The Impacts of Organizational Culture and Supply Chain Management (SCM) Practices on Enterprise Resources Planning (ERP) Decisions

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A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy
in
Decision Sciences and Managerial Economics

The Chinese University of Hong Kong
July 2011

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Abstract

In the past decade, more and more Chinese manufacturers adopt enterprise resources planning (ERP) systems to facilitate their planning, manufacturing, logistics and other business processes and management. Meanwhile, how to choose a suitable ERP system becomes a difficult problem for many companies.

Scholars have conducted many studies related to ERP decision problem. Findings of those existing studies have provided important references for companies to make decision on using or not using ERP system. However, very limit insight can be found from the previous studies regarding of which type of ERP system should be chosen.

Based on the findings of previous studies, we propose that culture and management practices significantly influence ERP decisions that include using or not using ERP and using which type of ERP system. To provide more insights for the ERP vendors to develop systems which fit Chinese culture and practices as well as for Chinese manufacturers to choose a suitable ERP system, this study explores and aims to empirically validate factors influencing ERP decisions from the perspectives of organizational culture and SCM practices.

We propose two research models integrating organizational culture, SCM practices and ERP decisions, based on a comprehensive review on the literatures of IT and culture, management practices and culture. We

conduct a survey in the manufacturing firms in five cities in Pearl River Delta (PRD) regions and empirically validate our research models. The empirical results indicate that *process versus results oriented*, *open versus closed system* and *information sharing* significantly influence the decision on using or not using ERP system; in addition, *loose versus tight control*, *normative versus pragmatic*, *information quality* and *internal agile practices* significantly influence the decision on using which type of ERP system.

Keywords: Organizational Culture, Supply Chain Management (SCM) Practices, Enterprise Resources Planning (ERP), Decisions

摘　要

近年來，越來越多中國製造廠採用企業資源計畫(ERP)系統以輔助其計畫、生產、物流等業務及管理流程。同時，如何選用一套合適的ERP系統（即ERP選型問題）成為困擾眾多企業的難題。

學術界曾對ERP選型問題進行了大量研究，這些研究為企業決定是否採用ERP系統提供了重要的參考。然而，過去的研究對如何選擇何種合適的ERP系統所提供的參考卻是有限的。

根據過去的研究結果，本文提出，文化及管理實踐對ERP選型（包括採用與不採用，以及採用何種類型的ERP系統）有著重要的影響。為幫助中西方ERP廠商開發出更適合中國企業的系統，同時亦為中國的製造工廠能從眾多ERP產品中選擇適合本企業實際的軟體系統提供參考，本研究從企業文化及供應鏈管理的角度出發，探討並實證影響企業ERP選型的因素。

本文總結過去關於文化與資訊技術行為、文化與管理實踐的大量文獻。基於這些文獻的成果及理論，本文提出結合企業文化、供應鏈管理實踐及ERP決策的理論模型。作者以實地問卷調查的方式，在珠三角5個城市近200家製造工廠進行調研，以實證的方法去驗證理論模型。實證的結果表明：*流程導向與結果導向*、*開放與封閉系統*及*信息共享*對企業採用與不採用ERP之決策有重要影響；而*寬鬆與嚴密控制*、*教條與實用*、*信息質量*及*內部敏捷實踐*對企業採用何種類型的ERP系統之決策有重要影響。

關鍵字：企業文化、供應鏈管理、企業資源計畫、決策

ACKNOWLEDGEMENTS

Pursuing this PhD degree is the really toughest job for me in my life and I know this dissertation is from away from perfection. I would like to express my deep appreciation and gratefulness to all the nice persons who have helped me in my six years of PhD study.

First of all, I would like to thank for my supervisor---Prof. Waiman Cheung, who has instructed me for six years with his endless patience and efforts, he never gives me up and always gives me encouragement. From him I learnt a lot in doing serious researches as well as being a person with straightness and honesty. Without his help, I can never finish this study.

I would like to thank for Professor Alex Chu, who has guided me to learn how to do a research and gives me many insightful suggestions. He shows me the right way to be a researcher from the beginning of my PhD study. I would also like to thank Professor Vincent Lai, Professor Xiande Zhao, Professor Gordon Cheung, Professor Leo Sin, Professor Hongyi Li, Professor Lawrence Leung, Professor TP Leung, Professor Ben Chan and the other professors in BA faculty who have taught or inspired me during my PhD study. Moreover, I would like to thank all my committee members for their constructive and insightful remarks which helped to improve this dissertation.

I am grateful to Professor Gang Chen, Dr. Min Zhang, Dr. Liang Huang, Dr. Connie Liu, Dr. Xiling Cui and Mr. Jerrel Leung, who have provided many helpful suggestions for me. I also thank for Mr. Xiaohua Huang from China Custom, Mr. Kewu He, Mr. Canxian Tang, Mr. Jiecai Chen, Mr. Weiquan Ye, Mr. Peter Zhu and other friends, who have never hesitated to offer their help in my data collection processes.

I am deeply indebted to my wife, Yuanyuan Lin, who always gives me supports and shows me her endless love, faithfulness, unselfishness and patience, without which I can never finish my study. I also want to thank my dearest daughter, Karen, who gives me great funs and makes me forget all the tiresomeness. Special thanks are to be given to my parents, who love me most in my life. I would like to thank for my younger sister and my mother-in-law, who never hesitate to support me and pray for me every day. Last but not least, I treasure the friendship and brotherhood of Mr. Yanbing Chen, who sincerely provides great helps and supports for me and my family during my PhD study.

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Chapter 1. Introduction

1.1 Background

Today, Chinese manufacturers are facing increasingly keen competition in the marketplace, their survivals are under challenge. Therefore, more and more manufacturers in China recognize the importance of introducing advanced management and technology initiatives like total quality management (TQM), supply chain management (SCM) and information technologies (IT) to facilitate their management and improve their competiveness (Wang et al., 2006; Xue el al., 2005). Among various initiatives, enterprise resources planning (ERP) has become a "must have" system for many firms to improve competitiveness in the past few years (Sheu et al., 2004; Zhang et al., 2005). By introducing this cross-functional software system, companies can improve their productivity, customer service and at the same time lowering costs and inventories. ERP systems hold the promise of providing companies with greater competitive advantages (Xue et al., 2005). In China, more and more companies adopt ERP systems to facilitate their business processes and operations. Some companies (mainly large corporations) choose Western-based ERP systems like Oracle and SAP, others choose locally developed Chinese ERP systems like Kingdee and UFIDA, there are also

some decided to develop their own ERP systems. For various reasons some companies do not use any ERP system.

Despite of its increasing acceptance, the failure rate of ERP implementation is very high in China (Zhang et al., 2003). Chinese companies encountered many unexpected problems and even failures when trying to apply ERP to improve their business processes and management, as ERP systems are extremely complex and difficult to implement (Xue et al., 2005). It is estimated that the success rate of ERP implementation in China is approximately 10% (Zhang et al., 2003). Many Chinese companies have found it very difficult to find a suitable one from off-the-shelf ERP packages. Western-based ERP systems like Oracle and SAP, which are functionally comprehensive, are often not affordable for many companies. Moreover, these ERP systems are modeled and developed based on Western culture and management practices, which are quite different from those of the Chinese companies. Therefore, companies who adopt these systems often find that they do not fit their practices (Yen & Sheu, 2004). Local Chinese ERP systems like Kingdee, Digital China and UFIDA on the other hand are more affordable to most Chinese companies, but they are relatively weak in their manufacturing and supply chain functions (AMR Research, 2007). There are still quite a number of companies decide to develop their own ERP system. However, not all of them have the necessary resources and

technical know-how. It is even worse when they do not recognize the difficulties until they get into deep trouble of over budgets in terms of time and costs.

The Chinese ERP market, which started from the late 1980s, grew with an annual rate of 20% above from 2003 to 2008 (CCW Research, 2009). Western ERP vendors such as SAP and Oracle rush into the Chinese ERP market and endeavor to catch a piece of this "ERP Pie". But it's really not easy for them to tame the Chinese ERP market. As reported in the CCID Consulting (CCW, 2009) report, about 33 percent of the ERP market share is held by SAP and Oracle, which is far below what they have got in the Western world (which was reported as 66% of the ERP market share is held by Oracle and SAP), this indicates that Western ERP giants have not got dominance in China ERP market (Xue et al., 2005; CCW Research, 2009). In addition, they encounter many difficulties when trying to localize their systems for the Chinese management practices (AMR Research, 2007). On the other hand, many local Chinese ERP vendors, which are assumed to be more familiar with the Chinese culture and management styles, still find it quite difficult to implement their ERP systems for the Chinese companies successfully as their systems are weak in manufacturing and SCM functions (AMR Research, 2007).

We would like to provide insights to explain why the Chinese firms encounter so many problems when applying ERP systems in their practices. Specifically, we focus on an organization's decisions upon ERP system (namely ERP decisions). ERP decisions are classified as (1) whether or not a company uses ERP system, and (2) if it does, which type of ERP system it uses. While the importance of adopting ERP systems has been well studied (Davenport, 1998; Sheu et al., 2004), ERP decisions still have not got much attention from literature. We believe that ERP decisions are very important as they are the first step to make ERP succeed in an organization (Wei et al., 2005; Donovan, 2001). The decisions will affect the subsequent implementation, adoption and outcome of an ERP system. Choosing a wrong ERP system has also been reported as a main factor that causes failure of an ERP project (Adebanjo, 2003; Adam & O'Doherty, 2000; Stefanou, 2001). We also believe that ERP decisions are not as simple as comparing the prices of various ERP systems. It is a process involving evaluation of an organization's resources (Stefanou, 2001; Bernroider & Koch, 2000), system maturity (Sammon & Adam, 2004; Gable & Stewart, 1999), practices/processes (Al-Mashari et al., 2008; Wei et al., 2005), culture (Xue et al., 2005; Soh et al., 2000) and vendors/consultants (Piturro, 1999; Wei & Wang, 2004). Therefore, it is very important to examine factors affecting an organization's ERP decisions.

Motivated by providing insights for ERP decisions, we conduct a comprehensive literature review and in-depth field studies. We found that many academicians and practitioners have attributed the underlying reasons of the phenomenon mentioned above to culture (AMR Research, 2007; Soh et al., 2000; Martinsons, 2004; Xue et al., 2005; Zhang et al., 2005; Avison and Malaurent, 2007). In the information systems (IS) field, scholars conceptualized the development, adoption, use and management of IS as information technology (IT) behaviors, which have been thoroughly studied from a cultural perspective. Scholars found that they are significantly affected by culture (Leidner and Kayworth, 2006). Therefore, we believe that culture also plays a significant role in ERP decisions. In this dissertation, we focus on organizational culture. All the companies we surveyed are operating in China, with different ownerships, sizes, and industries. They are in different degree affected by Chinese culture. Therefore, it would be more realistic and meaningful to examine the impacts of organizational culture on ERP decisions among these companies.

ERP system is closely related to SCM (Kwan, 1999; Kumar, 2001; Akkermans et al., 2003; Gunasekaran & Ngai, 2004). Technically, ERP can be the backbone facilitates SCM, Integration of ERP and SCM is a natural and necessary process in strategic and managerial consideration. An important development for ERP vendors today is to integrate the

software with SCM systems (Yen & Sheu, 2004; Tarn et al., 2002; Zheng et al., 2000). Therefore, we believe that SCM practices have a significant impact on ERP decisions. Building on the existing knowledge of the relationship between organizational culture and management practices (Aycan et al., 2000; McDermott and Stock, 1999; Naor et al., 2008), we also believe organizational culture has a significant direct effect on SCM practices. Therefore, we propose a theory in this dissertation that organizational culture does not only directly influence an organization's decisions upon ERP system, but also organizational culture indirectly influence ERP decisions through affecting an organization's SCM practices.

To illustrate the relationships between organizational culture, SCM practices and ERP decision, we take the previous IT-Culture studies (Leidner and Kayworth, 2006), which have proved that culture has significant impacts on IT behaviors, as one of our groundings; also, we employ those findings from the studies examining the relationship between culture and management practices as another theoretical support to this dissertation.

1.2 Motivations

In this dissertation, we not only examine the direct impacts of organizational culture on ERP decisios, but also investigate the mediating role of SCM practices in the relationship between

organizational culture and ERP decisions. We are motivated by providing insights for both practitioners and researchers. From a practitioner's point of view, this dissertation would provide the following insights. First, the findings will provide insights for manufacturers who want to choose a suitable ERP system for their practices. Second, the findings may also provide insights for both Chinese and Western ERP vendors. From the Western ERP vendors' (i.e. SAP, Oracle) perspectives, findings of this study could potentially help these vendors to localize their systems for their Chinese clients. Last the findings could help the Chinese ERP vendors, whose systems are now recognized as relatively weak in manufacturing and SCM functions (AMR Research, 2007), develop both affordable and comprehensive ERP systems. Theoretically, the proposition and validation the mediating role of SCM practices in the relationship between organizational culture and ERP decisions would provide a direction for IS researchers to conduct IT-culture studies by incorporating management practices, which is still a deficiency in IS field.

1.3 Research Questions

This dissertation attempts to answer the following research questions:

1) Which organizational culture dimension(s) significantly influence an organization's ERP decisions? And how this (these) dimension(s) influence ERP decisions?

2) Which SCM practices significantly influence an organization's ERP decisions? And how this (these) dimension(s) influence ERP decisions?

3) Are SCM practices significantly mediating the effects between organizational culture and an organization's ERP decisions?

Based on the existing knowledge of culture and IT studies (Leidner & Kayworth, 2006), we propose a theoretical model which details the relationships among organizational culture, SCM practices and ERP decisions. Hypotheses will be developed and validated through face-to-face questionnaire survey and statistical analysis. Implications and guideline of ERP decisions are also provided according to the theories examined.

