formalization, knowledge sharing and creation become less important for these enterprises. However, the interview results with large sized enterprise also suggest that formalization is "a good thing" for them. A general manager from a SOE (Case 5) described that "In our company, all the processes and management are very formal, which I think is a good thing. We have tried to introduce some change by flexible team for some projects that we gave the team member more freedom for those projects. However, the results were not encouraging. The performance of those projects is not good. Once the team members have more freedom, they all have different ideas which conflict with each other. Lots of arguments end up with no solution, and time was wasted. We can not afford to risk any more. My opinion might be conservative but our company has tried and it did not work....". From his story, we can conclude that the lack of corporation between employees in Chinese SOEs disabled the knowledge sharing and creation which had a negative impact on the performance of projects.

In summary, regarding the development of the quantitative survey for the organizational structure factors, this study will investigate **the degree of authority and control over decisions** for the centralization factor and **the degree of formal rules, procedures, and standard polices** for the formalization factor.

5.1.5 T-shaped skills

As stated in 2.3.1.4, people are at the heart of creating organizational knowledge (Chase, 1998; Holsapple and Joshi, 2001; Ndlela and Toit, 2001). Well-trained personnel are regarded as an important factor in the process of business transformation. Managers in many enterprises (Case 1, 5, 9, 13, 17, 21) described the difficulty of recruiting and keeping qualified personnel. This is particularly a serious problem for state-owned enterprises since for the same job income is far lower than in privately owned enterprises. Education and training were in general highly valued by the managers. Respondents in several enterprises of the "self-generative" learning type (Case 13, 17, 21) expect that a well-educated and trained workforce will be more entrepreneurial and more competent in problem-solving and strategy development. As one manager (Case 9) pointed "We want to raise the employees' consciousness so that they understand 'I will get the benefit if the company runs well; I will be unemployed if the company gets into a depression.'" Some managers (Case 13, 17, 21) mentioned great problems with the employees' "transformation of mind." Others reported that they already succeeded in 'binding' employees in this way to the firm. In one case (Case 1), a firm was transformed into a joint-stock company with the employees holding a part of the shares.

According to the interviews results (Case 1, 5, 9, 13, 17, 21), people with T-shaped skills in Chinese enterprises played important roles in the knowledge

management processes. Individuals with T-shaped skills are capable to see the world from two or more different perspectives – knowing one or more discipline in great depth as well as having a broader view of the bigger picture (Leonard-Barton, 1995; Madhavan and Grover, 1998). Particularly in private owned Chinese enterprises (Case 13, 17), people with T-shaped skills are normally a scientist with a management role in the firm, who have expert knowledge in the technical field and also be involved in other management and consultant activities within the firm. These people are in the position to manage and spring knowledge across departments, which makes it possible to create new knowledge. As a bridge between departments and enterprises, those people smooth the knowledge flow. As a general manager (Case 13) stated,

“They are the most valuable assets of our company, who are the main source of the technical knowledge for our company. They also help us to access the latest advanced technology in our industry through their personal networks. Inside our company, they are the bridge between R&D department and other departments, who smooth the communication and knowledge flow throughout our company. They have contributed many patents of our company ... ”

He also mentioned that the company offered very competitive salary and commission to keep those people with T-shaped skills. It implies that Chinese enterprises started to realize the importance of the highly skilled workers with expert knowledge, who are able to put them in the competitive position in the competitive market. The existence of those people has a positive impact on knowledge sharing and knowledge creation for Chinese enterprises.

Therefore, regarding the development of the quantitative survey for the T-shaped skills factor, this study will examine **the degree of understanding people's own and others' job task areas** within Chinese enterprises.

5.1.6 IT support

As stated in section 2.3.1.5, Technology contributes to knowledge creation (Gold et al., 2001). This technology infrastructure includes information technology and its capabilities (Scott, 1998; Zack, 1999c). Through the linkage of information technology in an organization, previously fragmented flows of knowledge can be integrated (Gold et al., 2001). The interview results has shown that Chinese enterprises today are spending much more than before on IT equipment and software. All of our interviewees expressed that their companies use computers to deal with their business processes on daily basis. As one of them (Case 22) stated,

“There are very few Hi – tech companies that don’t use computers in China now. Our company uses computer nearly in every area of our business process. As a medium sized software development company, we have our own ERP system to manage our human resource, finance and accounting, projects developments, internal training and learning, customer and client management, knowledge sharing, and marketing .etc. The use of these systems has accelerated the speed of doing our jobs.... ”

As an encouraging factor, the use of IT in Chinese enterprises has shown that the attention on IT of the Chinese managers. 16 of them (Case 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 17, 18, 21, 22, 24) claimed that their companies have introduced intranet system. The use of intranet has made the knowledge sharing easier and faster than ever before. All of the interviewees agreed that they have developed databases in their enterprises to store data electronically. Ten of them (Case 2, 3, 4, 6, 7, 8, 11, 21, 22, 24) mentioned that they have used data mining software tools to analyse those data for assistance of decision making.

To encourage tacit knowledge sharing, some of these companies developed online chat rooms or groupware for their employees. One employee from a R&D department of an ICT company told us,

“Our company management team understands the importance of inexplicit knowledge of employees. Besides our regular meeting every week to discuss our job issues and experience, we have an intranet based system that people can leave messages, instant chatting, and email to exchange ideas and help each other to solve problem. The system also archives all the questions and solutions as a type of database. It is very helpful to my job and I learned a lot from it. I love this system....” (Case 24).

In sum, IT support becomes important for Chinese enterprises as a powerful tool to manage knowledge. For the design of the survey, this study will examine **the degree of IT support for collative work, for communication, for searching and accessing, for simulation and prediction, and for systematic storing** in Chinese enterprises.

5.2 Survey Development

As a support tool for the quantitative survey design, the qualitative analysis above and literature review in chapter 2 and chapter 3 informed the constructs and measurement model of this study. To test the model, there are two steps in the process of theory testing in general:

- 1) Developing valid measures of theoretical constructs and
- 2) Testing the relationship between theoretical constructs.

As stated in section 4.4, Bagozzi's (1980) criteria were originally developed to ascertain the correspondence between theoretical constructs and observational constructs, these criteria can be used in research design. Both

the first and second criteria can guide theory generation and the development of the measures to be used. After empirical testing is undertaken, remaining criteria should be ascertained before the relationships among theoretical constructs using measure constructs are analyzed. This research summarizes these Bagozzi's (1980) criteria in terms of this study in Table 5 – 2.

Table 5- 2 How Bagozzi's Criteria are Used in This Study

Bagozzi's Criteria	This Study
Theoretical meaningfulness of concepts	Integrative view model is derived from earlier research on knowledge management framework, empirical study, and various theories
Observational meaningfulness of concepts	Used previously validated measures with new measures that are tested in pilot study
Internal consistency of operationalizations	Used multiple-item constructs and tested with Cronbach's alpha coefficient
Convergent validity	Used multiple-item constructs and tested with item-to-total correlation
Discriminant validity	Used multiple-item constructs and tested with factor analysis
Nomological validity	The results of the study should be consistent with a larger body of theory and contribute to the reference field

Based on the literature review and qualitative data analysis, the measurement of the constructs of this study can be summarized as shown in Table 5 – 3. For the online survey, the multiple-item method was used and each item was based on 6-point scale from 'strongly disagree' to 'strongly agree' to 'don't know'. The operational definitions of instruments and their related literature are summarized (see Table 5 – 3).

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Table 5 – 3 Conceptual Definitions and Measurements for Knowledge Management Constructs of this study

Factors	Variables	Cases	Conceptual Definition	Related Literature	Measurement	Indicator	Item
KM Strategy	Codification Strategy (V10)	1, 5, 9, 13, 17, 21	knowledge codification knowledge acquisition in codified forms documentation knowledge sharing through codified forms	Bierly & Chakrabarti (1996) Bohn (1994) Jordan & Jones (1997) Hansen et al. (1999) Swan et al. (1999) Zack (1999a)	Degree of knowledge codification, knowledge acquisition in codified forms, documentation, knowledge sharing through codified forms	4 items 6 scale	II: 1: 1)-4)
	Personalization Strategy (V11)	1, 5, 9, 13, 17, 21	knowledge acquisition from experts and co-workers face-to-face help by experts informal dialogues for knowledge sharing knowledge acquisition by one-to-one mentoring	Bierly & Chakrabarti (1996) Hansen et al. (1999) Jordan & Jones (1997) Nonaka & Takeuchi (1995) Venzin et al. (1998) Zack (1999a)	Degree of knowledge acquisition from experts and co-workers, face-to-face help by experts, informal dialogues for knowledge sharing, knowledge acquisition by one-to-one mentoring	4 items 6 scale	II: 2: 1)-4)
Culture	Collaboration (V12)	1, 5, 9, 12, 13, 17, 21	The degree to which people in a group actively support and help one another in their work	Hurley & Hult (1998) Gold et al. (2001) O'Dell & Grayson (1999) Nahapiet & Ghoshal, (1998)	Degree to which people in a group actively support and help one another in their work	5 items 6 scale	II: 3: 1)-5)
	Trust (V13)	1, 2, 4, 5, 9, 13, 17, 21	Maintaining reciprocal faith in each other in terms of intention and behaviours	Kreitner & Kinichi (1992) Nelson & Coopriider (1996) O'Dell & Grayson (1999) Nahapiet & Ghoshal (1998)	Degree of reciprocal faith in others' intentions, behaviour, and skills toward organizational goals	6 items 6 scale	II: 4: 1)-6)
Structure	Learning (V14)	1, 2, 5, 9, 10, 11, 13, 17, 21	The degree to which learning is encouraged in organizations	Miller (1996) Hurley & Hult (1998) Quinn et al. (1996) Ndlela and Toit (2001) Narasimha (2000) Swieringa & Wierdsma (1992)	Degree of opportunity, variety, satisfaction, and encouragement for learning and development in organization	5 items 6 scale	II: 5: 1)-5)
	Centralization	1, 5, 9, 13	The degree of decision authority and	Caruana et al., (1998);	Degree of authority and control	5 items	II: 6: 1)-5)

V(15)	control within an organizational entity	Ein-Dor & Segev, (1982) Graham & Pizzo (1996) Starbuck (1992) Stonehouse & Pemberton, (1999) Teece (2000)	over decisions	6 scale	
Formalization V (16)	The degree to which decisions and working relationships are governed by formal rules, standard policies, and procedures	Rapert & Wren (1998) Holsapple & Joshi (2001) Bennett & Grbriel (1999) Hedlund (1994) Ichijo et al. (1998) Lusch, et al., (1998) Wilkstrom & Norman (1994)	Degree of formal rules, procedures, and standard polices	5 items 6 scale	II: 7: 1)-5)
People	T-shape skill V(17)	1, 5, 9, 13, 17, 21, 22, 24	Degree of understanding his/her own and others' task areas	5 items 6 scale	II: 7: 1)-5)
Information System	IT support V(18)	1,2,3,4, 5,6,7,8, 9,10,11, 12,13,1 4,15,16, 17,18,1 9,20,21, 22,23,2 4	Degree of IT support for collative work, for communication, for searching and accessing, for simulation and prediction, and for systematic storing	4 items 6 scale	II: 9: 1)-4)
Knowledge Creation Processes	Knowledge Creation Process	Nonaka & Takeuchi (1995) Gupta & Govindarajan, (2000b) De Long & Seemann (2000)	How well the knowledge creation processes delivered matches the organizations' expectation	20 items 6 scale	III: 1-4

					(Degree of SECI)	
		enterprises share tacit and explicit knowledge		Alavi (1997) Davenport & Prusak, (1998) Raven & Prasser (1996)		
	Socialization (V19)	Share tacit knowledge and fosters new tacit			Degree of tacit knowledge accumulation, extra-firm social information collection, intra-firm social information gathering, and transfer of tacit knowledge	5 items 6 scale III: 1) 1)-5)
	Externalization V(20)	Codifies tacit knowledge into explicit concepts			Degree of creative dialogue, deductive and inductive thinking, use of metaphors, and exchanged ideas	5 items 6 scale III: 2) 1)-5)
	Combination V(21)	Converts explicit knowledge into more systematic explicit knowledge			Degree of acquisition and integration, synthesis and processing, and dissemination	5 items 6 scale III: 3) 1)-5)
	Internalization V(22)	Embodies explicit knowledge into tacit knowledge			Degree of personal experiences, simulation and experimentation	5 items 6 scale III: 4) 1)-5)
Organizational Creativity	Organizational Creativity (V23)	The capability of creating valuable and useful products, services, ideas, procedures or processes by individuals working together in a complex social system	1, 5, 9, 13, 17, 21	Amabile et al., (1996); Woodman et al., (1993). Davenport (1999) Vicari and Troilo (2000) Gurteen (1998)	Degree of belief that organizations is actually producing creative (novel/useful) ideas (services/products)	5 items 6 scale IV: 1) 1)-5)
Organizational Performance	Organizational Performance V(24)	The degree to which companies achieved its business objectives	1, 5, 9, 13, 17, 21	Elenkov (2002) Davenport (1999) Knight (1999) Han et al, (2000) Roos & Roos (1997) Sveiby (1997) Kaplan & Norton (2000) Kight (1999) Deshpande et al. (1993) Drew (1997)	Degree of overall success, market share, growth rate profitability, and innovativeness in comparison with major competitors	7 items 6 scale V: 1) 1)-7)

Most of the research constructs have already been validated and used for other studies on knowledge management, organizational design, organizational learning, or information technology management. For instance, formalization items have already been validated and used by Caruana et al. (1998) and Rapert and Wren (1998). Self-reported items have been used to assess organizational performance (Deshpande et al., 1993; Drew, 1997). Although these items do not present a fully balanced scorecard, they are effective for comparing business units and industries (Drew, 1997). Questionnaire items for the knowledge creation process, which were used in this study, had been validated and used by Nonaka et al. (1994).

Table 5-3 informed the design of the online survey used for the coming quantitative study. The survey questions were designed to assess the relationships of KM enablers, KM Processes and organizational performance measured by the variables and indicators listed in Table 5-3. Each indicator was measured through Likert scale assessment ranging from 5 (strongly agree) to 1 (strongly disagree). The survey can be seen in Appendix 7.

Chapter 6

Quantitative Data Analysis and Findings

This chapter presents the findings from the quantitative data analysis of this research. As stated in Chapter 4, the quantitative investigation involves collecting data through web-based online surveys. This chapter is organized as follows: Section 6.1 discusses the data sample and data collection results. Section 6.2 analyzes the data distribution and frequency. The research hypotheses and model testing are explained in Section 6.3, which presents reliability and validity test, regression analysis, and model test (SEM). Section 6.4 discusses the quantitative results and findings. Section 6.5 summarizes this chapter. The implication of the results drawn from this chapter will be discussed in Chapter 7.

6.1 Sample and Data Collection

As stated in 4.4.1, the researcher selected data sample from listed companies in the Chinese ICT and Medicine industry registered in the China Enterprise Confederation (<http://www.cec-ceda.org.cn/english/>). The survey respondents are the knowledge workers and managers in the selected companies. The survey was sent to a total of 2500 respondents electronically. Completed surveys were received from 556 individuals. 208 emails were received claiming that they were unable to participate in the survey due to various reasons such as having left the company or on leave. Therefore, an overall response rate of 22.2% was achieved (556/2500). This was a reasonable response rate given that this is an online survey and was fairly lengthy (25 questions, 7 pages). Table 6-1 summarizes the demographic characteristics of the respondents. From Table 6 – 1, majority of the respondents (88%) are at least educated at undergraduate level which shows

that qualification is important in innovative enterprises. Most of the responses (90%) are from managers and knowledge workers, which suggest the goodness of the data. Only 4% of respondents are aged over 45 years old which implicates that the Chinese younger generation pays more attention to the innovation processes in enterprises.

Table 6 – 1 Demographic characteristics of the research sample

Respondents' demographic characteristics		
	Results (Frequency)	Results (Percent)
Industry Sector		
ICT	491	88.3
Medicine	65	11.7
Age group		
20 - 25 yrs	96	17.3
26 - 30 yrs	211	37.9
30 - 35 yrs	185	33.3
35 - 45 yrs	42	7.6
over 45 yrs	22	4.0
Job		
Manager	147	26.4
senior scientist/engineer (non-management))	121	21.8
technical employee (non-management)	232	41.7
sales/marketing/finance (non-management)	38	6.8
Other	18	3.2
Legal basis of the organization		
State owned enterprise	10	1.8
Co-operative enterprise	360	64.7
private or joint stock company	67	12.1
Joint venture	19	3.4
Majority foreign owned	31	5.6
Number of years in current employment		
< 1 yrs	149	26.8
1 - 2 yrs	139	25.0
2 - 5 yrs	143	25.7
5 - 10 yrs	114	20.5
> 10 yrs	11	2.0
Highest qualification		
Vocational qualification (apprenticeship equivalent)	66	12.0
Undergraduate degree	307	55.8
Masters or MBA post graduate qualification	150	27.3
PhD	24	4.4
qualification that entitles membership of a professional association	3	.5

6.2 Frequency Analysis

Table 6 – 2 (Appendix 11) provides the summary of the frequency distribution of survey results. In general, the results of the study reveal positive. With few exceptions, responses appeared to indicate the existence of the studied knowledge management factors at an acceptable level. The overall trend in the results may be due to the nature of the research sample that these companies are relatively more innovative in nature as stated in section 4.4.1. Knowledge management is a key factor for these enterprises to sustain their growth and competitiveness. More than 60 percent of the participant organizations were from the co-operative enterprises (See Table 6 – 1). These organizations are known to be modernized and are characterized by flexible structures and advanced organizational cultures when compared to governmental sector organizations and private enterprises. Furthermore, participants in state owned enterprises were those generally known to have adopted modern managerial styles and undergone cultural transformations in order to achieve more flexible approach. Hence, these factors may have contributed in causing sampling bias.

