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Identifying success factors that influence the adoption process of ICT tools in China's SOEs and POEs

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Preface

The work of this thesis has been carried out as part of MSc in Project Management program at Norwegian University of Science and Technology (NTNU).

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Abstract

With the advent of globalization, increasingly companies span the globe in order to get highly competitive position and maximum profit (N.Dayasindhu, 2002). However, transferring information within these multinational organizations is a challenge, particularly when it comes to communication (Lucas and Leyland, 2006). Therefore, in order to keep a solid and rapidly economic growing and strengthen national competitiveness, Chinese enterprises have paid more attention to develop Information Communication Technology (ICT). Among all Chinese enterprises, China's state-owned enterprises (SOEs) and private-owned enterprises (POEs) are playing the most significant roles (Xiaohui Wang et al. 2007). However, little study has been done to research the use performance of ICT tools in China's SOEs and POEs. Consequently, this study addresses the question of what factors influence the adoption of ICT tools in China's SOEs and POEs. Due to the scholars such as Jozée and Arnaud (2005) argue that organizational culture can impede or encourage the adoption of ICT in firms, the study will consider how a particular organizational culture can influence knowledge sharing and in turn the adoption of the ICT tools in China's SOEs and POEs. Through literature review, we present theory on each of China's SOEs, China's POEs, organizational culture, ICT and general success factors related to ICT adoption process. The research was conducted through the use of online survey and two interviews respectively. We then analyzed these survey results and interviews using the theory we had already given in background chapter. From these two, we classified general success factors into three categories, namely 'important', 'good performance' and 'bad performance' for China's SOEs and POEs respectively. We found that organizational culture was not the only one main factor that influences the ICT adoption process. Other factors like organizational size and companies' background also have strong impact on prompting new ICT tools in China's SOEs and POEs. We conclude three main problems related to ICT adoption process and then, we put forward our suggestions to these problems.

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1 Introduction

1.1 Problem Formulation

With the "Open Door" policy implemented in 1978, China's economy is developing rapidly. According to IMF (2006), the average annual growth rate of China is near to 10% over the last three decades. Nowadays, China has become the world's second largest economy country only after the United States. Nevertheless, as the advent of globalization and global financial crisis, adopting Information and Communication Technology (ICT) in Chinese companies has become increasingly important. On one hand, more and more Chinese companies are venturing abroad and approaching the international marketplace in order to get highly competitive position and maximum profit (N.Dayasindhu, 2002). Therefore, how transfer information within these multinational organizations has become a challenge, particularly when it comes to communication (Lucas, 2006). On the other hand, under the sluggish economy, companies have to endure more competitive environment and economic pressure. Thus, enhancing the efficiency and core competency within companies is an increasingly urgent demand. Under these circumstances, implementing ICT systems become one of the best choices.

Using ICT tools enable the organizations to save huge time and money, dramatically decreases the requirement of travel, and thereby increasing the efficiency and effectiveness of companies (Bafoutsou G. and G. Mentzas, 2002). However, Mcbreen (2002) cautions that due to organization members need to

change existing attitude and values, adopting a new ICT tool is always tricky. It is not a simple and readily task and it often causes a dilemma to user companies (Guo and Miguel Baptista Nunes, 2008). Therefore, it is necessary to find success factors that suit specific organizational type for adopting new ICT tools. It's for this reason that we have embarked upon this study. Our chief research question is to:

What factors influence on implementing Information and communication technology (ICT) tools in different organization types?

In China, there are mainly seven ownership types: state owned, privately owned, collective owned (group owned or township owned), foreign directly invested, Sino-foreign joint venture, publicly owned and mixed owned. Comparing other ownership types in China, China's state-owned enterprises (SOEs) and private-owned enterprises (POEs) total contribute around 60% of overall proportion of GDP (Yifan Xu, et al. 2009). The develop path of China's SOEs and POEs are completely different. China's SOEs became dominate since the communist takeover China in 1949 and from 1980s, since China gradually changed its economy structure from the traditional planning economy to a market-oriented economy, SOEs started waning and have had no longer once one alone old scene. On the contrary, the POEs, as the conventional dominant ownership type before, banned from 1949 to 1977 and started recovering in 1980s. Until Deng Xiaoping, the former Chinese leader, took a south tour in 1992, POEs boosted in last two decades (Mu, 2004). However, both of these two types' enterprises are playing significant roles in current China economy. State owned company currently occupy the most key industry sectors in China,

including oil and gas, telecommunications, banking, military and public transportation industry and control bountiful resources. While, China's POEs represent reforming direction and breathe life into the China's economy (Xiaohui Wang et al. 2007). Therefore, we determine the main object of this paper is China's State-owned enterprises (SOEs) and Private-owned enterprise (POEs)

Nevertheless, adoption and maintenance of these ICT systems for both SOEs and POEs is a tough work (Alam and Nilufar Ahsan, 2007). On one hand, most of China's SOEs are lack of relevant experience and professional knowledge. On the other hand, until now, many China's POEs are still operating their business in a conventional way and are engaging in labor- intensive industry, which result in POEs not only lack related experience and knowledge but also some necessary resources. In addition, insufficient research has been done to investigate the ICT adoption status in the China and the success factors of ICT adoption on the SOEs and POEs. (Jennifer, Dimitrios Buhalis and Haiyan Song, 2003)

In order to reveal these issues, the thesis is organized as shown in Figure 1:

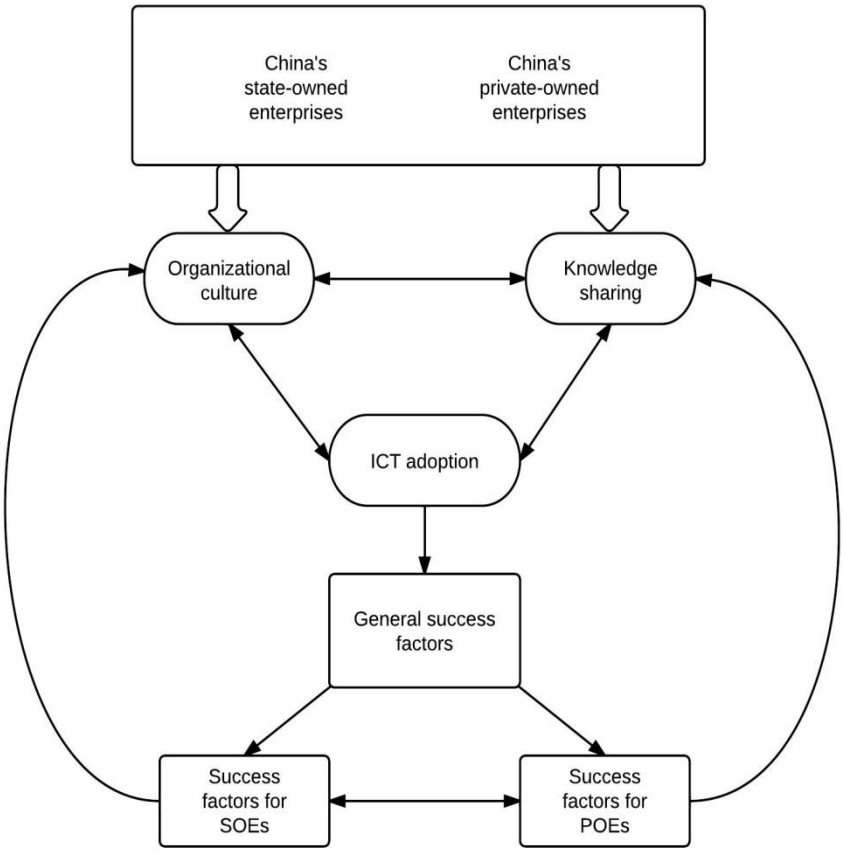

Figure 1 Research framework

We will start by introducing the background of China's SOEs and POEs. This will be done in the second chapter. In the third and fourth chapter, we will present theoretical background to our study. This is where we will use authentic sources to lay out the foundation for the paper. We will associate theories from different authors looking at the three main key points: Organizational culture, Knowledge sharing and Information Communications Technologies. After that, we will also go through several authentic sources to find out general success

factors for the ICT adoption process. From this chapter, we will analyze one by one where we will present our research methodologically. We will give justification on why we chose the used methods. We will consider their strengths and weaknesses. In chapter seven we will provide survey and interviews analysis to find out which factors are useful for SOEs and POEs, and put emphasis on the factor that particularly useful in one type. In chapter eight, we will present our findings from online survey and interviews. In chapter nine, we will discuss why ICT tools have different influence - if there are any - on State-owned enterprises and Privately-owned enterprises and how improve the use of ICT tools in organizations. We will analyze these based on the theory given in chapter 3 and 4. In the last charter, we will present our conclusions, limitation and recommendations for future work.

1.2 Research question

Therefore to restate the research question:

What factors influence on implementing Information and communication technology (ICT) tools in different organization types?

We would look at what success factors impact on ICT adoption process and how organizational culture and knowledge sharing interact and influence those success factors.

The focus of this study is to investigate what are the success factors of China's SOEs and POEs during implementing ICT systems, and then provide suggestion to improve the use of ICT tools in each type of organization.

2 A brief overview of State-owned enterprises and Private-owned enterprises

In this chapter, we start with a brief introduction for China's State-owned enterprises and Private-owned enterprises respectively. We will talk about their history, development path and current situation. Then we will carry out a comparison between these two China's main ownership types. We will focus on representing their difference in aspect of organizational size.

2.1 State-owned enterprises (SOEs)

According to Junyeop Lee (2009), the term "state-owned enterprises" (SOEs) refers to "business entities established by central and local governments, and whose supervisory officials are from the government".

Before 1978, the ownership structure of Chinese companies and western companies was very different. China's economy was a centrally controlled system where the state owned most economic entities, and government executed daily management. At that time, it was reported that SOEs represented 77.63% of overall industrial production (Junyeop Lee, 2009). From the reform and open-door policy was implemented in 1978, private-owned business began to prosperity and China entered to a new era. Through two decades of reform, now SOEs no longer totally dominate the economy and China comprises at least seven ownership types: stated owned, privately owned, collective owned (group owned or township owned), foreign directly invested, Sino-foreign joint venture,

publicly owned and mixed owned (Junyeop Lee, 2009). Among them, however, state owned company still occupy the most key industry sectors including oil and gas, telecommunications, banking, military and public transportation industry. At the same time, SOEs yielded more than 35% of overall GDP in 2000s averagely. However, the Chinese Statistical Yearbook represents that the GDP share rate of SOEs declined slightly from 37.6% in 1998 to 34.5% in 2002 and modified labor proportions of SOEs in urban workers and staffs from 66% in 1994 sharply decreased to 34% in 2006 (China Statistical Yearbook, 2008).

The partial reason is because the restructure policies of China since mid-1990s. These policies reflect the motto "retain the large and release the small" and government decided to list some large state firms and sale small SOEs (David A. Ralston, et al. 2006), as a result, a large number of SOEs exited from the ranks of state industry and some of the small SOEs being sold off to private individuals. Thus, most of current China's SOEs are the leaders in each industry and occupy enormous resources.

2.2 Private-owned enterprises (POEs)

According to Xiaohui Wang et al. (2007), POEs refers to "the companies that are founded, owned and run by domestic individuals, groups and non-governmental and non-public organizations". Xiaohui Wang, Baiyin Yang and Gary N. McLean (2007) also classify current ownership forms of China's POEs into four categories, which are private partnerships/cooperative businesses, private sole proprietorships, private-holding companies and individual/family businesses respectively.

The history of private owned company in China was only around 40 years, and this type of enterprises was completed banned between 1952- 1977 by the Chinese government (Young, 1995). In 1978, due to Chine implemented 'open door' policy, China began to move toward a new socialist market based economy that allows the existence of the private ownership (Alistair R. Anderson, et al. 2003). However, at the early of 1980s, the government stipulated that POEs are not allowed hiring more than eight employees, and until 1988, the regulation was modified as the National People's Congress authorized the establishment of private enterprises could employed more than eight employees (Hongbin Li, et al. 2008). However, the private owned enterprises still suffered both political and social discrimination and deal with an unfavorable economic environment.

The situation changed after the Deng Xiaoping, the former Chinese leader, took a south tour in 1992. Afterward, POEs finally got the chance to change their destiny. Since 1993, the Chinese government started to conduct reforming SOEs ownership structure (Yi-min Lin and Tian Zhu, 2001). At the early period of SOEs restructuring movement namely mid-1990s, although many SOEs wish to privatize, the government restricted the numbers of privatizations in order to maintain an orderly flow of privatizations so as not to overwhelm the fledgling stock markets (Gongmeng Chen, et al. 2006). Until to 1997, POEs was just started to be recognized as an important component of the economy (David A. Ralston, et al. 2006). At that time, small businesses and entrepreneurship boomed in China in the post-reform environment and have made a great contribution to the national economy (Chow and Fung, 1996). From zero in

1970s, POEs has employed the most, almost 50% of total employment and contributed 60% of the industrial output by 2004. Furthermore, POEs yielding 21 per cent of overall GDP and keeping the annual growth rate in 20% in the recent 20 years (Xiaohui Wang, et al. 2007) (Hongbin Li, et al. 2008).

2.3 Comparing with China's SOEs and POEs

SOEs became dominate since the communist takeover China in 1949 and from 1980s, they started waning and have had no longer once one alone old scene. Nevertheless, the POEs, as the conventional dominant ownership type before, banned from 1949 to 1977 and started recovering in 1980s until now (Mu, 2004). Currently, POEs have occupied the most emerging industry with the fastest increasing rate in the state economy (Wang, 2005). In other words, POEs represent the reforming direction and future of China (Xiaohui Wang, Baiyin Yang and Gary N. McLean, 2007). However, based on Felicia Fai and Jing-Ling Duanmu (2005)'s investigation, most of China's POEs are smaller than SOEs (average 620 employees in SOEs and 182 employees in POEs). What's more, compared with SOEs ,POEs were denied involved into certain sensitive industries such as oil industry and military industry, afforded more taxes, had less limited channel and harder to loans from state banks, gained less market inside market information, more restricted to obtain land and other resources, and oftentimes encountered interference from local governments (Asian Development Bank, 2002). For example, based on the statistic of Skoko Hazbo, Ceric Arnela and Huang Chun-yan (2008), China's POEs can only get 14% of all amount loans from government bank and credit cooperatives, 8%

from private finance organizations, 24% from inter-firms borrowings, and 54% money from other sources, such as civil private capital. On the contrary, SOEs controls most of the resources, occupies the most crucial sectors. What's more, state-owned enterprises still enjoy their privileged status in obtaining bank loans and other key inputs (Che, 2002). To some extent, both SOEs and POEs are playing the most crucial roles in Chinese economy. Under this circumstance, choosing Chinese SOEs and POEs as the investigation subjects made this research extraordinary meaningfulness.

A brief comparison between China's SOEs and POEs is shown in Table 1.

Table 1 Comparison between China's SOEs and POEs (adapted from (Yifan Xu, , 2009), (China Statistical Yearbook, 2008), (Deng, 2012), (Xu, 2010))

	Number of firms	Asset of firms	Number of Urban Employed Persons	Average Wage in year	Overall proportion of GDP	Profit (Jan.2012 to Feb.2012)
SOEs	0.143 million (2008)	4770 Billion (2008)	65.164 million (2010)	38359 Yuan (2010)	Around 38% (2008)	170.91 billion Yuan
POEs	3.6 million (2008)	2570 billion (2008)	60.71 million (2010)	20759 Yuan (2010)	21% (2008)	200.2 billion Yuan

Chapter summary

In this chapter, we have looked at China's SOEs and POEs. We conducted a comparison between these two ownerships. We also presented a table at the

end of this chapter to show the difference of organizational size between China's SOEs and POEs.

3 Organizational culture and knowledge sharing

In this chapter, we will talk about organizational culture. We will give a framework, from previous studies, on different cultures. Using this framework and knowledge theories, we will then link the two and talk about organizational culture and knowledge sharing. Next, we will introduce the organizational culture and knowledge sharing of China's SOEs and POEs.

3.1 The importance of organizational culture on the functions of organizations

In his 1979 paper, Pettigrew defined culture as:

"*The system of such publicly and collectively accepted meanings operating for a given group at a given time. This system of terms, forms, categories, and images interprets a people's own situation to themselves*."

He goes on to state that as a group represents itself to itself and the world, at birth, it:

Emphasizes, ignores, distorts and thereby attaches names and values to the physical fabric, structures, purposes and activities around it. The symbols that arise out of these processes, including beliefs about use and distribution of power, privilege, the rituals and myths that legitimize those distributions have significant consequences for the organization (Pettigrew, 1979)

Therefore, from the above it can be seen that not only is an organization's culture about its core beliefs and rituals. These very beliefs impact its functional performance

3.2 Background of Organizational Culture

But what is organizational culture?