1.4 Research Scope

In this dissertation, we investigate the roles that organizational culture and SCM practices play in an organization's ERP decisions. What is more important in this dissertation is the role of SCM practices in the relationship between organizational culture and ERP decisions.

First, we limit the survey subjects to be those manufacturers operating in Pearl River Delta (PRD) in South China. Secondly, organizational culture is defined as "the manifestation of practices or behaviors evolving from the shared values in the organization" (Hofstede

et al., 1990). We also adopt the Hofstede's six organizational culture dimension measurements in this study, with some changes in the scales. Third, though other management practices might also be related to ERP, they are beyond the scope of this dissertation, we only focus on SCM practices as they are very closely related. Finally, the results of ERP decisions are judged at the time we conduct the survey, the process to make the decision is beyond the scope of this dissertation, we only focus on the results (using or not using ERP system, and using which type of ERP system).

1.5 Expected Results

By conducting this study, we aim at making contribution to the literatures concerning organizational culture and IT behaviors by incorporating management practices. We expect the following results to be achieved in this dissertation.

First, cultural factors that directly influence an organization's ERP decisions will be found and validated. The results are expected to be consistent with the existing IT-culture literatures that culture significantly influences IT behaviors, with the specific cultural dimensions to be validated. Second, the impacts of SCM practices on ERP decisions will be examined and discussed, the direct effects of specific dimension(s) of SCM practices are to be found and validated. Third, the relationships between organizational culture and SCM

practices, with the specific dimensions, are to be illustrated. Finally, the mediating role of SCM practices playing in the relationships between organizational culture and ERP decisions will be discussed. Insights on ERP decisions will be provided.

1.6 Research Approach

This dissertation adopts field study approach for data collection in the Pearl River Delta (PRD) region. A comprehensive questionnaire was developed to measure manufacturing firms' organizational culture, SCM practices and their ERP decisions. We select top five cities (including Guangzhou, Shenzhen, Zhongshan, Foshan and Dongguan) in terms of their industrial outputs (GDP) to conduct the survey as these cities are most representative for manufacturing industries in PRD. As the dependent variables in the research models are categorical in nature, we use logistic regression as our main statistical technique for analysis and SPSS 16.0 is used. To examine the relationships between organizational culture and SCM practices, we use multiple regression as the analytical technique.

1.7 Organization of This Dissertation

We organize the rest of this dissertation in the following ways. Chapter 2 provides a comprehensive literature review which covers various concepts and measurement models of organizational culture. We also review comprehensive literatures about culture and IT behaviors, culture

and management practice, which formulate the theoretical foundations of this dissertation. We review literatures of SCM practices and provide the rationales of adding SCM practices to the research model. In chapter 3, we present the research model and hypotheses. We establish the model based on the previous studies on culture and IT behaviors, culture and management practices, in which we examine the relationships within the research scope we discuss above. Based on the theoretical findings in literature and the results of our in-depth interviews with practitioners, we develop the hypotheses regarding of the relationships between organizational culture, SCM practices and ERP decisions. Two research models are presented for two ERP decisions respectively. Chapter 4 discusses the research methodology of this dissertation in terms of methods, data collection, context, questionnaire design, measurement model, variable operationalization. In chapter 5, we discuss the statistical methods appropriate for this study, we use logistic regression and multiple regression as our main techniques, and then we present the results of the research models and hypotheses testing. In chapter 6, we present a detailed discussion on the results of this study. In chapter 7, we first present the contributions and implications in theory and practices of this dissertation and then we summarize the conclusions, limitations and future directions for further study.

Chapter 2. Literature Review

In this chapter, a comprehensive literature review related to this study is presented. Sources of this review include books, journal articles, reports, dissertations and online resources, the topics cover the areas of ERP research, organizational culture, IT-culture studies, organizational culture and management practices, SCM practices and supply chain strategies. These works build up the basis for developing the research model to examine the relationships between organizational culture, SCM practices and ERP decision. This review summarizes what have been done in existing literature and demonstrates the need for this study.

We organize the review as following. First, we briefly introduce the background related to this dissertation, mainly including literatures about Chinese ERP research and selection of ERP system. Through these discussions, we bring out the research topic. Second, we present a comprehensive review on organizational culture, in which a list of definitions and measurements of organizational culture are introduced. To build up the theoretical foundations for this dissertation, we review a broad range of cultural studies in information system area (namely IT-culture studies, Leidner and Kayworth, 2006) and summarize the research gap in the third section. We examine how organizational culture influences management practices, which builds up the basis of the proposed relationship between organizational culture and SCM practices

in the fourth section. Finally, a brief introduction of the literature about SCM practices and supply chain strategies as well as their relationships is presented.

2.1 Background of ERP Decision Problem

2.1 .1 Chinese ERP Research

Since its first introduction to China in 1981, ERP systems have got a lot attention from researchers of different disciplines like operations and production management, manufacturing engineering, and information systems (Wang et al., 2005). Both practitioners and academicians have conducted many discussions and studies on the Chinese ERP phenomenon described in the first chapter during the past two decades. Regarding of this ERP phenomenon, many practitioners argue that ERP system is not suitable for Chinese manufacturing companies because of differences in economic systems, culture and business processes between Western developed countries and China (Xue et al., 2005). In academics, scholars also conducted various ERP studies in China, they tried to provide insights for practitioners to know how to develop and implement ERP systems for Chinese companies (Wang et al., 2005), these studies include success factors of ERP implementation (Shanks et al., 2000; Zhang et al., 2003; Zhang et al., 2005; He, 2004; Lu et al., 2006; Woo, 2007), failure stories of ERP implementation (Xue et al., 2005), ERP implementation outcomes (Martinsons, 2004), China ERP market (Liang

et al., 2004; Liang and Xue, 2004) and also some technical issues (i.e. optimization algorithms and architectures) of ERP development, implementation and adoption. In this review, we focus on managerial issues of China ERP research, which is consistent with the main theme of the whole dissertation.

Similarly with existing literature conducted in non-Chinese context, scholars who examined success factors for ERP implementation in China also summarized some critical success factors in Chinese context, these factors include top management involvement, team configuration, qualification of project team members and so on (Reimers, 2003). On the other hand, scholars pointed out some obstacles that contribute to failures of ERP implementation in China, such obstacles include language, report and table format, business process re-engineering (BPR), economic reform impact, cost-control system, human resource problem, price issue, and connection with ERP consultants (Xue et al., 2005). In some marketing studies (i.e. Liang et al., 2004), researchers also refer to the obstacles mentioned above as the reasons that the Western ERP vendors could not dominate China's ERP market.

Moreover, scholars also include culture as an important factor that should be taken into consideration when implementing ERP systems for Chinese companies (Soh et al., 2000; Zhang et al., 2005; Martinsons, 2004; Xue et al., 2005; Avison and Malaurent, 2007). Avison and

Malaurent (2007) used a case study method and exposed cultural problems that occurred when attempting to implement a working ERP system in Europe into a company's Chinese subsidiary. They found that people involvement and language are the main cultural reasons that contribute to the failure of ERP implementation in the Chinese subsidiary. Zhang et al.(2005) used multiple cases and specifically incorporated organizational culture as a factor that influence ERP implementation success in China. In their study, they used three cultural dimensions "parochial versus professional, open versus closed system, and loose versus tight control", which were developed by Hofstede and colleagues (1990), to represent organizational culture and found that these three dimensions are most closely linked with ERP implementation. They concluded that Chinese people are more tolerant to unclear information, relying more on personal experience, keeping more information among themselves than their Western counterparts. These cultural characteristics are incompatible with the ERP deployment requirement which emphasizes clear and accurate data/information, focuses on business processes and inter-departmental cooperation (Zhang et al., 2005). Their findings are consistent with the knowledge that ERP is originated from the Western, the structure and processes embedded in an ERP system reflect Western cultures, it might not be appropriate in Chinese context due to cultural differences between China and the West

(Leung et al., 2005). These findings provide a direction for this study that culture could be one important factor for ERP decision.

2.1.2 ERP Selection

Usually ERP system is a critical investment to a company; it can significantly affect the competitiveness and performance of the company (Wei, Chien and Wang, 2005). Because of the complexity of the business environment, the limitations in available resources, and the diversity of ERP alternatives, selecting an ERP system becomes a tedious and time consuming job for many companies (Teltumbde, 2000). In addition, given the considerable investment, potential risks and benefits, companies cannot take the risk to underestimate the importance of selecting an ERP system. Although there are many ERP alternatives in the market, existing ERP packages cannot provide a once-for-all business model for every process of all industry. There is no single ERP system that can meet all company functionalities or all special business requirements (Sarkis and Sundarraj, 2000; Hong and Kim, 2002). Companies need to spend much time and efforts when selecting a suitable ERP system.

When a company wants to buy a product, the characteristics of the product play an important role in the final decision of the company to start using that new product (Everdingen et al., 2000). Therefore, companies need to take into consideration of the characteristics of an

ERP system when trying to find an ERP system and apply those characteristics to match with the criteria in selecting information systems. These criteria including supports, scalability, user friendliness, costs, flexibility and fit with business procedures, and they are mainly from technology diffusion theory (Rogers, 1995). For ERP system selection, scholars specifically emphasized organization's resources (Stefanou, 2001; Bernroider & Koch, 2000), system maturity (Sammon & Adam, 2004; Gable & Stewart, 1999; Archer-lean et al., 2006), practices (Al-Mashari et al., 2008; Deep et al., 2008; Wei et al., 2005), culture (Xue et al., 2005; Soh et al., 2000) and vendors (Piturro, 1999; Wei & Wang, 2004) as important factors that affect the decision to buy an ERP system. Stefanou (1999) pointed out that information sharing and commitment to change by all are two factors should play a major role in the decision whether or not to acquire an ERP system, especially in a SCM environment. The findings of these studies provide strong proof that ERP decision (or selecting an ERP system) is not as simple as comparing the prices of various alternatives only, there are many factors that influence such decision, it's necessary and important to examine the underlying factors if one wants to make ERP project a success.

However, the process of selecting a suitable ERP system is one of the least researched issues that warrant research on ERP (Livermore & Ragowsky, 2002). In addition, existing ERP selection literatures were

mainly focusing on proposing different selection methods or how to apply criteria to select an ERP system (Everdingen et al., 2000; Wei, Chien & Wang, 2005; Liao et al., 2007; Baki & Cakar, 2005). For example, Wei, Chien and Wang (2005) used an AHP-based approach to ERP system selection, their method allows a company to identify the elements of ERP system selection including total costs, implementation time, functionality, user friendliness, flexibility, reliability (namely system factors) and reputation technical capability and services (namely vendor factors). Liao et al. (2007) also established a linear programming model which is based on linguistic information processing for selecting the most suitable ERP system. Their method combines objective information from external professional and subjective information from internal project team, the aggregate result provides collective opinions for a company to select ERP system. Everdingen et al. (2000) conducted a survey in Europe to find out what factors that small and medium enterprises (SMEs) consider most when selecting ERP systems; similarly, Baki and Cakar (2005) used case study in Turkish manufacturing companies to determine what criteria are used in ERP selection process and what are the most important for firms. In their works in 2002, Livermore and Ragowsky incorporated culture and conducted a cross-cultural approach to see if culture does make a difference and attempted to demonstrate how the differences that can be found in the

decision making patterns of companies in the US and Israel. They found that some decision making patterns may be more appropriate for certain culture. From the discussion above, we can see that existing literatures mainly focus on the general issues for ERP system selection, they have provided insights for the decision on using or not using ERP system. However, limited insight is found regarding of choosing which type of ERP system. There is a need for more empirical works to examine how the underlying factors like organizational culture that influence the processes of ERP system selection.

2.2 Theoretical Foundations

Following the discussion above, we conducted a comprehensive literature review. This review provides the theoretical foundations for us to conduct this study. In this section, we incorporate organizational culture, IT-culture studies, organizational culture and management practices studies as the main theoretical foundations for this study.

2.2.1 Organizational Culture: Concepts & Measurements

To conduct a study involving culture, the first challenge is to clearly define culture. There are many definitions, conceptualizations and dimensions to describe culture. In 1952, Kroeber and Kluckhohn identified 164 definitions of culture, they found that culture had been defined as values and beliefs shared by members of a society and the

patterns of behavior, feel and reaction shared by a society. Under different conceptualizations, culture has been framed as implicit and/or explicit. Sackmann (1992) suggested that culture includes ideologies, coherent sets of beliefs, basic assumptions, shared sets of core values, important understandings, and the collective will. Some researchers suggest that culture should include explicit, observable artifacts like practices, symbols, languages, rituals, heroes and ceremonies (Hofstede, 1990; Burchell et al., 1980; Pettigrew, 1979). While many prominent views proposed that culture include (or range from) both explicit and implicit as a whole. For example, Schein (1985) proposed a three-level model of culture including artifacts, values and basic assumptions. Artifacts include the organization's written and spoken languages and jargons, office layouts and arrangements, organizational structure, dress codes, technologies and behavior patterns; Values is the reason for people's behavior, and the rationalization of their behavior, they are a sense of "what ought to be, as distinct from what is"; Basic assumptions, are unconscious but actually determine how group members perceive, think and feel. Hofstede (1980) presented the manifestations of culture ranging from symbols, heroes, rituals (also represented as practices) to values (here value serves as the core of culture), this frame of culture includes both explicit and implicit perspectives.

Regarding the definitions of culture, the most common view is the stream of definitions based on shared values. Value is an "enduring belief that a specific model of conduct or end-state of existence is personally or socially preferable to an opposite of converse mode of conduct or end-state of existence" (Rokeach, 1973). There is a stream of culture definitions based on values and it is very common for this stream of definitions to identify and describe culture as a set of value patterns that are shared across individuals and within group (Straub et al., 2002).