KM Strategy The majority of the respondents state that their respective organizations have strategies for knowledge management (codification strategy: 88%, personalization strategy: 58%). Nearly 90% agree knowledge is well codified and shared in codified forms in their organizations. Comparing to codified knowledge, the percentage of agreement on tacit knowledge acquisition and sharing is relatively smaller (58%). 69% share the view that knowledge can be easily acquired from co-workers and experts. 60% agree informal discussions and meetings are used for knowledge sharing in their organizations.

Culture The majority of the respondents (61%) acknowledged high level collaboration between colleagues. 56% state that there is a willingness to accept responsibility for failure. When respondents were asked if they have reciprocal faith in their colleagues' ability and intentions, the majority (58 percent) agreed. In particular, 69.1 percent believed that they have reciprocal faith in their colleagues' decisions toward organizational interests rather than individual interests, according to the results, which suggest that Chinese enterprises today have developed collaborative culture based on trust between co-workers. Regarding organizational learning, 69% agree that their company provides various formal training programmes for performance of duties. 67% agree that their company encourages them to attend seminars, symposiums, etc. to learn more knowledge and skills. The majority (77.7%) are satisfied with the contents of job training and self-development programmes indicating that Chinese enterprises today are investing much effort into speeding up the knowledge acquisition process.

Structure

It is predicted that centralized and formalized organizations lack flexibility and their management strategy will have a negative impact on knowledge management. According to the survey results, the fact that 85% responded that they can not take action without a supervisor in their company and 70% disagree that they can make decisions without approval indicate that Chinese organization is very centralized in terms of organizational structure. This finding is consistent to the literature. However, the responses regarding organization formalization are not significant in this research.

T-shaped skills & IT support

Approximately 60% of respondents indicate that they are not only specialists in their own job area but are also able to make suggestions concerning their colleagues' tasks. 59% agree that their job performance will not be affected by

environmental change. These results on T-shaped skills suggest that Chinese enterprises are starting to look at the bridges of knowledge transfer although they are still at the early stage. The fact that 70 percent of the participants stated that their respective organizations provide various knowledge sharing tools implies reasonable awareness of the importance of spreading knowledge by the management in Chinese enterprises.

Knowledge creation processes

According to the survey responses, these companies stress the importance of sharing experiences with suppliers and customers (88%), engaging in dialogues with competitors (78%), trying to find new strategies and market opportunities by within the company (89%), and creating a work environment that allows peers to understand the craftsmanship and expertise (91%). This implies that Chinese enterprise socialization (sharing of experiences to create tacit knowledge) is highly dependent upon the existence of strong networks. In respect to the results on externalization (the conversion of tacit knowledge into explicit knowledge), China is similar to Japan. The willingness of the Chinese to share knowledge is also underpinned by its group orientation; the Chinese also devote considerable time to the diffuse processes of explicating tacit knowledge. For the process of combination, 82% share the opinion that they are building databases on products and services. 60% agree that their companies stress the significance of gathering management figures and technical information. Chinese enterprises made great effort in internalizing knowledge to enactive liaison activities within functional departments by cross-functional development teams (70%):

Organizational creativity and Organizational performance

The responses of organizational creativity (57%) and organizational performance (43%) are not impressive in general. However, nearly 60% agree that their company is more innovative compared to key competitors

suggesting reasonable awareness of the importance of innovation in Chinese enterprises.

6.3 Quantitative Data Analysis

In this section, the research hypotheses and the SEM model are tested. In section 6.3.1, the research has applied factor analysis to reduce the highly correlated measures (indicators). Correlation analysis is carried out in section 6.3.2 to examine the relationships between variables. Section 6.3.3 tested the reliability and validity of the collected data. Section 6.3.4 adopted multiple regression technique to test the hypotheses. Finally, the whole SEM model was analyzed in section 6.3.5.

6.3.1 Factor Analysis

As stated in 4.3.3.2, factor analysis is a data reduction method that used as a tool in attempts to reduce a large set of variables to a more meaningful, smaller set of variables. Therefore, it is necessary to use factor analysis to explore and reduce the highly correlated indicator variables before the correlation analysis and reliability test. MacCallum et. Al (1999) stated that "samples between 100 - 200 can be good enough provided there are relatively few factors each with only a small number of indicator variables with communalities in the .5 range", which suggests that the data will be reliable if the community is over 0.5. Factor analysis is used to check discriminant validity (Kerlinger, 1986). Because each variable was measured by multi-item constructs, factor analysis with varimax was adopted to check the unidimensionality among items. Items with factor loading values lower than 0.5 were deleted. Since this study has collected over 500 data samples, factor loadings greater than .5 are treated as reliable.

According to Table 6 – 3, the factor analysis results shows that the factors of KM enablers and knowledge creation processes are clearly clustered.

Table 6 – 3 Rotated Factor Matrixes with Varimax Rotation analysis results

(A) Rotated Component Matrix(a) for Items of Knowledge Management Enablers

Variables	Factors								
	1	2	3	4	5	6	7	8	9
V10a								0.785	
V10b								0.914	
V10c								0.816	
V10d								0.583	
V11a	0.807								
V11b	0.845								
V11c	0.686								
V11d	0.806								
V12a				0.614					
V12b				0.643					
V12c				0.615					
V12d				0.627					
V12e				0.677					
V13a									0.677
V13b									0.555
V13c									0.799
V13d									0.811
V13e									0.498
V13f									0.623
V14a		0.636							
V14b		0.517							
V14c		0.716							
V14d		0.492							
V14e		0.609							
V15a					0.721				
V15b					0.713				
V15c					0.447				
V15d					0.694				
V15e					0.827				
V16a							0.754		
V16b							0.433		
V16c							0.868		
V16d							0.538		
V17a			0.454						
V17b			0.717						

V17c	0.612			
V17d	0.708			
V17e	0.641			
V18a				0.493
V18b				0.521
V18c				0.773
V18d				0.434
V18e				0.589

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 14 iterations.

(B) Rotated Component Matrix(a) for Knowledge Creation Processes

Variables	Factors			
	1	2	3	4
V19a		.803		
V19b		.489		
V19c		.664		
V19d		.773		
V19e		.864		
V20a	.723			
V20b	.753			
V20c	.654			
V20d	.661			
V20e	.511			
V21a				.659
V21b				.597
V21c				.707
V21d				.661
V21e				.543
V22a			.779	
V22b			.751	
V22c			.602	
V22d			.812	
V22e			.868	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

The variables are: Codification strategy (V10); Personalization strategy (V11); Collaboration (V12); Trust (V13); Learning (V14); Centralization (V15); Formalization (V16); T-shaped skills (V17); IT support (V18); Socialization (V19); Externalization (V20); Combination (V21); Internalization (V22); Knowledge

creativity (V23); Organizational performance (V24)

6.3.2 Correlation Analysis

Table 6 – 4 demonstrated the correlation analysis results of all the variables of the conceptual framework. 2-tailed Bivariate Pearson correlation method was used to test the correlation between variables. According to table 6 – 4,

- Codification strategy (V10, $r=.308^{**}$), Personalization strategy (V11, $r=.436^{**}$), Collaboration (V12, $r=.235^{**}$), Trust (V13, $r=.433^{**}$), Learning (V14, $r=.339^{**}$), T-shaped skills (V17, $r=.312^{**}$) and IT support (V18, $r=.179^{**}$) are significantly correlated with Socialization (V19) at .01 level;
- Codification strategy (V10, $r=.109^{**}$), Personalization strategy (V11, $r=.370^{**}$); Collaboration (V12, $r=.268^{**}$); Trust (V13, $r=.313^{**}$); Formalization (V16, $r=-.087^{**}$) and IT support (V18, $r=.307^{**}$) are significantly correlated with Externalization (V20) at .01 level;
- Personalization strategy (V11, $r=.339^{**}$), Trust (V13, $r=.307^{**}$), Learning (V14, $r=.464^{**}$), Centralization (V15, $r=-.138^{**}$) and IT support (V18, $r=.317^{**}$) are significantly correlated with Combination (V21) at .01 level;
- Codification strategy (V10, $r=.114^{**}$), Collaboration (V12, $r=.216^{**}$), Trust (V13, $r=.394^{**}$), Learning (V14, $r=.475^{**}$) and T-shaped skills (V17, $r=.231^{**}$) are significantly correlated with Internalization (V22) at .01 level.

Most of the KM enablers (V10, V11, V12, V13, V14, V15, V16, V17, V18) are correlated with KM processes (V19, V20, V21, V22). Therefore, it can be concluded that KM enablers are correlated with KM processes.

Also, Socialization (V19, $r=.259^{**}$), Externalization (V20, $r=.064^{*}$), Combination (V21= $.154^{**}$) and Internalization (V22, $r=.207^{**}$) are correlated

with Knowledge creativity (V23). Correlation between Knowledge creativity (V23) and Organizational performance (V24) is significant at .01 level as well, $r=.575^{**}$.

In summary, the KM factors (KM enablers, KM processes, organizational creativity and organizational performance) are correlated with each other.

Table 6 – 4 Variables Correlations Matrix

	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24
V10	1														
V11	.071*	1													
V12	.080	.103**	1												
V13	.017	.274**	.350**	1											
V14	.349**	.679**	.319**	.451**	1										
V15	-.060	-.210**	-.667**	-.508**	-.442**	1									
V16	.303**	-.164**	-.121**	-.093*	.229**	.471**	1								
V17	.049	.381**	.415**	.193**	.585**	-.043	-.102**	1							
V18	.223**	.088*	-.005	.032	.217**	.010	.184**	.253**	1						
V19	.308**	.436**	.235**	.433**	.339**	-.047	-.004	.312**	.179**	1					
V20	.109**	.370**	.268**	.313**	.083*	-.064*	-.087**	.025	.307**	.087*	1				
V21	.086*	.339**	-.032	.307**	.464**	-.138**	-.027	.008	.317**	.015	.037	1			
V22	.114**	.067*	.216**	.394**	.475**	-.083*	-.017	.231**	.021	.063*	.007	.268**	1		
V23	.191**	.260**	.079*	.387**	.542**	-.381**	-.212**	.137*	.038	.259**	.064*	.154**	.207**	1	
V24	.153*	.269**	.140**	.259**	.303**	-.142**	-.230**	.343**	.187**	.292**	.330**	.421**	.309**	.575**	1

** Correlation is significant at the 0.01 level 2-tailed; * Correlation is significant at the 0.05 level 2-tailed.

The variables are: Codification strategy (V10); Personalization strategy (V11); Collaboration (V12); Trust (V13); Learning (V14); Centralization (V15); Formalization (V16); T-shaped skills (V17); IT support (V18); Socialization (V19); Externalization (V20); Combination

(V21); Internalization (V22); Knowledge creativity (V23); Organizational performance (V24)

6.3.3 Reliability and Validity Test

To test the reliability of the data, the researcher applied Cronbach's alpha reliability analysis. Cronbach's alpha is the most common form of internal consistency reliability coefficient. Alpha equals zero when the true score is not measured at all and there is only an error component. Alpha equals 1.0 when all items measure only the true score and there is no error component. Cronbach's alpha can be interpreted as the percent of variance the observed scale would explain in the hypothetical true scale composed of all possible items in the universe. Alternatively, it can be interpreted as the correlation of the observed scale with all possible other scales measuring the same and using the same number of items. By convention, a lenient cut-off of .60 is common in exploratory research; alpha should be at least .70 or higher to retain an item in an "adequate" scale; and many researchers require a cut-off of .80 for a "good scale" (Allen and Yen, 2002).

To test the validity of the collected data, Convergent and Discriminant validity analysis is adopted for this study. Convergent validity, is the degree to which an operation is similar to (converges on) other operations that it theoretically should also be similar to. For instance, to show the convergent validity of a test of mathematics skills, the scores on the test can be correlated with scores on other tests that are also designed to measure basic mathematics ability. High correlations between the test scores would be evidence of a convergent validity. Convergent validity shows that the assessment is related to what it should theoretically be related to. In contrast, discriminant validity describes the degree to which the operationalization differs from (diverges from) other operationalizations that it theoretically should not be similar to. Although there is no standard value for discriminant validity, a result less than .85 tells us that discriminant validity probably exists between the two scales. A result greater than .85, however, tells us that the two constructs

overlap to a significant degree and they are likely measuring the same variable (John and Benet-Martinez, 2000).

Table 6 – 5 presents a summary of the reliability and validity test results of the collected data, which demonstrates that those data are statistically reliable and valid. More details of the reliability tests results can be seen in appendix 12.

Table 6 – 5 Statistical Results for Reliability and Validity Tests

Variable	Number of items	Mean	S. D.	Reliability (Cronbach's alpha)	Convergent Validity (Correlation of item with total score-item)
Knowledge Management Enablers					
Codification Strategy	4	3.99	.415	.696	.748**
					.831**
Personalization Strategy	4	3.48	.657	.855	.800**
					.540**
Collaboration	5	3.61	.644	.899	.850**
					.876**
Trust	5	3.60	.408	.743	.735**
					.871**
Learning	4	3.59	.739	.875	.846**
					.826**
Centralization	4	2.44	.610	.834	.863**
					.883**
Formalization	4	3.16	.723	.846	.802**
					.715**
T-shape skill	5	3.50	.636	.872	.672**
					.614**
IT support	5	3.86	.645	.873	.580**
					.664**
					.896**
					.855**
					.905**
					.882**
					.628**
					.839**
					.692**
					.839**
					.624**
					.885**
					.838**
					.913**
					.668**
					.846**
					.829**
					.774**
					.700**
					.820**
					.935**
					.887**
					.818**
					.783**

Knowledge creation process							
Socialization	5	3.97	.457	.795	.841**	.706**	.838**
						.760**	.841**
						.590**	
Externalization	4	3.08	.807	.858	.896**	.896**	.646**
						.881**	.927**
						.649**	
Combination	4	3.60	.696	.882	.900**	.900**	.895**
						.873**	.762**
						.682**	
Internalization	5	3.54	.670	.886	.829**	.829**	.804**
						.917**	.827**
						.788**	
Organizational Creativity	5	3.46	.660	.900	.875**	.875**	.877**
						.829**	.774**
						.876**	
Organizational Performance	7	3.13	.761	.913	.806**	.806**	.932**
						.918**	.922**
						.881**	.925**
						.823**	

**Correlation is significant at the 0.01 level

Table 6 – 6 shows the discriminant validity (factor loading on single factors) analysis results. In the table, capital letters (A, B, C, D, E, F, G) represent the measures of each variable. Five measures are deleted accordingly to improve the goodness of the data after factor analysis. (More details of factor analysis results can be seen in appendix 11.