The definition of the term organizational culture can be confusing especially because of the prominence of Hofstede's 1983 work on the equally important topic of national cultures and differences. While Hofstede's original study classified national cultures, according to five dimensions, in this paper the differences will not be due to national socialization. Our research will focus on a slightly different topic. We will be focused on the organizational culture difference between POEs and SOEs.

While it has been studied a lot and has been identified as a source of sustained superior financial performance, there is little consensus on organizational culture (Barney, 1986) (Lopez-Nicolas and Meroño-Cerdán, 2009). Lopez-Nicolas & Meroño-Cerdán (2009) and Jones, Jimmieson & Griffiths (2005) state independently that while there is no agreed definition on organizational culture, most scholars use Schein (1992)'s three dimensional view of organizational culture. These dimensions are ***assumptions, espoused values and artifacts*** *and* ***behaviors***.

Park, Ribière and Schulte Jr (2004) consider the following two definitions of organizational culture as being exemplary:

"Routinized ways of doing things that people accept and live by. Organizations have norms and values that influence how members conduct themselves. These norms may prevent members from applying a maximum effort or may encourage them to do so"

- (Blake and Mouton, 1969)

"A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that had worked well enough to be considered valid, and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems"

- (Schein, 1992)

Lopez-Nicolas and Meroño-Cerdán (2009) state that values are considered to be central to understanding organizational culture. And that they are also a reliable representation of OC.

Using the values dimension, Cameron and Quinn (1999) built up on earlier research work by Quinn and Rohrbaugh (1983), the Competing Values Framework (CVF) of OC, and produced another framework for diagnosing OC and management competency. The theoretical framework also provided the basis for understanding OC. The figure is reproduced below:

Flexibility and discretion

Culture: CLAN **Orientation**: COLLABORATIVE **Leader Type**: FACILITATOR MENTOR TEAM BUILDER **Value Drivers**: COMMITMENT COMMUNICATION DEVELOPMENT **Theory of Effectiveness**: HUMAN DEVELOPMENT AND PARTICIPATION	**Culture**: ADHOCRACY **Orientation**: CREATIVE **Leader Type**: INNOVATOR ENTREPRENEUR VISIONARY **Value Drivers**: INNOVATIVE OUTPUTS TRANSFORMATION AGILITY **Theory of Effectiveness**: INNOVATIVENESS, VISION, AND NEW RESOURCE
Culture: HIERARCHY **Orientation**: CONTROLLING **Leader Type**: COORDINATOR MONITOR ORGANISER **Value Drivers**: EFFICIENCY TIMELINESS CONSISTENCY AND UNIFORMITY **Theory of Effectiveness**: CONTROL AND EFFICIENCY WITH CAPABLE PROCESSES	**Culture**: MARKET **Orientation**: COMPETING **Leader Type**: HARD DRIVER COMPETITOR PRODUCER **Value Drivers**: MARKET SHARE GOAL ACHIEVEMENT PROFITABILITY **Theory of Effectiveness**: AGGRESSIVELY COMPETING AND CUSTOMER FOCUS

Internal focus ad and integration

External focus and differentiation

Stability and Control

Figure 2 Types of organizational cultures (Cameron & Quinn, 1999) as taken from (Lopez-Nicolas and Meroño-Cerdán, 2009)

Based on Lopez-Nicolas and Merono-Cerdán (2009), a brief description of each of the four culture types as below:

Clan: The clan culture encourages a friendly, familial approach towards colleagues. The management's role is seen as that of a mentor. Emphasis is on collaboration and teamwork. Members of the organization see themselves as part of something bigger, the team. Efficiency is achieved through human development and participation. As Lopez-Nicolas and Merono-Cerdán (2009) note, this management style and culture is synonymous with Japanese companies.

Adhocracy: As the name implies, the approach here is more ad hoc. The values under this culture type are creativity and innovation. Therefore the leader is usually a visionary, an innovator and entrepreneur. The values drivers are innovative outputs, transformation and agility. The environment values the individuals more, encouraging spontaneity (Lopez-Nicolas and Merono-Cerdán, 2009). An example of this type of organization was given as a consulting company, where each client demand is treated as project. Therefore the firm organizes a project team for this particular client. Once the task is accomplished, the team is disbanded. Therefore all of these teams and their governance are ad hoc.

Hierarchy: In this approach, the management is in control. They coordinate, organize and monitor progress. Efficiency and control, coupled with capable processes are the means of achieving effectiveness. Processes here are standardized and approached in more elaborate bureaucratic manner. Clearly defined goals form a basis of effectiveness in this culture. As Lopez-Nicolas and

Merono-Cerdán (2009) note this constitute a wide range of organizations, from fast-food chains and large conglomerates (such as Ford Corporation) to government agencies.

Market: This is a competition oriented culture. The focus is on the customer. This tends to be aggressive and have a winner takes all attitude. The management style is hard driver focused on results. In this environment there is likely to be very little collaboration. In many respects it is the anti-thesis of the clan culture. An example of this is typified by former General Electric CEO Jack Welch. In the 1980s, while at the helm of the conglomerate, he demanded that each GE business unit be either the best or number two in their market. If they were not, then they were sold off.

Learning culture

3.3 Organizational culture and knowledge sharing

According to Lopez-Nicolas and Merono-Cerdán (2009), citing Caccia-Bava et.al (2006) and Schein (1985), organizational culture is believed to be the most significant input that could encourage or impede learning in companies. They conclude that organizational culture must be considered an antecedent not the result of knowledge sharing. Therefore based on the above, organizational culture should in theory play a significant role in influencing knowledge sharing in organization.

Below shows how the different organizational cultures identified in affect knowledge transfer in organizations.

Adhocracy and Knowledge Sharing

While Lopez-Nicolas and Meroño-Cerdán (2009) state that few studies have been conducted to link organizational culture and knowledge management, there have been some. Apart from their study, Hendriks (2004) has also looked at the role of culture on knowledge sharing. He stated that adhocracy, which he calls entrepreneurial culture, is dichotomous. On one hand it is an open culture and therefore likely to encourage sharing among members. But equally important, it is founded on individual initiative and independence. This high value of independence could act as a barrier to willingness to share information. As he states it's '*task-oriented*' as opposed to '*people-oriented'*. The individual's focus on performing their tasks and delivering might leave little room for them to socialize and share knowledge with others.

Market Culture and Knowledge Sharing

Hendriks (2004) states that in the market culture the focus is on achieving specific objectives or goals. The culture is task-oriented and closed in nature. There is lack of loyalty towards the company by the professionals. They see the relationship purely in a contractual manner. They would deliver as per contract, knowing that the more they fulfill their contractual obligations, the greater the reward from the employer. This culture directly links reward (or punishment) with performance. This relationship would be analogous to transactional economics or agency theory between the firm and its employees. It stands to reason therefore that in such goal-oriented culture, sharing would not be 'intuitive'. Sharing goes against its principles, except if explicitly stated in the contract. Therefore while this culture does not explicitly impose barriers to

sharing, it conditions the professionals to engage in a *quid pro quo* relationship with the firm. The professional will share knowledge if the contract requires them to do so. Knowing that the more they share, the more they will be rewarded. But if this is not stated in the contract they would not have professional need to do it and therefore would be less likely to do so. It is our opinion that this approach by the market culture could prove wasteful. If the employees are motivated professionals, more value could be obtained by encouraging a culture of sharing that is not dependent on a reward system.

Clan culture and Knowledge Sharing

On the clan culture, Hendriks (2004) states that they are characterized by such value systems as allegiance, socialization, teamwork and solidarity. He classifies such organizations as having closed, people-oriented culture. He states that people are encouraged to share knowledge, especially within the organization. The problem that he envisages is one where they have to share with what they regard, internally, as 'outsiders'. The clan mentality that works well for the good of the company is likely to act as hindrance to knowledge sharing from what they might perceive as intruders. The culture tends to be inward oriented. On knowledge management means, he states that the employees prefer face-to-face meetings. Therefore, he argues that they are less likely to use impersonal media such as the company intranet or technology-based knowledge systems.

Hierarchical Culture and Knowledge Sharing

Hendriks calls this culture the bureaucratic culture. As he points out, it is characterized by rules and work processes. He uses DeLong and Fahey (2000) to support his theory that '*horizontal knowledge sharing at the level of operation is*

mostly problematic, particularly between functions and departments'. Therefore it can be concluded that the hierarchical culture does not encourage knowledge sharing. This is especially the case when one considers its emphasis on tasks, as opposed to people and also its closed nature.

Lopez-Nicolas and Merono-Cerdán (2009) further concluded from their research that only clan and adhocracy cultures could enhance the use of ICT in organizations. They state that '*specifically, clan values are found to be determinant in the implementation of ICT for personalization, while adhocracy culture has a positive significant influence on ICT for both codification and personalization strategies'*. They elaborate that these results for clan culture are consistent with the values shared by members of clan companies. These values include teamwork facilitating employees' participation and knowledge sharing (Cameron and Quinn 1999).

Adhocracies on the other hand are focused on innovation, entrepreneurship and dynamism. Therefore new technologies, like e-Collaboration, which can enhance all of these values, are welcome. They are used to manage knowledge both for codification and personalization (Lopez-Nicolas and Merono-Cerdán 2009).

3.4 Organization culture in Chinese SOEs and POEs

Traditionally, the pre-reform SOEs were dominated by the Hierarchy and Clan culture (Tianyuan Yu and Nengquan Wu, 2011). However, due to the restructure movement of Chinese SOEs that we mentioned in 2.1, China's SOEs has

become more market based and external orientation. Whereas, SOEs still remain stronger hierarchy culture factors than POEs in China (Deshpande R, 2000). Both of Boisot Max & John Child (1996) and Zhang Jianjun (2010) prove that China's SOEs are dominated by Hierarchy culture.

Boisot Max and John Child (1996) further state that China's SOEs own a Feudal Hierarchy culture rather than Bureaucratic Hierarchy. Based on the definition from Boisot (1986), the former one is maintained by the leaders' personal power and influences with low codification and the later one is run by impersonal, formal rules and regulations with high codification. He stressed this point because the organizational culture should be changed follow the path of modernization from Feudal Hierarchy to Market. For example, the western path to modernization is from Feudal Hierarchy towards Bureaucratic Hierarchy firstly and then due to the decentralization, it shift to Market culture. However, the situation in China is different. Boisot Max and John Child (1996) argue that although the reform movement of China's SOEs can be viewed as the determination process, the dominant organizational culture in China's SOEs still tends to be Feudal Hierarchy. The main reason is because China's SOEs are still at a low level of codification, as a result, leaders in SOEs are more likely to have some unethical behaviors, such as playing favoritism and committing irregularities, and giving promotion depending on "guanxi" rather than performance and the rule of law (Haina Zhang, 2011). Such atmosphere also compels people have to preserve their 'face', avoid direct confrontations, and maintain cooperative relationships for the sake of survival.

Zhang Jianjun and Hean Tat Keh (2010) also through three aspects to prove China's SOEs own the hierarchy culture. First of all, they point that SOEs often possess monopoly resources and policy strength that leading them to an advantageous bargaining position. As a result, they have gradually lost their motivation to develop a Market culture. Secondly, because the deficient supervision system in SOEs, these enterprises are likely to become a hotbed of corruption. Managers of SOEs have the opportunity to benefit themselves from receiving bribes from their potential business partners or suppliers. Therefore, when these companies choose their partners or suppliers, the key factor that they cared is whether or not they have a good relationship with companies' managers, rather than focus on the cost effectiveness and quality of their services or equipment. Consequently, all of those SOEs' potential business partners or suppliers like to ingratiate themselves with companies' managers, and companies have less drive for improving efficiency. Finally, compared with POEs, the longer organization histories also bring inertia to SOEs in daily working. Many modern management ideas and methods that learned from western companies only acted a ritual in SOEs. People, especially for those worked at one firm more than twenty years, usually rely on their experience to manage daily issues and they are difficult to accommodate themselves to changes.

The organization culture in POEs differs from that of SOEs in nature (David A. Ralston, et al. 2006). They argue that POEs have Clan and Adhocracy culture rather than Hierarchy culture. They pay much higher emphasis on innovation and scientific research rather than achieve political targets like SOEs. Therefore,

managers and employees in POEs generally have more research and innovative capability in their specialized area (Haina Zhang, et al. 2011). Also, China's POEs provide brightly career prospects and friendly working environment to attract talents. A large portion of managers in POEs are well educated and hold top-tier universities backgrounds or special technical certifications.

3.5 Knowledge sharing in POEs and SOEs

According to Nee and Cao (2005), the excessive government policy support result in SOEs fostered their inertia to learn and adapt new technology. Instead, POEs are faster at knowledge sharing and learning new rules due to the competition and pressure for survival in an expanding economy. Felicia and Jing-Ling (2005) also indicate that POEs have to engage in knowledge sharing in order to keep their competitiveness in their own fields. They further explain the current situation of knowledge sharing in China by comparing SOEs with POEs in terms of 'Knowledge Level' and 'Knowledge Efficiency', as shown in Table 2. In the light of definition from Felicia and Jing-Ling (2005), Knowledge Level represents '*the quantity of knowledge the company possesses*' and Knowledge Efficiency indicates a qualitative of knowledge or '*the use of knowledge to develop capabilities*'. In our opinion, these two aspects are interactive. When applied knowledge to develop capability, the new capability will create new knowledge and then increase the knowledge level. Therefore, we believe that knowledge efficiency can be viewed as a process of redeveloping new knowledge.

Table 2 Knowledge sharing comparing: SOEs vs. POEs source from (Felicia and Jing-Ling, 2005)

	SOEs	POEs
Knowledge Level	High	Medium-low
Knowledge Efficiency	Medium-low	High

Felicia and Jing-Ling (2005) found that SOEs have adequate technology capacities and strong financial backing to undertake R&D investment, which contribute to upgrade their potential technological capability in a long term. And also, SOEs obtain more opportunities to cooperate with foreign enterprises under the government support. They can buy technology and achieve a good amount of knowledge. Therefore, SOEs have high Knowledge Level. However, SOEs cannot transfer their technologies into know-how and capabilities building availably. Generally, SOEs only imitate original equipment that they have bought or only make some basis modification on them to develop their own products rather than absorbing their quintessence to innovation. Such a practice reflects the relatively low levels of Knowledge Efficiency in SOEs. Compared with SOEs, POEs are always smaller, and harder to get financial support from bank and government. In most of cases, POEs prefer to maximize their existing equipment by devoting themselves to learning process and innovation rather than to purchase new equipment like SOEs. Therefore, POEs have relatively low Knowledge Level but high Knowledge Efficiency.

In addition, Xiaohui Wang, al et (2007) state that POEs performed better than SOEs in 'promoting inquiry and dialogue', 'promoting collaboration and team learning', 'empowering people toward a collective vision', 'establishing systems to capture and share learning', 'connecting the organization to its

environment' and 'providing strategic leadership for learning', except the dimension of 'creating continuous learning opportunities (no difference)'. On a whole, POEs have a greater competiveness than SOEs in knowledge sharing. This might be explained by the theory of Lopez-Nicolas and Merono-Cerdán (2009) that Adhocracy culture is benefit to the knowledge sharing and ICT adoption since its high codification. What's more, the reason why there is no difference between POEs and SOEs in the aspect of 'creating continuous learning opportunities', is partly because the fact that SOEs have been required by the government to institute continuous training and education programs (Xiaohui Wang, al et 2007)).

Chapter summary

In this chapter, we presented literature on organizational culture and knowledge sharing. First, we presented each of these separately. Then we linked the two to show how they interact. We also talked about organizational culture and knowledge sharing in China's SOEs and POEs respectively.

4 Information communication technology

In this chapter, we will talk about Information Communication Technology. First, we will present some background information related to ICT, for example the advantage of using ICT tools. And then, we will classify common ICT tools into several categories. Next, we will introduce the situation of ICT in China. We will also link ICT adoption with organizational culture and show how they interact. Last, we will talk about the process of ICT adoption.

4.1 General ICT background information

With the advent of globalization, increasingly companies and inter-organizations span the globe, in order to get highly competitive position and maximum profit (N.Dayasindhu, 2002). However, transferring information within these multinational organizations is a challenge, particularly when it comes to communication (Lucas and Leyland, 2006). This is because traditional communication methods such as face to face contact and snail mail are unsuitable for transferring information across huge distances, within reasonable time. As a result, information communication technologies (ICT) play a central role in enhancing information sharing and it has become a new communication channel that to some degrees instead of the traditional communication methods. As Hoffman (1985) said, the international competitiveness can be dramatic improved by adopting ICT tools effectively.