Kluckohn (1951) defines culture as "patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional ideas and especially their attached values". Triandis (1972) defines culture as "a group characteristic way of perceiving the man-made part of its environment. The perception of rules and the group's norms roles and values are aspects of subjective culture". Geertz (1973) defines culture as "a historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop the knowledge about and attitudes toward life". Among these definitions, Hofstede, the most prominent scholar in this school of thought, defines culture as "the collective mental programming of mind

that differentiates the members of one group from another". He suggests that people share a collective national character which represents their cultural mental programming. This mental programming of mind shapes the values, attitudes, competences, behaviors, and perceptions of priority of their nationality (Morden, 1999). Lachman (1983) argues that culture is composed primarily of the core values and the beliefs of people in a society, these core values are more central, important or dominant to the individuals than others and they are more resisting to change more than those values which are peripheral. This shared patterns view was still being advocated in the late 1990s, some researchers still built their works on it. For example, Trompenaars (1993) support that culture is composed of shared values; Erez and Earley (1993) defined culture as the "shared way a group of people view the world". To sum up, we affirm that shared values are the core of culture, these shared values are said to differentiate cultures.

Based on different conceptualizations and definitions, researchers proposed different models for measuring culture, including national and organizational levels. In this dissertation, we only concentrate on organizational culture as we conduct this study in China only, the fit between organizational culture and the philosophy embedded in an ERP system is more important (Ke and Wei, 2008).

Organizational culture has been defined in various ways and ascribed numbers of identifiable value-sets (Schein, 1985; Quinn, 1991) such as management styles, reward systems, communication styles, manner of decision making, all of which help to define an organization's character and norms (Straub et al.,2002; Scott et al., 2003).

Schein (1985) defined organizational culture as "a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration--that has 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".

In this dissertation, we take Hofstede (1990) definition of organizational culture, in which organizational culture is defined as "the manifestation of practices or behaviors evolving from the shared values in the organization", this implies that organizational culture refers to practices, the more observable perspectives of culture. Researchers have developed many models to measure organizational culture, with the aim to differentiate organizations along the lines of dominant values guiding organizational behaviors (Leidner and Kayworth, 2006).

The measurement models of organizational culture adopt either a typological approach or a dimensional approach. The typological approach assesses organizations in one of more "types" of organizational culture (i.e. the competing values framework). The dimensional approach,

on the other hand, describes a culture by its position on a number of continuous variables (Fletcher and Jones, 1992).

From the literature, the most influential typological model is the Competing Values framework (CVF) developed by Quinn and Rohrbaugh (1981), this framework include two dimensions, the first dimension is internal emphasis and external focus, the second dimension considers stability/control and flexibility. This framework characterizes organizational cultures as group, developmental, rational, or hierarchical. The group culture type emphasizes flexibility and focuses on the internal organization. The developmental culture type pertains to flexibility and change too, but keeps a focus on the external environment. The rational culture type has an external focus, but it is control oriented. Rational culture emphasizes goal achievement. The hierarchical culture type pertains to internal efficiency, coordination, and evaluation. The focus is on the logic of the internal organization and its stability (Cameron & Quinn, 1999; Naor et al., 2008).

The Organization Ideology Questionnaire by Harrison (1972 and 1975) is also a typological one, but in contrast to the Competing Values Model, it appears to have been a product mainly of inspiration (Scott et al., 2003). Both models have been influential, applied in many settings by other researchers and practitioners.

We have summarized the dimensional approach of organizational culture measurements in table 2.1.

Table 2.1: Organizational Culture Measurements (Dimensional)

Name	Dimensions	References
Culture Gap Survey	Task support, task innovation, social relations and personal freedom	Kilman and Saxton, 1983
Organizational Beliefs Questionnaire	Work should be fun, being the best, innovation, attention to detail, worth and value of people, quality, communicating to get the job done	Sashkin, 1984
Organizational Culture Survey	Teamwork and conflict, climate and morale, information flow, involvement, supervision, meetings	Glaser, Zamanou, and Hacker 1987
Organizational Culture Inventory	Task orientation, people orientation, security needs, and satisfaction needs	Cooke and Lafferty, 1989
Organizational Practices	Process versus results oriented, job versus employee oriented, professional versus parochial, open versus closed system, loose versus tight control, normative versus pragmatic	Hofstede et al., 1990
Corporate Culture Questionnaire	Performance, human resources, decision making, and relationships	Walker, Symon, and Davies 1996

The existing literatures provided us with various kinds of instruments to measure organizational culture. We have found three basic dimensions / conceptual domains that appear to be common in most instruments. The first is people-orientation, which reflects perceived support, cooperation, mutual respect and consideration between organizational members. This dimension can be referred as the group culture of the Competing Values Models (CVM). Hofstede's (1990) practices, Organizational Beliefs Questionnaire and Organizational Culture Inventory, all use employee-oriented or people-orientation or value of people to illustrate this dimension. The second dimension is control, which focuses on the level of work

formalization, the existence of rules and procedures and the importance of the hierarchy. This dimension is well reflected in CVM (Hierarchical culture) and Hofstede's instrument (tight control). The third dimension is results orientation, which measures the level of productivity or performance expected inside an organization. In Hofstede's (1990) work, results-oriented is used as a symbol of this dimension. Xenikou and Furnham (1996) also conducted a study and reported the correlational results of four types of organizational culture instruments, which provide support for the discussion above.

In this dissertation, our instrument for measuring organizational culture is mainly based on Hofstede et al.'s (1990) six organizational culture dimensions (namely *process versus results oriented, job versus employee oriented, professional versus parochial, open versus closed system, loose versus tight control, pragmatic versus normative*). Hofstede (1990) defined organizational culture as being collective and often intangible, culture is what distinguishes one group, organization, or nation from another. There are two main elements of culture: the internal values of culture (invisible) and external elements of culture (visible), which are known as practices, thus, the shared practices define an organization's culture(Hofstede et al., 1990). According to De Long and Fahey (2000), practices are particularly important to investigate because they are the most direct ways to change behaviors needed to support

knowledge creation, sharing, and use. We choose Hofstede et al.'s (1990) work because: (1) this framework is relatively easy to map onto organizational issues like SCM practices and IT and is therefore useful for effectively managing change (Cabrera et al., 2001); (2) Hofstede et al.'s (1990) data shows that the different organizations within the same national culture could be distinguished from day-to-day practices they differently adopt and not from their values. This finding is very consistent and supportive for this dissertation. The six dimensions of Hofstede's organizational culture are as following.

1) *Process versus results oriented*, this dimension refers to whether an organization is more concerned with the means and procedures that must be followed to carry out the work or with the goals that are pursued with that work. Process-oriented is typical of mechanistic or bureaucratic organizations rich in rules and procedures, whereas results orientation is typical of organic, risk-taking organizations, in which mistakes are well tolerated and innovation is valued.

2) *Employee versus job oriented*, this dimension reflects whether the organization is more concerned with the well-being of the staffs or with getting the job done. Groups or committees often make the important decisions in

employee-oriented cultures, and an effort is made to help new members adjust. On the contrary, job-oriented cultures tend to rely on individual, top-down decision making.

3) *Parochial versus professional*, this dimension reflects the weight that is given to the occupational cultures of the members of the organization. In parochial organizations, employees identify strongly with their organization, whereas in professional organizations employees identify more with their profession. When hiring new employees, parochial organizations rely on social and family background information, whereas professional organizations hire on the basis of job competence alone.

4) *Open versus closed system*, this dimension refers to the communication style and climate within the organization. In an organization with open system culture, information flows easily through the organization, whereas closed system organizations are more secretive.

5) *Loose versus tight control*, this dimension refers to the amount of control an organization exerts over their employees. In a tight control organization, we could observe strict meeting times and show a strong cost-saving consciousness. While in loose control organizations, they

are more permissive about individual's preferences (e.g. people often play jokes openly and this is accepted)

6) *Normative versus pragmatic*, this dimension refers the degree of an organization conform to institutional pressures. A pragmatic organization is one that is more market driven and is open to ad hoc solutions, while a normative organization is more concerned with following institutional rules and procedures. Meeting customer needs is a major objective for pragmatic organizations while normative organizations are more interested in following the 'right' procedures as a way of obtaining legitimacy (Hofstede et al., 1990).

2.2.2 Culture & Information Technology (IT) Behaviors

Taking IT-culture studies as one of the theoretical foundations of this dissertation, we conducted a comprehensive but not exhaustive review on the literatures about culture and IT behaviors which including IT development, adoption and diffusion, management and strategies, use and outcome under the guideline of Leidner and Kayworth's (2006) work published in *MIS Quarterly*. In our review, we mainly focus on those studies at organizational level, which is consistent with the whole theme of this dissertation.

According to Leidner and Kayworth's findings, we believe that culture is a critical variable in explaining how social groups interact with IT. Leidner and Kayworth presented a holistic view on the existing literature of IT-culture studies. They summarized the literatures as six themes, namely

1) Culture and information systems development,
2) Culture, IT adoption, and diffusion,
3) Culture, IT use, and outcomes,
4) Culture, IT management, and strategies,
5) IT's influence on culture, and
6) IT culture.

These IT-culture studies, both at national and organizational level of cultures, indicate that culture plays a significant role in various IT behaviors. They provide insights to answer the following questions:

1) How culture influences IS design/development? (Dagwell & Weber,1983; Kumar et al., 1990; Keil et al., 2000; Tan, Smith, & Keil, 2003; Dube & Robey, 1999; Ngwenyama & Nielsen, 2003);
2) Whether culture influences the adoption and diffusion of IT? (Hoffman & Klepper, 2000; Huang et al., 2003; Garfield & Watson, 1998; Hasan & Ditsa, 1999; Hill et al., 1998; Hussain, 1998; Jarvenpaa & Leidner, 1998; Loch et al., 2003;

Ke & Wei, 2008);

3) Will the same IT be used in similar ways across cultures and result in similar benefits? (Calhoun et al., 2002; Chau et al., 2002; Choe, 2004; Chow et al., 2000; Alavi et al., 2004; Baltahazard & Cooke, 2003; DeLong & Fahey, 2000; Gold et al., 2001; Guo & D'Ambra, 2009);

4) How culture influences IT management and strategies? (Husted, 2000; Kettinger et al., 1995; Milberg et al., 1995; Shore et al., 2001; Grover et al., 1998; Kanungo et al., 2001; Jones et al., 2006)

At organizational level, various cultural models have been applied to examine culture's impact on IT behaviors like adoption and use. Kitchell (1995) used self-developed measures of organizational culture (flexibility, open communication, risk-taking, long-term orientation) to examine how organizational culture influences the propensity to adopt advanced manufacturing technologies (AMT), they found that companies with flexible and long-term oriented organizational culture have a greater propensity to adopt AMT. Hoffman and Klepper (2000) examined the link between different types of organizational cultures (networked, communal, fragmented, mercenary) and success with new technology assimilation. Their findings suggest mercenary cultures were more supportive of new technology assimilation than networked organizational

cultures. Cabrera, Cabrera and Barajas (2001) used Hofstede et al.'s (1990) six organizational culture dimensions to examine how organizational culture influences technology assimilation. They concluded that technology innovations and organizational culture should fit with each to make technology assimilation be a success; their findings are also consistent with the suggestion from organizational culture and sociotechnical theories that the goodness of fit between organizations and technology is critical to successful implementation and use (Pasmore et al., 1982). Rupple and Harrington (2001) used competing values framework (CVF, Quainn and Rohrbaugh, 1981) and found Intranet adoption is facilitated by a culture that emphasizes organizational values related to trust and concern for others (ethical culture) and flexibility and innovation (developmental culture). Ke and Wei (2008) characterized organizational culture as five dimensions namely learning and development, participative decision making, support and collaboration, power sharing, and tolerance for conflicts and risk, they used these five dimensions to examine how organizational culture influences ERP implementation and put forward with some propositions to link up the cultural dimensions with ERP implementation.

Existing literatures indicate the role of organizational culture playing in diversified IT behaviors (figure 2.1), which provide the groundings for this dissertation. However, most of the existing literatures only use single

or multiple case(s) method to examine the relationship between organizational culture and IT behaviors, there is a need for more empirical supports to improve the generalizability of the theory.

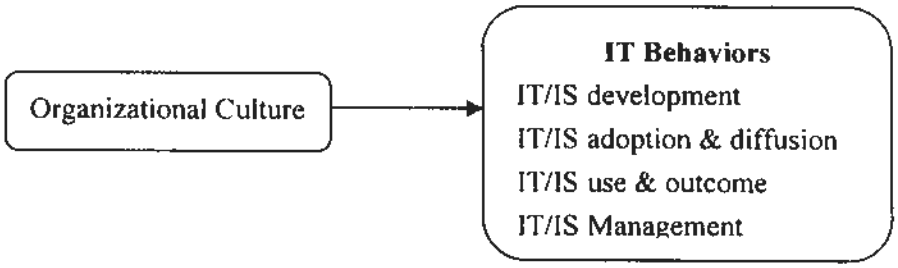

Figure 2.1: the Relationship between Organizational Culture & IT Behaviors

2.2.3 Culture and Management Practices

The second theoretical foundation we take from literature is the relationship between culture and management practices. Existing literatures indicate that culture has significant impacts on management practices, these works provide insights to answer the following questions:

1) Can any management practice be applied to different countries? (Marchese, 2001; Newman & Nollen, 1996; Gerhart & Fang, 1997);
2) Why the same management practice is practiced differently and achieves different results across different organizations? (Naor et al., 2008; McDermott & Stock, 1999; Nahm et al., 2004; Aycan et al., 1999)

Obviously, the first question stems from national culture studies, scholars examined why some management practices, which are assumed to be advanced and fit in Western countries like US, cannot achieve the

same results when practicing in other non-Western countries. These literatures indicate there should be a fit between national culture and management practices for multinational enterprises to achieve high performance, they have to adapt their management practices to the national culture where they operate.