Table 6 – 6 Discriminant Validity (Factor loading on single factors)

Factor Analysis Communalities		Measures						
		A	B	C	D	E	F	G
Variables	Codification Strategy	.611	.807	.704	.512	N/A	N/A	N/A
	Personalization Strategy	.730	.761	.542	.754	N/A	N/A	N/A
	Collaboration	.712	.679	.748	.782	.645	N/A	N/A
	Trust	.576	.501	.744	.727	.783	.471	N/A
	Learning	.770	.794	.771	.829	.387	N/A	N/A
	Centralization	.483	.741	.533	.808	.703	N/A	N/A
	Formalization	.761	.822	.582	.691	N/A	N/A	N/A
	T-shaped skills	.704	.565	.519	.661	.878	N/A	N/A
	IT Support	.673	.767	.642	.639	.695	N/A	N/A
	Socialization	.804	.828	.620	.795	.890	N/A	N/A
	Externalization	.812	.372	.820	.842	.544	N/A	N/A
	Combination	.817	.777	.756	.602	.470	N/A	N/A
	Internalization	.716	.660	.819	.649	.642	N/A	N/A
	Organizational Creativity	.755	.782	.674	.613	.767	N/A	N/A
	Organizational Performance	.653	.862	.847	.837	.793	.850	.680

Colour

Meanings:



Proved indicator variable



Deleted indicator variable

Organizational Creativity (KC). The regression equations are listed below:

$$KC = \alpha_{kc1} + \beta_{kc}Y_1 + \beta_{kc}Y_2 + \beta_{kc}Y_3 + \beta_{kc}Y_4 + \varepsilon_{kc1}$$

$$KC = \alpha_{kc2} + \beta_{kc2}Y_0 + \varepsilon_{kc2}$$

In regression 3 (between organizational performance and organizational knowledge creativity), the independent variable is Organizational Creativity (KC). The dependent variable is Organizational Performance (OP). Regression equations are listed below:

$$OP = \alpha_{op} + \beta_{op}KC + \varepsilon_{op}$$

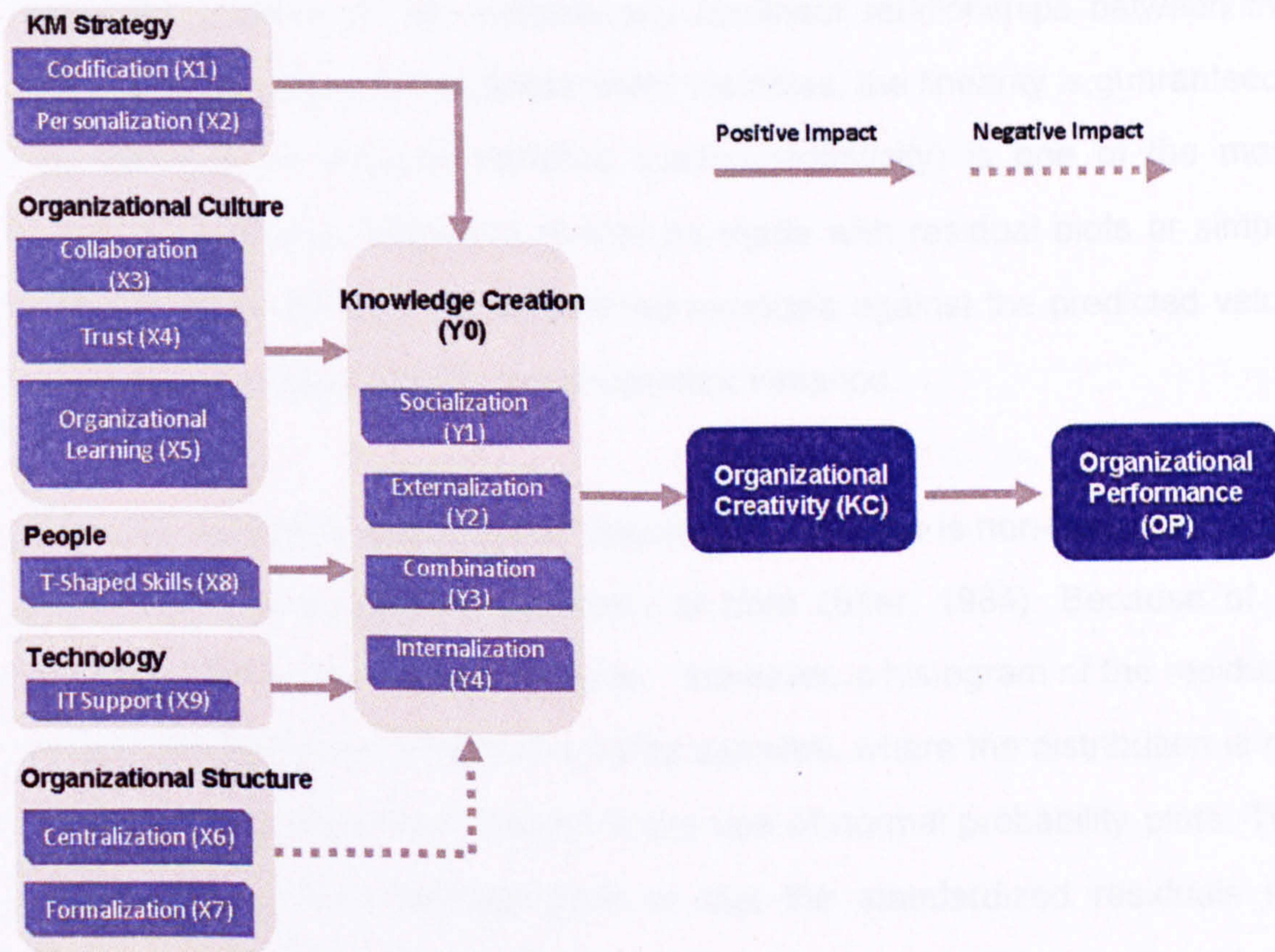


Figure 6 – 1 Regression Model

The whole research model would be meaningless if the correlation between knowledge enablers and knowledge creation processes (Y_0) is not significant. Therefore, Y_0 was considered as an aggregated variable, and its correlation is computed. The researcher tested each hypothesis to identify which enablers

have a more significant impact on knowledge creation and which knowledge creation processes are central to organizational performance.

To meet the assumptions of regression analysis, the researcher examined the linearity, constant variance, and normality (Hair et al., 1995). The linearity of the relationship between dependent and independent variables represents the degree to which the change in the dependent variables associated with the predictor variables is constant across the range of values for the independent variable. The concept of correlation is based on a linear relationship, thus making it a critical issue in regression analysis. Because the scatter plots of individual variables do not indicate any nonlinear relationships between the dependent variable and the independent variables, the linearity is guaranteed. The presence of unequal variance (homoscedasticity) is one of the most assumed violations. Diagnosis should be made with residual plots or simple statistical tests. Plotting the studentized residuals against the predicted value shows that no variable violates the constant variance.

The most frequently encountered assumption violation is non-normality of the independent or dependent variables, or both (Seer, 1984). Because of its simplicity, this method is very popular. However, a histogram of the residuals method is particularly difficult in smaller samples, where the distribution is not well-formed. An improved method is the use of normal probability plots. This method differs from residual plots in that the standardized residuals are compared with normal distribution. In addition, each statistical computer programme has statistical tests for non-normality. For example, SPSS provides the Kolmogorov-Smirnov tests for non-normality. The result from the normal probability plot and Kolmogorov-Smirnov tests indicates no violation of normality (statistic = 0.050~0.096, $p > 0.200$). More detailed regression results can be seen in appendix 12.

6.3.4.1 Regression between KM enablers and KCP (knowledge creation processes)

According to the results in Table 6 – 7, the knowledge creation process is significantly affected by KM strategy (codification $\beta=0.327$, $p<0.05$, and personalization $\beta=0.355$, $p<0.01$) which supports H1 (H1a and H1b).

Organizational culture variables have a significant impact on knowledge creation processes. Collaboration is a significant predictor of knowledge creation processes ($\beta=0.277$, $p<0.05$), supporting H2; it is positively correlated with socialization ($\beta=0.313$, $p<0.01$), externalization ($\beta=0.297$, $p<0.05$), and internalization ($\beta=0.193$, $p<0.05$) while it does not affect the combination mode. Trust significantly impacts on the knowledge creation processes ($\beta=0.424$, $p<0.1$), supporting H3. In particular, it is a significant predictor of all knowledge creation modes; it is positively correlated with socialization ($\beta=0.523$, $p<0.05$), externalization ($\beta=0.376$, $p<0.05$), combination ($\beta=0.344$, $p<0.05$), and internalization ($\beta=0.309$, $p<0.05$). Learning has a significant positive effect on the knowledge creation processes ($\beta=0.487$, $p<0.05$), supporting H4; it has a very significant positive impact on socialization ($\beta=0.539$, $p<0.01$), externalization ($\beta=0.639$, $p<0.1$), combination ($\beta=0.303$, $p<0.05$) and internalization ($\beta=0.468$, $p<0.01$) which suggests that Chinese enterprises are trying to absorb knowledge from different sources internally and externally.

In relation to organizational structure, centralization is negatively related to knowledge creation processes ($\beta=-0.221$, $p<0.01$), which support H5; it is a significant predictor of externalization ($\beta=-0.301$, $p<0.1$), combination ($\beta=-0.180$, $p<0.05$) and internalization ($\beta=-0.235$, $p<0.1$). Contrary to expectations, the effect of formalization on knowledge creation processes is not significant, indicating the lack of support of H6, although formalization has

a significant effect on knowledge externalization according to the result ($\beta=0.101$, $p<0.1$).

T-shaped skills of members do not significantly affect knowledge creation processes according the results. This finding does not support H7. However, T-shaped skills are significant to socialization ($\beta=0.205$, $p<0.05$) and internalization ($\beta=-0.188$, $p<0.05$).

Information technology support is not significantly related to knowledge creation processes, indicating the lack of support for H8. However, IT support significantly impacts on externalization ($\beta=0.291$, $p<0.05$) and combination ($\beta=0.301$, $p<0.05$).

Table 6 – 7 Regression between KM enablers and KCP

Variables	Socialization (Y1)	Externalization (Y2)	Combination (Y3)	Internalization (Y4)	KCP (Y0)
	$R^2 = .398$ $F = 60.732^{***}$	$R^2 = .375$ $F = 42.557^{**}$	$R^2 = .493$ $F = 64.087^{**}$	$R^2 = .521$ $F = 71.354^*$	$R^2 = .469$ $F = 86.798^{**}$
Codification Strategy (X1)	$\beta = .292$ $t = 3.169^{**}$	$\beta = .309$ $t = 4.002^{***}$	$\beta = .233$ $t = 7.327^*$	$\beta = .389$ $t = 4.265^{**}$	$\beta = .327$ $t = 6.253^{**}$
Personalization Strategy (X2)	$\beta = .242$ $t = 4.976^{**}$	$\beta = .185$ $t = 5.497^{**}$	$\beta = .441$ $t = 7.235^{**}$	$\beta = .301$ $t = 5.277^*$	$\beta = .355$ $t = 6.370^{***}$
Collaboration (X3)	$\beta = .313$ $t = 4.029^{***}$	$\beta = .297$ $t = 3.856^{**}$	$\beta = .193$ $t = .993$	$\beta = .332$ $t = 3.235^{**}$	$\beta = .277$ $t = 3.609^{**}$
Trust (X4)	$\beta = .523$ $t = 4.499^{**}$	$\beta = .376$ $t = 5.330^{**}$	$\beta = .344$ $t = 6.218^{**}$	$\beta = .309$ $t = 4.288^{**}$	$\beta = .424$ $t = 5.179^*$
Learning (X5)	$\beta = .539$ $t = 7.298^{***}$	$\beta = .639$ $t = 9.031^*$	$\beta = .303$ $t = 6.787^{**}$	$\beta = .468$ $t = 5.896^{***}$	$\beta = .487$ $t = 7.476^{**}$
Centralization (X6)	$\beta = -.089$ $t = -1.466$	$\beta = -.301$ $t = -4.358^*$	$\beta = -.180$ $t = -2.958^{**}$	$\beta = -.235$ $t = -5.606^*$	$\beta = -.221$ $t = -3.089^{***}$
Formalization (X7)	$\beta = -.064$ $t = -1.985$	$\beta = -.101$ $t = -2.955^*$	$\beta = .006$ $t = .571$	$\beta = .079$ $t = 2.342$	$\beta = -.039$ $t = -.973$
T-shaped skills (X8)	$\beta = .205$ $t = 2.912^{**}$	$\beta = .109$ $t = 1.897$	$\beta = .159$ $t = 1.344$	$\beta = .188$ $t = 3.398^{**}$	$\beta = .067$ $t = 1.870$
IT Support (X9)	$\beta = .200$ $t = .904^{**}$	$\beta = .291$ $t = 3.497^{**}$	$\beta = .365$ $t = 2.392^{**}$	$\beta = .092$ $t = 1.645$	$\beta = .107$ $t = 1.746$

Significant results are highlighted, ***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

6.3.4.2 Regression between KCP and Organizational creativity

As shown in Table 6 – 8, Knowledge creation is positively related with organizational creativity ($\beta=0.447$, $p<0.05$), supporting H9. R^2 (0.549) suggests that 54.9 % of the organizational creativity variance is explained by 4 variables: socialization, externalization, combination, and internalization. In particular, it is a significant predictor of all knowledge creation modes; it is positively related to socialization ($\beta=0.492$, $p<0.05$), externalization ($\beta=0.297$, $p<0.05$), combination ($\beta=0.273$, $p<0.1$), and internalization ($\beta=0.379$, $p<0.05$).

Table 6 – 8 Regression between KCP and Organizational Creativity

Variables	Organizational Creativity (KC)
	$R^2 = .549$ $F = 67.119^{**}$
Socialization (Y1)	$\beta = .492$ $t = 3.310^{**}$
Externalization (Y2)	$\beta = .297$ $t = 5.014^{***}$
Combination (Y3)	$\beta = .273$ $t = 4.286^{**}$
Internalization (Y4)	$\beta = .379$ $t = 5.036^*$
KCP (Y0)	$\beta = .447$ $t = 4.693^{**}$

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

6.3.4.3 Regression between Organizational Creativity (OC) and Organizational Performance (OP)

As shown in table 6 – 9, organizational creativity is positively related with organizational performance ($\beta=0.572$, $p<0.01$), supporting H9. R^2 (0.637) suggests that 63.7 percent of the variance of organizational performance is explained by organizational creativity. This finding confirms that an organization can achieve strategic benefits of knowledge management through effective knowledge creation. The strength of these associations indicates a very significant relationship between knowledge creation processes and

organizational creativity, and organizational performance.

Table 6 – 9 Regression between OC and OP

Variables	OP
	$R^2 = .637$ $F = 70.216^{***}$
Organizational Creativity (KC)	$\beta = .572$ $t = 6.051^{**}$

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

6.3.5 SEM Model testing

The SEM model goodness of fit indices is shown in table 6 – 10. From the results, P (p-values < .05) is indicating a good fit. The value of CMIN/DF (minimum sample discrepancy divided by degrees of freedom) is 1.796 (<2.0), which suggests that the proposed model is acceptable (Hu and Bentler, 1995). The TLI (Tucker-Lewis Index) (.873) and the CFI (Comparative Fit Index) (.857) indicate a mediocre fit suggesting the model can be improved substantially. The RMSEA (Root Mean Square Error of Approx) (.079), which is less than .08, shows an acceptable fit (Brown and Cudeck, 1992). Therefore, the proposed model is acceptable according the SEM model analysis. The results of the whole SEM model are presented in Figure 6 – 2.

Table 6 – 10 Model Fit Summary

CMIN					
Model	NPAR	CMIN (Chi-Square)	DF (Degree of freedom)	P	CMIN/DF
Default model	174	4278.377	2382	.000	1.796
Baseline Comparisons					
Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.877	.861	.889	.873	.857
RMSEA					
Model	RMSEA	LO 90	HI 90	PCLOSE	
Default model	.079	.077	.080	.000	

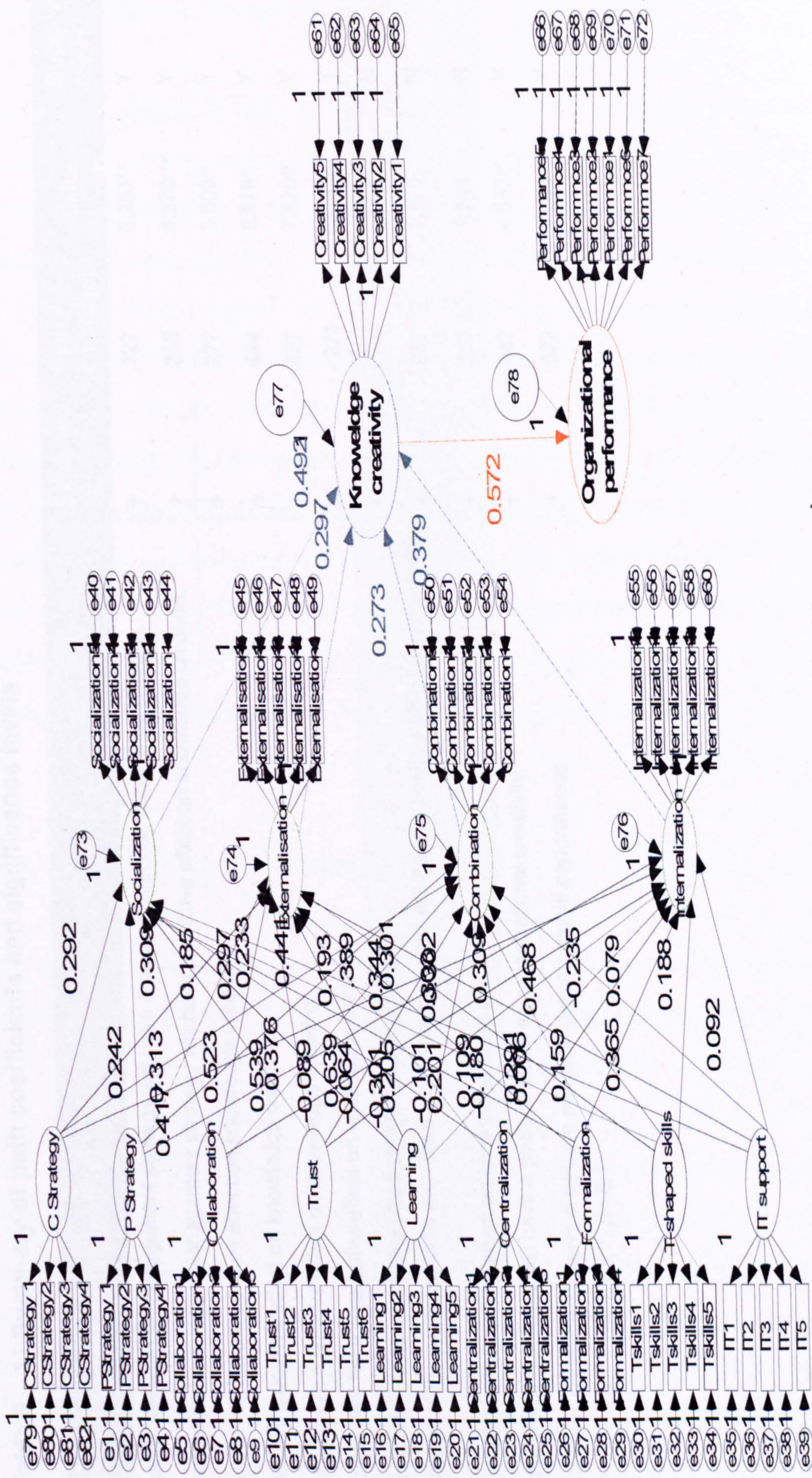


Figure 6 – 2 The SEM model for this research

Table 6 – 11 Summary of path coefficients and significance levels

Hypotheses and corresponding path(s)	Expected sign	Path coefficient	t-value	Support for H?
H1a: Codification Knowledge Management strategy will have a positive effect on knowledge creation.	+	.327	6.253**	Y
H1b: Personalization Knowledge Management strategy will have a positive effect on knowledge creation.	+	.355	6.370***	Y
H2: Collaboration will have a positive effect on knowledge creation.	+	.277	3.609**	Y
H3: Trust will have a positive effect on knowledge creation.	+	.424	5.179*	Y
H4: Learning will have a positive effect on knowledge creation.	+	.487	7.476**	Y
H5: Centralization will have a negative effect on knowledge creation.	-	-.221	-3.089**	Y
H6: Formalization will have a negative effect on knowledge creation.	-	-.039	-.973	N
H7: The presence of the organizational members with T-shaped skills will have a positive effect on knowledge creation.	+	.067	1.870	N
H8: IT support will have a positive effect on knowledge creation.	+	.107	1.746	N
H9: Knowledge creation process will have a positive effect on organizational creativity.	+	.447	4.693**	Y
H10: Organizational creativity will have a positive effect on organizational performance.	+	.572	6.051**	Y

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$

6.4 Quantitative Results Discussion

The study explored how knowledge management enablers influence the knowledge management processes to increase knowledge creativity and organizational performance in the Chinese high technology enterprises. The researcher extended the Nonaka and Takeuchi 's (1995) SECI model of knowledge management to evaluate Chinese enterprises' organizational performance. Table 6 –11 contains a summary of the hypotheses, the path coefficients obtained from the PLS analysis of the initial model, and the t-statistic values for each path. Seven of the paths were statistically significant. All of these significant paths were consistent with the directions hypothesized, supporting the associated hypotheses. According to table 6 – 8, H1, H2, H3, H4, H5, H9 and H10 are proved to be consistent with original hypotheses significantly while H6, H7 and H8 are not statistically significant. This section discusses the findings related to each hypothesis in turn.