Using ICT tools enables the organizations to save huge time and money, dramatically decreases the requirement of travel, and thereby increasing the

efficiency and effectiveness of decision making (Bafoutsou and Mentzas, 2002). ICT tools also help companies and organizations to collect, process, store and share information (Lopez-Nicolas & Merono-Cerdán, 2009). For example, search engines and database based on the Internet or Intranet can improve the organizational efficiency by reducing the cost and efforts associated with information searches. And ICT tools like virtual meetings, images and video clips can help geographically dispersed teams share information and document across different cities, countries or even continents and then, enhance team's collaboration (Abudayyeh O., al et. 2001). What's more, firms can apply ICT tools to extend their business and provide more comprehensive customer service as well (Skibniewski and Nitithamyong, 2004). Apart from being used in companies, another important function of ICT tools is their utilization in the education. From using 'PowerPoint' when you make a presentation to downloading course curriculum from E-Learning system like *It's learning*, *Wattle* and *WebCT*, ICT tools are around of us.

4.2 The classify of ICT tools

The development history of ICT is always accompanied with Computer technology, Internet and Telecommunication upgrade. Each ICT tool is based on at least one or more above. Nowadays, ICT has covered a huge field of hardware, communication software and office equipment (Sohal, al et. 2001). However, ICT tools have been classified into various ways from different aspects of ICT. One is from Ana Isabel, al et. (2006), they argue that ICT tools are more than only computer software or the Internet, their effect on economic

and business fields should be recognized. According to their research, there are two angles to understand what ICT tools are. One is from an economic and management point of view where ICT tools are considered as a social construction, an information provider, an infrastructure (both hardware and software) and a business process and system. Another point of view is from a marketing viewpoint, which views ICT tools as a variety of applications, a promotional channel, a communication media and a tool for relationship marketing. Other researchers like Athanasios Drigas, al et. (2011) consider all of ICT tools can be divided into two categories: synchronous and asynchronous respectively. Synchronous tools are those tools that enable communication at the same time from different places. Usually communication here is in real-time. Examples of these include chatting tools like Skype, MSN and Video conference. In contrast, asynchronous tools like Email, Wiki and Podcast enable the communication at different times, from different places (Ashley and Julia, 2003). Besides communication tools, there are also other computing ICT tools such as Spread sheet, Presentation tools and Data maintenance and so on. What's more, some ICT tools are used in course management, such as Learn management system and Content management system. Social networking is another popular field of ICT tools. Facebook, MySpace and Twitter are some of the more common tools in this area. Last, both project management systems and workflow systems are collaboration tools based on ICT. Figure 3 gives a detailed picture of ICT tools and their classification.

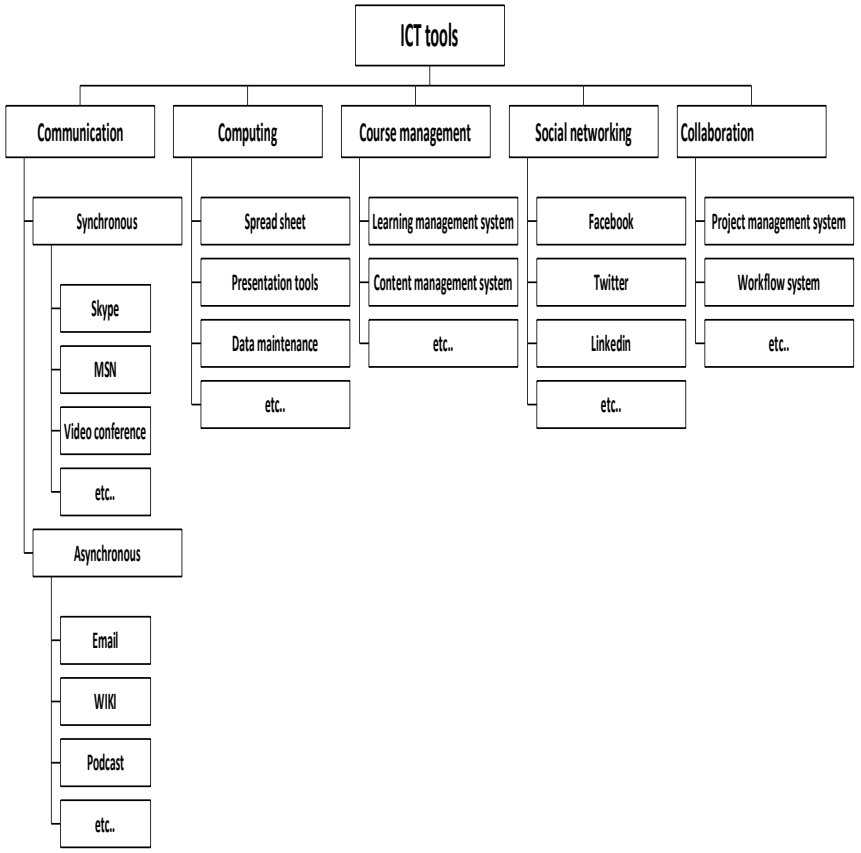

Figure 3 Classification of ICT tools

4.3 The situation of ICT in China

In order to keep a solid and rapidly economic growing and strengthen national competitiveness, Chinese government has paid more attention to develop ICT. ICT has been gradually realized as an important contributor to industrialization and globalization by Chinese government (Press L., al et. 2003). In 1992, Chinese government adopted a developmental policy of 'informatization', which efficiently promoted ICT development in some major industries in China (Zheng and Yingqin 2005). However, referring to the current situation of

China's ICT adoption and diffusion in China, Meng and Li (2002) reveal that Chinese companies spend considerable money on hardware (88.1%), but only 7.3% of the total consumption on software and IT service. Therefore, they believe that the overall level of the ICT usage in Chinese organizations was still relatively low. Liying Shen, al et. (2006) further indicate that in China, ICT has been widely used in many areas such as office automation and communication by e-mail or instant messaging software. However, most of Chinese companies especially those EPC (Engineering, Procurement and Construction) firms still have not applied some advance software such as Primavera Project PlannerP6 and Microsoft project to manage and control their projects while those software are wildly used by their global competitors (Shen L. Y., al et. 2006). Xu and Greenwood (2006) also argue that some large Chinese construction enterprises even do not have any specialized software which has been required by overseas client, such as ETABS structural design software in international bidding work area. Those limited uses of ICT makes a lot of Chinese companies fail to achieve better performance in the global market.

What's more, limited literatures discuss the situation of ICT adoption in China. Even few make comparisons between SOEs and POEs. According to Yifei and Yu (2011)'s research, there is no large gap in innovative between SOEs and POEs, in other words, POEs are no more innovative than SOEs. This situation does not respond to David A. Ralston, et al. (2006)'s research finding: '*POEs pay much higher emphasis on innovation and change than SOEs*'. The reasons are complex. Yifei and Yu (2011) explain that on the one hand, SOEs have improved their management philosophy and skills caused by China's recent

changes in SOEs structures, management and culture, and they are becoming increasingly innovative and flexible. On the other hand, Chinese POEs have not possessed enough capabilities to integrate internal and external resources to pay higher attention to innovation since the government policies mentioned before. Therefore, these two aspects narrowed the gap between SOEs and POEs on the efficiency and effectiveness of innovation. However, Yifei and Yu (2011) only compare the innovative capabilities which just reflect partial variables influencing the adoption of ICT tools in companies without conducting further comparisons on other respects such as the availability of human, knowledge capital and so on. Therefore, the findings of Yifei and Yu (2011) cannot be regarded as an ample explanation to the current situation of ICT adoption in China's SOEs and POEs.

4.4 Organizational culture and ICT adoption

Many researchers believe that organizational culture play a crucial role in the aspect of adopting an ICT tool in enterprises (Jozée and Arnaud, 2005) (C. Pullig, et al. 2002) (Matthew and Philip, 2007) (Guo and Miguel, 2008) (Gichoya and David, 2005) (Lopez-Nicolas and Meroño-Cerdán, 2009). They believe that organizational culture influences the management style and the flow of decision making, and then indirectly impact whether or not managers support to employees, or whether or not mangers provide enough training to them during the ICT adopt process (Gichoya and David, 2005). Lopez-Nicolas and Meroño-Cerdán (2009) argue that a flexible, dynamic and innovative organization culture has a great positive influence on the adoption of ICT tools.

Jozée and Arnaud (2005) believe that in Canada, a hierarchy culture has positive effect on technology adoption, while adhocracy culture has negative effect on the communication effectiveness. However, does this mean that this theory is suitable for China's SOEs and POEs? And why their conclusion is different from Lopez-Nicolas and Merono-Cerdán (2009)'s argument: "only clan and adhocracy cultures could enhance the use of ICT in organizations"? No evidence can explain that. Therefore, one of the major purposes of this study is to figure out the relationship between the organizational culture and ICT adoption effectiveness in China's SOEs and POEs.

Based on the Jozée and Arnaud (2005) theory, it can be considered that '*China's POEs are more adept at adopting a new ICT tool than SOEs*'. This thesis will look at this issue.

4.5 ICT adoption process

Based on the literature research, there is no mature model for adopting new ICT tools related in SOEs or POEs. However, Robertson, Webb and Fluck (2007) proposed a model for adopting ICT tools in education sphere. This can be looked upon as a rudimentary model for ICT tools for general application. According to their model, there are seven steps to integrate new ICT tools in education as shown in Figure 4(adapted from (Robertson, Webb, and Fluck, 2007)).The first step is about preparation, which starts with involving motivated participants. They also emphasized the significance of analyzing local context. Then in step 2, the work is aimed at building an appropriate working environment for change to happen. What is more, alignment of activities and involving senior personnel to

support the process is also considered essential. After achieving an agreed outcome, identifying the constraints to successful integration of ICT tools and trying to bridge them will be done in the step 3. Afterwards, new ICT tools can be put into practice in step 4. During this step, recognizing what you have known and raising insightful questions regarding that knowledge is the suggested way for understanding what changes happened due to the new ICT tool. The next step is the process of professional learning for embedding ICT tools. And then in step 6, ICT tools are integrated into the organizational practice. Finally, the last step is related to the debriefing period for improvement in the future.

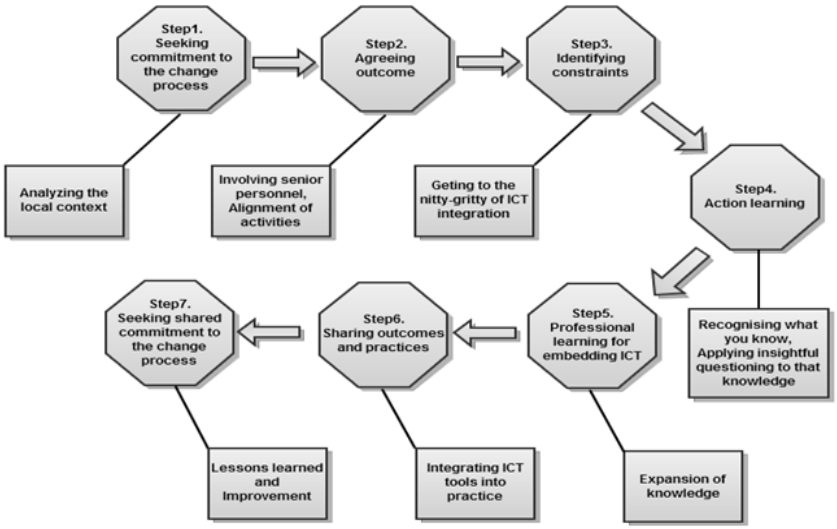

Figure 4 Adoption process of ICT tools (Adapted from (Robertson, Webb, & Fluck, 2007))

However, comparing with Tearle and Penni (2003)'s 'general process used for implementation of project', the theory of Robertson, Webb, & Fluck (2007) has many limitations and need to be modified.

First of all, before the Step 1: Seeking commitment to the change process, it should have one more step such as 'Identifying the need'. Finding out the reason why the company needs to adopt a new ICT tool is important. It will provide initial mental picture of the functions of the ICT tool and how it fits in with the organization's needs. Any new tool adopted in organization will cause change, but people are unlikely to accept change unless they know how the change will impact on them or they can get support from the top organization level (Schwahn and Spady 1998). Therefore the need of identification stage provides justification for system acquisition. It is the quickest way to find out whether the project is worth taking. The step 'Identifying the need' is aimed at providing enough reasons to seek support from top managers and demonstrate the benefits if the organization, and by extension employees, use the tool. Afterwards, both top managers and employees' commitment to the change process will be much easier to achieve. In order to realize the need identification, fully understand the tool that will be adopted is fundamental. Questions such as: what is the function of tool? why do we need it? and how large impact to both employers and employees will it have? are necessary. What's more, asking those questions gives the project manager the opportunity to map information flow pattern within the organization. Understanding early on, the flow of current communication within the company and discussing with senior managers will also help in the later stages of managing the project.

The whole process could be continued to planning phase only if top managers reach a commitment to apply the new ICT tool in company, or the ICT adoption process will be terminated. Such commitment is pretty important, because once

this committee is established by top managers, a criteria list that they are able to use to measure a system and address their requirements can be created. And once the list had been refined and most of people feel that the list best represents what the company needs, then they could find out what constraints will impact on ICT tools' implementation and consider above constraints carefully during planning stage. During planning phase, people should think about two prospects, one of which is to discover what they do have (AS-IS) and the other is understand what they really what to achieve (TO-BE). The critical part in this stage is to seek an answer about how could improve from 'AS-IS' to 'TO-BE'. Therefore, planners should ask themselves over and over again why to do it, when to do it, where to do it and how to do it.

After planning phase, the adoption process goes into implementation which is affected by three main points: training, culture for knowledge sharing and making proper infrastructure at workplace. There are two sub processes under the training aspect. They are 'Action Learning' and 'Professional learning' respectively. These two sub processes respond to stage 4 and stage 5 in Figure 4. Besides training, the culture of knowledge sharing helps to build a typical atmosphere in company, which to a certain degree, has a strong influence on the whole adopt process. As Lopez-Nicolas and Merono-Cerdán (2009) said, Clan and Adhocracy culture are more adaptable to cultivate a learning atmosphere, and therefore have a positive impact on ICT adoption. Whereas, Market and Hierarchy culture have negative influence on the whole process, as a result, top managers should understand what the company culture is and know how to make best use of the advantages and bypass the disadvantages. The third perspective

that impacted on implantation phase is the infrastructure at company or workplace. As the name suggests, ICT (Information Communication Technology) is a technology used to communicate information. Therefore, without enough infrastructure support such as high speed internet, some ICT tools like video conference or IP camera cannot be exploited effectively.

The next stage is Follow up, during this stage, managers should check the deviation of current achievement with plan by asking two questions. The first is 'How well did the chosen processes?' and the second is 'How well did the team follow the chosen processes?' (Wysocki, 2011). Managers should ask themselves those two questions along with using them to adopt a new ICT tool. If there is no deviation, the adoption process continues to the next check point. However, if the current situation has diverged from previous plan or employees have poor performance, the process should return to the planning stage to reconsider the rationality of initial plan and strategy. It should be noted that the support from top managers is supposed to follow the 'Implement' stage and 'Follow up' stage. During these two periods, providing enough resource and establishing positive company policy are pretty substantial to the success of a new ICT tool's adoption.

If the final check point doesn't reveal any deviation from plan and everything goes smoothly, which imply that the process of adopt ICT tool is near to end. However, this stage is also crucial to the whole process. Before top managers approve the success of ICT adoption process, an examination may be required in order to figure out how much employees know or don't know the new tool. What's more, final summary and lesson learned also play a crucial role on the

whole process since that means the knowledge and experience has stored and transferred.

The modified ICT adoption model is shown in Figure 5 (use Tearle and Penni (2003)'s 'general process used for implementation of project' for reference.)

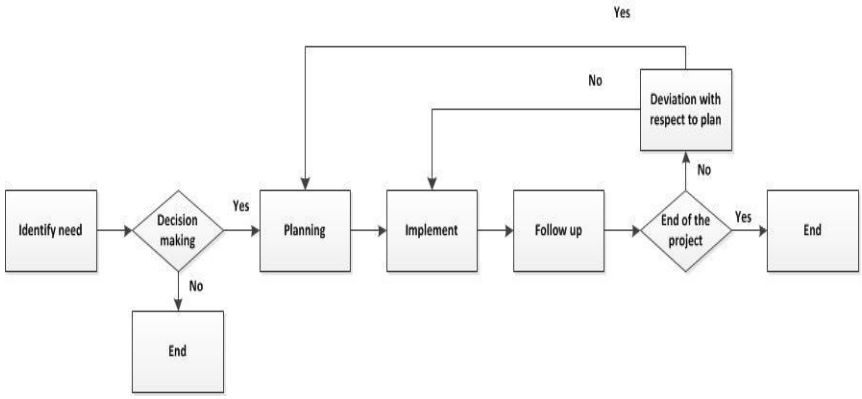

Figure 5 Modified ICT adoption process

Chapter summary

In this chapter, we presented literature on ICT. First, we presented a brief introduction about ICT including the advantage of using ICT in firms and what ICT tools are. Then, we talked about the situation of ICT in China. We also linked ICT with organizational culture to show how they interact. Finally, we presented our ICT adoption process model based on literature.