The themes of existing literatures related to the second questions are consistent with what we are going to examine in this dissertation in that they proved the existence of the relationships between organizational culture and various management practices like human resources management practices (Chan, 2004; McAfee, Glassman & Honeycutt, 2002; Aycan et al., 1999; Schneider, 1988), quality management practices (Naor et al., 2008; Prajogo & McDermott, 2005; Maull, Brown & Cliffe, 2001; Wakefield, 2001; Zeitz, Johannesson & Ritchie, 1997) and operations management practices (Khazanchi, Lewis & Boyer, 2007; Skerlavaj et al., 2007; Nahm, Vonderembse and Koufteros, 2004; Yauch & Steudel, 2002; McDermott & Stock, 1999; Nakata & Sivakumar, 1996; Nironen, 1995; Zammuto & O'Connor, 1992). These works adopted different organizational culture instruments and their findings indicate that organizational culture influences management practices and subsequently leads to different levels of performance.

Naor et al. (2008) employed competing values model to represent organizational culture and examined the linkage between culture and

quality management practices, as well as their linkage with performance. They found organizational culture (namely group, developmental, rational and hierarchical cultures) is positively related to infrastructure quality practices which emphasize top management support, work force management, supplier and customer involvement. As these aspects involve more of the social and behavioral aspects of quality management, whereas the impacts of organizational culture on core quality practices, which emphasizes quality information on processes, process management and product design have a more technical orientation, are not significant. Their study pointed out behavioral perspectives of management practices are more closely related to organizational culture. Their findings provide significant insights as we cannot use an exhaustive list of SCM practices to conduct this study.

Nahm, Vonderembse and Koufteros (2004) adopted Schein's (1985) conceptualization of organizational culture and used six managerial beliefs (espoused values) which include beliefs on investing facilities and equipment, beliefs on working with others, beliefs on making decision that are global, beliefs on management control, and beliefs on integrating with suppliers to represent organizational culture and examined the impacts of these beliefs on time-based manufacturing practices such as reengineering setups, cellular manufacturing, quality improvement efforts, preventive maintenance and pull production. They found that

beliefs on investing facilities and equipment, beliefs on integrating with suppliers and beliefs on making decision that are global are significantly affecting time-based manufacturing practices.

Existing literatures extensively prove that organizational culture significantly influences various management practices (Figure 2.2). However, the impacts of organizational culture on SCM practices, which are important for both practitioners and academics, have not been well studied. Therefore, this dissertation also contributes to literature by providing more insights about the relationships between organizational culture and SCM practices.

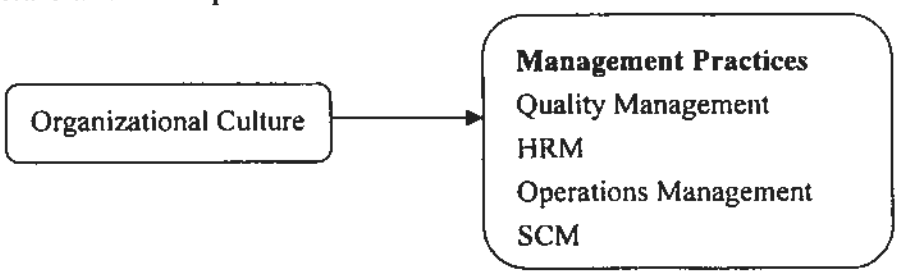

Figure 2.2: Relationship between Organizational Culture & Management Practices

2.2.4 Supply Chain Management (SCM) Practices

As discussed above, existing literatures have provided a theoretical support for the existence of the impacts of organizational culture on SCM practices on one hand. On the other existing literatures also prove that there is a close relationship between SCM and ERP (Kwan, 1999; Kumar, 2001; Akkermans et al., 2003; Gunasekaran & Ngai, 2004), technologically, ERP is said to be the backbone of SCM (Sheu et al., 2003; Singh, 2003; Stadtler, 2008), the integration of ERP and SCM is a

natural and necessary process in strategic and managerial consideration, also the most important trend for ERP vendors today is the integration with SCM (Yen & Sheu, 2004; Tarn et al., 2002 ; Zheng et al., 2000; Koh et al., 2006, Bose et al., 2008). Therefore we believe SCM practices also have a significant impact on an organization's ERP decision. There are many literatures studying SCM practices, through the review in this section, we aim to provide a picture for the current status of SCM practices research and present the rationales of choosing certain dimensions of SCM practices for this dissertation.

SCM has become an essential prerequisite to staying in the competitive global race and to growing profitably (Power et al., 2001; Moberg et al., 2002), the concept of SCM has got increasing attention from academicians, consultants, and business managers (Croom et al., 2000; Tan et al., 1998; Van Hoek, 1998; Li et al., 2005). In academics, many research works have been conducted to examine the relationships of various SCM practices and organizational performance (Choi and Hartley, 1996; Vonderembse and Tracey, 1999; Tan 2002; Li et al., 2005; Zhou and Benton, 2007). However, many of the current empirical studies focus on either the internal supply chain, the upstream (supplier side) or downstream (customer side) of the supply chain (Li et al., 2005). We summarize some main research works as table 2.2 that focus on SCM practices.

Table 2.2: Literature of SCM Practices

Source	Dimensions of SCM Practices
Donlon (1996)	Supplier partnership, Outsourcing, Cycle time compressing, Continuous process flow, IT sharing
Tan et al. (1998)	Purchasing, Quality, Customer relations
Alvarado & Kotzab (2001)	Core competencies, Use of inter-organizational systems, Elimination of excess inventory levels
Tan (2002)	Supply chain integration, Information sharing, Supply chain characteristics, Customer service management, Geographical proximity, JIT capability
Chen and Paulraj (2004)	Supplier base reduction, Long-term relationship, Communication, Cross functional teams, Supplier involvement
Li et al. (2005)	Strategic supplier partnership, Customer relationship, Information sharing, Information quality, Internal lean practices, Postponement
Zhou and Benton (2007)	Supply chain planning, JIT production, Delivery

SCM practices have been defined as the set of activities undertaken in an organization to promote effective management of its supply chain (Li et al., 2005). In this dissertation, we include supplier side, customer side and internal supply chain as whole to represent SCM practices. Supplier side SCM practices mainly refer to those activities related to deal with suppliers including purchasing management (Banfield, 1999; Tan et al., 1998; Lamming, 1996), supplier relationship (Kalwani & Narayandas, 1995; Donlon, 1996; Carr & Pearson, 1999; Li et al., 2005), supplier development (Choi & Hartley, 1996; Watts & Hahn, 1993; Krause et al., 1998), supplier involvement (Vonderembse & Tracey, 1999; Chen & Paulraj, 2004) and supplier alliance (Monczka et al., 1998; McCutcheon & Stuart, 2000; Zsidisim & Ellram, 2001; Arend, 2006). While customer side SCM practices include demand management,

customer services management (Lambert & Cooper, 2000; Tan, 2002) and customer relationship (Tan et al., 1998; Li et al., 2005), most of which are related to the activities in dealing with customers. Internal SCM practices refer to the activities related to manufacturing and production processes including lean production (Shah & Ward, 2007; Zhou and Benton, 2007; Oliver et al., 2007;Li et al., 2005; King & Lenox, 2001; Lewis, 2000; Levy, 1997), agile manufacturing (Booth, 1996; Kusiak and He, 1997; Gunasekaran, 1998; Zhang & Sharifi, 2000), IT and information sharing (Tan, 2002; Alvarado & Kotzab, 2001; Li et al., 2005; Chen & Paulraj, 2004; Donlon, 1996). Also there are some activities unclassified like Geographical proximity (Tan, 2002), postponement (Feitzinger & Lee, 1997; Pagh & Cooper, 1998; Emst & Kamrad, 2000; Li et al., 2005).

Therefore, we adopt the following five dimensions from Li et al.'s (2005) work to represent SCM practices in this dissertation. These dimensions are:

1) *Supplier relationship*, which is defined as "the long-term relationship between the organization and its suppliers. It is designed to leverage the strategic and operational capabilities of individual participating organizations to help them achieve significant ongoing benefits" (Li et al., 2005; Stuart, 1997)
2) *Customer relationship*, which is defined as "the entire array of

practices that are employed for the purpose of managing customer complaints, building long-term relationships with customers, and improving customer satisfaction" (Li et al., 2005; Tan et al., 2002)

3) *Information sharing*, which is defined as "the extent to which critical and proprietary information is communicated to one's supply chain partner" (Li et al., 2005)
4) *Information quality*, which includes "such aspects as the accuracy, timeliness, adequacy, and credibility of information exchanged" (Li et al., 2005)
5) *Internal lean practices*, which is defined as "the practices of eliminating waste (cost, time, etc.) in a manufacturing system, characterized by reduced set-up times, small lot sizes, and pull-production" (Li et al., 2005)

These dimensions of SCM practices cover supplier side, customer side and internal supply chain, which represent the basic concept of supply chain management. In addition to the five dimensions above, we also develop *internal agile practices*, which has been defined as "the capability of surviving and prospering in a competitive environment of continuous and unpredictable change by reacting quickly and effectively to changing markets, driven by 'customer-defined' products and services" (Cho et al., 1996), as a dimension to be included in the construct SCM

practices as agile manufacturing represents another type of strategies which emphasizes on flexibility and response to changes. We follow the principles of agile manufacturing (including concurrent engineering, empowerment of decision making, multi-skilled workforce, cross-functional teams etc.) defined by Gunasekaran (1999) and develop the measurement items for *internal agile practices*.

To sum up, existing literatures have provided a pool of dimensions of SCM practices; most of these dimensions have been empirically validated.

2.3.5 Supply Chain Strategies

A company's SCM practices are also influenced by its supply chain strategies (Qi, Boyer & Zhao, 2009; Narasimhan et al., 2008; Li et al., 2006; Tan, 2002). However, we focus on the impacts of organizational culture on SCM practices in this dissertation. Therefore, we take into consideration of the effects of supply chain strategies on SCM practices by taking supply chain strategies as a control variable.

Fisher (1997) proposed two fundamental supply chain strategies: efficient and market-responsive. Following his work, quite some authors propose and empirically validate different taxonomies of supply chain strategies; most of their works have been focused on lean and agile supply chain.

Lean supply chain follows the ideal of "lean thinking", which focuses on eliminating all kinds of waste; it is an extension of lean

thinking in manufacturing (Womack & Jones, 1996). Lean supply chain aims to reduce cost and enhance efficiency through elimination of wastes; it matches with a relatively stable environment (Qi et al., 2009). Lee (2004) proposed "*efficient supply chain*", which is very close to *lean supply chain*. In an *efficient supply chain*, both demand and supply uncertainties are low. Under such environment, companies practice their best to eliminate the no-value-added activities and pursue scale economies, and they deploy optimization techniques to get the best capacity utilization in production and distribution.

Agile supply chain comes from a paradigm "agility", which is proposed by Kidd (1994). It was extended from the agility of a single company to supply chain (Christopher and Towill, 2001; Yusuf et al., 2004), it aims to provide customer-driven products to the market quickly in order to maintain a competitive advantage in a rapidly changing environment (Lee, 2004; Qi et al., 2009).

Besides the two types of supply chain strategies, "*leagile*" supply chain, which is a combination of lean and agile supply chain strategies, is also proposed by authors (Bruce et al., 2004; Mason-Jones et al., 2000). Naylor et al.(1997) defined *leagile* as "the combination of the lean and agile paradigms within a total supply chain strategies by positioning the decoupling point so as to best suit the need for responding to a volatile demand downstream yet providing level scheduling upstream from the

marketplace". In Lee's (2004) uncertainties framework, *leagile* is decomposed as *risk-hedging* and *responsive* supply chains which stay between *lean* and *agile* supply chains.

Qi et al. (2009) conducted a survey-based empirical study in China and proposed that Chinese manufacturers can be mapped using the typology of lean, agile, and lean and agile supply chain strategies. As a world factory, much of the manufacturing in China is labor-intensive and low cost focused, thus we expected that lean approaches would dominate over agile in China. However, there are some Chinese companies who may also pursue agile strategies to meet the dynamically changing needs of the customer (Qi et al., 2009). Still there are some companies who always emphasize both lean and agile strategies, by adopting such strategies they aim to achieve lower cost in a rapidly changing environment. In this dissertation, we adopt Qi et al.'s (2009) framework to measure supply chain strategies for Chinese manufacturing firms.

Chapter 3. Research Hypotheses and Models

In this chapter, we elaborate how the specific dimensions of organizational culture and SCM practices influence an organization's ERP decisions. Based on the theoretical findings of IT-culture and culture-management practice studies, we propose a research framework which integrates culture, management practices and IT behaviors. To seek answers to the research questions of this dissertation and further validate this framework, we propose the existence of the relationships between organizational culture, SCM practices and ERP decisions.

3.1 Research Framework

Based on a comprehensive literature review, a conceptual model which integrates culture, management practices and IT behaviors is proposed as figure 3.1.

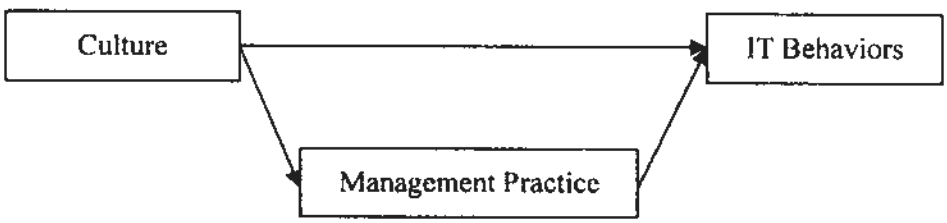

Figure 3.1: the Conceptual Model

According this research framework, culture not only has a direct impact on IT behaviors, but also culture could affect IT behaviors through influencing management practices.