6.4.1 KM enablers and KM creation

In this section, the hypothesized constructs on knowledge management enablers and knowledge creation processes (H1, H2, H3, H4, H5, H6, H7 and H8) are explained.

H1: In section 2.3.1.1, the researcher hypothesized that Knowledge Management strategy (codification and personalization) will be positively associated with the knowledge creation processes. The results suggest that the association between codification strategy and knowledge creation is significant ($\beta=.327$, $p<.05$), consistent with the research results from Hansen et al. (1999), and Zack (1999). There is also a strong association between personalization strategy and knowledge creation according to the results

($\beta=.355$, $p<.01$), suggesting that these knowledge workers exchange experience and share knowledge with peers while working in Chinese enterprises. It can be argued that knowledge creation is effected positively by human factors instead of codified knowledge. As stated in section 2.3.1.1, knowledge management strategies can be described along two dimensions reflecting knowledge management focus. One dimension refers to knowledge sharing via interpersonal interaction. The other dimension refers to the capability to help create, store, share, and use an organization's explicitly documented knowledge. Based upon Nonaka and Takeuchi's SECI model, the analysis results confirm that human (personalization) strategy works for socialization, while system (codification) strategy is more effective for combination.

H2: Consistent with Hurley and Hult's (1998) findings, the results indicate that collaboration inside organizations has a positive impact on knowledge creation ($\beta=.277$, $p<.05$). The association between collaboration and knowledge creation processes (socialization, externalization, and combination) is significantly positive suggesting that some of the Chinese enterprises today have developed a collaborative culture to accelerate the knowledge creation processes. This implicates that collaborative interactions are able to foster exchanging knowledge among people by reducing fear and increasing openness to other members. It can help to develop a shared understanding of an organization's external and internal environments through supportive and reflective communication. As stated in section 2.3.1.2, Nahapiet and Ghoshal (1998) has mentioned that some open dialogue and social interaction have encouraged the knowledge workers to share ideas and experience and enabled the knowledge flow within and between organizations, which will help to create organizational knowledge. Our analysis results have shown the evidence that knowledge creation can occur in a collaborated organizational environment.

H3: As hypothesized in 2.3.1.2, trust among organizational members has a very strong positive effect on knowledge creation according to the results ($\beta=.424$, $p<.1$). In fact, the results suggest that trust is an extremely important factor for knowledge sharing in Chinese organizational culture. It is perhaps due to the fact that socialization is key to business activities in China. As explained in section 2.2.2, social capital's relational dimension (Burt, 1992; Putnam, 1995; Coleman, 1990) such as trust may facilitate open, substantive, and influential information exchange (O'Dell and Grayson, 1999). When the relationships of those knowledge workers are high in trust, they are more willing to participate in knowledge exchange and social interactions (Nahapiet and Ghoshal, 1998). In the context of China, similar to social capital, Guanxi is ubiquitous in playing a fundamental role in daily life and relationships are created over long periods of time that are built on frequent exchanges (Michailova and Worm, 2003). Trust in Chinese enterprises starts from Guanxi and develops to achieve personal or organizational goals. While organizations may profit from the existence of Guanxi between organizational members, "Guanxi is a relationship between two people who are expected, more or less, to give as good as they get" (Hutchings and Murray, 2002). In a trusted environment, knowledge sharing and transfer will occur which will lead to better knowledge creation.

H4: In section 2.3.1.2, it is hypothesized organizational learning will have a positive effect on the knowledge creation. According to the data analysis results, the hypothesized relationship between organizational learning and knowledge creation is strongly supported. The path from learning to knowledge creation processes (socialization, externalization, combination and internalization) is positive and statistically significant ($\beta=.487$, $p<.05$). This result suggests that Chinese enterprises today are investing lots effort into encouraging organizational learning. As stated in section 2.3.1, learning is the acquisition of new knowledge by people who are able and willing to apply that

knowledge in making decisions or influencing others (Miller, 1996). Through the emphasis on learning and development, companies can encourage individuals play a more active role in learning and discover something new and transfer them into knowledge. According to Cohen and Levinthal's (1990) notion of absorptive capacity, continuous learning opens up the possibility of achieving scale in knowledge creation. Despite the traditional Chinese culture that people are usually afraid of asking questions to avoid "loosing face", this study results suggest the learning environment in Chinese companies are changing into the direction of encouraging creating new knowledge. As Ndlela and Toit (2001) mentioned, individuals should be encouraged to ask questions for successful knowledge creation. The change of the learning environment in Chinese companies might be a result of the pressure from competitive native and global market and the push from Chinese government which is eager to develop new technology and innovation. The emphasis on knowledge acquisition of Chinese enterprises also implies that they are still at the early stage of building up knowledge-based enterprises. Apparently, the results have confirmed that the knowledge creation processes in Chinese enterprises are positively affected by their heavy investment in knowledge acquisition.

H5: It was hypothesized that centralization has a negative impact on knowledge creation. The results confirmed that there are negative and statistically significant ($\beta = -.221$, $p < .05$) associations between centralization and externalization, and between centralization and internalization. Consistent with Graham and Pizzo's (1996) research findings, the concentration of decision-making authority inevitably reduces creative solutions while the dispersion of power facilitates spontaneity, experimentation, and the freedom of expression, which are the lifeblood of knowledge creation. Chinese organizations are traditionally centralized which has lasted over thousands of years. In China, authority and seniority are highly respected and top-down decision making actually serves to work against sharing of knowledge. When

new ideas pop up, people at lower position have to ask permission from senior position to go ahead even the idea is proved to be effective. However, those good new ideas are often terminated by those senior members because of corruption and fear of "loosing their job position". Therefore, this centralized model caused distortion and discontinuousness of ideas. Without a constant flow of communication and ideas, knowledge creation rarely occurs. Although the organizational environment in Chinese enterprises is changing to encourage knowledge creation and innovation in recent years, the strict centralized structure has discouraged and slowed the knowledge creation processes. The research results confirmed the negative impact of Chinese enterprises' structural centralization.

H6: Several studies have come to the conclusion that formalization weakens knowledge management (Glynn, 1996; Starbuck, 1992). In contrast, the study suggests the association between formalization and knowledge creation is statistically non-significant ($\beta = -.039$), which does not support H6. This rather intriguing result reflects the two different aspects of formalization. According to the ambidextrous model, which is based on the distinction between the initiation and implementation stages of innovation (Duncan, 1976), formalization is not only an inhibiting but also an encouraging factor for innovation (Rogers, 1983). Formalization may inhibit tacit related activities such as consideration of new concepts and know-how sharing, but it may encourage explicit related activities such as codification and formal learning of knowledge. Furthermore, formalization may tend to inhibit socialization and externalization whereas it facilitates combination and internalization. This characteristic can be found in this study (refer to Table 6-4). Formalization is negatively related with socialization ($\beta = -0.064$) and externalization ($\beta = -0.101$), whereas it is positively related with combination ($\beta = 0.006$, not significant) and internalization ($\beta = 0.079$). However, this interpretation needs further exploration because all β values are not statistically significant. In particular, a more

in-depth investigation on externalization is needed. Externalization involves the expression of tacit knowledge (Becerra-Fernandez and Sabherwal, 2001). From this perspective, a formal organizational structure may inhibit spontaneity and freedom of expression necessary for externalization (Bennet and Gabriel, 1999). This research concentrates on tacit knowledge in respect of knowledge externalization; that is negatively associated with formalization. However, externalization may also involve conversion of tacit into explicit knowledge (Becerra-Fernandez and Sabherwal, 2001). The formal structure can facilitate the rapid and continuous conversion of tacit into explicit knowledge (Graham and Pizzo, 1996). If the conversion process or its technology perspective of externalization is emphasized as with Becerra-Fernandez and Sabherwal (2001), we may speculate that formalization can affect externalization positively.

H7: Many studies suggested that T-shaped skills positively influence knowledge creation (Johannessen et al., 1999; Leonard-Barton, 1995; Madhavan and Grover, 1998). However, the study shows that the association between T-shaped skills and knowledge creation in Chinese companies is not significant ($\beta=0.067$), a fact which does not support H7. This contradiction may reflect the importance of T-shaped management systems. T-shaped management systems attempt to break out of the traditional corporate hierarchy. They encourage people to share knowledge (Hansen and Oetinger, 2001). However, most current formal organizational incentives encourage T-shaped skills (the deep functional expertise) only (Leonard-Barton, 1995). It implies that the crucial element of successful knowledge management is not T-shaped skills themselves, but the systematic management of these skills. This result also suggests that knowledge creation mediates between enablers and organizational creativity.

H8: It would be expected that information technologies could facilitate knowledge creation. However, the results suggest that IT support is not significantly ($\beta=0.107$) associated with knowledge creation in Chinese firms. It is perhaps because information technologies do not support all processes of knowledge creation directly. For instance, the project memory system or knowledge-based system assists in storage, search, and transfer of codified knowledge (Thompson, 1998). Accessing tacit knowledge such as knowledge inside employees' heads is not possible simply by an intranet or a database (DeTienne and Jackson, 2001). However, some researchers present a contrasting view. As Bolisani and Scarso (1999) suggests, certain types of information technology enable tacit-to-tacit knowledge transfer (i.e., socialization).

6.4.2 KM Creation and Organizational Creativity

As hypothesized in 2.3.3, knowledge creation processes have a significant positive impact on organizational creativity (H9) ($\beta=0.447$, $p<0.05$). This section discusses the findings based on Nonaka and Takeuchi's SECI (Socialization, Externalization, Combination and Internalization) model.

6.4.2.1 Socialization

This study confirmed that socialization impact on organizational creativity significantly ($\beta=0.492$, $p<0.05$) (See table 6 – 5), China is a culture that demonstrates socialization (sharing of experiences to create tacit knowledge) highly dependent upon the existence of strong networks. Hutchings and Michailova (2003) have suggested that contrary to popular opinion the Chinese are not completely resistant to sharing knowledge. However, they will

only share knowledge freely within their trusted networks where an insider relationship exists between transmitter and receiver. It is consistent to the results. In these Chinese enterprises, the networks generally operate on a departmental basis and consequently information is only shared within departments according to the research findings. Accordingly, international managers cannot expect that employees in subsidiary operations in China will automatically develop an organizational culture in which departments will share knowledge for the benefit of the organization as a whole. Similar to Nonaka and Takeuchi's (1995) characterization, Chinese enterprises also exhibit a business culture in which there is mutual obligation amongst members of networks and interdependence between members of organizations and other institutions. Political connections are vital in China. In fact, organizational members are normally closely connected to key public service departments.

Glisby and Holden (2003) suggest that external sharing of tacit knowledge among organizations is facilitated by distinctive business systems which are not easily copied. Yet the interpersonal connections that facilitate business in China do share similarities to those in Japan (Nonaka and Takeuchi, 1995). This study suggest that the cultural embeddedness of internally sharing tacit knowledge rests on a foundation that is akin to that of Japan, and not as Glisby and Holden (2003) suggest a Japan-specific phenomenon. While the Chinese employees have not been bound to organizations through the life-time employment ethos of Japanese organizations, they have until quite recently also engaged in life-time employment as a consequence of nationalist production and like the Japanese also have had pay and promotion systems which were related to seniority rather than meritocracy. As with Japan, punishment has been used as a deterrent for poor performance rather than rewards and incentives being implemented for good performance. While the Chinese do not engage in the after-hours socializing endemic to Japanese

business culture, they do nonetheless use social activities as a key means to build business relationships and despite pressures of internationalization connotations of doing favours, banqueting and visits to KTV bars are still commonly practised as a means of enhancing business relationships and developing good "Guanxi" (Hutchings and Murray, 2002).

6.4.2.2 Externalization

In respect to externalization (the conversion of tacit knowledge into explicit knowledge), this research found that externalization has a significant impact on organizational ($\beta=0.297$, $p<0.01$). Chinese firms have demonstrated some similarities with Nonaka's characterization of Japanese organizations in their approach to knowledge management and the sharing of knowledge. The willingness of the Chinese to share knowledge is underpinned by its group orientation and the Chinese devote considerable time to the diffuse processes of explicating tacit knowledge. Kreiner and Lee (2000) argue that knowledge in Japan is created in communities of practice and exists in tacit forms and cannot be formalized without loss of authenticity. This study confirms that the same is true in China. McMaster (1995) has argued that instead of striving to make tacit knowledge explicit, the focus should be on making the implicit available. However, such a situation cannot be expected to occur in China for the reason that interpersonal connections are built over a long time period and the development of trust that occurs simultaneously suggests that information will only be shared with a trusted few. This is why it is unrealistic for international managers to put groups of Chinese workers together and expect that cooperation and knowledge sharing will occur. Indeed, many Western managers are themselves excluded from the process of knowledge sharing because of the lack of trust that workers feel towards them as outsiders and as people that are unlikely to stay in their country (Michailova and Worm, 2003).

Indeed, Hutchings and Michailova (2003) argue that it takes a long time to move into a situation of knowledge sharing because it depends upon tacit knowledge already existing. Though it can be expected that the richer the communication experience, the more effective the knowledge sharing, this will only occur where trust and in-group status are already established (Hutchings and Michailova, 2003).

6.4.2.3 Combination

This study suggests that organizational creativity is significantly affected by combination ($\beta=0.297$, $p<0.05$). Similar to organizations in most cultures, knowledge is not distributed equally throughout organizations and people only share knowledge with members of their trusted networks in Chinese firms. These trusted networks have evolved around family networks in feudal and empire times and around departments within state-owned enterprises within the Communist era. Glisby and Holden (2003) argue that the general absence of inter-departmental rivalry and consequences of loss of face in Japan make combination (the sorting, combination and categorization of explicated tacit knowledge) more straightforward than in Western organizations. In China, too, employees are certainly keen to save face and avoid conflict but that does not mean that they do not demonstrate inter-departmental rivalry. In direct contrast to Japan's participative style of management, authority and seniority are highly respected in China and top-down decision making actually serves to work against sharing of knowledge. Most specifically, employees are reluctant to share information with managers as that would cause loss of face to a manager who is expected by virtue of his/her position to be all knowing and managers, for their part, do not feel comfortable in receiving advice or information from people below them in hierarchy. Thus, it has been argued that management education and training programmes are problematic when

people of differing hierarchical levels are expected to work in teams (Hutchings and Michailova, 2003) and unethical behaviour continues to be tolerated in organizations as employees will not share knowledge of superiors' indiscretions (Jackson and Bak, 1998).

6.4.2.4 Internalization

According to the analysis results, internalization has a significant impact on organizational knowledge creativity ($\beta=0.379$, $p<0.1$). The internalization mode of Nonaka and Takeuchi's model refers to the embodying of explicit knowledge into tacit knowledge (Nonaka and Takeuchi, 1995) and involves learning-by-doing and training to access the knowledge of the group and entire organization (Nonaka and Konno, 1998). However, this study suggests that Nonaka and Takeuchi's (1995) depiction does not have universal application. During the Communist years, Chinese people were conditioned not to admit mistakes. In fact, a culture of fear existed in which people were denounced for exposing government secrets as well as employees being punished for imagined sharing of organizational information. Accordingly, it has been argued that very few Chinese enterprises have drawn up systematic programmes of training and development (Wright et al., 2002) and, despite suggestions that this culture of fear may dissipate as a result of China's increasing internationalization, it still permeates through the ranks of organizations and most people still feel hesitant to share information with all but their most trusted acquaintances. Moreover, lawlessness has pervaded China and resulted in a situation in which everything is prohibited until it is officially approved, but the rules can be bent and interpreted very differently according to one's position in society. This also has implications for the extent to which knowledge may be shared.