5 Success factors in ICT adoption process

Although there are enormous advantages related to the use of ICT tools within companies, employees are sometimes unwilling to use them (Mathieson, 1991). The reason that resulting this phenomenon is complicate, a few researchers were engaged in interpreting this phenomenon by finding success factors that impact on the ICT adoption in companies. In this section, an overview of previous findings and brief review of their research work will show in follows.

5.1 Overview of success factors relating ICT adoption

Rashid and Al-Qirim (2001) conclude four major categories from macro point of view that related to the process of ICT adoption in companies, which are technological, organizational, environmental and individual.

1. **Technological factors**: The aspect of technological factors includes the cost, complexity and compatibility of the new ICT tools.
2. **Organizational factors**: Organizational factors relate to the size of firms, the quality of infrastructure, the specialization areas of the firm as well as the extent of organizational support.
3. **Environmental factors**: In the aspect of environmental factors, firms' competitive pressure and government policy impact the ICT adoption.
4. **Individual factors**: Individual factors mainly reflect managers' innovativeness and knowledge.

Although Rashid and Al-Qirim (2001) does not point out the level of influences of those factors on specific periods of the adoption process, they realize that some factors may have stronger influence than others at particular stages. The most obviously example is that since the government policy and external competitive pressure have provided prominent motivation for adoption new ICT tools, environment factors impact on the firms whether or not require adopt a new ICT tool in identify need period.

Ali Alaghbandrad, et al. (2011) provide a more detailed statement for each success factors, and they consider infrastructure, culture matters, training, regulation, user friendless, financial issues and compatibility are the main factors that influencing ICT adoption process. For each category, a brief statement written by Ali Alaghbandrad, et al. (2011) as follows:

1. **Infrastructure**: First of all, infrastructures such as high speed internet, convenient network access are the preconditions of using some communication tools such as video conference software.
2. **Culture matters**: The culture matters mentioned by (Ali Alaghbandrad, 2011) are about the people whether or not can adapt with new ICT tools in their work. Ali Alaghbandrad, et al. (2011) state that some of people are difficult to accommodate themselves with new technologies due to they are afraid of their information easily stolen through the internet. Therefore, ensuring the data security and being integrity when utilizing ICT tools can help some people embrace new stuff. What's more, one of the most appropriate ways to encourage employees to use new ICT

tool is that they can experience benefits themselves from using that tool.

3. **Training**: Training is also important for the ICT adoption. Ali Alaghbandrad, et al. (2011) find that company is better to educate their employees inside of the company in order to tailor the content of training.
4. **Regulations**: As the technology development, some regulations should also be revised to smooth the ICT development in company. For instance, electron signing technique is getting mature and it can reduce much paper work, however, many firms still not accept it.
5. **User friendliness**: User friendliness means that users can easily master the new ICT tool, which is crucial for those middle aged or elderly employees who have limited computer or other related knowledge.
6. **Financial issues**: Guaranteed financial support from top managers assures cultivate skilled employees effectively and which is also one of prerequisites for ICT adoption.
7. **Compatibility for ICT adoption among firms**: Ali Alaghbandrad, et al. (2011) state that an ICT tool cannot be adopted in a company successfully unless it compatible with other software and hardware of both internal company and external business partners.

Vachara and Derek (2005) also conclude a number of factors in five categories relating to ICT adoption. As the supplementary of Rashid and Al-Qirim (2001) and Ali Alaghbandrad, et al. (2011) have mentioned above, Vachara and Derek (2005) further argue that training and learning atmosphere as well as support

environment in companies are extraordinarily significant for the ICT adoption process. The detail content as follows:

1. **Self-motivation:** The first category is regarding to the self-motivation, which concludes distinct benefit from using ICT tools, easy to use ICT tools, confident on using ICT tools, enjoyment on learning and previous experiences. The motivation of employees determine whether they willing to adopt new application or reject it. In addition, a super-learning environment as well as sufficient previous experiences can facilitate the process of learning and promote employees willing to use new tools.
2. **Training and technical support:** The second category is related to training and technical support, which contains two aspects. One aspect is about quality and time of training, and the other is about the technical support. Vachara and Derek (2005) believe that training and technical support directly influences the performance of ICT tools' adopted in companies. Through providing training programs to employees, they can learn these tools better than self-study. Enough technical support ensures problems of end-users can be timely solved.
3. **Technology characteristics:** The compatibility and complexity of the ICT tools as well as employees background technology knowledge belong to the third category, technology characteristics. These two factors also impact on the learning and adoption of ICT. For instance, if the tool is designed easy-use, the employees may learn it faster,

otherwise the adoption process require more motivation from management support.

4. **Workplace support environment:** The forth category is workplace support environment that includes personal and organizational commitment and enough resource provided by company during the implementation process. Organizational support can give employees impetus and benefits to use ICT tools. Therefore, the level of employees' determination on using ICT is much relying on the extent of support from top managers and organizations.
5. **Sharing and learning environment:** The last category is related to sharing and learning environment. Vachara and Derek (2005) state that an open discussion and favorable sharing environment promote the ICT knowledge diffusion within companies. Furthermore, through developing communities of practice, the level of shearing and learning environment can be significant improved.

Besides above factors, Delone and McLean (1992) also find that the employees' attitude toward ICT tools are inextricably linked with ICT tools usage. Delone and McLean (1992) believe that employees' positive attitude toward ICT tools can enhance the extent of their use of ICT tools in daily work and vice-versa. In addition, Houghton et al. (2001) and Houghton & Winklhofer (2004) focus their attention on the knowledge background of employees. They state that if employees have technical difficulties or lack of IT knowledge, a tendency to depress the rate of adoption may happen in company. Furthermore, Paul and Pascale (2003) through investigating a sample of 164 UK firms find that larger

sized companies are more likely to adopt new ICT tools than smaller sized companies.

The summary of success factors in ICT adoption process is shown in the Table 3:

Table 3 Summary of success factors based on (Craig Allan, 2003), (Walker, 2004), (Guo Chao Peng, 2008), (Smallbone D., 2001), (Mehrtens J., 2001), (Gichoya, 2005), (Vachara Peansupap, 2005), (Ali Alaghbandrad, 2011), (Rashid M. A., 2001)

Technological factors	ICT compatibility with business partners; System security in using ICT; ICT are ease of use; Sufficient support from system vendors
Organizational factors	Organizational size Supportive and committed management support; Professional support; Enough resource support; Previous experiences and lessons learned; Efficient collaboration and communication between departments; Explicit ICT development plan; Actively invlolvement of employees; Return on investment
Environmental factors	Competitive pressure ; Supplier pressure; Government policy; Competitive advantage relative to competitors; Supporting openly discuss; Supporting colleagues help and sharning each other; Tailored training content for specific situation; Enough training time
Inidividual factors	Manager's knowlwedge and innovativeness; Managers's actively involvement; Employees are willing to disclose problems;

Inidividual factors	Managers are willing to modify ICT system based on feedbacks from users; Clear benefits of use ICT; Supporting tangible and intangible reward; Education background; Employees'attitudes toward ICT

5.2 Success factors regarding to ICT adoption process

Although there are large number of researchers engage themselves in exploring success factors for the whole ICT adoption process, few of researchers are classified these factors in terms of different stages of ICT adoption process. The result of this situation is that managers only know what are really matters for the adoption process, rather than when to pay attention to what factors. In order to deal with this problem, we identified success factors that mentioned in Table 3 into five stages and using these success factors as the questions in our survey.

1. **Identify need:**

***Concerning on the attitude of Employees toward ICT (Q1)*:** Managers care about employees' feeling when they are preparing to adopt a new ICT tool in company.

***Managers' knowledge and innovativeness (Q2)*:** Before company promotes information and communication technology tools, managers should aware and know the new ICT tool.

***Concerning on the education background of employees (Q3)*:** Before company promotes information and communication tools, managers consider

the background knowledge of employees (such as computer background) in order to estimate whether or not their employees can be familiar with ICT tools in future.

***Enough budgets for ICT investment (Q4)*:** Before company promotes information and communication tools, managers ensure company has enough money for ICT investment.

***Sufficient previous experiences and lessons learned (Q5)*:** Before company promotes ICT tools, managers consider whether company has previous successes experience on related field.

Appropriate return on investment of ICT (Q6): Before company promotes ICT tools, managers consider the return on investment of those tools.

2. **Planning**:

***High security of ICT system (Q7)*:** Company's managers and designers are concerned about the security of information in ICT tools.

***Explicit ICT development plan (Q8)*:** Before company implements this tool, an explicit business and ICT development plan should be established.

***Ease of use (Q9)*:** People who involved in the design and implement phases of ICT tools are concerned about the ease of use of this tool.

***Commitment between planners and managers (Q10)*:** Commitment has been reached between planners and managers regarding to ICT development plan before implementation phase.

***High compatibility of ICT system (Q11)*:** Those ICT tools that using in company are compatibility with company's external trading partners and internal different departments.

3. **Implementation**:

Favorable learning atmosphere (Q12): Company has a favorable learning atmosphere, which includes:

- ***Open discussion (Q12-1)*:** Company encourage open discussion and sharing experiences between colleagues.
- ***Colleagues help each other (Q12-2)*:** Co-workers often help each other.
- ***Managers help subordinates (Q12-3)*:** Managers often help subordinates.
- ***Co-workers share knowledge and information (Q12-4)*:** Co-workers often share knowledge and information.

High quality training (Q13): Company provides high quality training program regarding to the ICT tools, which includes:

- ***Sufficient training time (Q13-1)*:** Company provides sufficient training time.
- ***Training is tailored for the specific tools (Q13-2)*:** Company's training is tailored for the specific tools.
- ***Encourage communication and share knowledge (Q13-3)*:** Company encourages communication and knowledge sharing.
- ***Provides reward (Q13-4)*:** Company reward to employees according to the result of training.

***Managers' active involvement (Q14)*:** Managers actively involved in ICT adoption process.

***Efficient collaboration and communication (Q15)*:** Collaboration and communication between functional departments or work units is efficient and effective.

***Enough resource support (Q16)*:** Company provides enough resource, including money, time and human resource during development of ICT tools.

4. **Follow up:**

***Willing to disclose problems (Q17)*:** People are willing to reveal problems, faults and failures rather than preservation of 'face' and afraid of receiving negative response from managers.

***Actively modify ICT system (Q18)*:** Managers actively modifying their ICT system based on feedback from users.

***Sufficient support from system vendors (Q19)*:** ICT system's vendors provide sufficient supports and services.

5. **End:**

***Competitive advantage relative to competitors (Q20)*:** After promoting ICT tool, company achieves technology competiveness compared to competitors.

***Supporting tangible and intangible reward (Q21)*:** Employees receive tangible or intangible reward because using ICT tools.

***Lessons learned* (Q22):** After the ICT adoption process, the lesson learned could be collected for future use.

Chapter summary

In this chapter, we presented literature on success factors of ICT adoption. We listed success factors from three main articles. Then, we drew a conclusion by presenting a table. In the end, we linked these success factors with ICT adoption process, and classified them into five stages which are Identify need, Planning, Implementation, Follow up and End.

6 Research Methodology

In order to compare the situation of ICT adoption in China's SOEs and POEs, in this study, two research methodology methods were used. The first was a quantitative method that was making an online survey to those people who not only worked in POEs or SOEs but also more or less have experienced in ICT adoption process. The second was a qualitative method that interviewing two persons who were considered knowledgeable and experienced in the field of ICT adoption, one is from POEs and another is from SOEs. Both online survey and interviews were conducted in Chinese.

The above two method approach is the modification of the complementary or triangular method. This approach is used to increase construct validity, to identify correct operational measures for the concepts being studied as discussed in (Yin and Robert K., 2009). When only one method is used, it's prone to have inherent flaws. These flaws could severely impact the study. However, if more than one method is used then the faults of one method are balanced by another. What's more, using triangular method makes the study more convincing and accurate since multiple sources show the same fact or phenomenon.

6.1 Online survey:

As the leap-forward development in computer and internet fields in the past decades, increasingly people began to use online survey to conduct their questionnaire (Yun and Trumbo, 2000). Recently, the technology of online survey has improved vastly. Creating an online survey no longer require web

programming and HTML code background like as before, people can design their surveys only by using online survey software, which make online survey research much easier and faster (Wright and Kevin, 2005). However, according to Wright and Kevin (2005)'s research, using online survey also has its pros and cons.

6.1.1 Advantage of online survey:

Wright and Kevin (2005) conclude three distinct advantages of online survey. They are access to individuals in distant locations, time saving and money saving respectively.

Firstly, they believe that online survey research with the help of internet can access larger population than other research methodology in worldwide. You can even design your research survey and processing data statistic without stepping outdoors. What's more, it is easier to access your target group through sending your survey's web link in virtual communities. For example, in this study, we sent a web link of our survey to several specific virtual groups of QQ, the most popular free instant messaging computer program in mainland China, and the simultaneous potential respondents may near one hundred.

Another advantage of online survey is time saving. As mentioned before, through sending web link, researcher can reach hundreds or even thousands of potential respondents in a short period of time no matter of where they are. This is a huge advantage compare to other research methods like face to face interview or post survey to respondents. What's more, the software provider also helps you collect your survey data continuously in 24 hours even you are offline

after you distributed your survey. Therefore, you can threw yourself into work when you waiting survey's responses. Nowadays, most of online survey providers also offer various survey templates, copious question types, advanced survey logic and branching function and real-time reporting systems to analyze your data. What's more, online survey providers can export the original data format to CSV, SPSS and other statistic software. Therefore, it is easier to analyze your survey.

The last advantage of online survey is cost saving. Comparing with traditional paper survey, researchers who use online survey are no longer need to pay labor fee and paper cost. These expenses are usually enormous even in a relatively small paper survey.

As an example from our study, we only used two weeks to conduct this questionary from question design until to close the survey. During that period, we totally collected 95 responses and all of respondents were working in China at that time.

6.1.2 Disadvantage of online survey

The most significant disadvantage of online survey is the comparatively low response rate (Janet Ilieva, et al. 2001). According to Comley (2000), web based online survey only has 15% to 29% total response rate which is significantly lower than e-mail surveys (25% - 50%). Although there are hung number of potential respondents, most of them may dislike involving in the survey or view it as a waste of time if there is no prize for them.

What's more, another issue in the online survey is the data quality. Researchers have no opportunity to guide respondents to fill the survey. They are also difficult to get feedback from respondents in the light of each question. As a result, respondents may produce ambiguity to those questions or misunderstand the instructions. For example, if one respondent request further information or clarification on one or some issues, he or she is hard to contact the people who conduct that survey unlike the face to face interview. Therefore, researchers must consider the language that respondents used. In addition, simple sentences as well as unambiguous words are also required in online survey. For example, in some cases, two simple questions are better than one long question in order to avoid confusion. And words like usually, normally, frequently can have different meanings to different people, as a result, these words are liable to response bias (Naresh and K. Malhotra, 2006).

As an example from our study, we tested the survey before distributed it to potential respondents. However, many respondents still misunderstood some questions which result in their responses did not meet our requirements. Among those invalid responses, some of them were incomplete and some questions' answer were contradictary. As a result, the total validate rate of this survey was only 19.7%.

6.1.3 Likert-type scale：

In this study, we selected Likert-type scale method in our online survey, which created by Rensis Likert in the 1930s and nowadays, have developed to probably the most popular response scale featured in survey (Glenn, 2007). Before

designing survey, the number of categories in each question needs careful consideration. Glenn (2007) states that people are not capable of applying their point of view more than nine and less than three. Furthermore, the number of options in each question should be an odd number due to a neutral point is required for most of respondents (Naresh and Malhotra, 2006). Finally, according to Andrew and Claire (1997), 5-point and 7-point rating scales are by far the most common lengths in Likert-type scale. Both Dawes & John (2008) and Alwin & Krosnick (1991) find that 5-point and 7-point scales are the most accurate comparing with other scale types, as a result, we chose 5-point scale in our online survey and scale ranging from strongly agree to strongly disagree. Specifically, we coded the responses accordingly: Strongly disagree = 1, disagree = 2, neither disagree nor agree = 3, agree = 4, and strongly agree = 5. In addition, Naresh and Malhotra (2006) suggest that a certain number of negative questions are required in online survey in case of respondent blindly answer questions. In this case, it is should be noticed that the data get from this online survey are demanded to treat as interval scale, and this means that the options selected to the negative questions by respondents be scored by rotating scale.

6.1.4 Overview of online survey

The survey was hosted at Surveygizmo (http://www.surveygizmo.com/). It contains total 39 questions and expected to take 8 to 10 minutes to answer. Among them, 8 questions are related to background information of respondents, 30 questions that used Likert-type scale method are related to ICT adoption

success factors based on literature review and 1 question is related to overall evaluation of ICT system. A short introduction including the description of this survey, the purpose and some general information for example several common ICT tools were showed at the beginning. In order to avoid ambiguous question, we sent a web link of test-survey to 5 of our friends and 2 of managers from SOEs and POEs respectively, and then we got some useful advices to modify the initial edition. Therefore, the second edition of our online survey was revised sufficiently in aspects of the words choice, sentence construction and the order of questions.