To further investigate the relationships proposed in the conceptual model, we conduct this study in a supply chain context and focus on the ERP decision problem. As discussed in the first two chapters, we

concentrate on organizational culture and SCM practices. In the following section, we first elaborate the conceptualization of the dependent variables – ERP decisions for the research models. Then we develop the hypotheses and illustrate the relationships between the dimensions of organizational culture, SCM practices and ERP decisions. After that we propose two research models to validate the theory we proposed in this dissertation.

3.2 ERP Decisions

As discussed in the first chapter, ERP decisions include two categories in this study: one is the decision on using or not using ERP system (namely ERP decision one), the other is the decision on using which type of ERP system. According to our observation, companies in China mainly have three choices in selecting an ERP system:

The first choice is that they can buy a Chinese locally developed ERP system like UFIDA, Kingdee, Digital China etc. Most of these Chinese ERP systems are originated from financial and accounting software, which are known for being finance-centric. With a new upsurge of ERP since late 1990s, these financial software vendors gradually add manufacturing management modules like inventory management, production management and material management to the original accounting software and make their software become an ERP system. From a practical perspective, Chinese locally developed ERP

systems usually start with finance and accounting and then extend its functions to financial analysis, with an emphasis on sourcing, sales and stocks. Regarding of the core function – planning, most of these Chinese ERP systems only partially realize production planning and cannot accurately control the costs. One of the main characteristics of these Chinese ERP systems is that they are flexible and mainly follow the existing management practices and processes of their clients, which means an important element -- business process reengineering (BPR) of ERP adoption becomes less important. Many companies who choose to use these Chinese locally developed ERP systems are not required to conduct BPR in their companies. Therefore, many manual works are still necessary even after implementation of ERP systems. As reported by the consultants from UFIDA and Kingdee, the BOM structures of their ERP systems are very simple and only have several tiers. As a result, many of their clients still have the executive staffs for production planning in their companies. Most of the Chinese locally developed ERP systems are based on a modularized management style. Modularized management details the problem and assigns the management tasks and activities according to the levels of organizational structure, each level of management takes its own responsibility. Most of the Chinese locally developed ERP vendors (i.e. UFIDA) apply this modularized management style to their systems. As a result, companies can buy and

implement different modules for their needs and implement the full ERP system step by step. Chinese local ERP vendors get the advantage of knowing well about the managerial ideals and styles, operation habits of the Chinese companies, with which they get the success in selling their ERP systems to these companies.

The second choice is that they can buy a Western developed ERP system like Oracle, SAP etc. These Western ERP systems are developed based on the "best practices" of the Western world, they are developed from MRP and MRP2, manufacturing management and planning functions are the core of the whole system. These ERP systems embody the ideal of "manufacturing centric", which is far different from that of the Chinese ERP systems. In addition, Western developed ERP systems are based on process management, which connects all the business departments or units within a company by applying series of standardized business processes to achieve business performance. These Western ERP systems possess comprehensive manufacturing management and planning functions and integrate the whole supply chain of the company from the upstream suppliers to downstream customer and embody the ideals of SCM. Regarding of the practices, most of the Western ERP systems have strict requirements on the data input, work flows, authorization etc. As they are based on process

management, the modules of these Western ERP systems cannot be separated, with the modules business processes are integrated.

The third choice is to develop ERP systems according to the needs of the specific companies. These self developed ERP systems are completely following the business processes and are assumed to well fit the companies. However, very few companies have the (capital and/or technological) resources to develop their own ERP systems. There is no standard for these in-house ERP systems and actually for most of the cases the companies only automate their business processes.

As the origins of these three types of ERP systems (especially Chinese locally developed and Western developed ERP systems) are different, therefore, their cultural implications having been embedded by the sponsors or developers of the systems are expected to be different. We present a detailed discussion in the following section regarding of the cultural implications embedded in the ERP systems. We believe that the existence of the causal relationship between cultural implications of different ERP systems and the decision upon using which type of ERP system.

3.3 Research Hypotheses

As discussed above, Hofstede et al.'s (1990) six dimensions are finalized into the research models. For SCM practices, we adopt five dimensions

from Li et al.'s (2005) work and incorporate *internal agile practices* as the sixth dimension.

We organize and present the hypotheses in the following ways: first we elaborate the cultural implications embedded in the three types of ERP systems, which forms the rationales for theoretical hypotheses; second, we present the hypotheses for the relationship between the dimensions of organizational culture and ERP decisions respectively, mainly based on the literatures of culture-IT adoption and innovation compatibility; similarly, hypotheses about the relationships between the dimensions of SCM practices and ERP decisions are also illustrated. Finally, based on the proposed hypotheses of the dimensions of SCM practices and ERP decisions, we develop the hypotheses about the relationships between organizational culture and SCM practices.

3.3.1 Cultural Implications Embedded in ERP Systems

Like other technologies, ERP system is embedded with the developers'/sponsors' cultural implications (i.e. values, norms, practices) (Leidner & Kayworth, 2006; Ngwenyama & Nielsen. 2003; Dube, 1998; Kumar, Bjørn-Andersen & King, 1990). As the three types of ERP systems (Chinese locally developed, Western developed and self developed) are modeled and developed by different developers, we believe their cultural implications are different. To develop the hypotheses, we elaborate the cultural implications of ERP system for the

three types of ERP systems respectively, in terms of the Hofstede's organizational culture dimensions adopted in this study. However, two dimensions: *employee versus job oriented* and *parochial versus professional* are excluded from our analysis as they are not related to any IT behaviors to our best knowledge.

Process versus Results Oriented

This dimension refers to the innovativeness and risk-taking of an organization (Hofstede, 1998). As a technology, ERP system itself is innovative and its use implies certain level of uncertainty or risk to be taken (Davison, 2002), no matter which type of ERP it is. Therefore, no indication shows the existence of the difference among these systems in terms of innovativeness and risk taking.

Open versus Closed System

This dimension refers to the communication climates of an organization (Hofstede, 1998). As an integrated system for a company, ERP system requires the supports, trust and information sharing from employees across different departments (Nah, Zuckweiler & Lau, 2003; Kelle & Akbubut, 2005; Benders, Batenburg & Blonk, 2006). An open communication climate is a facilitator for any ERP system, no matter which type of ERP system it is. When the developers develop the ERP system, they have embedded in the system with the assumption that the adopters (organization) have a communication climate that embrace

information sharing and open communication among the employees and across departments, by which ERP system runs smoothly.

Loose versus Tight Control

This dimension deals with the rules, policies and structure (hierarchy) of an organization (Hofstede, 1998). Organizations with tight control culture are more strictly following the rules and being formalized. Regarding of ERP system, it is a manufacturing planning and control system which emphasizes on strict control of all processes, which is consistent with the ideals of tight control. However, the extent of control is believed to be different among the three types of ERP systems as their origins are different.

Western developed ERP systems are modeled and developed on the basis of "best practices" of particular industry in US or Europe (Srivastava & Gips, 2009; Benders et al., 2006; Wagner & Newell, 2004). These "best practices" well reflect the Western culture, management and control styles (Davison, 2002). Western management strictly emphasizes on rules and work formalization (Xue et al., 2005; Wang, Klein & Jiang, 2006; Woo, 2007) and these ideals are well embedded and reflected in their ERP systems by the rigid processes and procedures in the systems. Therefore, compared with the other two types of ERP systems, we expect that Western developed ERP systems are based on a tighter control culture.

Chinese ERP systems are said to develop from accounting software and the vendors add the manufacturing functions in their systems and become an ERP system (AMR Research, 2007). These systems are developed by Chinese vendors who know well about the Chinese management culture, which emphasize flexibility and reluctance to change (Lockett, 1988; Xing, 1995; Martinsons & Westwood, 1997; Fan, 2000; Xue et al., 2005). These cultural characteristics are reflected at organizational level as being less formalized and less addicted to rules. Compared with their Western rivals, Chinese locally developed ERP systems are said to be more flexible, this is proved by the fact that many Chinese vendors are willing to change the processes defined in their systems to cater the needs of their clients while Western vendors are reluctant to do so (Zhang et al., 2005; Deng, 2005; Davenport, 2000). Therefore, we expect that Chinese locally developed ERP systems are less tight control compared with their Western rivals.

Self developed ERP systems (or named as in-house ERP systems) are completely modeled and developed according to the companies' processes and needs. In most of the cases, these companies are reluctant to change their processes which they have persisted for years (Avison & Malaurent, 2007), they prefer automation of their processes rather than redesign them (Woo, 2007). This also implies that these companies are reluctant to follow the pre-defined processes in off-the-shelf ERP

systems which are more formal and rule-based. Thus we expect that these self developed ERP systems are also less tight control.

Normative versus Pragmatic

This dimension deals with the popular notation "customer orientation". Normative organizations emphasize more on following the correct procedures than the result while pragmatic organizations emphasize on meeting the customer's needs, results are more important than correct procedures (Hofstede, 1998).

ERP system is an enterprise-wide integration that aims to improve the company's competitiveness and meet the customers' needs (Beretta, 2002). However, as the origins are different, different types of ERP systems embedded different assumptions on meeting the customers' needs. We expect that the extent of being pragmatic varies across different ERP systems, which is reflected in the characteristics of the ERP systems.

Western ERP systems like Oracle and SAP, they are developed on the basis of "best practices", the processes in the systems are well defined and standardized processes which are recognized and followed in the particular industry. Western ERP vendors try to persuade all companies to use their standardized template (Wagner & Newell, 2004; Benders et al., 2006), in which a series of standardized procedures, rules and policies are embedded in their ERP packages (Bunker et al., 2007).

The standardization of processes show an emphasis on correct procedures of the Western developed ERP systems while also aiming to meet the customers' needs.

Chinese locally developed and self developed ERP systems are expected to be very pragmatic. In these systems, standardized rules and procedures are less important than getting the job done to satisfy the customers' needs. These pragmatic characteristics are showed in the processes and functions of these ERP systems.

3.3.2 Effects of Organizational Culture on ERP Decisions

Besides the insights we get from the in-depth interviews with practitioners, we mainly follow the guideline of previous literatures in culture-IT adoption, ERP selection and innovation compatibility to develop hypotheses regarding of ERP decisions as they are quite close in nature. It's worthy to note that not all linkages between all the dimensions of organizational culture and ERP decisions are necessarily supported by theoretical or empirical evidence, nor they are supported by our in-depth interviews. Therefore, we propose that four dimensions of organizational culture including *process versus results oriented, open versus closed system, loose versus tight control* and *normative versus pragmatic* significantly influence an organization's ERP decisions, either the decision on using or not using ERP system or the decision on using which type of ERP system or both decisions.

3.3.2.1 Process versus Results Oriented

Organizations that are relatively process-oriented might have conservative attitudes toward innovations (i.e. information technologies) and its associated risks, exerting minimal effort while preferring the use of existing or well-known methods (Hofstede et al., 1990; Hofstede, 1998).While results-oriented (similar with outcome orientation, Kanungo et al., 2001) organizations are risk-oriented and foster an environment that encourages and actively supports the use of innovative techniques for the survival and growth of the organization (Hofstede et al., 1990; Hofstede, 1998). In IT-culture studies, people found that organization with risk taking and innovative culture have positive effect in technology adoption (Nystrom, Ramamurthy & Wilson, 2002; Rupple & Harrington, 2001; Cabrera, Cabrera & Barajas, 2001; Kitchell, 1995). Rupple and Harrington (2001) found that organizations that promote innovativeness and a willingness to try new things will have better result for IT (e.g. knowledge management system). In such organizations, employees are usually more willing to try to get competitive advantage by making changes and taking risks with the technology. Kitchell (1995) found that organizational culture characterized as open and risk-taking evidenced a greater propensity to adopt advanced manufacturing technologies. This is also very consistent with the finding from our in-depth interviews with the manufacturing firms, most of the practitioners reported that their

companies have developed an open atmosphere (where people work very hard and take every day as new challenges) and people are willing to try new technology and embrace the adoption of technology like ERP systems. Therefore, we propose the hypothesis as following.

H1a: the dimension of organizational culture, process versus results oriented, significantly influences the decision on using or not using ERP system. Specifically, the more results-oriented an organization is, the more likely it's going to use ERP systems.

However, this dimension is expected to have no significant effect on the decision on using which type of ERP system. Like other technologies, ERP systems (no matter which type of ERP system) are innovations that are embedded with certain cultural implications (i.e. values, norms and/or practices) (Leidner & Kayworth, 2006; Ngwenyama & Nielsen. 2003; Dube, 1998; Kumar, Bjørn-Andersen & King, 1990). In terms of *process versus results oriented*, adoption of ERP systems implies certain risk to be taken (Thatcher et al.,2003; Png et al., 2001) but there is no indication to show that the levels of risks vary among different types of ERP systems according to the descriptions of the characteristics of the three types of ERP systems above. Therefore, *process versus results oriented* is assumed to be not related to the decision on using which type of ERP system.

3.3.2.2 Open versus Closed System

This dimension refers to the "communication climates" of an organization, a closed-system environment is one that is secretive and reserved and also one in which it takes a relatively long time for employees to "fit in" (Hofstede et al., 1990; Hofstede, 2002). In IT-Culture studies, scholars found that secretive and reserved culture significantly influences technology adoption. For example, Kitchell (1995) explicitly found that companies with closed communication culture have a less propensity to adopt advanced manufacturing technologies. Regarding of ERP adoption, a culture supports information sharing from a wide spectrum of coworkers, supervisors, and managers is an advantage to ERP (Motwani et al., 2002), as ERP requires the supports, trust and information sharing among employees across different departments. Obviously, in a closed-system environment, such supports are less likely to happen. While an open communication system, alternatively, is an environment that is characterized as being open to newcomers where it will take relatively short time for employees to feel at home in the organization (Hofstede et al., 1990). Employees in such environment are more willing to share their experiences and information to support one another, which subsequently positively affects the adoption of ERP system (Bai & Cheng, 2009; Jones & Alony, 2007). Therefore, we hypothesize it as:

III b: the dimension of organizational culture, open versus closed system significantly influences the decision on using or not using ERP system. Specifically, more open system organizations are more likely to use ERP systems.