Nonaka (1991) has suggested that rotation helps employees understand a multiplicity of organizational perspectives and this makes organizational knowledge more fluid. However, Glisby and Holden (2003) argued that this contrasts with Western organizations where people hired as specialists are inclined to resist rotation. The study results imply that China also contrasts with Nonaka's characterization in that job rotation is a relatively new phenomenon in organizations as people do not like to cross boundaries in their work. It should be noted, however, that behaviour of Chinese employees in respect to knowledge sharing can be expected to differ substantially between those employed in the remaining state-owned enterprises (SOEs) and those employed in foreign-owned corporations and between people of rural and urban areas and varying educational standards and exposure to Western concepts of management.

In summary, this section has discussed the impact of knowledge creation processes on organizational creativity based upon Nonaka and Takuchi's (1995) SECI model. Due to the similar culture background between Chinese and Japanese, the SECI model works effectively to analyse the knowledge creation processes in Chinese enterprises.

6.4.3 Organizational creativity and organizational performance

The data analysis results (table 6 – 11) suggest the associations between organizational creativity and organizational performance (H10) ($\beta=0.572$, $p<0.05$) are positive and statistically significant, which indicate that organizational creativity does have positive impact on Chinese enterprises organizational performance. As stated in section 2.3.3, as the link between knowledge creation processes and organizational performance, organizational creativity, organizational creativity provides a key to the understanding of

organizational effectiveness and survival (Woodman et al., 1993). Consistent with Davenport (1999)'s findings that improvements in creativity might lead to better organizational performance, this research confirmed that organizational creativity can improve organizational performance significantly. This research adopted Drew (1997)'s method that assessed organizational performance by the use of global output measures such as market share, profitability, growth rate, innovativeness, successfulness, and the size of business in comparison with key competitors. It examined the organizational performance of these Chinese enterprises financially and non-financially. Different to other studies in KM field, instead of linking KM enablers (culture, structure, strategies, people, etc.) and organizational performance, this research has investigated organizational performance through direct impact from organizational creativity, which is the link between organizational performance and, KM enablers and processes. Based on the research findings, building competitive strategies to manage knowledge effectively to improve organizational creativity is central to achieve higher business performance and the success of Chinese enterprises.

6.5 Summary

A summary of the key issues that emanated from the findings of the quantitative study is presented below.

KM strategy has significant positive impact on knowledge creation processes. Organizational culture variables are found to be essential for knowledge creation. Collaboration is positively related with socialization, externalization, and internalization while it does not affect the combination mode. In particular, trust is a significant predictor of all knowledge creation processes. Centralization is negatively related with socialization, externalization, and internalization while it is not significantly related with combination according to

the results. Different to the hypotheses, formalization and centralization of members do not have significant impact on knowledge creation in Chinese firms. Information technology support is significantly related with knowledge combination only.

The study confirms that Knowledge creation is positively related with organizational creativity, which is positively related with organizational performance. The findings of this study confirm that Chinese firms will be able to obtain strategic benefits of KM through effective knowledge creation processes. Another objective of this study is to investigate how managers can align KM strategies with its creation process to improve organizational performance. For this objective, this research investigated the relationship between KM strategy, knowledge creation, and organizational performance empirically. The research results implicate that companies should align their knowledge strategies along with knowledge creation processes.

In Chinese enterprises, the socialization and externalization elements are remarkably similar to the Japanese situation that Nonaka and Takeuchi (1995) described, as the Chinese are highly networked, hold tacit knowledge within these networks and are prepared to make this knowledge explicit only within the context of these pre-existing relationships. In respect to the combination and internalization elements, however, China differs from Nonaka and Takeuchi (1995)'s categorizations. The departmental focus of the Chinese firms mean that the combination of tacit knowledge is not straightforward, while learning-by-doing is important to sustain their development. The research result also suggests that internalization is also problematic in Chinese firms because of individuals' fear of admitting mistakes.

Chapter 7

CONCLUSIONS, CONTRIBUTIONS, AND FUTURE RESEARCH

7.1 Summary of the Research

This study was set up to investigate the relationships among the KM factors that shape the organizational creativities and organizational performance in Chinese enterprises in order to assist managers to build effective KM initiatives. To accomplish the objectives, this research proposed a KM model, which is composed of KM enablers (e.g. organizational culture, organizational structure, people, and information technology), knowledge creation processes, organizational creativity, and organizational performance. To validate the proposed conceptual model, this study adopted a mixed methods approach (Creswell, 2003). As a supportive tool for the quantitative survey, the researcher observed 6 enterprises located in Beijing, Shanghai, and Shenzhen, and interviewed 24 managers and knowledge workers. Based on the findings of the qualitative analysis, an online survey was developed and sent to over 2500 Chinese high-tech enterprises. As an analytical method for 556 valid responses, multiple regression and SEM model analysis were selected (using SPSS 13.0 and AMOS 6.0).

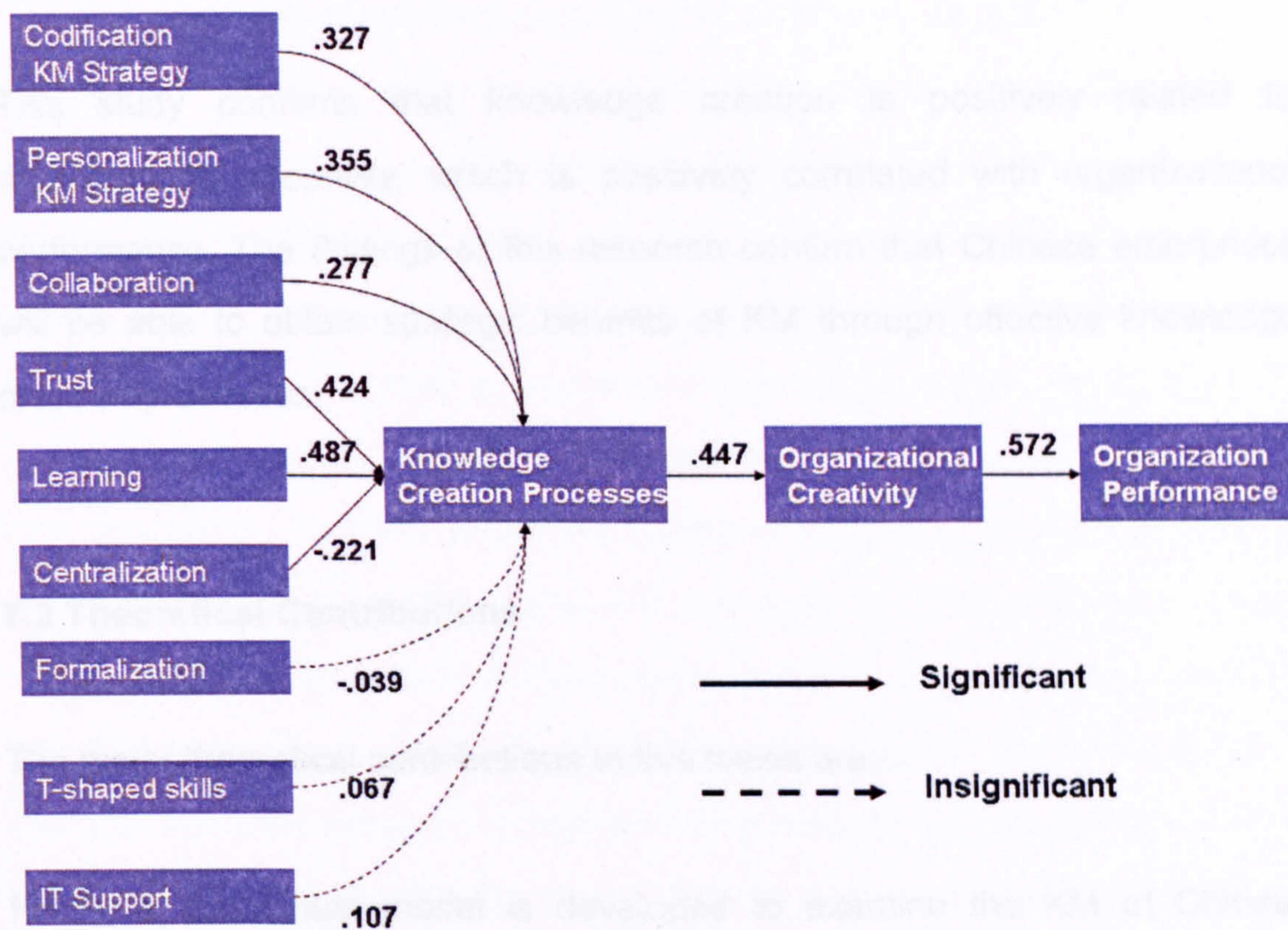


Figure 7 – 1 Conceptual Model (final)

This study tested the relationships among KM components as shown in Figure 7 – 1, to assess how KM enablers improve organizational performance. The research results suggest KM strategies (Codification and Personalization) have a significant positive impact on knowledge creation processes. One of the clearest messages to emerge from this study is that organizational culture variables (Collaboration, Trust and Learning) are found to be essential for knowledge creation. Collaboration is positively related with knowledge creation processes. In particular, trust is a significant predictor of all knowledge creation processes. Centralization is negatively related with KM creation processes according to the results. In contrast to the hypotheses, formalization and T-shaped skills of members do not have a significant impact on knowledge creation in Chinese enterprises. Information technology support is significantly related with knowledge combination only.

This study confirms that knowledge creation is positively related to organizational creativity, which is positively correlated with organizational performance. The findings of this research confirm that Chinese enterprises will be able to obtain strategic benefits of KM through effective knowledge creation processes.

7.2 Theoretical Contributions

The major theoretical contributions of this thesis are:

Firstly, a conceptual model is developed to examine the KM of Chinese enterprises by integrating KM enablers, processes, and organizational performance through empirical studies. This research is the first attempt to establish an integrative view of KM from the mainland China origin. The proposed model is preliminary because KM research field is still in its early stage. However, it is meaningful for researchers and practitioners in the KM field. To the researcher, the KM model can be a starting point for further empirical research. Furthermore, it is developed from a process-oriented perspective of knowledge by adapting Nonaka and Takeuchi's SECI model. Although managing knowledge relies on processes more than objects, few empirical studies have been explored from a process-oriented perspective. To the managers, the model may provide a guideline as to how enterprises will be able to utilize KM enablers and adjust knowledge creation processes to sustain their performance.

Secondly, this study clarifies the role of knowledge creation processes. Knowledge creation processes need to be treated as distinct from KM enablers (section 6.4.2). They can be thought of as a structured coordination for the

purpose of managing knowledge effectively. KM processes are enhanced by appropriate KM. This study confirmed that KM enablers are the preconditions of knowledge processes. Different to other studies in KM field, instead of linking KM enablers (culture, structure, strategies, people, etc.) and organizational performance, this research has investigated organizational performance through direct impact from organizational creativity, which is the intermediate outcome between organizational performance and, KM enablers and processes. This enhancement enriched the steps of analysing KM in enterprises. Although this study was informed by system thinking theory, social capital theory, and absorptive capacity theory (Section 2.2), it does not consider making a substantial theoretical contribution to these fields. It perhaps indirectly applied the conceptual and analytical framework informed by those theories empirically. In that sense, it sets precedence for further studies informed by such theories.

Thirdly, one of the major concerns of this study was to identify and examine the relationships between enablers and each creation process (section 6.4.1). Most previous studies neglected this relationship because they assessed KM processes by the use of object-perspective measures such as the number of created ideas or patents. However, this study measures the capacity for knowledge creation by adapting Nonaka and Takeuchi's (1995) knowledge creation model, allowing Chinese managers to identify which enablers are critical for their knowledge creation processes. Because no enterprise can manage all forms of knowledge creation processes equally well, this study may help to increase specific creation processes such as socialization or combination and enriches Nonaka and Takeuchi's knowledge creation model in the Chinese context.

Fourthly, the research results confirm that networking in Chinese enterprises is vital to the success of knowledge management and organizational

performance improvement. This is consistent with Ibarra and Hunter's (2007) theory, which states that working through networks means relying on "who you know" rather than "what you know", which in Chinese term named "Guanxi". It is "Guanxi" that enables the flow of knowledge sharing, acquisition and creation in and between enterprises in the highly networked Chinese society.

Finally, the investigation of Chinese enterprises' effort and experience of knowledge management will be valuable for enterprises in developing countries to guide their KM strategy (section 6.4). For instance, this study confirmed that the culture environment of an enterprise is central to its success in the context of China. A collaborated, trusted, learning environment within enterprises will have a positive impact on their organizational performance. This message implicates that enterprises in developing countries can also develop and adjust their strategies to maximize their organizational performance. Enterprises from developed countries can also benefit from this study when they outsource their business processes to developing countries. It will assist them to obtain a greater understanding of the KM environment in developing countries and survive in emerging economies such as China.

7.3 Implications for Practice

Conclusions and implications drawn from the investigation and data analysis of this research are presented below:

- Knowledge management strategies have a significant positive impact on knowledge creation processes, which will increase organizational creativity to improve enterprises' financial and non-financial performance. In relation to Nonaka and Takeuchi's SECI model, human

(personalization) strategy works for socialization while system (codification) strategy is more effective for combination. In the context of China, the KM strategies in Chinese enterprises today are more focused on exploiting external sources of advanced technological knowledge.

- The culture environment of an enterprise is central to its success in the context of China. A collaborated, trusted, and learning environment within enterprises will have a positive impact on their organizational performance. Three culture variables are explained as following:
 - Collaborative interactions within Chinese enterprises are able to foster exchanging knowledge among people by reducing fear and increasing openness to other members. It helped people to develop a shared understanding about an organization's external and internal environments through supportive and reflective communication.
 - Trust in Chinese enterprises started from "Guanxi" and developed to achieve personal or organizational goals. In the trusted environment, the increased knowledge transfer will lead to better knowledge creation.
 - Chinese enterprises today are spending lots effort on encouraging organizational learning. In a learning environment, they developed cultural and social contexts to facilitate the transfer and dissemination of acquired technology. Their heavy investment on knowledge acquisition and dissemination has had a positive impact on knowledge creation process.
- In China, authority and seniority are highly respected and top-down decision making actually serves to work against sharing of knowledge. The centralized nature of Chinese organizations caused distortion and discontinuousness of ideas, which affected the flow of knowledge within and between subunits of an organization. Without a constant flow of

communication and ideas, knowledge creation rarely occurs. Although the centralized model works effectively in Chinese firms when manufacturing products with less complicated technology, it will not be so good when products are more systemic. Things that involve a high level of complexity and consequently also a very high level of value-added. That is something that will be much harder for Chinese businesses to do successfully and is partially related to the centralized model that is built into Chinese enterprises.

- The key to understanding KM in the Chinese context is recognizing the networked nature of Chinese society which operates on the basis of "Guanxi". KM activities in Chinese enterprises are also influenced by the desire of both managers and employees to avoid conflict and loss of face, to respect hierarchical status, and to achieve "collective" goals (often determined by the "big boss"). The socialization and externalization elements are remarkably similar to the Japanese situation that Nonaka and Takeuchi (1995) described, as the Chinese are highly networked, hold tacit knowledge within these networks and are prepared to make this knowledge explicit only within the context of these pre-existing relationships. In respect to the combination and internalization elements, however, China differs from Nonaka and Takeuchi's categorizations. In Chinese enterprises, the combination of tacit knowledge is not straightforward, while learning-by-doing is important to sustain their development. The research results also suggest that internalization is problematic in Chinese enterprises because of individuals' fear of admitting mistakes.

7.4 Limitations of the Research

The findings of this study are of significance in the field of KM, but they should

be considered in the light of its inherent limitations. The subject area of empirical, survey-based studies on KM in China is still in its infancy. This study is one of the pioneering first steps towards a greater understanding of the KM in Chinese enterprises. Therefore, it is necessary to outline some general limitations of this research.

Firstly, this study adopted mixed methods (two separated steps: qualitative study and quantitative study), which enhanced the validity of the research. However, the research quality would be improved if more quantitative elements (i.e. small questionnaires) are mixed into qualitative study, and more qualitative elements (i.e. interviews after the main survey) are mixed into quantitative study. In the meantime, a longitudinal study to investigate the dynamic features of KM would provide further robust results.

Secondly, samples of this study were restricted to the listed companies in order to include major companies in the ICT and medicine industries in China; it focuses on relatively large and profitable enterprises. Therefore, the results might differ in small or venture enterprises. To increase the generalizability of the research results, we should investigate more small or joint venture enterprises.

Thirdly, the results are limited to Chinese enterprises in mainland China. The generalizability from a China setting to researchers in other countries (i.e. Singapore, Taiwan) may be questionable. Therefore, the results of this study should be carefully interpreted. Further empirical research which involves data collection over diverse countries is needed. It will be possible to conduct analyses on knowledge creation processes and organizational performance variables in various countries.

Fourthly, measures might need to be refined. While most variables used in this

study had high measurement reliability (Cronbach's alpha values higher than 0.63) and validity (Item-to-total correlation values higher than 0.50 and factor loading value higher than 0.50), some variables could have had further instrument refinement. More specifically, T-shaped skills, organizational creativity, and organizational performance should be improved as follows: (1) Measurements of T-shaped skills lack problem solving aspects. T-shaped skills enable organizational members to interact with one another meaningfully to solve the problems. Organizational members possessing this skill are able to connect their knowledge to fit the problem at hand. Therefore, T-shaped skills measurements should be considered according to the capability of individual specialists to sustain a meaningful and synergistic conversation with one another within the problem-solving context. (2) Organizational performance measures should be enhanced to obtain more stable results.