The main background questions are:

Organizational size in terms of turnover and number of staff;

Organizational area of expertise;

Respondents' working status;

Respondents' role in the ICT adoption process.

Other 30 questions are related to the success factors that shown in Table 3, 5 of which are asked in negative way and other 25 are in positive way. Among these questions, question 12 and 13 (*Q12 & Q13*) have four sub-questions respectively.

The last question is asked whether or not respondents believe the ICT adoption process in their company is successful.

Besides the questions that mentioned above, one open question is placed at the end of the survey, respondents are all welcome to provide any comments regarding to this survey.

6.2 Interviews

In this study, we conducted two interviews with two managers from SOEs as well as POEs. The interviews were semi-structured. The questions were designed related to research question.

6.2.1 Advantages of interview

The first advantage of interview is that interview is a quick way of getting relevant information. The interviewees are people with considerable experience within this field. Therefore, they are more likely to have had experience with issues raised in this study. This could either be at a personal level (as employees of knowledge organizations) or through their research, since both are involved in academic research. What's more, since this is done face to face, it is easier to pick up on any nuance that cannot be easily communicated through any other means. It is also a more efficient method. Since we are conducting the interview, we can guide the focus of the interview so that the topics of discussion are only centered on what we consider relevant to our study. It also allowed the interviewee to mix their personal experience with professional opinions. One such way of doing this would be through anecdotes. While they would start on a personal level, they usually are used to drive home a point based on professional opinion. Semi-structured interview was chosen over a structured interview because of its flexibility. It allowed the interviewees to fully express themselves within the confines of the topic. In a structured interview, however, they would have been limited only to each question behind asked. It would not have afforded

much room for them to share with the interviewers any relevant information outside that which the researchers sought. In semi-structured approach, the interviewers can choose to skip some of the questions if they feel that they have been answered as part of an answer for another question.

The other advantage of this interview is that as the authors talk to the interviewee, they can pick up quite quickly (from their responses) if the respondent misunderstood the question. This can then lead to a rephrasing of the question or clarification of point that is the source of misunderstanding.

As an example from our study, the first interviewee gave an anecdote of his experience related to knowledge sharing in his company. He mentioned that in his company, each department holds a morning meeting to discuss what employees have learned recently. This helped put in more understandable terms his point about knowledge sharing. Although he had already stated the point, it wasn't until he told the story that a mental image began to form. From these, further questions were asked about his opinion on promoting new ICT tool.

6.2.2 Disadvantages of interview

It is hard to decouple personal feelings from professional opinion or conclusion. More often than not the interviewee is influenced by their personal experience, therefore might have distorted view of a question being put forth. This is more so because the interview is real time. Had the interviewee had time to think the answers over, they might have had opportunity to give more 'professional' or 'objective' answer. But since there was not enough time to evaluate and revise

what they said, there is a chance the answers given were not always what they would regard as the best.

The other disadvantage of interviews, especially semi-structured ones, is that they can get out of topic if not properly handled. If the interviewer cannot properly control the interview, the interviewee might spend a lot of time discussing what is essentially off topic and irrelevant to the research question. Last, it is hard to find interviewees who are knowledgeable in most area fields and willing or able to avail themselves for an interview. Therefore considerable amount of time is spent trying to organize with the interviewees and fitting into their rather hectic professional (and personal) schedules.

As an example from our study, both interviewees had to squeeze us in to their rather tight schedules. These two interviewees were extremely busy during that time. Therefore, interview's time was changed several times due to their tight working schedule.

Chapter summary

Chapter 6 dealt mainly with the used methodology. It was concerned with reliability issues of the project. We started the chapter by presenting the different actual methods that used to gather data for the project. We looked at the advantages and disadvantages of each method. In the next chapter we will present the results.

7 Online survey and interview results

In this chapter, we will present the results of online survey and make a brief summary for our two interviews. A more detailed analysis is represented in Chapter 8: Findings and Chapter 9: Discussion.

7.1 Online survey

7.1.1 Response rate

After launched the survey for one week, 95 responses are received, and 59 of which are valid. Among them, 32 respondents are working in SOEs and 27 respondents are working in POEs, the proportion of valid responses from SOEs and POEs are 54.2% and 45.8%. The total number of invitation is around 300. Therefore, the response rate is 31.7% and valid rate is 19.7%.

Table 4 Overview of survey

Total invitation	Total responses	Valid responses	Valid of SOEs	Valid of POEs	%Responses	%Valid
300	95	59	32 (54.2%)	27 (45.8%)	31.7%	19.7%

Based on some feedbacks from respondents, the reason of invalid responses and low responses rate are identified as:

1. The survey has too much questions and respondents have to take around 15 minutes to answer.
2. There is no relevant incentive to respondents

3. Due to the internet problems in China, many respondents complained the web link of survey cannot be opened or they can only browse the first page and cannot turn page.

7.1.2 Data validation

For online survey, data validation is a primary process before further analysis (S.M. Jafari, 2006). Only if the related reliability coefficient of data is proved higher than a standard value, the further analysis can be viewed as meaningful. According to the formula of Rosner and Bernard (2010), the sample size for this survey should be 624 (the level of significance (α) is 0.05 and false negative rate (β) is 20%). Due to the number of responses of this survey is lower than the theoretic sample size, we have to prove the data validation from other sides before further analysis. Because the purpose of this survey is comparing the situation of ICT adoption in China's SOEs and POEs respectively, we viewed these two items as variable factors in this survey and then calculated effect size to examine how much the number of sample pool impact on the final result. The calculation was made by '*Effect Size Generator*', and the answer is 0.15636 (Cohen's *d*).

				95% Confidence Intervals	
Pooled standard deviation:	.89083	Derived effect size (Cohen's d):	.15845	-95% (Lower Bound) –	+95% (Upper Bound)
				-.35453	.67143

Figure 6 Effect Size calculated by *'Effect Size Generator'*

According to Cohen (1992), the guideline of effect size for the social sciences is shown in Table 5:

Table 5 Guideline of effect size for the social sciences

Effect size	Effect size
Small	0.10
Medium	0.30
Large	0.50

The effect size of this survey is 0.15845, which slight higher than 0.10 but lower than 0.30, therefore, the size of survey's sample pool only has small effect on the analysis result.

In order to further ensure the data validation, we also tested the reliability coefficient of survey. Among several reliability coefficients, this study chose Cronbach's alpha, one of the popular coefficients, as reference criterion and calculated it by Excel. According to Joseph and Rosemary (2003), '*When using Likert-type scales it is imperative to calculate and report Cronbach's alpha coefficient for internal consistency reliability for any scales or subscales one may be using*'.

The commonly accepted level for describing data validation using Cronbach's alpha as shown in Table 6:

Table 6 Accept level for Cronbach's alpha adapted from (George and Mallery, 2003)

$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

In this survey, the Cronbach's alpha value is 0.912 and higher than 0.9, therefore, it can be concluded that the result of survey is reliable.

7.1.3 Individual background

As the primary focus of this study is finding the success factors of ICT adoption and identifying the difference between China's SOEs and POEs, therefore, two types of analysis need to be done in this study, they are

- Finding the success factors for China's SOEs and POEs
- Calculating correlation on each two data column for China's SOEs and POEs.

The overall data analysis is done with Microsoft Excel 2010.

The sample is comprised of 59 respondents and 54.2% of the respondents (32) are working in SOEs and the rest 45.8% (27) are working in POEs. Among them, 22 respondents have experience on Identify need stage of ICT adoption project, 13 respondents have experience on Planning stage, 26 respondents have experience on Implementation stage, 16 respondents have experience on Follow up stage and 12 respondents have experience on End stage. Most respondents have been working for their company for 10 to 30 month (39.6%). The average working months is 46.9 month. Having working experience will help them to understand most terms in the survey and it also means that they have more opportunity to use ICT tool in their daily work. In addition, most of companies that respondents working in hold less than 50 million Yuan in assets (37.5%), however, the average assets of SOEs is 12.63 billion Yuan and 15.6 % of SOEs even hold more than 10 billion Yuan in assets. What's more, SOEs overall have more employees than POEs. More than 70% of SOEs have 500 or more employees but only 25% of POEs have the similar size. Therefore, SOEs that involved in this survey are much bigger than POEs either in the total assets

or the number of employees. A summary of the sample description of individual's background is presented in the Table 7.

Table 7 Sample description of individual background

	Generally		SOEs		POEs	
	NO.	%	NO.	%	NO.	%
Months worked	Response rate: 89.8%					
0-10	9	17%	2	3.8%	7	13.2%
10-30	21	39.6%	11	20.8%	10	18.9%
30-50	10	18.9%	7	13.2%	3	5.7%
50-100	8	15.1%	6	11.3%	3	5.7%
100+	5	9.4%	3	5.7%	2	3.8%
Mean working months	Generally: 46.9		SOEs: 55.2		POEs: 36.8	

Experience on ICT adoption project	Response rate: 69.5%	
	NO.	%
Identify need	22	37.3%
Planning	13	22.0%
Implementation	26	44.1%
Follow up	16	27.1%
End	12	20.3%

Company's assets (Chines Yuan)	Response rate: 54.2%					
Fewer than 50 million	12	37.5%	1	3.1%	11	34.4%
50 million-3 billion	9	28.1%	7	21.9%	2	6.3%
3 billion-10 billion	6	18.8%	6	18.8%	0	0%
More than 10 billion	5	15.6%	4	12.5%	1	3.1%

Mean company's assets	Generally: 103.5	SOEs: 126.3	POEs: 74.1

Number of employees	Response rate: 83.1%					
Fewer than 100 employees	7	14.3%	2	14.3%	5	25%
100-500 employees	16	32.7%	6	20.7%	10	50%
500-2000 employees	15	30.6%	13	44.8%	2	10%
More than 2000 employees	11	22.4%	8	27.6%	3	15%
Mean number of employees	Generally: 1843		SOEs: 1760.3		POEs: 1961.7	

7.1.4 Data analysis

Before calculating the mean score of each factor, it should be noted that negative questions should be recoded scores to ensure that the direction of the scale is the same for all items.

7.1.4.1 Success factors

Due to the success factor Q12-1 to Q12-4 are the sub-factors of the success factor 'favorable learning atmosphere' (Q12), the final synergy score for Q12 is the average of all the five factors from Q12 to Q12-4.

Table 8 Score of Favorable learning atmosphere

Success factors	Mean		Standard deviation	
	SOEs	POEs	SOEs	POEs
Q12 Favorable learning atmosphere	3.53	3.70	1.02	0.95
Q12-1 Open discussion	4.03	4.04	0.82	1.09
Q12-2 Colleagues help each other	3.91	4.07	0.86	0.69

Q12-3 Managers help subordinates	3.78	3.81	0.83	1.08
Q12-4 Co-workers share knowledge and information	4.03	4	0.74	1.07
Synergy=(Q12+Q12-1+Q12-2+Q12-3+Q12-4) /5	3.86	3.93	0.87	1.00

Table 8 shows that the synergy score of China's POEs is slightly higher than SOEs, which means that the learning atmosphere in POEs is a little better than that in SOEs. However, these two different ownership types received almost same mean score in Q12-2 and Q12-4, namely Open discussion and Co-workers share knowledge and information. The most distinctive difference between SOEs and POEs appeared on the factor Q12-2, which SOEs received 3.91 with s.d. of 0.86 and POEs received a higher score of 4.07 and the s.d. value is 0.69.

As the same reason, the final synergy score for Q13 is the average of all the five factors from Q13 to Q13-4.

Table 9 Score of High quality training

Success factors	Mean		Standard deviation	
	SOEs	POEs	SOEs	POEs
Q13 High quality training	3.88	3.63	0.94	0.79
Q13-1 Sufficient training time	3.69	3.63	0.93	0.79
Q13-2 Training is tailored for the specific tools	3.91	3.89	0.73	0.70
Q13-3 Encourage communication and share knowledge	3.88	4.00	0.79	0.83
Q13-4 Provides reward	3.09	2.81	0.93	0.93

Synergy=(Q13+Q13-1+Q13-2+Q13-3+Q13-4) /5	3.69	3.59	0.87	0.91

Table 9 shows that the synergy score of whether the respondents consider their companies have high quality training is 3.69 for SOEs and 3.59 for POEs on an average with an s.d. of 0.87 and 0.92 respectively. Although the mean score of SOE is higher than POEs, both of them received a similar score in Q13-1 and Q13-2, and even POEs got a greater average score in Q13-3. However, respondents who worked in POEs rated a comparatively lower score of 2.81 to Q13-4.

After calculated synergy score of Q12 and Q13, we prioritized these 22 success factors and represented in Table 10 and Table 11.

The factors' ranking of SOEs is shown in Table 10. The highest mean score's success factor is *High security of ICT system (Q7)*, which receives a score of 3.97 with a standard deviation (s.d.) of 0.93. The next one is the *Favorable learning atmosphere (Q12)*, which the synergy score is 3.86 with an s.d. of 0.93. *Enough budgets for ICT investment (Q4)* is rated to a mean of 3.78 with an s.d. of 1.01 and ranked third. *Enough education background of employees (Q3)* and *Ease of use (Q9)* have the fourth highest mean score of 3.72, with an s.d. of 0.73 and 0.81 respectively. The lowest mean score is 3.13 of *Competitive advantage relative to competitors (Q20)* with an s.d. of 0.79. *Willing to disclose problems (Q17)* and *Explicit ICT development plan (Q8)* have comparatively higher mean score than the lowest one. Their scores are 3.31 and 3.34 respectively with s.d. value around 0.90. The forth from the bottom is *Commitment between planners and managers (Q10)* as well as *High*

compatibility of ICT system (Q11). They have the same mean score that is 3.41 but the standard deviation of them is 0.84 and 1.01 respectively.

Table 10 Success factors ranking for SOEs

Rank	Success factors	Means	Standard deviation
1	Q7 High security of ICT system	3.97	0.93
2	Q12 (Synergy) Favorable learning atmosphere	3.86	0.87
3	Q4 Enough budgets for ICT investment	3.78	1.01
4	Q3 Concerning on the education background of employees	3.72	0.73
4	Q9 Ease of use	3.72	0.81
6	Q13 (Synergy) High quality training	3.69	0.87
7	Q16 Enough resource support	3.66	0.60
8	Q22 Lessons learned	3.59	0.67
8	Q15 Efficient collaboration and communication	3.59	0.71
8	Q2 Managers' knowledge and innovativeness	3.59	0.87
11	Q5 Sufficient previous experiences and lessons learned	3.56	0.91
12	Q19 Sufficient support from system vendors	3.53	0.72
13	Q21 Supporting tangible and intangible reward	3.5	0.67
13	Q6 Appropriate return on investment of ICT	3.5	0.95
15	Q18 Actively modify ICT system	3.47	0.80
15	Q14 Managers' active involvement	3.47	0.84

17	Q10 Commitment between planners and managers	3.41	0.84
17	Q1 Concerning on employees' attitude toward ICT	3.41	1.01
17	Q11 High compatibility of ICT system	3.41	1.01
20	Q8 Explicit ICT development plan	3.34	0.90
21	Q17 Willing to disclose problems	3.31	0.93
22	Q20 Competitive advantage relative to competitors	3.13	0.79

The factors' ranking of POEs is shown in Table 11. There are two success factors get the same highest mean score 3.96, they are *High security of ICT system (Q7)* and *Ease of use (Q9)*. *Favorable learning atmosphere (Q12)* comes to the second place with a mean score of 3.93 and *Appropriate return on investment of ICT (Q6)* has the similar mean score, which is 3.92 with an s.d. of 0.87. *Enough budgets for ICT investment (Q4)*, *Willing to disclose problem (Q17)* and *Efficient collaboration and communication (Q15)* also received a relatively high mean score 3.89, and their standard deviation are 0.97, 0.80 and 0.75 respectively. The lowest five factors of POEs are *High compatibility of ICT system (Q11)*, *Concerning on employees' attitude (Q1)*, *Managers' active involvement (Q14)*, *Competitive advantage relative to competitors (Q20)* and *Managers' knowledge and innovativeness (Q2)*. Their mean scores are only 3.26, 3.30, 3.44, 3.44 and 3.48 respectively. However, these five factors also have comparatively higher standard deviation and the overall s.d. of them is 1.024, which indicates that the data points are spread out over a large range of values.