Similar with the dimension *process versus results oriented, open versus closed system* is not expected to be significant in distinguish the companies using different types of ERP systems as all these companies are assumed to have an open system culture in nature, there is no indication to prove the difference in the openness of communication among these companies using different types of ERP systems. Regarding of the ERP systems themselves, their success cannot be achieved without the support of the willingness to share information across different departments even across different organizations (Koh, Gunasekaran & Rajkumar, 2008; Law & Ngai, 2007), while such support is more likely to happen in organizations who have "open communication climates" (Jones & Alony, 2007), no matter which type of ERP system they use. Therefore, *open versus closed system* is assumed to be not related to the decision on using which type of ERP system.

3.3.2.3 Loose versus Tight Control

Organizations also vary in the amount of control they exert over individuals (Cabrera et al., 2001). In a tight-control organization, strict meeting times and strong cost-saving consciousness can be observed

while in loose-control organization it's more permissive about jokes and other personal preferences (Hofstede et al., 1990). This dimension focuses on the level of work formalization, the existence of rules and procedures and the importance of the hierarchy, which is very close to the hierarchical culture defined in competing values framework (Cameron and Quinn, 1999). The original intention of using ERP system is to enhance a company's efficiency by formalizing and streaming the management and operation processes, which have also been confirmed by the interviewees, thus we expect that companies with tight control culture are more propend to use ERP systems. In literature, scholars also reported tight-control organizational culture (similar with hierarchical culture) has significant effect on IT adoption (Twati, 2006). Though not using the explicit term "tight control", Raymond and Uwizeyemungu (2007) reported that more formalized SMEs will more predisposed to adopt ERP systems. Therefore, we propose the hypothesis as following:

H1c: the dimension of organizational culture, loose versus tight control significantly influences the decision on using or not using ERP system. Specifically, more tight control organizations are more likely to use ERP systems.

As discussed above, control focuses on the level of work formalization, the existence of rules and procedures and the importance of the hierarchy (Hofstede et al., 1990). Western ERP systems (i.e.

Oracle, SAP etc) are well known to be modeled on Western business values and developed based on a way of working deemed 'the best' for particular industries (Srivastava & Gips, 2009; Benders et al., 2006; Wagner & Newell, 2004). These practices well reflect the Western culture, management and control styles (Davison, 2002). The Western developed ERP systems, which have been developed from MRP and MRP2, are manufacturing centric and emphasize on planning and "feed forward control" (AMR Research, 2007). They are characterized as being formalized, centralized and high addicted to the rules and procedures with which companies can achieve high efficiency by doing the things in a right way, which embodies a culture being highly tight control (Krumbholz & Maiden, 2001; Davison, 2002; Zhang et al., 2003; Martinsons, 2004; Wang, Klein & Jiang, 2006; AMR Research, 2007). This tight control is reflected by the processes and procedures defined in the system. For example, Krumbholz and Maiden (2001) report that "[SAP] R/3 system requires delivery times that are longer than real times, and bad to be controlled by the system and not able to make adjustments to specific situations", "R/3 made personnel ineffective and unproductive...30% of manpower here goes on data registration". Western ERP systems have been also reported for their rigidness of procedures. Bunker, Kautz and Nguyen (2007) point out this by using the example that "they (employees) must follow the defined 5-step process.

Skipping one phase...before creating an invoice as practiced by many employees is not tolerated by the system". These features indicate that formalization of rules and procedures are significant components of the ERP system, which reflect a 'tight control' nature embedded in the system (Sia & Soh, 2002; Morton & Hu, 2006). Therefore, from the compatibility point of view, we believe that organizations with more tight control organizational culture are more likely to use Western developed ERP systems.

Chinese locally developed ERP systems (i.e. UFIDA, Kingdee, Digital China etc.), which have been developed from financial and accounting software, are financial and accounting centric and emphasize on "feed back control"(Fang et al., 2009; Srivastava & Gips, 2009; AMR Research, 2007; Wang et al., 2005; Liang et al., 2004). Chinese ERP are said to be relatively weak in manufacturing and SCM functions (AMR Research, 2007) and implementing these ERP systems in China seems to be more about automating manual processes than gaining strategic advantage through process innovation(Srivastava & Gips, 2009; Woo, 2007). This is also reflected and confirmed by the users and ERP consultants in our interviews and they reported that companies usually prefer to use the system to automate current processes rather than following the changed processes defined by the ERP systems. To some extent, Chinese locally developed ERP systems overwhelm their Western

rivals as they are simplified and less addicted to rules and policies, though being criticized to not resemble ERP systems at all by Western standards (Srivastava & Gips, 2009; Liang et al., 2004). This can be explained by the fact that Chinese local ERP vendors know better about the Chinese culture and management styles and they are more flexible and more willing to change their systems to cater the needs and requirement of their clients while the Western ERP vendors are reluctant to doing so (Zhang et al., 2005; Deng, 2005) . Therefore, based on the theory of technology compatibility, we expect that organizations with less tight control culture are more likely to use Chinese locally developed ERP systems.

Though time-consuming and complex, there are still quite many companies who develop their own ERP systems. Based on the results of our interviews, one important reason for them to take so much effort to develop their own ERP system is that they have difficulty in finding an off-the-shelf system that fits their needs in existing market; as ERP implementation usually require business process redesign or reengineering (Avison & Malaurent, 2007), the other important reason is that they are reluctant to change their management culture and processes, with which they have persisted for years. These self developed ERP systems, which are completely modeled and developed according to their management processes and procedures, truly reflect the companies'

culture and management styles and their processes are ready to be changed to fit for the needs (Olsen & Sætre, 2007). From an organizational culture point of view, the companies embody a cultural characteristic that they propend to be less formalized and emphasize less on procedures.

Based on the discussion above, we hypothesize it as

H1a': the dimension of organizational culture, loose versus tight control significantly influences the decision on using which type of ERP system. Specifically, tighter control organizations are more likely to use off-the-shelf ERP systems.

3.3.2.3 Normative versus Pragmatic

This dimension deals with the popular notion of "customer orientation" (Cabrara et al., 2002). In a pragmatic organization, it is market-driven while a normative one perceives its task towards the outside world as the implementation of inviolable rules. Normative organizations mainly emphasize on correctly following organizational procedures, which are more important than results while pragmatic organizations emphasize on meeting the customer's needs, results are more important than correct procedures (Hofstede, 2002).

In today's keen competition environment, to meet the needs of customers becomes the ultimate goal for most companies (Kumar, 2010; Choi & Eboch, 1998; Karlsson & Åhlström, 1997; Lengnick-Hall, 1996),

no matter whether they use or do not use technologies. Therefore, an organization's culture regarding of its customer orientation will not affect its willingness to use or not ERP system.

However, as discussed in the cultural implications of ERP systems, we believe that the dimension *normative versus pragmatic* can distinguish the companies that are using different types of ERP systems.

Modeled and developed upon the 'best practices' of the particular industry in US or Europe, Western ERP systems try to force all companies into using their standardized template (Wagner & Newell, 2004; Benders et al., 2006). With that template, vendors embed strict request for standardized procedures, rules and policies into their ERP packages, which actually shows the normative design of these systems (Bunker et al., 2007). This is also reflected by the rigidness of the processes defined in their systems. Krumbholz and Maiden(2001) report "[SAP]R/3 makes order entry slow, difficult and sometimes with errors while the users' belief order entries should be quick, easy and correct with an efficient computerized system" and find that the process of order entry "defined as in a best and right manner of the industry". In our interview with the companies who are using SAP or Oracle ERP system, interviewees put forward with many complaints for the inflexible processes in their ERP systems. And quite a few of them were informed by their consultants or vendors that they have to follow the "right"

processes and redesign their business process as those embedded in their systems are well proved to be the best in their industry. In addition, Western vendors are usually reluctant to change their processes as they hold that those processes are based on 'best practices' (Soh et al., 2004; Krumbholz & Maiden, 2001), this also reflects a cultural characteristic of being normative of the Western ERP vendors, who are expected to build in such normative belief in their systems (Bai & Cheng, 2010; Srivastava & Gips, 2009; Woo, 2007; Boersma & Kingma, 2005; Harrington & Rupple, 1999). Based on the findings of innovation compatibility and the discussion above, we believe that companies with more normative (less pragmatic) organizational culture are more likely to use Western developed ERP systems.

As discussed above, Chinese locally developed ERP systems as well as the self developed ERP systems are assumed to more flexible and less concern on the rules and policies. In our interviews with two consultants (one from UFIDA and the other from Kingdee, the two largest Chinese local ERP vendors in China), both of them pointed out that their ERP systems (UFIDA U8 and Kingdee K3) are flexible than Oracle or SAP in that their systems will not inhibit the users from achieving the results (for example, fulfillment of a delivery) because of the 'right' but actually unreasonable procedures defined in the system, their systems are helpful for their users to meet the customers' needs to achieve the ultimate goal.

In our interviews with the CIO/GM from the companies who are using self developed ERP systems, the interviewees report that they aim to meet customers' needs and do not want to limit by the fixed procedures in the commercial ERP systems, which might make their competitors quickly catch up by incorporating best practices of the off-the-shelf ERP systems (Benders et al., 2006). These findings indicate that both the Chinese locally developed and self developed ERP systems are built on a more pragmatic (less normative) and flexible culture compared with the Western ones. Therefore, we hypothesize it as

H1b': the dimension of organizational culture, normative versus pragmatic significantly influences the decision on using which type of ERP system. Specifically, more normative organizations are more likely to use Western developed ERP systems.

3.3.3 Effects of SCM Practices on ERP Decisions

In this dissertation SCM practices include *supplier relationships, customer relationships, information sharing, information quality, internal lean practices* and *internal agile practices*. However, we do not expect that all the linkages between the six dimensions of SCM practices and ERP decisions (either one or two) are to be supported. We revisited the literature and combined the theoretical findings with the results from in-depth interviews to develop the hypotheses regarding of the relationships between SCM practices and ERP decisions. We propose

that *information sharing, information quality, internal lean practices* and *internal lean practices* significantly influence ERP decisions.

Information Sharing

As reported by most of the practitioners we interviewed, sharing information with their partners which can facilitate their operations and management like order processing, production planning and delivery planning is one of the key factors that they take into account when planning to use ERP systems. In literature, scholars also found that generic information sharing significantly influences ERP adoption. Academics indicated that the higher level of information sharing that an organization needs, the more willing it is to use an ERP system to facilitate its information sharing (Koh & Gunasekaran, 2008; Law & Ngai, 2007; Raymond & Uwizeyemungu, 2007; Cagliano et al., 2006; Tan & Pan, 2002; Morrell & Ezingeard, 2002; Stefanou, 1999). Therefore, we develop the hypothesis regarding of information sharing as following:

H3a: Information sharing with partners in supply chain significantly influences an organization's decision on using or not using ERP system. Companies with higher level of information sharing are more likely to use ERP systems.

However, no indication shows that the practice of information sharing embedded in different types of ERP systems are significantly

different. Information sharing is a basic requirement for all ERP systems to perform smoothly. When the vendors develop the ERP systems, they have assumed that information exchanged across departments or organizations is smoothly so that the systems could fully perform their functions. Therefore, we do not expect that the practice of sharing information with partners in supply chain will influence the decision on using which type of ERP system.

Information Quality

Information quality refers to "the accuracy, timeliness, adequacy, and credibility of information exchanged" (Li et al., 2005). While information sharing is important to ERP system, but what information is shared, when and how it is shared, with whom to share are also very important and vary among organizations. In literature, information quality is reported as a major determinant for ERP system to achieve its goal (Zhang et al., 2005; Tan & Pan, 2002; Xu et al., 2002).

Western organizations are dependent on information to make decisions, thus the accuracy, timeliness and reliability of the information on which they rely to make decisions are critical (Zhang et al., 2003). Modeled and developed on the basis of Western management and culture, Western ERP systems are manufacturing centric, they emphasize on the functions of planning (production planning, sales forecasting, delivery planning etc). However, the full functions of ERP cannot be well

accomplished without the support of accurate, timely and complete information (Chien & Tsaur, 2007). As Western developed ERP systems are based on the "best practices" of the Western companies, they embody a highly tight control culture and imply strict requirement on the accuracy, timeliness and completeness of information exchanged through the systems (Ross & Vitale, 2000; Sia & Soh, 2002; Soh et al., 2003). That is, to make the system work smoothly, the requirement for timely, correct, adequate and credible information is expected to be fulfilled. These ideals have been embedded when the Western ERP vendors develop their systems and it is also reflected by the strict formalization, routines, rules and policies defined in these Western ERP systems (Bai & Cheng, 2009; Bunker et al., 2007; Morton & Hu, 2006; Martin, 2002; Robey, Ross & Boudreau 2002; Krumbholz & Maiden, 2001; Soh et al., 2000). According to the literature of compatibility, the higher congruence between the practices embedded in the technology (like ERP system) with existing practices of the adopters, the higher propensities that the technology will be used (Karahanna et al., 2006; Hardgrave et al., 2003; Harrington & Rupple, 1999). Therefore, companies who embody a high emphasis on *information quality* are more likely to choose Western developed ERP systems as these systems are more compatible with their daily practices regarding of *information quality*.