Furthermore, many factors help to determine organizational performance, and attempts to trace causality to any single factor such as organizational creativity are fraught with obstacles. Therefore, the results related to organizational performance may have to be carefully interpreted. In order to pursue further investigation of the conceptual model, it would be appropriate (a) to develop more direct and objective measures and (b) to introduce more diverse intermediate outcomes for organizational performance. First, direct and objective measures for organizational performance will increase the credibility of relationship between KM processes and organizational performance. However, objective measures such as financial performance are insufficient. Although the traditional financial performance measures work well for the industrial era, they do not for knowledge era (Knight, 1999). Specifically, they can not consider various environmental factors. For example, the non-significant result may reflect the unique economy environment in China between 2000 and 2006. During this period, China is in the period of its 10th five-year plan with very high annual economic growth rate (more than 10%).

Finally, information technology was measured from an IT support perspective; it focuses on IT service quality for KM. However, other information technology factors such as IT usage have the possibility of affecting the KM processes. To increase the explanation power of the research results, the researcher should investigate actual frequency of information technology.

7.5 Directions of Future Research

Based on the current findings, this study indicates the following avenues for further research.

Firstly, some other factors such as institutional (government) support, domain knowledge (Shaft and Vessey, 1998) or knowledge process are of interest. Institutional support might be very helpful for Chinese enterprises to acquire and digest knowledge. The exploration of the role of the Chinese government in the process of assisting enterprises to capture knowledge is also required. Szulanski's (1996) knowledge transfer model which is made up of four processes - initiation, implementation, ramp-up, and integration, might be worth considering.

Secondly, a cross-cultural comparison may investigate which enablers are critical, depending on different specific countries. Similarly, a comparative study is of interest (e.g., consulting vs. manufacturing). An industry specific comparison may reveal which industry sectors relies more on tacit or explicit knowledge. Exploration of the relationship between knowledge creation processes and department types may be necessary. Some departments such as planning and R&D may need different strategies in case of externalization and combination.

Thirdly, although this study shows which knowledge enablers can enhance a firm's capability to manage knowledge and relationship between KM strategy and knowledge creation process, it is still unclear how to use KM enablers in a strategic fashion. Appropriate KM strategies may be able to facilitate these enablers. To explore the ways that KM strategies facilitate in the enterprise in order to capture, manage and create knowledge will be extremely helpful for management practitioners.

Fourthly, as an emerging economy, China's practices and experiences in the KM will be useful to other developing countries. A comparison study on the KM of developing countries (for instance, middle-east countries) will enhance the proposed conceptual KM model of this study.

Finally, electronic commerce is changing the business world rapidly. The quality of KM may determine a template for electronic commerce. For example, Holsapple and Singh (2000) proposed the potential benefits of applying KM principles to e-business and e-government.

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Appendix 1: Interview Protocol

Background Information of the Interviewee

Date:

Name:

What is your job title?

What primary functions does your job involve?

How many years have you been working for this company?

What is your highest qualification?

Knowledge management enablers

- Does your company have a strategy to manage knowledge (know-how, technical skill, problem solving methods, projects results and reports, or organization manuals)?
- Do you share knowledge between each other in your company? If yes, can you describe how is it managed?
- Is the KM strategy included in the organizational oval strategy objectives?
- What is the objective of KM strategy in your company?

1. Collaboration

- Are your company members supportive to each other? How do you collaborate with each other in your company?

2. Trust

- Do your company members have reciprocal faith in other members' ability and decision toward organizational interests than individual interests?
- How do you describe the relationships between company members based on reciprocal faith?

3. Learning

- Does your company provide job training or self-development programs?
- How do you describe the learning environment in your company?
- In which ways, does your company absorb knowledge from outside the company to be more competitive?

4. Centralization

- What are the normal procedure that decisions get made?
- Are your company members encouraged to make their own decisions?
- Can company members make decisions without approval?

5. Formalization

- Can you describe the formalization in your company?

- (Procedures for activities, contacts management, company rules)
- Can company members ignore the rules and reach informal agreements to handle some situations?

6. T-shaped Skills

- Do you encourage company members to have knowledge not only in their own tasks but also others'?
- How do members in your company react to organizational environment changes? Will their performance be affected by those changes?

7. IT Support

- How do you describe the IT support in your company?
- To what extent is information and knowledge used and shared through the following electronic tools (E-mail, Intranet/GroupWare, Teleconference, Computerized advisors (Intelligent agents), Videoconference, Database applications, Other...)?

Organizational Performance

- Do you think your knowledge management strategy improved the organizational performance?
- Can you give us more details regarding to the impact of KM on your organizational performance?

Appendix 2: Interview Protocol Chinese Version

采访

背景资料

日期:

姓名:

您的工作职称?

您在贵公司的主要指责?

您在这家公司工作多长时间了?

您的最高学历?

知识管理的推动因素

贵公司是否有知识管理战略计划 (技术技能,解决问题的方法,项目成果报告,或组织手册)?

在你们公司, 职员之间互相交流并共享知识和经验吗? 如果有的话, 你可以形容它们是如何发生的?

在你们公司的总体战略规划里是否也包括了知识管理的步骤?

如果有, 你们公司的知识管理战略的目标是什么?

1. 职员间的合作互助

- 你们公司的职员之间合作互助吗? 你能描述一下你们是如何互助的吗?

2. 相互信任

- 在你们公司, 在面对公司的利益时, 大家都彼此相互信任吗?
- 你能描述一下你们公司职员间的相互信任程度吗?

3. 组织学习

- 你们公司经常为员工提供职业培训吗?
- 你能介绍一下你们公司组织学习的情况吗? 都有哪些学习活动?
- 你们公司是如何从外面汲取知识以在同行中更有竞争力?

4. 集中管制

- 你们公司的通常的决策是如何通过的?
- 你们公司鼓励普通职员参与公司的重大决策吗?
- 在你们公司, 公司职员能在不经过领导的批准而直接做决定吗?

5. 正规化

- 你能描述一下你们公司的正规的程度吗? 在你们公司有各种规章制度制约职员的行为吗? 请举例说明。

- 在某些特殊情况下，你们能够忽略一些公司的规章制度来完成你的工作任务吗？

6. T 型技能

- 你们公司鼓励学习你工作氛围意外的其它职员的工作技能吗？
- 你们公司的职员对公司的变化是如何看待？ 这些变化对他们的工作效率有影响吗？

7. 计算机应用辅助

- 你能介绍一下你们公司的计算机应用及维护管理情况吗？
- 你们公司应用一些知识共享的软件到什么程度了？ 比如：电子邮件，聊天室，留言板，网上远程会议，数据库，等等

公司的绩效

你认为知识管理战略会促进你们公司的绩效吗？ 能具体描述一下吗？

谢谢你们的参与！

Appendix 3: Contact Summary Form

Company name:

Date:

Time:

Name:

Position:

Notes:

Appendix 4: Cover Letter for Survey

Dear xxx,

I am writing to ask if you would be willing to take part in an on-line survey on the knowledge management enablers, processes and organizational performance in Chinese enterprises. Your participation is crucial to the success of the study.

The survey explores how Chinese enterprises develop their knowledge management strategy to obtain the competitiveness in the global market. We propose that the knowledge management motivation, corporative culture, KM processes and creation will have significant impact on organizational performance. We are keen to learn the views of both managers and non-managers who have actually engaged in these activities and those who have not. This will enable us to have a balanced picture of the current situation and practice.

I should be most grateful if you would kindly complete the survey. It should take about 10-15 minutes of your time. The identity of individual responses will remain completely confidential. The information provided will be used in an aggregated form only. If you would like additional information concerning this study, please feel free to contact me by e-mail on weifeng.chen@brunel.ac.uk

Please complete the survey by going to:

www.brunel.ac.uk/~cbpgwwc/kmsurvey-en.htm

Thank you for your participation.

Yours sincerely,

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Appendix 5: Cover Letter for Survey Chinese Version

尊敬的先生/女士,

非常感谢您打开这份电子邮件。在知识经济时代,知识已成为经济增长、社会发展以及企业成长的关键性资源,知识管理也成为新兴且日益重要的研究课题,越来越多的机构通过知识管理来塑造自身的核心竞争力。我们希望通过本次调查准确了解和分析知识管理在中国信息技术行业和医药行业的应用情况和发展趋势,以便在此基础上协助国内和国外机构更好地认知及应用知识管理,并推动知识管理在中国的普及,为政府制定有利于技术创新活动的政策提供决策依据。

企业的创新能力能够增加该企业在同行业中的竞争力并维持其可持续性发展。正确的企业知识管理策略是提高创新能力的保障。我们目前正在做关于中国医药行业知识管理动机、过程与组织绩效的问卷调查。您热心的参与是我们这次调研成功的关键。理论表明企业知识管理的动机、社团文化、知识管理的过程及创新将对企业的绩效有着积极的影响。我们非常想知道在实际操作中,理论与实践是否相符。您的工作经历和体会将揭开这个疑问。

完成这份问卷大约需要10-15分钟。十分感谢您在百忙中能抽出时间完成这份问卷。请如实填写,不要漏项。我们将保证对您的回答严格保密,未经您的授权不会将有关信息向第三方披露或公开。如果您有任何疑问或想更多地了解关于这次问卷的信息,请发电子邮件到 Weifeng.Chen@brunel.ac.uk

请点击下面的链接完成问卷:

www.brunel.ac.uk/~cbpqwwc/kmsurvey.htm

再次感谢您的参与和帮助。

此致!

敬礼!

陈伟锋

Weifeng Chen
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Brunel Business School
Brunel University
Uxbridge, Middlesex UB8 3PH
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Appendix 7: Survey

Survey on 'knowledge management factors and organizational performance'

The survey questionnaire comprises the following six parts and will take about 10-15 minutes to complete.

- Part I. Background information
- Part II. Knowledge Management Strategy
- Part III. Knowledge Management Enablers
- Part IV. Knowledge Creation Processes
- Part V. Organizational Creativity
- Part VI. Organizational Performance

Your responses will remain completely confidential. The information provided will be used in an aggregated form only and will not be individually identified.

Thank you for taking time to participate in the survey. If you have any questions regarding this survey, please contact us by e-mail: wofeng.chen@brunel.ac.uk

Part I Background Information

(1). Please indicate what industry sector your organization belongs to

(2). Please write the name of the organization you work for

(3). Your age

20 - 25 yrs

26 - 30 yrs

30 - 35 yrs

35 - 45 yrs

over 45 yrs

(4). Your sex

Female Male

(5). Please indicate your current position in our organization

Manager

Non-manager senior scientist/engineer

Non-management technical employee

Non-management sales/marketing/finance

Other, please specify.

(6). Please tell us some background information about your organization

Number of total employees _____

Number of employees in R&D _____

Turnover (year 2006) _____

Organization established time (year) _____

(7). Please indicate the legal basis of your organization

A Co-operative enterprise

Private or joint stock (JS)

- company
- Private or JS with ultimate majority ownership by public sector body
 - Joint venture
 - Majority foreign owned
 - Other, please specify.

(8). How many years have you been in your current employment?

- < 1 yrs
- 1 - 2 yrs
- 2 - 5 yrs
- 5 - 10 yrs
- > 10 yrs

(9). Please indicate your highest qualification

- Vocational qualification (apprenticeship equivalent)
- Undergraduate degree
- Masters or MBA post graduate qualification
- PhD
- Certificate or qualification that entitles membership of a professional association (eg IEEEI?)

Part II. Knowledge Management Strategy

1. Codification Strategy

(10). Please click the appropriate answer for the following statements regarding to codification strategy.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Knowledge (know-how, technical skill, or problem solving methods) is well codified in our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge can be acquired easily through formal documents and manuals in our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Results of projects and meetings should be documented in our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge is shared in codified forms like manuals or documents in our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Personalization Strategy

(11). Please click the appropriate answer for the following statements regarding to personalization strategy.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Knowledge can be easily acquired from experts and co-workers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy to get face-to-face advice from experts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Informal discussions and meetings are used for knowledge sharing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowledge is acquired from one-to-one mentoring.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Part III. Knowledge Management Enablers

A. Organizational Culture

1. Collaboration

(12). Please click the appropriate answer for the following statements regarding to collaboration.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our organization members are satisfied by the degree of collaboration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organization members are supportive to each other.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our organization members are helpful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a willingness to collaborate across organizational units within our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a willingness to accept responsibility for failure.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Trust

(13). Please click the appropriate answer for the following statements regarding to trust.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company members are generally trustworthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members have reciprocal faith in other members' intentions and behaviours.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members have reciprocal faith in others' ability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members have reciprocal faith in others' behaviours to work toward organizational goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members have reciprocal faith in others' decision toward organizational interests than individual interests.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members have relationships based on reciprocal faith.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Learning

(14). Please click the appropriate answer for the following statements regarding to learning.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company provides various formal training programs for performance of duties.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company provides opportunities for informal individual development other than formal training such as work assignments and job rotation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company encourages people to attend seminars, symposia, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company provides various programs such as clubs and community gatherings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members are satisfied by the contents of job training or self-development programs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B. Organizational Structure

4. Centralization

(15). Please click the appropriate answer for the following statements regarding to centralization.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company members can take action without a supervisor.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members are encouraged to make their own decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members do not need to refer to someone else.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members do not need to ask their supervisor before action.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members can make decisions without approval.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Formalization

(16). Please click the appropriate answer for the following statements regarding to formalization.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
In our company, there are many activities that are not covered by some formal procedures (R).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In our company, contacts with our company are on a formal or planned basis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In our company, rules and procedures are typically written.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In our company, members can ignore the rules and reach informal agreements to handle some situations (R).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

C. People

6. T-shaped Skills

(17). Please click the appropriate answer for the following statements regarding to people.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company members can understand not only their own tasks but also others' tasks.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members can make suggestion about others' task.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members can communicate well not only with their department members but also with other department members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members are specialists in their own part.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company members can perform their own task effectively without regard to environmental changes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D. Information Systems

7. IT Support

(18). Please click the appropriate answer for the following statements regarding to IT support.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company provides IT support for collaborative works regardless of time and place.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company provides IT support for communication among organization members.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company provides IT support for searching for and accessing necessary information.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company provides IT support for simulation and prediction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company provides IT support for systematic storing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Part IV. Knowledge Creation Processes

1. Socialization

(19). Please click the appropriate answer for the following statements regarding to socialization.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company stresses gathering information from sales and production sites.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses sharing experience with suppliers and customers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses engaging in dialogue with competitors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Our company stresses finding new strategies and market opportunities by wandering inside the firm.

Our company stresses creating a work environment that allows peers to understand the craftsmanship and expertise.

2. Externalization

(20). Please click the appropriate answer for the following statements regarding to externalization.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company stresses creative and essential dialogues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses the use of deductive and inductive thinking.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses the use of metaphors in dialogue for concept creation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses exchanging various ideas and dialogues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses subjective opinions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Combination

(21). Please click the appropriate answer for the following statements regarding to combination.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company stresses planning strategies by using published literature, computer simulation and forecasting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses creating manuals and documents on products and services.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses building databases on	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

products and service.

Our company stresses building up materials by gathering management figures and technical information.

Our company stresses transmitting newly created concepts.

4. Internalization

(22). Please click the appropriate answer for the following statements regarding to internalization.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Our company stresses on active liaisoning activities with functional departments by cross-functional development teams.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses forming teams as a model and conducting experiments, and sharing results with entire departments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses searching and sharing new values and thoughts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses sharing and trying to understand management visions through communications with fellows.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company stresses benchmarking and test marketing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Part V. Organizational Creativity

(23). Please click the appropriate answer for the following statements regarding to organizational creativity.

Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
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Appendix 3: Survey (Chinese Version)

Our company has produced many novel and useful ideas (services/products).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company fosters an environment that is conducive to our own ability to produce novel and useful ideas (services/products).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company spends much time for producing novel and useful ideas (services/products).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company considers producing novel and useful ideas (services/products) as important activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our company actively produces novel and useful ideas (services/products).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Part VI. Organizational Performance

(24). Please click the appropriate answer for the following statements regarding to organizational performance.

	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Don't know
Compared with key competitors, our company is more successful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared with key competitors, our company has a greater market share.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared with key competitors, our company is growing faster.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared with key competitors, our company is more profitable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared with key competitors, our company is more innovative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared with key competitors, our company has larger size in terms of turnover.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared with key competitors, our company has more patents.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(25). Would you like a copy of our summary findings?

Yes No

Thank you very much for your time, please click the "Submit" button below to finish the survey. If you have any query or questions regarding this survey and our research, please feel free to email us: wofeng.chen@brunel.ac.uk

Submit

Appendix 8: Survey (Chinese Version)

关于中国企业知识管理策略和组织绩效的问卷调查

请填写问卷中以下六个部分,约需10-15分钟完成。

- 第一部分: 背景资料
- 第二部分: 知识管理策略
- 第三部分: 知识管理手段
- 第四部分: 知识创造过程
- 第五部分: 组织创新能力
- 第六部分: 组织绩效

请如实填写,不要造假。我们将保证您的回答严格保密,并给企业授权不会将有关信息向第三方披露或公开。
感谢您抽空参与了我们的调查。如果您对这项调查有任何疑问,请联络我们的电子信箱: knowledge.china@pccw.com

第一部分: 背景资料

(1) 请写明贵组织属于何种行业

(2) 请填写贵所在企业的名称

(3) 请填写贵所在的企业年龄

20-25岁

26-30岁

30-35岁

35-45岁

超过45岁

(4) 您的性别

男 女

(5) 请填写您目前的职业类别

经理

高级工程技术人员(非经理)

普通工程技术人员(非经理)

营销/市场/财务人员(非经理)

其它(请注明)

(6) 请填写贵公司的相关信息

员工总人数

研发人员总数

营业额(万元): (请填整数)

公司成立时间(年份)

(7) 请填写贵公司的绩效: (请点出相应的选项后的小圆圈,若认为提供的选项不能表达您意,请在其后空白处作简短说明)

高绩效

- 乡镇企业
- 私营企业或股份公司
- 股份制企业
- 联营企业
- 中外合资企业
- 外资企业 (包括香港、台湾、澳门)
- 其它 (请填写) _____

(8). 您在目前的工作岗位多长时间了?