Table 11 Success factors ranking for POEs

Rank	Success factors	Means	Standard deviation
1	Q7 High security of ICT system	3.96	0.98
1	Q9 Ease of use	3.96	0.85
3	Q12 (Synergy) Favorable learning atmosphere	3.93	1.00
4	Q6 Appropriate return on investment of ICT	3.92	0.87
5	Q4 Enough budgets for ICT investment	3.89	0.97
5	Q17 Willing to disclose problems	3.89	0.80
5	Q15 Efficient collaboration and communication	3.89	0.75
8	Q5 Sufficient previous experiences and lessons learned	3.81	0.83
8	Q3 Concerning on education background of employees	3.81	0.96
8	Q10 Commitment between planners and managers	3.81	0.88
11	Q22 Lessons learned	3.74	0.90
12	Q19 Sufficient support from system vendors	3.70	0.87
13	Q18 Actively modify ICT system	3.63	0.93
14	Q8 Explicit ICT development plan	3.59	0.93
14	Q16 Enough resource support	3.59	0.97
14	Q13 High quality training	3.59	0.91
17	Q21 Supporting tangible and intangible reward	3.52	0.89
18	Q2 Managers' knowledge and innovativeness	3.48	1.09
19	Q20 Competitive advantage relative to competitors	3.44	0.97
19	Q14 Managers' active involvement	3.44	0.97
21	Q1 Concerning on employees' attitude toward ICT	3.30	1.03
22	Q11 High compatibility of ICT system	3.26	1.06

The total average score of SOEs and POEs is respectively 3.55 and 3.69, and the average standard deviation value of SOEs and POEs is 0.85 as well as 0.92.

China's POEs received higher mean score for most of success factors than SOEs, except for the factors Q1, Q2, Q7, Q11, Q13, Q14 and Q16. In order to further represent the differences between SOEs and POEs, the five most visibly differences between the mean value of SOEs and POEs is show in the Table 12.

Table 12 Score difference between SOEs and POEs

Rank	Success factors	Means		Score difference
		SOEs	POEs	
1	Q17 Willing to disclose problems	3.31	3.89	0.58
2	Q6 Appropriate return on investment of ICT	3.50	3.92	0.42
3	Q10 Commitment between planners and managers	3.41	3.81	0.40
4	Q20 Competitive advantage relative to competitors	3.12	3.44	0.32
5	Q15 Efficient collaboration and communication	3.59	3.89	0.30

The most significant difference lies on the factor *Willing to disclose problems (Q17)* whose score difference is 0.58. What's more, POEs' mean scores are higher than that of SOEs around 0.4 on the factor *Appropriate return on investment of ICT (Q6)* and *Commitment between planners and managers (Q10)*. Factor *Competitive advantage relative to competitors (Q20)* and *Efficient collaboration and communication (Q15)* are ranked at the fourth and fifth place, where the score difference are 0.32 and 0.30 respectively.

The question 23 is "In your opinion, the ICT adoption process in your company is successful" which represents the overall performance on the ICT adoption

process. For this question, participants rated 3.47 to SOEs and 3.78 to POEs, and the standard deviation value is 0.62 and 0.75 respectively.

Table 13 Mean value and s.d. of Q23

Success factor	Mean value		Standard deviation	
	SOEs	POEs	SOEs	POEs
Q23	3.47	3.78	0.62	0.75

As the organizational size is one of the success factors for ICT adoption process, analyzing to what extent the size of firms influence the level of success that respondents believed becomes essential. In this study, the scale of corporate is representing by two aspects, one is the size of assets holding by companies, another is the number of employees in companies. The relationship between these two aspects with the agree levels of question 23 are shown in the Figure 7 and Figure 8. The vertical axis value of these two figures represents how many participants select this item. And the horizontal axis of Figure 7 and Figure 8 respectively means the scale of companies' assets as well as the number of employees. The various color represents the certain agree level of participants regarding to Q23.

Figure 7 represents that the relationship between the size of assets holding by companies with Q23. For SOEs, it is obvious that most of people who work in a small to medium company are more likely to rate "Neither disagree nor agree" (3) to the Q23. And people who work in large SOEs are prefer to choose "Agree" (4) to the question 23. On the contrary, in spite of the fact that most of POEs are holding only less than 3 billion Chinese Yuan assets, 9 of 13 people choose the "Agree" (4) and even one choose "Strongly agree" (5) to Q23. In

addition, it is weird that there are two respondents considered the ICT adoption process in their company is success and rated “Strong agree” to Q 23, but they came from two totally different organizations. One was from extreme small firm and another was from a huge private owned enterprise.

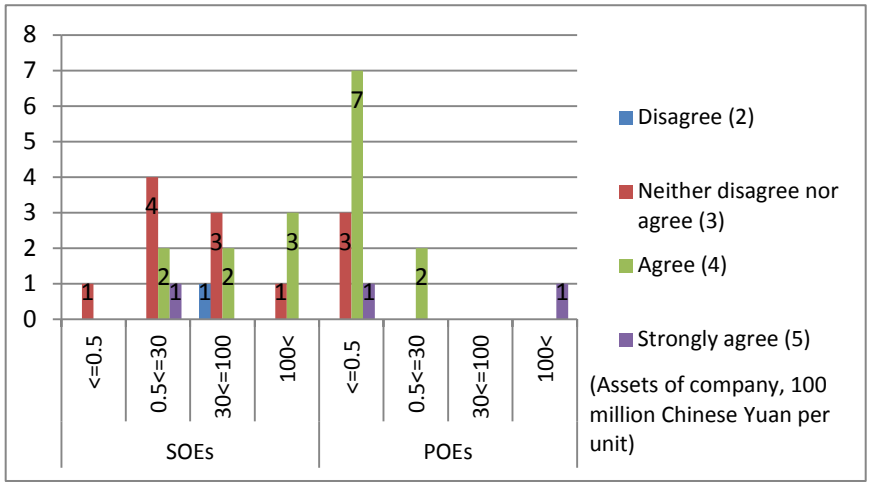

Figure 7 Relationship between organizational assets with Q23: “In your opinion, the ICT adoption process in your company is successful”

Figure 8 represents that the relationship between numbers of employees with Q23. For SOEs, most of respondents choose “Neither disagree nor agree” (3) and “Agree” (4) as their answer to Q23 no matter how many employees their companies have. However, it should be noticed that there is only one participant who worked in a company with more than 2000 employees selected “Disagree” (2). And another participant from a company with 100 to 500 employees strongly agreed his or her company has a successful ICT adoption process. Oppositely, for POEs, two of the three “Strongly agree” (5) were selected by the respondents who worked in companies with more than 500 employees. What’s more, there is no clear distinction between the proportions

of “Neither disagree nor agree” (3) “Agree” (4) and “Strongly agree” (5) for the companies that have more than 500 staffs.

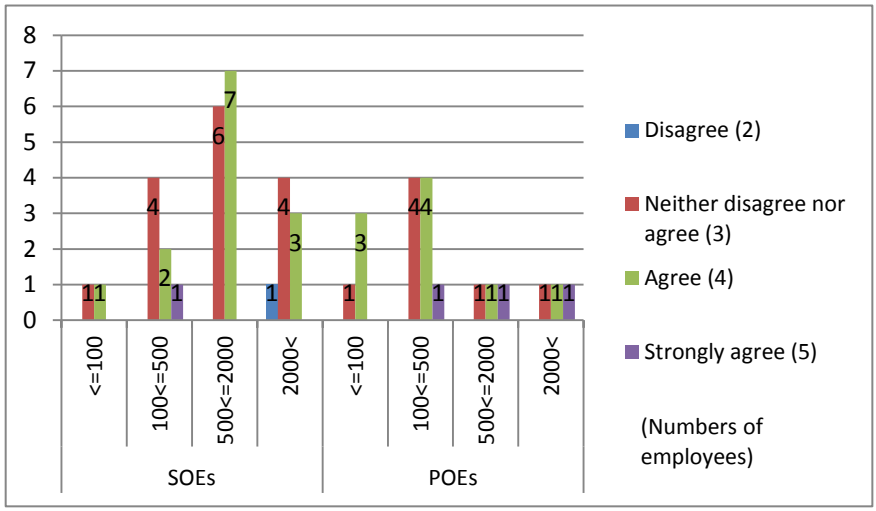

Figure 8 Relationship between numbers of employees with Q23: “In your opinion, the ICT adoption process in your company is successful”

7.1.4.2 Correlation

The second part of the data analysis is to calculate the correlation on each two data column. Due to the success factors Q12-1 to Q12-4 are the sub-factors of *Favorable learning atmosphere (Q12),* we didn’t analysis the correlation between these five factors, and the same as Q13 to Q13-4.

The correlation calculated by Excel function: *CORREL* and the Confidence level was set by 95%. The most five obvious correlations among SOEs and POEs are shown in Table 14 and Table 15.

For SOEs, *Actively modify ICT system (Q18)* is linked to the *Sufficient support from system vendors (Q19)* with the highest correlation value 0.674 (P<0.01). The second most significant correlation is between *High security of ICT system (Q7)* with *Ease of use (Q9)*, which receives correlation value of 0.669 (P<0.01).

What's more, *Enough resource support (Q16)* with *Sufficient support from system vendors (Q19)*, *Appropriate return on investment of ICT (Q6)* with *Supporting tangible and intangible reward (Q21)* as well as *Open discussion (Q12-1)* with *Enough communication and share knowledge (Q13-3)* also have comparatively high correlation level and all of their score are higher than 0.640.

Table 14 Correlation of SOEs (exclude the correlation between Q12-1 to Q12-4 and Q13-1 to Q13-4)

Rank	Success factors	R_s
1	Q18 with Q19	0.674***
2	Q7 with Q9	0.669***
3	Q16 with Q19	0.661***
4	Q6 with Q21	0.657***
5	Q12-1 with Q13-3	0.649***

**Correlation significant at P < 0.05. ***Correlation significant at P < 0.01. Confidence level=95%

For POEs, success factor 'Lessons learned' (Q22) is visible linked with *Appropriate return on investment of ICT (Q6)*, *High security of ICT system (Q7)* and *Managers' knowledge and innovativeness (Q2)*, which receive the correlation value are 0.706, 0.684 and 0.681 respectively (P<0.01). The forth most obvious relationship is success factor *Open discussion (Q12-1)* with success factor *Encourage communication and share knowledge (Q13-3)* (Rs=0.678, P<0.01) and the fifth one is success factor *Appropriate return on investment of ICT (Q6)* with success factor *Ease of use (Q9)*(Rs=0.666, P<0.01).

Table 15 Correlation of POEs:

Rank	Success factors	R_s
1	Q6 with Q22	0.706***
2	Q7 with Q22	0.684***
3	Q2 with Q22	0.681***
4	Q12-1 with Q13-3	0.678***
5	Q6 with Q9	0.666***

**Correlation significant at P < 0.05. ***Correlation significant at P < 0.01. Confidence level=95%

Due to the question 23 is asked about whether or not respondents consider the adoption process of ICT system in their company is successful, the correlation level between Q23 with other 22 success factors is to some extent reflecting the importance of each success factors for the whole ICT adoption process.

Table 16 Correlation between success factors with question 23 for SOEs

Rank	Success factors	R_s
1	Q6 with Q23	0.737***
2	Q21 with Q23	0.734***
3	Q12(Synergy) with Q23	0.690***
4	Q7 with Q23	0.527***
5	Q9 with Q23	0.525***

**Correlation significant at P < 0.05. ***Correlation significant at P < 0.01. Confidence level=95%

Table 16 shows the relationship between each success factor and question 23rd for SOEs. Success factor *Appropriate return on investment of ICT (Q6)* and *Supporting tangible and intangible reward (Q21)* are distinctively influencing the success of ICT adoption process. *Favorable learning atmosphere (Q12)* is also received a high correlation value with question 23 (Rs =0.69, P<0.01). Furthermore, *High security of ICT system (Q7)* and *Ease of use (Q9)* are

respectively linked to the question 23 with the correlation value of 0.527 (P<0.01) and 0.525 (P<0.01).

Table 17 Correlation between success factors with question 23 for POEs

Rank	Success factors	R_s
1	Q21 with Q23	0.522***
2	Q16 with Q23	0.504***
3	Q15 with Q23	0.500***
4	Q22 with Q23	0.479**
5	Q17 with Q23	0.469**

**Correlation significant at P < 0.05. ***Correlation significant at P < 0.01. Confidence level=95%

Table 17 shows the relationship between each success factor and question 23 for POEs. The average correlation value of POEs is much lower than the SOEs. However, *Supporting tangible and intangible reward (Q21)*, *Enough resource support (Q16)* and *Efficient collaboration and communication (Q15)* have also relatively high score with 0.522, 0.504 and 0.500 respectively (P<0.01). *Lessons learned* (Q22) and *Willing to disclose problems (Q17)* receive a slightly lower correlation value than that of the top three and at an less significant level with P < 0.05.

7.2 Interview 1

7.2.1 Background of interviewee

The first interviewee has considerable experience of project management. He has worked in a private-owned engineering and consulting company for three years and as the manager in project management department for one and a half

year. The company built in 2003 and so far has around 200 employees. From the date when he was hired as the manager, he was responsible for promoting Primavera P6 in the company until now.

7.2.2 ICT tools

Primavera P6 is professional project management software designed by Oracle. It is designed to handle large-scale, highly sophisticated and multifaceted projects. It provides project controllers a multitude of ways to organize, filter and sort activities, projects, and resources.

During the promotion process, the first interviewee mentioned that he met a few issues but most of them are ideological rather than technological. He believes that the conflict between new advanced technologies with existing working habits is inevitable and this is the big challenge for promoting new ICT tool.

7.2.3 Organizational culture and knowledge sharing

The company which he is working for is committed to become one of the most outstanding engineering consultancies in China, therefore, managers view effective, efficiency and honesty as the foundation of company. When asked about how the organizational culture influences prompting Primavera P6, he stated that any project management tools have to connect with the corporate culture and inextricably linked with it. Moreover, he said certain organizational culture may motivate companies to adopt new ICT tools. The reason for implementing Primavera P6 in this company was that the top managers believed

that through using Primavera P6, the overall company competitiveness, management capability and working efficiency will be significantly improved.

The company has a favorable learning environment, he mentioned. Every day, each department convenes employees and takes 30 minutes to hold a morning meeting to discuss what employees have learned recently. Managers also encourage staff to share their knowledge with other colleagues. In addition, company set up a small but well-stocked library and provides free leading services to employees.

7.2.4 Success factors

For the success factors that influence on the promoting Primavera P6, he believed that the most important matter is whether the management of company pays enough attention to the specific ICT tool. Furthermore, the commitment regarding to the development plan is whether reached among project participants is another key success factor for the whole promotion process. However, as the Primavera P6 is mature software, he didn't believe technological problem is a tough issue.

For the period of Identify Need, he stated that relevant background information of the company should be considered solidly. For example, before managers determined to adopt new ICT tools, they'd better ensure the existing technologies and the knowledge level of employees reached a certain level.

For the period of Planning, he considered that ICT tools should be compatible with other tools that have used within company. What's more, achieving the original purpose in a simple method is also crucial for the project. Therefore,

people who are involved in the design and implement phases of this tool are needed to concern on the ease of the use of the tool.

For the period of Implementation, he looks upon this stage as most burdensome. Based on his experience, he met most of issues during this period. Among these issues, greater parts of them had not thought before. Therefore, he suggested that before prompt an ICT tool in company, some pilot projects are needed. For example, in his company, the Primavera P6 didn't popularize to all departments until several experiment projects were perceived as success.

For the period of Follow Up, he argued that the main question is 'How well did the project?' and 'Is it the usability and functionality reach to a balance?'. It should be noticed that the project mentioned here is representing the business of company. Through measuring the situation of project, he said, it can evaluate the ICT software in an indirect way. If the project went off smoothly or even better than the previous similar projects, we can consider that P6 has a positive influence on company's business and the company has got technology competiveness through adopting P6.

For the period of End, he stated that he didn't have any experience relating to this issue since the ICT promoting project in his company was ongoing. However, he considered summarizing and sharing lessons learned from this project are the main tasks during this stage. Furthermore, he looked ICT promoting project as a long-term process, and the effeteness of ICT tools for company is inconspicuous in short-term.

7.3 Interview 2

7.3.1 Background of interviewee

The second interviewee has considerable management experience in gas and oil field. He has worked in a China's state owned enterprise for 30 years. Nowadays, he is a midlevel manager and managing several nature gas pipelines' SCADA (Supervisory Control and Data Acquisition) system. He is responsible for the management of daily operation of the first large-bore automatic control pipeline in China.

7.3.2 ICT tools

In his company, there are two main ICT systems, one is Enterprise asset management (EAM) software and the other is Enterprise resource planning (ERP) system. In 2002, his company began to promote EAM system, which was mainly used in company asset management, including materials procurement, financial management and equipment management. Nowadays, this system is mainly used in contract management. From 2007, his company started to adopt ERP system to substitute EAM software in asset management.

When asked about the advantage of ICT system, he stated that these two ICT tools not only improve the working efficiency, but also benefit to the full life-cycle tracking management which can record every stage's activities. For example, if the field equipment broke down, field maintenance engineers can use ERP system to document the whole process of failure maintenance and

count any expenses includes equipment, manpower and time cost. What's more, EAM and ERP system also help relevant person to constitute maintenance plan and financial plan, and enhance the maintenance efficiency as well as reduce the maintenance cost. However, there are at least two disadvantages regarding to the EAM and ERP system, he mentioned. Firstly, the cost of software is comparatively high. These two software were bought from foreign companies. Therefore, his company had to pay millions of Chinese Yuan to buy the software copyright and to invite foreign experts as trainer and technical supporter. Another disadvantage is related to the infrastructure of software, which is internet. He stated that both EAM and ERP system are based on the internet to transfer information. As a result, if the internet system is non-stable, their work must be influenced.