Most of the Chinese locally developed ERP systems (i.e. UFIDA and Kingdee), which are developed from financial and accounting software, are taking finance and accounting as the core and expanding their functions and structures to ERP. These ERP systems are developed by local Chinese developers and they are embedded with the developers' management attitudes, values concerning control, management and communications (Avison & Malaurent, 2007; Woo, 2007; Deng, 2005; Zhang et al., 2005; Kumar, Bjørn-Andersen & King, 1990). In Chinese management culture, information is highly regarded as an asset or a token of power, sharing information especially sharing high quality information usually implies a loss of power and advantage, this is especially true for those who are in top management (Yusuf, Gunasekaran & Wu, 2006; Martinsons, 1997; Chow et al., 2000). Though the built-in assumption that ERP success requires high quality of information is also true for Chinese locally developed ERP systems, the practice of providing high quality information cannot necessarily be true in a Chinese business environment (Yen & Sheu, 2004). This can be showed by the fact reflected in the Chinese locally developed ERP systems that they are flexible enough to allow the delay inputting data into the systems without affecting the operations. And this also shows a concern with less formalized and less addicted to the rules and policies,

namely they show a less tight control organizational culture (Lockett, 1988; Martinsons, 1997).

Our interviews also confirmed the discussion above. Quite many manufacturers reported that they actually do not mind if the data entry works delayed as their ERP systems still work well. Therefore, we believe that companies who are using Chinese locally developed ERP systems embody a lower level of information quality compared with those who are using Western developed ERP systems.

For those companies who are using self developed ERP systems, they used to be familiar with the management culture and business practices they have been persisting for years and they are reluctant to change. These companies show a less formalized procedure as they expect automation of the process rather than getting the strategic benefits by providing high quality information to make better planning and forecasting. Therefore, we expect lower level of information quality of the companies who are using self developed ERP systems.

Based on the discussion above, we believe that Chinese companies vary in *information quality* and subsequently they are likely to adopt different types of ERP systems to match with their daily practices as a result of practical compatibility. We propose the hypothesis as

H3'a: the dimension of SCM practices, information quality, significantly influences the decision on using which type of ERP system.

Specifically, companies with higher level of information quality are more likely to use Western developed ERP systems.

Internal Lean Practices

Internal lean practices in this study include reduced set-up times, small lot size, shorten lead-time from suppliers, continuous process improvement and pull-production etc (Li et al., 2005). ERP systems can dramatically reduce the amount of time required to obtain information related to products and processes. The adoption of ERP system can stimulate the standardization of business processes which is well aligned with the principles of "lean thinking" (Al-Mashari, 2002). We have witnessed many lean companies now use ERP approaches for communication through the supply chain to facilitate their production and delivery (Riezebos et al., 2009). Therefore, although the relationship between internal lean practices and the adoption of ERP systems is not explicitly proved in literature, we foresee that higher level of lean practices will have a positive effect on ERP adoption. Thus, we hypothesize it as

H3b: Internal lean practices significantly influences an organization's decision on using or not using ERP system. Specifically, companies with higher level of internal lean practices are more likely to use ERP systems.

Other than influencing the decision on using or not using ERP system, *internal lean practices* is expected to influence the decision on using which type of ERP system as the levels of *internal lean practices* vary among the companies. Companies who are practicing lean production need supports from ERP systems to facilitate their lean practices, though lean practices and ERP are said to be complementary in concept but competing in practices (Cagliano, Caniato & Spina, 2006). ERP system vendors begin to recognize the power and advantages of lean and then explore ways to build lean-related features into their ERP systems (Halgeri et al., 2008).

Western developed ERP systems which originate from MRP and MRP2, their functions in manufacturing and SCM are said to be comprehensive (Pan & Tang, 2010). In terms of the function of lean production, Western ERP vendors have accumulated much experience and make lean applications are part of the standard manufacturing modules (for example, SAP acquired Factory Logic and integrated the SAP Lean Planning and Operations (SAP LPO) application and extended the value of SAP manufacturing solutions by providing lean planning and scheduling capability for plant execution) (SAP, 2011). According to IQMS, nearly all major Western ERP vendors have extended their applications to "support the core lean principles of value definition and specification, value stream mapping, uninterrupted flow, customer pull

and the pursuit of perfection" (IQMS, 2011). Oracle also reports that it provides support for lean operations such as mixed model map, line balancing, line design, flow routings. It even provides a good tool for flow scheduling, sequencing and execution to support manufacturing multiple products on a balanced line to meet the overall customer demand for the day. Oracle also provides a Kanban planning engine to design the operational parameters for Kanban including bin size, quantity, etc. based on average daily demand (Oracle, 2011). The discussions above show that the functions facilitating "lean practices" that are embedded in Western developed ERP systems are matured and comprehensive (Dixon, 2004; Chai, Zhou & Wang, 2008).

However, most of the Chinese locally developed ERP systems have been reported as relatively weak in manufacturing functions (Pan & Tang, 2010; AMR Research, 2007), not to mention their functionalities in facilitating lean practices. Among the companies who are using Chinese locally developed ERP systems, the most frequently used modules are financial and logistics, this fact also reflects the weakness of the Chinese locally developed ERP systems (Wang et al., 2005; Liang & Xue, 2004). In our interview with two Chinese ERP consultants (one from UFIDA, the other from Digital China, two major players of the Chinese ERP vendors), both of them claimed that some lean functions are provided in their systems (for example, Kanban in Kingdee's K/3,

which includes Kanban loop, Kanba calculation, Kanban execution, Kanban diagrams and Kanban alarm) (Source: Kingdee website), but the relative weakness in manufacturing and SCM functions limits their extension to provide comprehensive lean production facilitation of their systems.

Regarding of the self developed ERP systems, their functionalities are fully following the company's processes and they represent a credible alternative for ERP adoption (Poba-Nzaou & Raymond, 2009). Their function to facilitating lean practices depends on their requirement. In addition, lacking of reference model to develop ERP systems, companies who develop their own ERP systems could have more difficulty in developing systems with comprehensive manufacturing functions. Therefore, we expect that the *lean* functions in these self developed ERP systems are weak.

Based on the findings from innovation compatibility literature and discussion above, we propose that being compatible between an ERP system's capabilities (here it refers to lean functions) and existing business practices (here it refers to *internal lean practices*) is a main factor that cause the willingness to use a particular type of ERP system (Bingi, Sharma & Godla, 1999; Umble & Umble, 2002; He & Brown, 2005). Therefore, we hypothesize it as

H3'b: Internal lean practices significantly influences an organization's decision on using which type of ERP system. Specifically, companies with higher level of internal lean practices are more likely to use Western developed ERP systems.

Internal Agile Practices

Corresponding with *internal lean practices*, *internal agile practices* is added as one dimension of SCM practices, it includes adopting modularized techniques, concurrent production activities, empowerment of decision making, cross functional teamwork and multi-skill training (Cho et al., 1996; Gunasekaran, 1999). *Internal agile practices* not only represents a kind of capability that can response quickly and effectively to the changing market and changing customer needs but also it represents a kind of market (or customer) oriented management philosophy (Koh, Simpson & Lin, 2006; Gunasekaran, 1998 & 1999). Like other SCM practices, *internal agile practices* is expected to be affected by organizational culture and supply chain strategies and it varies among organizations.

ERP system is said to be one of the enablers and facilitators of agile manufacturing (McMullen, 1996; Gunasekaran, 1998). Specifically, concurrent production activities, empowerment of decision making, cross functional teamwork, all of which are the components of *internal agile practices*, are reported as the most important components to be supported

by enterprise systems like ERP (Coronado et al., 2002; Song & Nagi, 1997). However, due to the different origins and maturities of different types of ERP systems, their capabilities to supporting agile practices are different, not all off-the-shell ERP systems are well supportive to agile practices (Oetinger et al., 2002). For those companies who stay in a fluctuating market and need to be quickly and effectively responsive to customers' needs, they have high requirement on information technology like ERP to facilitate their agile practices (or to achieve agility) (Gunasekaran & Ngai, 2004; Yusuf, Sarhadi & Gunasekaran, 1999; Gunasekaran, 1998). In other words, the level of a company's *internal agile practices* might lead to different technology adoption as their practices require different levels of support from technologies to achieve the goals.

As discussed above, Western developed ERP systems are originated from MRP/MRP2, their manufacturing functionalities are quite matured, complicated and integrative (AMR Research, 2007). These matured functionalities are expected to form a prerequisite to support *internal agile practices* like modularized production techniques, concurrent production activities, empowerment of decision making etc (Gunasekaran, 1999; Coronado et al., 2002). This also has been reported in many industrial reports regarding of the agile manufacturing

supportive functions of various Western developed ERP systems (i.e. SAP, Oracle, Microsoft, Baan etc.).

For most of Chinese locally developed ERP systems, they embody an ideal to be flexible (Liang et al., 2004; Brown & He, 2007), which is reflected in their functions and processes defined in their systems. Though still lagged behind by their Western rivals in terms of manufacturing and SCM functions, Chinese local ERP vendors are also looking for a way to improve their systems and subsequently they are able to provide their clients with more suitable ERP systems. Regarding of agile practices, some vendors have already provided functions to support agile practices like modularized production, empowerment and concurrent engineering. Therefore, we expect that Chinese locally developed ERP systems embody a medium level of agile practices.

For self developed ERP systems, they are automation of processes rather than making the strategic benefits of ERP as discussed above. We expect that their capabilities in supporting agile practices are weak.

As discussed above, we expect that the agile practices embodied by different types of ERP systems are different; therefore, from a practical compatibility point of view (Harrington & Rupple, 1999), we infer that companies are more willing to use an ERP system that matches with their practices. The proposed hypothesis is

H3'c: the dimension of SCM practices, internal agile practices, significantly influences the decision on using which type of ERP system. Specifically, companies with higher level of internal agile practices are more likely to use Western developed ERP systems.

3.3.4 Relationships between Organizational Culture and SCM Practices

As the main proposed theory of this study, organizational culture not only directly influences ERP decisions but also influences ERP decisions through SCM practices. Therefore, we propose the existence of the relationships between organizational culture and SCM practices. To be consistent with the proposed hypotheses and discussion above, we only focus on the relationships between of the specified dimensions of organizational culture and SCM practices that have been proposed to have significant impacts on ERP decisions.

3.3.4.1 Direct Effects of Organizational Culture on Information Sharing

In this study, two dimensions of organizational culture: *process versus result oriented* and *open versus closed system* are supposed to significantly influence information sharing, other than directly affect ERP decision one (showed as figure 3.2). Information sharing refers to "the extent to which critical and proprietary information is communicated to one's supply chain partner" (Li et al., 2005) and the

benefits of sharing information with partners have been well studied by both academics and practitioners (Lalonde, 1998; Yu et al., 2001; Tompkins & Ang, 1999). However, the willingness of sharing information is affected by culture, both at national and organizational levels (Constant, Kiesler & Sproull, 1994; Chow et al., 1999; Rupple & Harrington, 2001; Wu et al., 2001; Shin, Ishman & Sanders, 2007).

In terms of organizational culture, Wu et al. (2001) have proposed that innovation culture, which is conceptually similar with results oriented, is strongly associated with information sharing. Menon and Varadarajan(1992) suggest that an innovation culture facilitates information sharing and use. As discussed above, an organization with results oriented culture are innovative and more willing to take risk. People are more concerned about getting the job done (Hofstede et al., 1990). Thus, it is more propend for such organizations to cultivate a climate that facilitates information sharing (Menon & Varadarajan, 1992). Chow et al. (1999) note that organizations with innovative (results oriented) culture are open for sharing of information and experiences, in order to promote organizational learning, creativity and adaptive flexibility. Jones, Cline & Ryan (2006) also report that *process versus results oriented* culture significantly influences information and knowledge sharing in ERP implementation. Therefore, we hypothesize it as

H2a: the dimension of organizational culture, process versus results oriented, significantly influences information sharing. Higher level of results oriented culture leads to higher level of information sharing.

The dimension "*open versus closed system*" refers to the communication climate within the organization. In an organization with an open system culture, information flows easily through the organization, whereas closed system organizations are more secretive (Hofstede, 1998). Hooff and Ridder (2004) reported that supportive communication climate (characterized as open exchange of information) positively influences information and knowledge sharing. Open system is also extended to an organization's information culture, which is a subset of organizational culture. According to Jarvenpaa and Staples (2001), open and organic information culture is expected to be coexisting and facilitate information processing and sharing. Based on the discussion above, the hypothesis is

H2b: the dimension of organizational culture, open versus closed system, significantly influences information sharing. Higher level of open system culture leads to higher level of information sharing

3.3.4.2 Direct Effects of Organizational Culture on Information Quality

Information quality refers to "the accuracy, timeliness, adequacy, and credibility of information exchanged" (Li et al., 2005). While

information sharing is important and influenced by organizational culture, what information is shared, when and how it is shared, and with whom also vary across organizations (Chizzo, 1998). It has been suggested that organizations might distort information exchanged even with their supply chain partners (Mason-Jones & Towill, 1999). Organizations (or individuals) have a built-in reluctance to give away information more than minimal as information is perceived as power or an advantage (Block, 2002; Berry et al., 1994). While the willingness to sharing information is assumed to be influenced by organizational innovativeness and the openness of communication climate, the accuracy, timeliness, adequacy, and credibility of information exchanged (namely information quality) are expected to be influenced by the formalization, structure and control of an organization (Zhu & Meredith, 1995). In literature, scholars have reported that cultural factors significantly influence data quality that includes the accuracy, timeliness, adequacy, and credibility of data (English, 1999; Xu et al., 2002). Specifically, Xu, Koronios and Brown (2003) reported that organization with a culture emphasizing on data quality (which means it focuses on more control in place) will have a higher level of data quality. Therefore, we hypothesize it as

H2a': the organizational culture dimension, loose versus tight control, significantly influences information quality. Specifically, tighter control culture leads to higher level of information quality.