- < 1年
- 1-2年
- 2-5年
- 5-10年
- > 10年

(9). 您拥有的最高学历

- 大专、中专、技校、函授班
- 本科
- 硕士
- 博士
- 其它高级职称 (比如 IEEE 职员)

第二部分 知识管理策略

1. 显性策略

(10). 请就下列关于知识显性策略的描述做出选择:

	非常不同意	不同意	中立	赞同	非常赞同	不知道
在我们公司, 文件化、标准化、系统化的知识(如何应用知识, 甚至包括有解决方案)都被很好的整理、归档、分类、检索。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司, 知识可以通过公司内部的文件库(如报告、项目总结、模板、电子数据库、参考书、说明书等)很容易地获得。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司, 各个项目会议的结束都会记录在案。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司, 知识能通过会议摘要或文件的形式来共享的。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. 隐性策略

(11). 请就下列关于知识隐性策略的描述做出选择:

	非常不同意	不同意	中立	赞同	非常赞同	不知道
在我们公司, 知识可以很容易地从专家和同事那里获得。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司, 很容易与专家进行面对面的咨询。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司, 我们经常通过非正式的交流会议进行知识共享。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司, 知识是通过的一对一辅导获得的。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

第三部分 知识管理成功因素

A. 企业文化

1. 组织协作

(12) 请就下列关于企业职员及部门间协作的描述做出相应的选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司的职员对相互间的协作程度表示满意。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员之间乐于与他人分享知识心得。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
当被问及一些新创意或提供建议时，我们公司的职员之间非常愿意并尽量提供帮助。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司提倡部门与部门之间的协作。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
当有危机发生时，我们公司的职员都勇于承担责任。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. 组织诚信

(13) 请就下列关于企业职员及部门间诚信的描述做出相应的选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司的职员相互间都彼此信赖。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司大家都相信并遵守彼此的承诺和行为。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司大家都相信并遵守彼此的工作能力。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员都深信大家在为公司共同的事业而努力。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

在我们公司，大家都深信每个人所做的决策都是为了公司的利益而非个人的利益。

我们公司职员间的关系是建立在互相信任和尊重基础上的。

3. 组织学习

(14) 请就下列关于组织学习的描述做出相应的选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司经常有针对性地提供各种正式培训。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
除了正式培训外，我们公司还提供工作业务分析及工作轮岗为公司职员个人的发展提供了机会。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司鼓励职员参加研讨会、研习班等。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司鼓励各种形式的自主学习，如社团和基金会。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员对工作培训和个人发展培训的内容感到满意。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B. 组织结构

4. 组织授权

(15) 请就下列关于组织授权的描述做出相应的选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司职员可以不经上级主管同意擅自行动。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司鼓励职员为问题自行决策。	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	非常不同意	不同意	中立	赞同	非常赞同	不知道
在我们公司，大家不会相互推卸责任	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员采取行动之前不需要请示自己的上司	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员可以不经上级批准就做决策	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. 组织规范化						
(16) 请就下列关于组织规范化的陈述做相应的选择：						
	非常不同意	不同意	中立	赞同	非常赞同	不知道
在我们公司，有很多活动并不通过某些正式程序	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司对客户和顾客有非常正规的公关计划	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的规章制度非常正规、清楚	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司，大家有时可以不遵守公司规章制度来办一些情况	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. 职员						
6. 7 团队合作						
(17) 请就下列关于公司职员团队合作的陈述做相应的选择：						
	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司的一些职员不仅可以完成自己的任务，而且会帮助其他人完成工作任务	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员能够对同事的工作任务提供建设性帮助	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员不仅可以与本部门同事进行技术交流，还能够与其它部门职员进行交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

我们公司的职员只擅长自己的专业领域	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
不论企业的组织环境如何变化，我们公司的职员都能高效的完成工作任务	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. 信息技术系统						
7. 信息计算机技术支持						
(18) 请就下列关于公司对信息计算机技术支持的陈述做相应的选择：						
	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司对新项目提供及时的提供信息和计算机技术支持和帮助	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的职员可以使用计算机和网络进行交流和协作	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司职员能够快速获取信息和计算机技术支持和帮助	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在我们公司，计算机技术和网络技术的广泛应用提高了辅助决策分析能力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司使用数据库系统对公司的数据进行操作存储(如：ORACLE, ACCESS)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
制造部分 知识制造过程						
1. Sorkidmolen 转化						
(19) 请就下列关于公司转化过程的陈述做相应的选择：						

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司注重从销售和生部门收集有用的信息	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司注重与客户和供应商之间的经验交流和知识共享	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司十分关注与同行竞争公司的交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司注重管理战略的制定和制定公司员工发展的市场机会	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司注重建立和保持相互了解彼此技能和专长的工作氛围	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Externalisation 外化

(20). 请就下列关于公司外化的陈述做出选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司愿意尝试与其它公司进行有建设性的交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和供应商交流、经验交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和竞争对手交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和同行交流意见和工作经验	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
在工作上，我们公司愿意和员工发表自己的看法	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Combination 组合

(21). 请就下列关于公司知识组合的陈述做出选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
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我们公司注重使用新技术、计算机和以网络技术来制定战略计划	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司注重对我们的产品和服务质量进行提升	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司注重产品和服务数据管理的高效率	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意对收集的管理数据和技术支持进行存储	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司注重推广最新的知识管理	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. 内化

(22). 请就下列关于公司知识内化的陈述做出选择：

	非常不同意	不同意	中立	赞同	非常赞同	不知道
我们公司愿意在工作中和职能部门团队的经验交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和团队成员的经验交流，并与各个部门分享成果	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和团队成员的经验交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和团队成员的经验交流，并努力提升其共同的知识管理管理水平	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司愿意和团队成员的经验交流	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

第五部分 组织创新能力

(23). 请就下列关于企业组织创新能力的陈述做出选择：

Appendix 9: Cover Letter (2nd) for Survey

Dear xxx,

	非常不同意	不同意	中立	赞同	非常赞同	不知道
在客户服务和产品研发方面, 我们公司有许多新颖, 有效的方法	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司的环境有利于产品研发, 促进了客户服务的质量	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司十分注重改善客户服务和产品研发	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司在发展客户服务和产品研发方面投入了很多时间和精力	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
我们公司在发展客户服务和产品研发方面十分活跃	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

第六部分 组织绩效

(24) 请就下列关于企业组织绩效的描述做出选择:

	非常不同意	不同意	中立	赞同	非常赞同	不知道
与同行中主要竞争对手相比, 我们的公司更成功	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
与同行中主要竞争对手相比, 我们公司占有更大的市场份额	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
与同行中主要竞争对手相比, 我们公司有更多的产品专利	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
与同行中主要竞争对手相比, 我们公司年利润更高	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
与同行中主要竞争对手相比, 我们公司更具有创新精神	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
与同行中主要竞争对手相比, 我们公司发展速度更快	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
与同行中主要竞争对手相比, 我们公司规模更大	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(25) 你愿意一份我们的调研结果吗?

是 否

再次感谢您抽出时间参与我们的调查, 请点击下面完成按钮结束本次问卷, 如果您对此次调查有任何疑问, 请联系我们的电子邮箱: knowledge.china@postmail.com

完成

Yanfeng Chen

Yanfeng Chen
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Brunel University

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Email: Yanfeng.Chen@brunel.ac.uk

Appendix 9: Cover Letter (2nd) for Survey

Dear xxx,

Thank you for reading this email. I sent you an online survey last week. I am writing to ask if you would be willing to take part in an on-line survey on the knowledge management and organizational performance in Chinese enterprises. Your participation is crucial to the success of our study, which will be helpful to you in developing the efficient knowledge management strategy for your company.

The survey explores how Chinese enterprises develop their knowledge management strategy to obtain the competitiveness in the global market. We propose that the knowledge management motivation, corporate culture, KM processes and creation will have significant impact on organizational performance. We are keen to learn the views of both managers and non-managers who have actually engaged in these activities and those who have not. This will enable us to have a balanced picture of the current situation and practice.

I should be most grateful if you would kindly complete the survey. It should take about 10-15 minutes of your time. The identity of individual responses will remain completely confidential. The information provided will be used in an aggregated form only. If you would like additional information concerning this study, please feel free to contact me by e-mail on weifeng.chen@brunel.ac.uk

Please complete the survey by going to:

www.brunel.ac.uk/~cbpgwww/kmsurvey-en.htm

Thank you much for your participation.

Yours sincerely,

Weifeng Chen

Weifeng Chen
Doctoral Researcher
Brunel Business School
Brunel University
Uxbridge, Middlesex UB8 3PH
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Email: Weifeng.Chen@brunel.ac.uk

Appendix 10: Cover Letter (2nd) for Survey Chinese

尊敬的先生/女士,

非常感谢您打开这份电子邮件。我上个星期给您发了一封关于中国企业知识管理和企业绩效的问卷,您还没有完成。在知识经济时代,知识已成为经济增长、社会发展以及企业成长的关键性资源,知识管理也成为新兴且日益重要的研究课题,越来越多的机构通过知识管理来塑造自身的核心竞争力。我们希望通过本次调查准确了解和分析知识管理在中国信息技术行业和医药行业的应用情况和发展趋势,以便在此基础上协助国内和国外机构更好地认知及应用知识管理,并推动知识管理在中国的普及,为政府制定有利于技术创新活动的政策提供决策依据。

企业的创新能力能够增加该企业在同行业中的竞争力并维持其可持续性发展。正确的企业知识管理策略是提高创新能力的保障。我们目前正在做关于中国医药行业知识管理动机、过程与组织绩效的问卷调查。您热心的参与是我们这次调研成功的关键。理论表明企业知识管理的动机、社团文化、知识管理的过程及创新将对企业的绩效有着积极的影响。我们非常想知道在实际操作中,理论与实践是否相符。您的工作经历和体会将揭开这个疑问。

完成这份问卷大约需要10-15分钟。十分感谢您在百忙中能抽出时间完成这份问卷。请如实填写,不要漏项。我们将保证对您的回答严格保密,未经您的授权不会将有关信息向第三方披露或公开。如果您有任何疑问或想更多地了解关于这次问卷的信息,请发电子邮件到 Weifeng.Chen@brunel.ac.uk

请点击下面的链接完成问卷:

www.brunel.ac.uk/~cbpgwwc/kmsurvey.htm

再次感谢您的参与和帮助。

此致!

敬礼!

陈伟锋

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Appendix 11: Frequency Distribution

Table 6 – 2

Variable	Measurement	Results (percent)				
		Strongly disagree	Disagree	Neural	Agree	Strongly agree
Codification Strategy (V10)	A: Knowledge (know-how, technical skill, or problem solving methods) is well codified in the organization.		2.5	5.4	75.2	16.9
	B: Knowledge can be acquired easily through formal documents and manuals in the organization.		3.2	9.2	73.7	13.8
	C: Results of projects and meetings are documented in the organization		1.4	9.7	78.4	10.4
	D: Knowledge is shared in codified forms like manuals or documents in the organization.		4.1	9.7	74.1	12.1
Personalization Strategy (V11)	A: Knowledge can be easily acquired from experts and co-workers.	.7	11.5	19.2	64.6	4.0
	B: It is easy to get face-to-face advice from experts.	.2	12.1	44.4	32.4	11.0
	C: Informal discussions and meetings are used for knowledge sharing.	.5	9.5	30.2	59.7	
	D: Knowledge is acquired from one-to-one mentoring.	.5	14.6	35.3	43.0	6.7
Collaboration (V12)	A: The organization members are satisfied with the degree of collaboration.		13.5	37.8	42.1	6.7
	B: The organization members are supportive to each other.		9.7	31.1	50.4	8.8
	C: The organization members are helpful.		6.5	31.5	49.6	12.4
	D: There is a willingness to collaborate across organizational units within the organization.		5.9	21.2	58.1	14.7
	E: There is a willingness to accept responsibility for failure.		5.9	38.7	49.3	6.1
Trust (V13)	A: Company members are generally trustworthy.		3.6	40.3	46.8	9.4
	B: Company members have reciprocal faith in other members' intentions and behaviours		8.1	34.2	52.9	4.9
	C: Company members have reciprocal faith in others' ability.		3.1	36.5	57.4	3.1
	D: Company members have reciprocal faith in others' behaviours to work toward organizational goals.			41.7	55.2	3.1
	E: Company members have reciprocal faith in others' decision toward organizational interests rather than individual interests.		1.6	29.3	69.1	

	F: The company members relationships are based on reciprocal faith.		2.7	43.9	50.0	3.4
Learning (V14)	A: The company provides various formal training programs related to performance.	3.4	11.5	16.5	32.6	36.0
	B: The company provides opportunities for informal training rather than formal training, e.g. work assignments and job rotation.		8.6	29.7	61.7	
	C: The company encourages people to attend seminars, symposia, etc.	5.9	11.0	26.1	33.0	23.9
	D: The company provides various social programs such as clubs and community gatherings.		11.3	35.3	53.2	.2
	E: Company members are satisfied with the job training or self-development programs.		.4	34.9	52.5	12.2
Centralization (V15)	A: Company members can take action without a supervisor.	44.1	40.3	15.6		
	B: Company members are encouraged to make their own decisions.	2.0	30.8	37.9	29.3	
	C: Company members do not need to refer to someone else.	4.1	25.9	47.5	22.5	
	D: Company members do not need to ask their supervisor before action.	9.7	51.6	32.7	5.9	
	E: Company members can make decisions without approval.	12.1	58.1	16.9	12.8	.2
Formalization (V16)	A: Many activities are not covered by formal procedures	5.0	22.5	34.9	32.6	5.0
	B: Contacts with the company are on a formal or planned basis.		35.6	20.1	42.4	1.8
	C: Rules and procedures are typically written.		6.5	48.7	44.8	
	D: Members can ignore the rules and reach informal agreements when handling some situations		40.5	17.8	39.0	2.7
T-shaped skills (V17)	A: Company members can understand not only their own tasks but also others' tasks.	3.2	10.3	41.7	44.6	.2
	B: Company members can make suggestion about others' task.		11.7	21.8	54.1	12.4
	C: Company members can communicate well not only with their department members but also with other department members.			58.8	35.3	5.9
	D: Company members are specialists in their own specific field.	.2	18.2	19.8	61.9	
	E: Company members can perform their own task effectively without regard to environmental changes.		11.0	29.9	43.7	15.5
IT Support (V18)	A: Company provides IT support for collaborative works regardless of time and place.	.4	4.3	25.4	56.7	13.3
	B: Company provides IT support for communication among organization members.	2.5	13.5	10.3	48.2	25.5

	C: Company provides IT support for searching for and accessing necessary information.				33.6	48.0	18.3
	D: Company provides IT support for simulation and prediction.			3.2	26.1	69.4	1.3
	E: Company provides IT support for systematic storing.			7.2	5.6	48.2	39.0
Socialization (V19)	A: Gathering information from sales and production sites is important.			.2	11.3	73.9	14.6
	B: Sharing experience with suppliers and customers is important.				21.2	57.9	20.9
	C: Engaging in dialogue with competitors is important.		11.3		10.3	69.1	9.4
	D: Finding new strategies and market opportunities by wandering inside the firm is important.				10.1	70.3	19.6
	E: Creating a work environment that allows peers to understand the craftsmanship and expertise is important.				19.6	66.7	13.5
Externalization (V20)	A: Creative and essential dialogues is important.	15.1		29.3	29.3	24.8	1.4
	B: The use of deductive and inductive thinking is important.			21.4	30.2	39.6	8.8
	C: The use of metaphors in dialogue for concept creation is important.			26.3	32.0	41.4	.4
	D: Exchanging various ideas and dialogues is important.	26.3		21.2	17.3	24.8	10.4
	E: Subjective opinions is important.			5.4	52.2	33.6	6.1
Combination (V21)	A: Planning strategies by using published literature, computer simulation and forecasting is important.	.2		14.2	25.5	49.8	10.3
	B: Creating manuals and documents on products and services is important.	7.2		11.2	21.8	50.5	9.4
	C: Building databases on products and service is important.			14.7	8.1	61.5	15.6
	D: Building up materials by gathering management figures and technical information is important.			1.8	39.2	45.9	13.1
	E: Transmitting newly created concepts is important.			4.9	43.0	47.7	4.5
Internalization (V22)	A: Liaison activities with functional departments by cross-functional development teams are important.	1.1		1.8	29.3	61.7	6.1
	B: Forming teams as a model and conducting experiments, and sharing results with entire departments is important.			10.4	24.6	59.7	5.2
	C: Searching and sharing new values and thoughts is important.	2.5		22.7	29.0	37.2	8.6
	D: Sharing and trying to understand management visions throughout is important.	2.2		21.8	28.1	45.7	2.3
	E: Benchmarking and test marketing is important			5.0	16.7	63.1	15.1
Organizational	A: The company has produced many novel and useful ideas (services/products).	2.5		16.0	24.1	54.7	2.7