7.3.3 Organizational culture

The company has a formal set of values and corporate culture. The interviewee mentioned that 'People-oriented', 'Honesty', 'Technological innovation' and 'Sustainable development' are the slogan of his company. He believed that organizational culture is the soul of every company, especially for those high risk industries like nature gas and pipeline industry. He also believed that organizational culture has strong impacts on the ICT adoption process. He explained: "Adopting scientific management tools is absolutely necessary when the size of company reach to a certain scale. At that time, simply relying on the traditional administered method has become difficult to achieve the target of management."

7.3.4 Success factors

For the period of Identify Need, he stated that the requirement of ICT tools must be clearly. He believed the most advanced tools didn't represent the best. Executives should find out what tools are the most suitable for the company before prompting them to employees. Moreover, managers should also identify whether or not employees have the capacity and interest to use that ICT tool before promoting it. Managers ought to choose those tools that easy to use and generally accepted by employees. He also pointed out that managers must ensure the budget is enough for implementing the ICT system during Identify Need stage.

For the period of Planning, the most important factor is the commitment between managers regarding to the ICT development plan. He also said, without a comprehensive paper planner, any tools cannot be distributed to end users even when they are suit for this company in theory. Therefore, an explicit ICT development plan is also important.

For the period of Implementation period, he considered high quality training as the most important factor. He further stressed that the content of training must be tailored to the situation of company and satisfied by participants in order to achieve the best result. What's more, enough technical support to end users is also significantly to solve any problems in time during users' application.

For the period of Follow Up, as users becoming more familiar with ICT tools, they might put forward some new requests and change proposal, therefore he considered keeping abreast of the adoption situation and demands shift from users are the main success factors.

For the period of End, he indicated two success factors. First of all, he regarded contract management as the main factor since every project's termination should obey the terms and conditions in their contract. Secondly, he stated that sufficient technical support after implementation period is playing a critical role in this stage. The ICT adoption process is a long-term process, thus the frequency of system upgrade and the quality of following services is what differentiates a successful ICT tool adoption from a failed.

Chapter summary

In this chapter, we first presented the results of online survey. We tested data validation and introduced background information of respondents. Then, we presented success factors' ranking for both China's SOEs and POEs and showed the main correlation between success factors. In the second part, we made brief summaries for our two interviews. We will further analyze these results in the next chapter where we will put forward our findings to this study.

8 Findings

We will analyze the results of online survey and interviews in this chapter. We will summarize success factors of ICT adoption process by analyzing online survey and interviews. We will also classify these success factors into three categories, 'important', 'good performance' and 'bad performance' for both SOEs and POEs.

8.1 Survey

According to the results of survey and two interviews, we find that China's SOEs and POEs focus on different success factors during the ICT adoption process. As shown in Table 10 and Table 11**,** China's POEs performed well on nearly all success factors, including *Enough budgets for ICT investment (Q4), Ease of use (Q9), Favorable learning atmosphere (Q12)* and so on. POEs perform poorly than SOEs on some factors, such as *Concerning on employees' attitude toward ICT (Q1), Managers' knowledge and innovativeness (Q2), High security of ICT system (Q7), high compatibility of ICT system (Q11), Hgh quality training (Q13), Managers' active involvement (Q14)* and *Enough resource support (Q16).* What's more, although the average score of POEs is lower than SOEs on the factor Q13, POEs received a higher mean score on the subfactor *Encourage communication and share knowledge (Q13-3).* In addtion, China's POEs also received higher score than SOEs on the average of total 22 success factors and the average of question 23, which means that POEs have better performance than SOEs in the ICT adoption process too.

Compared with each average score of success factor, it should be noticed that participants from POEs rated a pretty high value to factor Q17, Q6, Q10 and Q5 but their mean scores rated by people from SOEs are comparatively low. Both of them received fairly low mean score on sub-factor *Provides reward (Q13-4).* Separately, SOEs is 3.09 and POEs is 2.81. Furthermore, in the aspect of China's SOEs, it received relatively low mean scores on the factor Q8, Q17 and Q20, while in the aspect of China's POEs, the mean value of success factors Q1 and Q11 are very low. The most obvious difference appears in factor *Willing to disclose problems (Q17)*, which the difference value is up to 0.58. In addition, all of the top five difference values are higher than 0.3 and the POEs always the big one. However, the average standard deviation of POEs is a little higher than SOEs (0.92 to 0.85), which means that the data points are spread out over a large range of values. In other word, the performance chasm within China's POEs is larger than that within SOEs.

From the success factor organizational size, we found that it also has different influence on these two groups. Figure 7 and Figure 8 show that if China's POEs own more than 50 million Chinese Yuan in assets or employ more than 500 people, POEs' proportion of "Strongly agree" in the question 23rd is much higher than SOEs. On the contrary, there are only two respondents from SOEs rated "Strongly agree" to question 23rd, and their companies belong to medium-to-small size. As for SOEs，apart from only two respondents selected "Disagree" to question 23rd, both of them are working for comparatively large scale SOEs. As a result, the organizational size to China's SOEs has almost negative influence on the performance of ICT promotion.

8.2 Interviews

The first interviewee is working at a medium size private owned company. He considers *Ease of use (Q9), High compatibility of ICT system (Q11), Favorable learning atmosphere (Q12), Competitive advantage (Q20), Lessons learned (Q22), Support from managers*, *Commitment between managers* and *Pilot projects* as essential for implementing ICT tool. The second interviewee who working at a state owned enterprise in monopoly industrial believes that factors, such as *Employees' attitude toward ICT* (Q1), *education background of employees (Q3), Enough budgets (Q4), Explicit ICT development plan (Q8), Commitment between planners and managers (Q10), High quality training (Q13), Actively modify ICT system (Q18),* Technical support during both Implementation and End stages and Contract management, which are playing crucial roles in the ICT adoption process.

8.3 Correlation

As shown in Table 14 and Table 15, the general correlation value of SOEs is lower than POEs. For SOEs, success factor *Sufficient support from system vendors (Q19)* has noteworthy correlation respectively with success factor *Actively modify ICT system (Q18)* and *Enough resource support (Q16).* Therefore, we perceive that as the support level from system vendors is low, managers are more likely to half-heartedly modify the ICT system and provide insufficient resources during the adoption process. Due to the success factor Q19 has pronounced relationship with both factor Q18 and Q16, we believe that

Sufficient support from system vendors (Q19) is an critical success factor for China's SOEs. Comparing with SOEs, the correlation between success factors in the aspect of China's POEs is more obviously. Among the total 22 success factors, factor *Lessons learned (Q22)* has significant correlation with factor *Appropriate return on investment of ICT (Q6), High security of ICT system (Q7)* and *Managers' knowledge and innovativeness (Q2).* Hence, we find that as managers pay more attention on lessons learned, the return on investment of ICT tools is more likely to reach an appropriate level. Similarly, the ICT system is more likely to be designed safety and managers are more likely to have rich knowledge about ICT tools. And also, we considered *Lessons learned* is vital for the China's POEs in the ICT adoption process. What's more, we find that as the company is more likely to encourage open discussion, willingness of knowledge sharing among employees can be relatively high (Q12-1 with Q13-3). This correlation is also noticeable in the aspect of SOEs. As a result, we viewed sub success factor Q12-1 and Q13-3 as the key success factors for both SOEs and POEs.

Due to the question 23rd is the overall evaluation to the whole ICT adoption process, we considered the level of correlation between the question 23rd with other 22 success factors reflects the degree of importance of each success factor. As shown in Table 16 and Table 17, success factor *Supporting tangible and intangible reward (Q21)* has strong correlation with the question 23rd in both two groups. Moreover, success factor *Appropriate return on investment of ICT (Q6)* and *Favorable learning atmosphere (Q12)* also closely correlated with the question 23rd in the aspect of SOEs. For POEs, besides the success factor Q21,

there is no other obvious correlation raise between the success factors and question 23rd from.

8.4 Summary

In Table 18, we sum up the most important success factors (represented by 'I'), good performance success factors (represented by 'G') and bad performance success factors (represented by 'B') for both SOEs and POEs respectively from above findings.

Table 18 Summary of success factors

	Success Factors	SOEs	POEs
Identify need	Concerning on employees' attitude toward ICT	I&B	B
	Concerning on the education background of employees	I&G	I
	Enough budgets for ICT investment	I&G	G
	Appropriate return on investment of ICT system	I	G
	Support from managers		I
	Sufficient previous experiences		G
	Managers' knowledge and innovativeness		B
	Organizational size		I
Planning	Explicit ICT development plan	I&B	
	Commitment between planners and managers	I&B	I
	Ease of use	G	I&G
	High compatibility of ICT system	B	I&B
	High security of ICT system	G	G
Implementation	High quality training	I	

Implementation	Open discussion within company	I	I
	Encourage communication and share knowledge	I	I
	Technical support	I	
	Favorable learning atmosphere	I&G	I&G
	Pilot projects		I
	Willing to disclose problems	B	G
	Efficient collaboration and communication		G
	Managers' active involvement		B
Follow up	Actively modify ICT system	I	
	Technical support	I	
	Evaluate ICT software		I
End period	Contract management	I	
	Supporting tangible and intangible reward	I	I
	Competitive advantage relative to competitors	B	I&B
	Lessons learned		I&G

Chapter summary

We started the chapter by analyzing the results of online survey and two interviews. Then we classified success factors that we identified into three categories for China's SOEs and POEs respectively. In the next chapter, we will explain these findings by using theory that we presented in previous chapters.

9 Discussion

In the previous chapter, success factors were classified into several categories according to the degree of importance and performance. In this chapter, we will link our study back to the original research question and try to explain the results through discussing the relationship between ICT tool with organizational culture and knowledge sharing. In addition, we will put forward our suggestions on improving the performance of ICT adoption to China's SOEs and POEs.

9.1 Organizational culture

From the results of online survey, we find that the overall performance of ICT usage in China's POEs is better than that in SOEs. As we have demonstrated in literature review, organizational culture plays an important role during the ICT adoption process. Both two interviewees have expressly pointed out this point of view, such as the first interviewee said *"any project management tools have to connect with the corporate culture and inextricably linked with it*". From the literature review, we know that the organizational culture of China's SOEs is hierarchy culture. In such circumstances, the personal power and authority of managers are greatly extended. Those managers of SOEs can control over almost all matters within the company, including the business of company and personal promotion issues. As a result, employees have to preserve their 'face' and avoid direct confrontations in order to maintain cooperative relationships with managers for the sake of survival.

We believe that China's SOEs' organizational culture result in the average score of success factor *Commitment between planners and managers, Explicit ICT development plan* and *Willing to disclose problems* are much lower than that of POEs. First of all, because top managers own supreme power in the companies, employees for example system planners feel hard to against the instructions of managers and sometimes, they even don't have any chance to discuss with top managers. Thus, reaching a commitment between corporate executives and employees become a tricky task in China's SOEs. Secondly, due to top managers in China's SOEs are the absolute decision makers, most of ICT promotion projects would be started very hasty and the start time only depends on the willingness of managers. Consequently, other junior managers and employees are hardly having enough time to establish an explicit ICT development plan. Finally, a hierarchy organizational culture cause employees always ingratiate themselves with managers and deepened the idea of saving face among people. Therefore, they wouldn't like to reveal problems that they have met, especially when they are the trouble makers.

On the contrary, Clan and Adhocracy culture contribute to China's POEs build up a favorable learning atmosphere. Besides, these two kinds of culture also promote collaboration and communication among employees and encourage people reveal problems. There are also different characteristics of Adhocracy and Clan culture. On one hand, Adhocracy culture can stipulate the creativity and innovation of companies. Therefore, such environment values China's POEs more, encouraging spontaneous learning in order to keep their leadership in technology in emerging industries. One the other hand, Clan culture encourages

a friendly and familial communication style towards colleagues. And also, Clan culture conducts to establish a decentralized power system in China's POEs. Employees are no longer need to flatter superior leaders for promotion. As a result, employees are willing to expose problems become reasonable and unhindered in China's POEs, as the first interviewee said "*honesty is the foundation of company*". What's more, members in such organizations see themselves as part of the team and gradually, companies have better performance on the aspects of collaboration and teamwork.

9.2 Organizational size

However, the results of online survey can only verify the partial theories of Jozée Lapierre & Arnaud Denier (2005) and Lopez-Nicolas & Meroño-Cerdán (2009). We find that China's SOEs and POEs have their own strengths and weaknesses when they adopting new ICT tools. Both Jozée Lapierre & Arnaud Denier (2005) and Lopez-Nicolas & Meroño-Cerdán (2009) put forward their suggestions merely base on organizational culture. But we believe that special national conditions and companies' background also need to be considerate. The results of online survey show that China's SOEs receive a higher score on the success factor *High quality training (Q13)* and *Enough resource support (Q16)*. We believe that this is mainly because most of China's SOEs are monopolistic companies, which sit on billions of Chinese Yuan in assets and extensive human resources. Since they own sufficient resources, they are more likely to provide employees with high quality training, especially for inviting professional trainers and tailoring training content for specific ICT tools. For the same reason,

China's SOEs can also provide enough resource, including money and human resource during the development phase. Counter-view the survey results of POEs, the average scores of these two success factors are obvious lower than others. We believe that the primary reason is that their scale in assets is comparatively smaller than China's SOEs. Such firms have to save labor and expenses to invest in technical research or other key fields to maintain their competitiveness with SOEs. Therefore, they would not like to spend too much money and effort on the ICT adoption process.

On the whole, we consider that the larger the organizational size, the harder it would be for the companies to implement new ICT tools for China's SOEs. While for China's POEs, the situation is the opposite. Since the restructure policies of China "retain the large and release the small", many small scale SOEs have begun hire managers with high quality and professional knowledge of specific industries in order to further development. They have few features of traditional SOEs, and operate more like a private-owned enterprise with a lack of company hierarchy. Therefore, these small size SOEs have a better performance than large size SOEs on the implementing ICT projects. But for POEs, most of them own much less resources than SOEs. However, if there are comparatively sufficient resources for them, it will remedy the main flaws of China' POEs. Thus, we believe that POEs' scale is larger, adopting new ICT tools easier.

9.3 Problems

Moreover, we have also identified some problems in China's SOEs and POEs.

Firstly, both of them have poor performance on designing ICT system with high compatibility. But it is not means that companies do not lay emphasis on this issue. As the first interviewee said "*ICT tools should compatible with other tools that have used within company",* managers come to realize the importance of compatibility. Therefore, we consider that the reason is due to the overall technical level of China's companies is limited, most of companies still cannot ensure their ICT tools are totally compatible with other existing systems in technically.

Secondly, the results of survey show that managers of China's SOEs and POEs do not much care about employees' feeling when they are preparing to adopt a new ICT tool in company. However, both first and second interviewees also have mentioned the importance of end users' attitude toward ICT tools, for example, the second interviewee said *"managers should also identify whether or not employees have the capacity and interest to use that ICT tool before promoting it".* It represents that at least many managers are not disregard the feeling of employees during identify need period. In addition, the standard deviation values of success factor *Concerning on employees' attitude toward ICT (Q1)* for both SOEs and POEs are far higher than the average. Therefore, we argue that whether or not decision makers concern on employees' attitude toward new ICT tools is not much depending on the organizational culture and ownership type, this issue stems more from the managers themselves, such as the leadership style.

And thirdly, after promoting ICT tools, both China's SOEs and POEs are not achieved obvious technology competiveness when compare to competitors.

Since the ICT system is still at its initial stage in China and the usage of advance ICT software in Chinese organizations was still relatively low (Shen et al. 2006), companies are hard to establish their own competiveness advantage through adopting one ICT tool that currently has used in each company. We believe that most of ICT tools contribute to maintain competitive for companies rather than as a shortcut to help them lead to other competitors. Besides, as the first interviewee has demonstrated *"ICT promoting is a long-term process. The effeteness of ICT tools for company is inconspicuous in short-term"*. Therefore, people are difficult to perceive the strengths of ICT tools during the initial stage.

9.4 Suggestions

According to our findings above, we put forward five propositions to China's SOEs and POEs in order to improve the usage of ICT tools in these companies. Firstly, in spite of the fact is comparing with Hierarchy culture, Clan and Adhocracy culture are more adaptable to prompt the usage of ICT tools in companies, we still could not encourage change any companies' culture as first choice. We believe that changing organizational culture to fit with ICT tools adopted is bound to be met with strong resistance. It requires the company to invest a large amount of time and other resources to achieve. Instead changing ICT tools to fit the organizational culture, costly as they are, would yield better results. As a result we propose that when organizations embark on projects to implement new ICT tool, they should place organizational culture at the center and lay down ICT development plan based on their specific organizational culture.