Creativity (V23)	B: The company fosters an environment that is conducive to its own ability to produce novel and useful ideas (services/products).	.2	9.4	34.5	51.4	4.5
	C: The company spends much time producing novel and useful ideas (services/products).	.1	14.2	26.6	53.4	5.6
	D: The company considers producing novel and useful ideas (services/products) as important activities.		7.7	36.2	54.7	1.3
	E: The company actively produces novel and useful ideas (services/products).	.2	16.7	26.3	54.1	2.7
	A: Compared with key competitors, the company is more successful.	2.9	18.5	39.2	32.7	6.7
Organizational Performance (V24)	B: Compared with key competitors, the company has a greater market share.	14.9	14.0	24.1	36.3	10.6
	C: Compared with key competitors, the company is growing faster.	14.7	21.2	24.8	35.6	3.6
	D: Compared with key competitors, the company is more profitable.	14.7	15.6	23.7	37.2	8.6
	E: Compared with key competitors, the company is more innovative.	.2	15.6	25.5	54.7	4.0
	F: Compared with key competitors, the company is larger in terms of turnover.	14.6	16.7	30.8	30.9	7.0
	G: Compared with key competitors, the company has more patents.		36.5	21.4	40.1	2.0

Appendix 12: Factor Analysis Results

Communalities

	Initial	Extraction
V10a: Knowledge (know-how, technical skill, or problem solving methods) is well codified in our organization.	1.000	.611
V10b: Knowledge can be acquired easily through formal documents and manuals in our organization.	1.000	.807
V10c: Results of projects and meetings should be documented in our organization.	1.000	.704
V10d: Knowledge is shared in codified forms like manuals or documents in our organization.	1.000	.512

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.242	56.061	56.061	2.242	56.061	56.061
2	.965	24.133	80.194			
3	.563	14.086	94.280			
4	.229	5.720	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V11a:Knowledge can be easily acquired from experts and co-workers.	1.000	.730
V11b:It is easy to get face-to-face advice from experts.	1.000	.761
V11c:Informal discussions and meetings are used for knowledge sharing.	1.000	.542
V11d:Knowledge is acquired from one-to-one mentoring.	1.000	.754

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.787	69.673	69.673	2.787	69.673	69.673
2	.571	14.266	83.939			
3	.349	8.722	92.661			
4	.294	7.339	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V12a:Our organization members are satisfied by the degree of collaboration.	1.000	.712
V12b:Our organization members are supportive to each other.	1.000	.679
V12c:Our organization members are helpful.	1.000	.748
V12d:There is a willingness to collaborate across organizational units within our organization.	1.000	.782
V12e:There is a willingness to accept responsibility for failure.	1.000	.645

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.566	71.312	71.312	3.566	71.312	71.312
2	.553	11.069	82.381			
3	.442	8.840	91.221			
4	.288	5.759	96.980			
5	.151	3.020	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V13a:Our company members are generally trustworthy.	1.000	.576
V13b:Our company members have reciprocal faith in other members' intentions and behaviours	1.000	.501
V13c:Our company members have reciprocal faith in others' ability.	1.000	.744
V13d:Our company members have reciprocal faith in others' behaviours to work toward organizational goals.	1.000	.727
V13e:Our company members have reciprocal faith in others' decision toward organizational interests than individual interests.	1.000	.783
V13f:Our company members have relationships based on reciprocal faith.	1.000	.471

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.635	43.911	43.911	2.635	43.911	43.911	2.097	34.953	34.953
2	1.166	19.440	63.351	1.166	19.440	63.351	1.704	28.398	63.351
3	.712	11.865	75.216						
4	.586	9.765	84.981						
5	.488	8.136	93.117						
6	.413	6.883	100.000						

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V14a:Our company provides various formal training programs for performance of duties.	1.000	.770
V14b:Our company provides opportunities for informal individual development other than formal training such as work assignments and job rotation.	1.000	.794
V14c:Our company encourages people to attend seminars, symposia, etc.	1.000	.771
V14d:Our company provides various programs such as clubs and community gatherings.	1.000	.829
V14e:Our company members are satisfied by the contents of job training or self-development programs.	1.000	.387

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.551	71.025	71.025	3.551	71.025	71.025
2	.695	13.905	84.930			
3	.379	7.576	92.506			
4	.248	4.953	97.459			
5	.127	2.541	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V15a:Our company members can take action without a supervisor.	1.000	.483
V15b:Our company members are encouraged to make their own decisions.	1.000	.741
V15c:Our company members do not need to refer to someone else.	1.000	.533
V15d:Our company members do not need to ask their supervisor before action.	1.000	.808
V15e:Our company members can make decisions without approval.	1.000	.703

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.068	61.362	61.362	3.068	61.362	61.362
2	.861	17.215	78.576			
3	.550	11.006	89.582			
4	.364	7.289	96.871			
5	.156	3.129	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V16a:In our company, there are many activities that are not covered by some formal procedures	1.000	.761
V16b:In our company, contacts with our company are on a formal or planned basis.	1.000	.822
V16c:In our company, rules and procedures are typically written.	1.000	.582
V16d:In our company, members can ignore the rules and reach informal agreements to handle some situations	1.000	.691

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.756	68.901	68.901	2.756	68.901	68.901
2	.818	20.448	89.349			
3	.286	7.138	96.488			
4	.140	3.512	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V17a:Our company members can understand not only their own tasks but also others' tasks.	1.000	.704
V17b:Our company members can make suggestion about others' task.	1.000	.565
V17c:Our company members can communicate well not only with their department members but also with other department members.	1.000	.519
V17d:Our company members are specialists in their own part.	1.000	.661
V17e:Our company members can perform their own task effectively without regard to environmental changes.	1.000	.878

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.327	66.539	66.539	3.327	66.539	66.539
2	.766	15.314	81.853			
3	.498	9.967	91.820			
4	.254	5.078	96.898			
5	.155	3.102	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V18a:Our company provides IT support for collaborative works regardless of time and place.	1.000	.673
V18b:Our company provides IT support for communication among organization members.	1.000	.767
V18c:Our company provides IT support for searching for and accessing necessary information.	1.000	.642
V18d:Our company provides IT support for simulation and prediction.	1.000	.639
V18e:Our company provides IT support for systematic storing.	1.000	.695

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.416	68.317	68.317	3.416	68.317	68.317
2	.656	13.116	81.433			
3	.422	8.447	89.879			
4	.306	6.129	96.008			
5	.200	3.992	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V19a:Our company stresses gathering information from sales and production sites.	1.000	.804
V19b:Our company stresses sharing experience with suppliers and customers.	1.000	.828
V19c:Our company stresses engaging in dialogue with competitors.	1.000	.620
V19d:Our company stresses finding new strategies and market opportunities by wandering inside the firm.	1.000	.795
V19e:Our company stresses creating a work environment that allows peers to understand the craftsmanship and expertise.	1.000	.890

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotati
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.855	57.110	57.110	2.855	57.110	57.110	2.290
2	1.081	21.618	78.728	1.081	21.618	78.728	1.647
3	.524	10.471	89.199				
4	.321	6.416	95.615				
5	.219	4.385	100.000				

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V20a:Our company stresses creative and essential dialogues.	1.000	.812
V20b:Our company stresses the use of deductive and inductive thinking.	1.000	.372
V20c:Our company stresses the use of metaphors in dialogue for concept creation.	1.000	.820
V20d:Our company stresses exchanging various ideas and dialogues.	1.000	.842
V20e:Our company stresses subjective opinions.	1.000	.544

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.287	65.739	65.739	3.287	65.739	65.739
2	.780	15.595	81.335			
3	.601	12.027	93.362			
4	.187	3.749	97.110			
5	.144	2.890	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V21a:Our company stresses planning strategies by using published literature, computer simulation and forecasting.	1.000	.817
V21b:Our company stresses creating manuals and documents on products and services.	1.000	.777
V21c:Our company stresses building databases on products and service.	1.000	.756
V21d:Our company stresses building up materials by gathering management figures and technical information.	1.000	.602
V21e:Our company stresses transmitting newly created concepts.	1.000	.470

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.422	68.430	68.430	3.422	68.430	68.430
2	.631	12.616	81.046			
3	.529	10.589	91.635			
4	.240	4.799	96.434			
5	.178	3.566	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V22a:Our company stresses enactive liaisioning activities with functional departments by cross-functional development teams.	1.000	.716
V22b:Our company stresses forming teams as a model and conducting experiments, and sharing results with entire departments.	1.000	.660
V22c:Our company stresses searching and sharing new values and thoughts.	1.000	.819
V22d:Our company stresses sharing and trying to understand management visions through communications with fellows.	1.000	.649
V22e:Our company stresses benchmarking and test marketing	1.000	.642

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.485	69.706	69.706	3.485	69.706	69.706
2	.593	11.869	81.575			
3	.379	7.572	89.147			
4	.363	7.256	96.403			
5	.180	3.597	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V23a:Our company has produced many novel and useful ideas (services/products).	1.000	.755
V23b:Our company fosters an environment that is conducive to our own ability to produce novel and useful ideas (services/products).	1.000	.782
V23c:Our company spends much time for producing novel and useful ideas (services/products).	1.000	.674
V23d:Our company considers producing novel and useful ideas (services/products) as important activities.	1.000	.613
V23e:Our company actively produces novel and useful ideas (services/products).	1.000	.767

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.591	71.815	71.815	3.591	71.815	71.815
2	.533	10.653	82.468			
3	.317	6.335	88.803			
4	.312	6.244	95.047			
5	.248	4.953	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
V24a: Compared with key competitors, our company is more successful.	1.000	.653
V24b: Compared with key competitors, our company has a greater market share.	1.000	.862
V24c: Compared with key competitors, our company is growing faster.	1.000	.847
V24d: Compared with key competitors, our company is more profitable.	1.000	.837
V24e: Compared with key competitors, our company is more innovative.	1.000	.793
V24f: Compared with key competitors, our company has larger size in terms of turnover.	1.000	.850
V24g: Compared with key competitors, our company has more patents.	1.000	.680

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.523	78.895	78.895	5.523	78.895	78.895
2	.462	6.599	85.494			
3	.357	5.093	90.587			
4	.288	4.119	94.706			
5	.179	2.557	97.263			
6	.118	1.690	98.953			
7	.073	1.047	100.000			

Extraction Method: Principal Component Analysis.

Appendix 13 Regression Results

Regression Socialization

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.634 ^a	.402	.398	9.219

a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning

b. Dependent Variable: V19: Socialization

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13704.601	9	1522.733	60.732	.009 ^a
	Residual	13689.858	546	25.073		
	Total	27394.459	555			

a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning

b. Dependent Variable: V19: Socialization

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.533	39.157		2.421	.023
	V10: Codification strategy	2.267	.023	.292	3.169	.039
	V11: Personalization strategy	1.218	.254	.242	4.976	.021
	V12: Collaboration	2.291	.478	.313	4.029	.007
	V13: Trust	.514	.267	.523	4.499	.043
	V14: Learning	1.331	.472	.539	7.298	.008
	V15: Centralization	-.006	.734	-.089	-1.466	.044
	V16: Formalization	-3.153	.101	-.064	-1.985	.058
	V17: T-shaped skills	.148	.378	.205	2.912	.029
	V18: IT support	.128	.876	.200	.904	.014

a. Dependent Variable: V19: Socialization

Regression Externalization

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.607 ^a	.368	.375	8.406

- a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning
- b. Dependent Variable: V20: Externalisation

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10787.370	9	1198.597	42.557	.035 ^a
	Residual	15377.544	546	28.164		
	Total	26164.914	555			

- a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning
- b. Dependent Variable: V20: Externalisation

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40.295	38.095		1.850	.073
	V10: Codification strategy	.593	.227	.309	4.002	.008
	V11: Personalization strategy	1.289	.471	.185	5.497	.047
	V12: Collaboration	1.311	.885	.297	3.856	.038
	V13: Trust	2.023	.496	.376	5.330	.044
	V14: Learning	.772	.829	.639	9.031	.068
	V15: Centralization	-.374	.369	-.301	-4.358	.073
	V16: Formalization	-2.194	.575	-.101	-2.955	.061
	V17: T-shaped skills	.222	.700	.109	1.897	.059
	V18: IT support	.040	.320	.291	3.497	.036

- a. Dependent Variable: V20: Externalisation

Regression Combination

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.708 ^a	.501	.493	13.226

a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning

b. Dependent Variable: V21: Combination

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24171.786	9	2685.754	64.087	.022 ^a
	Residual	22881.734	546	41.908		
	Total	47053.521	555			

a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning

b. Dependent Variable: V21: Combination

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	74.442	55.162		.286	.348
	V10: Codification strategy	.468	1.350	.233	7.327	.064
	V11: Personalization strategy	1.554	.619	.441	7.235	.035
	V12: Collaboration	.461	.924	.193	.993	.052
	V13: Trust	1.113	1.276	.344	6.218	.023
	V14: Learning	2.447	.461	.303	6.787	.013
	V15: Centralization	-.754	.992	-.180	-2.958	.024
	V16: Formalization	-.156	1.197	.006	.571	.042
	V17: T-shaped skills	.184	.389	.159	1.344	.083
	V18: IT support	.313	.627	.365	2.392	.044

a. Dependent Variable: V21: Combination

Regression Internalization

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.727 ^a	.528	.521	17.237

a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning

b. Dependent Variable: V22: Internalization

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27191.439	9	3021.271	86.798	.053 ^a
	Residual	19005.207	546	34.808		
	Total	46196.646	555			

a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning

b. Dependent Variable: V22: Internalization

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	43.299	67.193		2.547	.051
	V10: Codification strategy	2.025	.805	.389	4.265	.038
	V11: Personalization strategy	1.540	.526	.301	5.277	.084
	V12: Collaboration	1.017	.875	.332	3.235	.028
	V13: Trust	.551	1.083	.309	4.288	.043
	V14: Learning	.800	.550	.468	5.896	.008
	V15: Centralization	-.258	.794	-.235	-5.606	.064
	V16: Formalization	-.380	.815	.079	2.342	.049
	V17: T-shaped skills	2.202	1.045	.188	3.398	.014
	V18: IT support	.110	.585	.092	1.645	.047

a. Dependent Variable: V22: Internalization

Regression KM Processes

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.688 ^a	.473	.469	19.171

- a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning
- b. Dependent Variable: Vkmp: knowledge management process

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29877.822	9	3319.758	86.798	.044 ^a
	Residual	20882.830	546	38.247		
	Total	50760.652	555			

- a. Predictors: (Constant), V18: IT support, V10: Codification strategy, V13: Trust, V16: Formalization, V11: Personalization strategy, V15: Centralization, V17: T-shaped skills, V12: Collaboration, V14: Learning
- b. Dependent Variable: Vkmp: knowledge management process

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	95.124	46.123		4.012	.031
	V10: Codification strategy	2.079	1.086	.327	6.253	.047
	V11: Personalization strategy	2.301	.990	.355	6.370	.006
	V12: Collaboration	.950	.740	.277	3.609	.011
	V13: Trust	1.945	.952	.424	5.179	.054
	V14: Learning	.513	.503	.487	7.476	.035
	V15: Centralization	.875	1.025	-.221	-3.089	.004
	V16: Formalization	-2.094	.343	-.039	-.973	.021
	V17: T-shaped skills	-.115	.796	.067	1.870	.081
	V18: IT support	1.868	.515	.107	1.746	.051

- a. Dependent Variable: Vkmp: knowledge management process

Regression Organizational Creativity (4 to 1)

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.744 ^a	.553	.549	9.327

a. Predictors: (Constant), V22: Internalization, V19: Socialization, V20: Externalisation, V21: Combination

b. Dependent Variable: V23: Knowledge creativity

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7382.497	4	1845.624	67.118	.043 ^a
	Residual	15151.507	551	27.498		
	Total	22534.003	555			

a. Predictors: (Constant), V22: Internalization, V19: Socialization, V20: Externalisation, V21: Combination

b. Dependent Variable: V23: Knowledge creativity

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	123.259	39.132		5.967	.040
	V19: Socialization	1.032	1.042	.492	3.310	.032
	V20: Externalisation	1.524	.317	.297	5.014	.006
	V21: Combination	.669	.479	.273	4.286	.038
	V22: Internalization	2.312	.433	.379	5.036	.046

a. Dependent Variable: V23: Knowledge creativity

Regression Organizational Creativity (1 to 1)

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.814 ^a	.662	.662	8.384

a. Predictors: (Constant), Vkmp: knowledge management process

b. Dependent Variable: V23: Knoweldge creativity

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1159.961	1	1159.960	55.708	.024 ^a
	Residual	11535.468	554	20.822		
	Total	12695.429	555			

a. Predictors: (Constant), Vkmp: knowledge management process

b. Dependent Variable: V23: Knoweldge creativity

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.242	29.099		2.438	.051
	Vkmp: knowledge management process	.908	.276	.447	4.694	.047

a. Dependent Variable: V23: Knoweldge creativity

Regression Organizational Performance

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.796 ^a	.634	.637	.456

a. Predictors: (Constant), V23: Knowledge creativity

b. Dependent Variable: V24: Organizational performance

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	716.764	1	716.764	70.216	.007 ^a
	Residual	5655.232	554	10.208		
	Total	6371.996	555			

a. Predictors: (Constant), V23: Knowledge creativity

b. Dependent Variable: V24: Organizational performance

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	136.191	57.103		11.522	.043
	V23: Knowledge creativity	.825	1.029	.572	6.051	.007

a. Dependent Variable: V24: Organizational performance