Secondly, we believe that systems work best when people know them and are comfortable to use them. This requires system designers should be aware of the demand of companies and employees. What's more, such ease can only come from people taking part. Once they view the prompt project as their 'baby' too they are bound to be more committed to making it work. Thus, to make people involve, we suggest that managers should appeal to employees' natural sense of curiosity.

Thirdly, before the system goes online, we propose that project managers should use beta system for beta testing, as the first interviewee demonstrated. During the testing period, system designers and other people involved have more opportunities to find out system bugs such as the incompatibility problem with existing tools. Through trial and error process, new ICT systems would be constant improve and gradually become perfected. In addition, through testing new tools, relevant planners and managers are also easier to reach commitment on the subsequent development plan. They have more chances to communicate and exchange ideas for the ICT systems in order to better cooperation in future.

Fourthly, because encouraging people become more socialized would be facilitated them more likely to share knowledge and solve problems, we suggest that companies should organize a variety of activities to promote communication between colleagues and then, make their employees more fit for companionship with others. Managers should also actively attend such activities, which would help their teams integrated into the ICT implementing project better and know each other much more quickly. Attending such activities also benefit to build trust among colleagues. We believe that people are willing to

share their knowledge and communicate with others only when they trust each other.

Finally, we suggest that company should involve relevant people in the ICT adoption process in the beginning. Firstly, it can help people feel a kind of ownership and responsibility. Secondly, it can create communication opportunity for the relevant people. Thirdly, involving people in the beginning can also increase trust level among colleagues, then, people might become more respectful to each other. Finally, because there are adequate of communication and trust, people are more willing to give feedback when the system goes into implementation.

Chapter summary

In this chapter, we presented the analysis of findings that showed in chapter 8. Using theory from previous chapters, we explained our findings. We showed the link between the finding and the theory. We also identified some problems that appeared in ICT adoption process in China's SOEs and POEs. Then, we put forward our suggestions on each problem.

10 Conclusion and future work

10.1 Conclusion

We started this study by giving a background on problem formulation. We defined our research study as investigation on 'the factors influence on implementing ICT tools in different organization types'. We presented our research model and then we gave theoretical background on each of China's SOEs, China's POEs, organizational culture and ICT. We also presented our model of ICT adoption process based on literature review. And then we presented empirical evidence to our study in the form of online survey and semi-structured interviews. In chapter 8, we analyzed the results and found out success factors that important for China's SOEs and POEs. Also, we grouped success factors according to their performance and then put forward our proposals about how to optimize ICT adoption process for both SOEs and POEs.

As already stated, our study looked at the influence of success factors for China's SOEs and POEs. From the results of online survey, we found that China's POEs have better performance on ICT promotion projects. But in some aspects, China's SOEs received higher scores than that of POEs.

We concluded that organizational culture has strong influence on ICT adoption process. Clan and Adhocracy culture are more suitable for companies than Hierarchy culture when adopting new ICT tools. What's more, we believed that organizational culture should lead ICT development policies. Organizations

have to adopt deliberate and mature approaches to do that. One approach is involving all members of the organization.

But we found that other success factors also play significant roles in the whole adoption process. For example, the scale of companies has different influence on the ICT implementation projects. For China's SOEs, it seems that the bigger the firms get, the more trouble it has trying to prompt new ICT tools. While for China's POEs, companies have better performance on adopting new ICT systems as they grow larger.

We also found some problems related to ICT adoption projects for both SOEs and POEs and then we gave five suggestions on these issues. Firstly, we proposed that organizations should place organizational culture at the center when implementing new ICT projects and lay down ICT development plan based on their specific organizational culture. Secondly, we suggested that managers should appeal to employees' curiosity. Thirdly, we proposed that project managers should use beta system for beta testing before the system goes online. Fourthly, we suggested that companies should promote communication between colleagues by holding a variety of activities and then, make their employees more fit for companionship with others. Finally, we suggested that company should involve people in the ICT adoption process in beginning. If so, people might feel kind of ownership and responsibility and they are more willing to give feedback during the implementation stage.

10.2 Future work

As we have noted, the study results was limited in scope, namely the sample size did not reach the theoretic amount. Since the time limited, we only received 59 validate responses, and the sample size should be around 600. Although the effect size and Cronbach's alpha were higher than requirements, we still believed that such comparatively small sample size might have negative effect on the accuracy of results.

We have also noted that whether or not decision makers concern on employees' attitude toward new ICT tools largely depends on the leadership of managers. However, there is lack of adequate research on the leadership in China's SOEs and POEs. For future work, a research could be made on discussing the types of leadership in China SOEs and POEs. The research could also focus on what types of leadership has positive influence on the usage of ICT tools in these companies.

10.3 Summary

In conclusion, we found important success factors, both good and bad performance success factors for China's SOEs and POEs. We also found some problems in ICT promotion process for these two groups and then, we put forward our suggestions to them. We stated that organizational culture has strong influence on the ICT adoption projects, but other aspects for example, organizational size are also significant to them. We noted that not enough had been done to research the manager's leadership of China SOEs and POEs and

its relationship with the performance of ICT adoption project. We propose that future work could be done in this area.

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12 Appendix

Questions of online survey:

Background question

How long have you been working in this company?: _____

The organization size in terms of turnover: _____

The organization size in terms of number of staff: _____

Your position in company: _____

How long have you been in this position?: _____

What's your company's organization type?

[ ] State-owned enterprise

[ ] Private-owned enterprise

[ ] Foreign-controlled businesses

[ ] Others

What's your organization's area of expertise? (Multiple choice)

[ ] IT

[ ] Telecommunication

[ ] Building and Construction

[ ] Globe trading

[ ] Manufacturing

[ ] Management Consulting

[ ] Petroleum and Chemical

[ ] Energy and Mineral

[ ] Government

[ ] Others

In which phases you have been involved in the ICT development? (Multiple choice)

[ ] Identify need

[ ] Planning

[ ] Implement

[ ] Follow up

[ ] End

Please based on your actual experience rate your level of Agreement to the following 25 questions.

'1 'Represents for strongly disagree

'2 'Represents for disagree

'3 'Represents for neither disagree nor agree

'4 'Represents for agree

'5 'Represents for strongly agree

1) In your company, managers care about employees' feeling when they prepare to adopt a new ICT tool in company.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

2) Before your company promote information and communication technology tools, managers are aware and know that new ICT tool, and enthusiastic it.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

3) Before your company promote information and communication tools, managers does not consider the background knowledge of employees (such as computer background), in order to estimate whether or not their employees can be familiar with ICT tools in future.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

4) Before your company promotes information and communication tools, managers ensure company has enough budgets for ICT investment.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

5) Before your company promotes ICT tools, managers do not consider whether company has previous successes experience on related field.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

6) Before your company promotes ICT tools, managers will consider the return on investment of those tools.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

7) Your company managers and designers are concerned about the security of information in ICT tools.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

8) Before your company implements this tool, an explicit business and ICT development plan will be established.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

9) In your company, the people who involved in the design and implement phases of this tool are concerned about the ease of use of this tool.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

10) In you company, there is no commitment reached between planners and managers regarding to ICT development plan.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

11) The ICT tools that using in your company are compatibility with your company's external trading partners and internal different departments

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

12) In you company, there is a favorable learning atmosphere.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

13) Please based on your company's situation select your level of agreement on the following four issues

	Strong disagree	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strong agree**
Your company encourage open discussion and sharing experiences between colleagues	___	___	___	___	___
Your co-workers often help each other	___	___	___	___	___
Your managers often help subordinates	___	___	___	___	___
Your co-workers often share knowledge and information	___	___	___	___	___

14) Your company provide high quality training program regarding to the ICT tools

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

15) Pleased based on your company's situation select your level of agreement on the following four issues

	Strong disagree	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strong agree**
Your company provides sufficient training time.	___	___	___	___	___
Your company's training is tailored for the specific tools.	___	___	___	___	___
Your company encourages communication and knowledge sharing between employees during the training.	___	___	___	___	___
Your company provides reward to employees according to the result of training.	___	___	___	___	___

16) In your company, managers are actively involved in ICT adoption process.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

17) In your company, collaboration and communication between functional departments or work units is difficult.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

18) Your company provides enough resource, including money, time and human resource during development of ICT tools.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

19) In your company, people are willing to disclose problems, faults and failures rather than preservation of 'face' and afraid of receive negative response from managers

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

20) In your company, managers are willing to modify the ICT system based on feedback from users.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

21) In your company, the ICT system's vendors provide sufficient supports and services

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

22) After promoting ICT tool, your company has not achieved technology competiveness compare to competitors.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

23) In your company, employees can receive tangible or intangible reward because using ICT tools.

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

24) After the ICT adoption process, the lesson learned are collected for future use

( ) 1

( ) 2

( ) 3

( ) 4

( ) 5

( ) Not available

25) In your opinion, the ICT adoption process in your company is successful.

[ ] 1

[ ] 2

[ ] 3

[ ] 4

[ ] 5

[ ] Not available

Questions of interview:

1) Can you give us background information about yourself (Your experience, the kind projects you have worked on in the past and the organizations you have worked with)?

2) How do you appraise status of ICT in your company?

3) What are barriers and problems of adopting ICT in your company?

4) What are advantages and disadvantages of adopting ICT in your firm?

5) Provide an everyday example of how ICT tools are used in your company, what benefits and values has it brought for your organization?

6) How would you describe your organization's corporate culture? Based on your experience, is corporate culture (on paper) reflected in practice?

7) Are staff-members ever involved in or make input on which ICT tools the company should use (specifically for KT)?

Why or why not?

Does the organizational culture influence the ICT tools adoption process?

8) Do you have any other comments or relevant information regarding our research that you might like to add (maybe issues you feel we haven't discussed/raised).

Correlation values between each factors for SOEs:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23
Q1	1																						
Q2	0.374837	1																					
Q3	-0.05879	-0.0332	1																				
Q4	0.279923	0.042322	0.089226	1																			
Q5	0.163623	0.416273	0.293685	0.208077	1																		
Q6	0.58722	0.368637	0.162989	0.252663	0.260063	1																	
Q7	0.321609	0.537481	0.034105	0.095471	0.210571	0.564056	1																
Q8	0.443072	0.346267	-0.09354	0.049918	-0.00734	0.545666	0.55001	1															
Q9	0.418216	0.469447	0.243394	-0.07757	0.26343	0.647451	0.669024	0.444268	1														
Q10	0.370284	0.10051	0.457701	0.147027	0.239919	0.263583	0.471297	0.236344	0.410551	1													
Q11	0.464039	0.08317	0.072467	0.406531	0.023998	0.486554	0.287418	0.372358	0.300478	0.294084	1												
Q12	0.284044	0.22003	0.356414	0.330117	0.310133	0.674823	0.39137	0.237812	0.476346	0.284772	0.332443	1											
Q13	0.489755	0.446056	0.254061	0.044083	0.204932	0.483158	0.380221	0.37804	0.671893	0.29144	0.18712	0.504625	1										
Q14	0.375274	0.13553	0.326942	-0.02734	-0.06029	0.262079	0.183592	0.205787	0.293261	0.453512	0.223744	0.346392	0.239452	1									
Q15	0.505231	0.606913	0.021365	0.051988	0.313006	0.262165	0.271684	0.425352	0.186414	0.23171	0.370876	0.160279	0.210152	0.327924	1								
Q16	0.183883	0.461688	0.508089	0.191265	0.304471	0.310321	0.440163	0.105899	0.455748	0.41441	0.130872	0.375881	0.323721	0.328442	0.416526	1							
Q17	0.271864	0.200514	-0.10398	0.556629	0.203828	0.291633	0.308764	0.367312	0.162551	0.24576	0.408866	0.38055	0.066049	0.383256	0.294964	0.255559	1						
Q18	0.353884	0.4638	0.232637	0.210679	0.332698	0.528635	0.494209	0.215846	0.554911	0.5237	0.155212	0.668319	0.509976	0.284974	0.400398	0.544933	0.272491	1					
Q19	0.093032	0.509012	0.233168	0.165891	0.218305	0.307396	0.362912	0.256943	0.485708	0.166124	0.181898	0.398615	0.32846	-0.05172	0.372793	0.660737	0.12973	0.673752	1				
Q20	-0.02513	-0.01744	-0.27204	-0.00505	0.166945	0.042796	0.136271	-0.19729	0.006257	0.115406	-0.30659	-0.06327	-0.12062	-0.1389	-0.24989	0.025354	0.076445	0.107688	-0.12042	1			
Q21	0.450818	0.3567	0.296359	0.119107	0.315244	0.656599	0.540375	0.505589	0.443049	0.372762	0.261	0.53181	0.439257	0.370635	0.438168	0.43886	0.154662	0.508369	0.300963	-0.12105	1		
Q22	0.301114	0.261592	0.288986	0.00752	-0.03649	0.331648	0.394792	0.025201	0.378567	0.421824	0.349052	0.333471	0.405731	0.581424	0.321337	0.445855	0.211574	0.428591	0.128791	-0.08407	0.469021	1	
Q23	0.30313	0.30232	0.371716	0.169073	0.202437	0.737446	0.527033	0.451479	0.525092	0.24228	0.251807	0.689908	0.500364	0.368092	0.225555	0.444977	0.184696	0.515455	0.363928	-0.25365	0.733897	0.397517	1

Correlation values between each factors for POEs:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23
Q1	1																						
Q2	0.485462	1																					
Q3	0.096216	0.198773	1																				
Q4	0.110659	0.488237	0.182384	1																			
Q5	0.111044	0.356678	0.243251	0.494655	1																		
Q6	0.025303	0.443783	0.211773	0.261099	0.191617	1																	
Q7	0.315899	0.450569	0.155615	0.277617	0.320832	0.400963	1																
Q8	0.090575	0.467355	-0.13044	0.627024	0.394709	0.529021	0.404593	1															
Q9	0.275071	0.392705	0.084938	0.318523	0.206059	0.666205	0.595804	0.657778	1														
Q10	0.105367	0.298189	0.185326	0.154791	-0.04861	0.332102	-0.05294	0.186394	0.246779	1													
Q11	0.103037	0.288107	0.162083	-0.15736	0.056441	0.436991	0.120751	-0.00578	0.053528	-0.1117	1												
Q12	0.497194	0.530126	0.379385	0.286153	0.393113	0.333597	0.396185	0.299862	0.378127	0.097086	0.401288	1											
Q13	0.592961	0.56456	0.540146	0.201315	0.216994	0.257316	0.417309	0.069671	0.14817	0.045227	0.45652	0.597756	1										
Q14	0.05533	0.298591	0.214302	0.337838	0.247327	0.627642	0.138808	0.249867	0.251736	0.234683	0.592185	0.339341	0.238356	1									
Q15	0.093832	0.256407	0.342961	0.45565	0.272976	0.162791	0.255503	0.207874	0.233188	0.142461	-0.01074	0.395929	0.167088	0.4907	1								
Q16	0.278906	0.411464	-0.08384	0.234941	0.188254	0.008394	0.104795	0.107184	-0.15802	-0.27212	0.181376	-0.01031	0.284844	0.11747	0.199216	1							
Q17	0.227823	0.32889	-0.02774	0.082199	0.256074	0.207688	0.337736	0.195003	0.21875	-0.13972	0.125948	0.010353	0.086208	0.312358	0.362441	0.582629	1						
Q18	0.159667	0.145714	0.222208	-0.00474	0.405896	0.249981	0.238625	0.13058	0.225153	-0.08753	0.258439	0.405781	0.116319	0.104234	0.159753	-0.04594	-0.05764	1					
Q19	0.144722	0.197512	-0.02215	0.09594	0.346071	0.071296	0.122139	0.27305	0.036474	0.076497	0.044874	0.107719	0.027682	0.252474	0.242291	-0.01182	0.282576	0.38417	1				
Q20	0.438381	0.371221	0.296374	-0.02703	-0.0842	0.085359	0.420903	0.037716	0.159262	0.144805	0.033129	0.147863	0.397798	-0.13514	0.122675	0.198796	0.115079	0.146875	0.070693	1			
Q21	0.411546	0.366697	-0.06298	0.245618	0.28885	0.149671	0.550165	0.171378	0.22784	-0.06897	0.258923	0.273393	0.213688	0.299654	0.375865	0.252928	0.298807	0.520133	0.453383	0.388076	1		
Q22	0.375058	0.680669	0.341121	0.315936	0.342587	0.706149	0.68448	0.373055	0.585769	0.131107	0.515365	0.531071	0.527718	0.486056	0.29626	0.313639	0.437571	0.43285	0.045405	0.398566	0.554801	1	
Q23	0.187665	0.324434	0.206959	0.438125	0.361693	0.384188	0.406482	0.360723	0.226526	0.051804	0.171854	0.071736	0.334176	0.45565	0.5	0.503899	0.469042	0.098309	0.307775	0.297925	0.522388	0.479059	1