3.3.4.3 Direct Effects of Organizational Culture on Internal Lean Practices

Internal lean practices in this study include the practices of eliminating waste (cost, time etc.) in a manufacturing system, characterized by reduced set-up times, small lot sizes, and pull-production (Li et al., 2005). Lean thinking is a process-based method that aims to reduce various wastes through the activities above (Lewis, 2000). Wong (2007) reported that culture (both national and organizational) affects the implementation of lean production system. To stimulate lean practices, it is required for the employees to participate and contribute their efforts to the operations and processes to find out where the company can improve (Dahlgaard & Dahlgaard-Park, 2006). Imai (1986) attributes the success of Japanese manufacturing, which is known for being lean, to process-oriented thinking. He pointed out that results-oriented management is probably a remnant of the mass-production legacy and that process-oriented management is more suited for the postindustrial, high-tech, high-touch society. As an important component of lean practices, continuous improvement has also been reported to be influenced by *process versus*

results oriented culture (Choi & Liker, 1995; Etienne-Hamilton, 1994). Based on the discussion above, we hypothesize it as

H2c: the organizational culture dimension, process versus results oriented, significantly influences internal lean practices. Specifically, higher level of process oriented leads to higher level of internal lean practices.

In this study, *open versus closed system* refers to the communication climates of an organization (Hofstede et al., 1990). An open communication climate is important for lean production (including setup time reduction, continuous improvement, lead time reduction and pull production etc, all of which consist of *internal lean practices* in this study), as an organization members depend on one another for effective and efficient flow of information (Koufteros et al., 2007). Communication is also reported as a factor influencing lean practices like continuous improvement (Choi & Liker, 1995; Imai, 1986). Based on the discussion, we hypothesize it as

H2d: the organizational culture dimension, open versus closed system, significantly influences internal lean practices. Specifically, higher level of open system culture leads to higher level of internal lean practices.

As a process-based approach, lean is also expected to be influenced by the dimension *loose versus tight control*. Besides the emphasis on

rules and procedures, tight control also implies a strong consciousness on cost saving, which is matched with the ideals of lean production – to reduce waste by eliminating non-value-added processes. As discussed above, management emphasizes on "process" or "procedure" will support and stimulate *internal lean practices* like continuous improvement, which in turn make lean production more effective to be achieved (Choi & Liker, 1995). Therefore, we expect that *loose versus tight control* significantly influence *internal lean practices*. We hypothesize it as

H2e: the organizational culture dimension, loose versus tight control, significantly influences internal lean practices. Specifically, higher level of tight control culture leads to higher level of internal lean practices.

3.3.4.4 Direct Effects of Organizational Culture on Internal Agile Practices

Internal agile practices include adopting modularized techniques, concurrent production activities, empowerment of decision making, cross functional teamwork and multi-skill training. The levels of *internal agile practices* represent the capability of being able to response to the changing market and changing customer needs (Christopher, 1998). As environmental pressures such as globalization and the need for greater customer focus force companies to become more agile (Griffiths, Elson & Amos, 2001). Based on the findings from literatures, we propose that

loose versus tight control and *normative versus pragmatic*, which cover the structure, formalization and customer orientation of an organization, will significantly influence *internal agile practices*.

In literature, organizational structure is reported as one important factor affecting agility of an organization (Gunasekaran, 1998; Dove, 2001; Maskell, 2001; Goldman & Nagel, 2009). Traditional organizational structures, with the usual hierarchical pyramid, emphasizing levels of power and authority, are often unhelpful in developing customer service programs which aims to response quickly to the changing demands and market (Griffiths, Elson & Amos, 2001). While flexible structure with fewer layers of management may not only slash overhead costs, but also bring the business more close to its customer (Doyle, 2006), which implies improvement of agility. Specifically, formal organizational structure is said to influence the empowerment of decision making (James, 2000), concurrent production activities (Vazquez-Bustelo & Avella, 2006) and cross functional teamwork (Chen, 2007), all of which are important components of *internal agile practices*. As mentioned and discussed above, the dimension of organizational culture, *loose versus tight control*, refers to the formalization, rules and policies, hierarchy of structure (Hofstede et al., 1990), therefore, we hypothesize it as

H2c': the organizational culture dimension, loose versus tight control, significantly influences internal agile practices. Specifically, higher level of tight control culture leads to higher level of internal agile practices

As discussed, the objective of 'being agile' is to response to the changing needs of customers, which indicates a high customer orientation of an organization (Grewal & Tansuhaj, 2001). Agile focuses less on the process of manufacturing and more on the need to respond to customer demands. In literature, scholars have done works on the relationships between customer orientation and the components of internal agile practices defined in this dissertation. For example, Rafiq and Ahmed (1998), Maskell (2001) reported that customer-oriented significantly influence empowerment of decision making. The dimension *normative versus pragmatic*, which is also known to be very close to customer-orientation (Hofstede, 1998), therefore, we hypothesize it as

H2d': the organizational culture dimension, normative versus pragmatic, significantly influences internal agile practices. Specifically, higher level of pragmatic culture leads to higher level of internal agile practices.

3.4 Research Models

Based on the discussion above, we propose two research models (according to two ERP decisions), which are going to be validated in this dissertation.

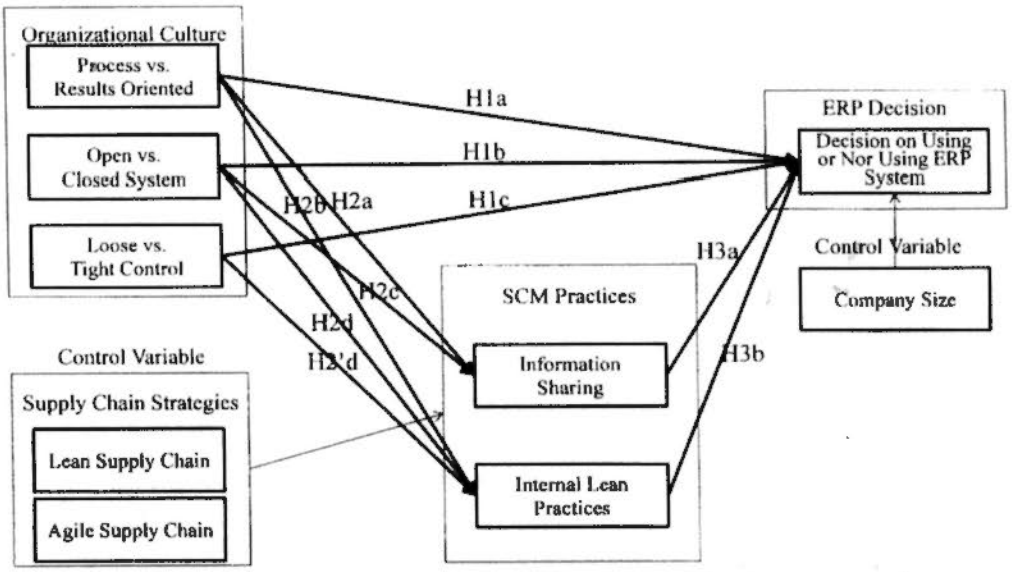

Figure 3.2: Research Model for ERP Decision One

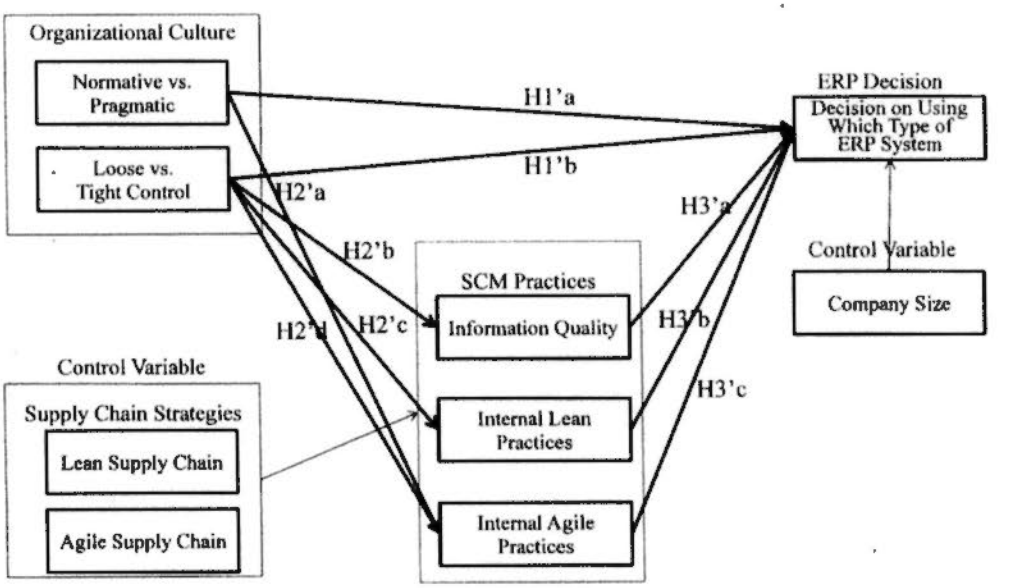

Figure 3.3: Research Model for ERP Decision Two

Chapter 4. Research Methodology

In this chapter, we are going to present the research settings, data collection method and procedure, variable operationalization, question development, translation and pilot test; also we will discuss the methods and techniques we are going to use for this dissertation.

4.1 Research Settings

It's very difficult to conduct nationwide survey in such a large country like China, as China has 31 provinces and autonomous regions, cities under the direct administrative guidance of the central government, and two special administrative regions (Hong Kong and Macau). Moreover, not all the regions are developed. The concepts and practices of SCM might be new to many managers in China. Therefore, we follow the suggestion of Qi et al.'s work that we select the target cities in which the manufacturing companies are relatively better developed and the SCM concepts are better established than other areas in China (Qi et al., 2009). As a result, we chose five representative cities in Pearl River Delta regions, which are well known as global manufacturing base in China, these cities include Guangzhou, Shenzhen, Dongguan, Foshan and Zhongshan. These five cities contribute more than 70% of the GDP of Guangdong province in 2009 according to China National Bureau of Statistics. To make our sample be more representative, we mainly include electronics and telecommunications, electricity and machinery,

appliance, garment and textile, automobiles, chemicals, foods and beverage as the main industries. Also we take it into consideration that different industry has its own industrial and supply chain characteristics, which might influence the firms' SCM practices (Lee, 2004; Qi et al., 2009).

4.2 Data Collection

Based on these geographical and industrial criteria, we use a database provided by Guangdong Shikang Information Service Limited, who provides us a database of Guangdong Manufacturing Firms in 2010. As suggested by Li et al.(2005), manufacturers with fewer than 100 employees seldom engage in sophisticated supply chain management. Still the sampling list is too large to manage if we set the edge of the numbers of employees in the companies; thus, we only include those companies with 200 or more employees to participate in our survey.

In this dissertation, data are collected by the author via field visits. We started the data collection process from the beginning of June 2010 to the end of March, 2011. Following the contacts listed, 1780 companies were contacted by telephone or email and finally 212 agreed to do the survey. However, there were 35 companies we visited in the beginning of our survey including two respondents (one from production and the other from IT) to answer the questionnaire. In addition 15 of them were unwilling to do the survey with a third respondent again when

we contacted them. Therefore, we excluded these 15 companies for the purpose of consistency as there were three respondents in all other companies. Moreover, we found that 7 companies have less than 200 employees; we also excluded them from further analysis. The remaining 190 companies represented 10.67% of the list.

To better measure organizational culture, we include three questionnaires in our survey, all of which include the questions of measuring organizational culture. The first questionnaire is required to be completed by supply chain manager, production manager, general manager or equals. It includes the questions of organizational culture, SCM practices, supply chain strategies, organizational performance and company profile information. The second questionnaire is required to be finished by the CIO or equals. It also includes the questions of organizational culture, ERP decisions, ERP modules used (if they are using ERP systems) and the extent of ERP adoption. The third questionnaire is finished by a common employee, who is regarded in lower level of the company. Through this way, the credibility of the measurement results of organizational culture is improved compared with only asking one respondent in one company (Naor et al., 2008).

The unit of analysis is the manufacturing firms in the five cities mentioned above. Supply chain manager, operations manager, CIO, general manager and experienced staff (who have more than 3 years

working experience in the target company) were selected as potential respondents for this study. They are assumed to have good knowledge about the organizational culture of their companies, also their SCM practices. A significant problem with organizational-level research is that senior and executive-level mangers receive many requests to participate and have very limited time (Qi et al., 2009) to participate in such kind of survey. To improve the quality of the data, we give up the method of email or fax but directly go to the targeting companies. In the pilot study stage, we counted the average time for the production/SC manager (or equals) to finish the SCM section of the questionnaire, which is about 30 to 40 minutes. With such criteria, we conducted our survey and monitored the whole procedure of the survey. In addition, we also talked to the respondents and asked them give brief introduction of their companies, through which we obtained additional information such as some industrial and product characteristics.

To get more information about this topic and make this study more reliable and creditable, we conducted in-depth interviews with general managers and CIOs from 6 manufacturing firms through connections and three experienced ERP consultants from UFIDA, Digital China and Oracle.

Following the suggestions of Myers and Newman (2007), we designed a list of semi-structured questions and talked to the managers

from the manufacturing firms, we recorded the whole procedure of the interview with recorder. We also wrote down the answers of the questions presented by the interviewees.

4.3 Variable Operationalization

In this study, we employed literature in information systems, operations management and sociology as our references to develop proper measurements in the questionnaire. The review process provides us a basis for measurement development and reliability assurance of most of the variables used in the questionnaire. However, this study is an exploratory one in nature, there is some variable which is not available in existing literature, including internal agile manufacturing. Therefore, we develop new measures for this variable. Except those demographic questions like company size, ownership, sales in 2009, number of employees, most measure are composed of multi-statements in which the respondents are required to rate their responses from 1 (strongly disagree) to 5 (strongly agree).

4.3.1 Measures of ERP Decisions

For the dependent variable ERP decision, we use two questions, that is whether the surveyed company is using an ERP or not, this consists of the first dependent variable, using or not using ERP system. If the respondent indicates that the company is using an ERP system, he or she is required to give the name of the ERP system, from which we can

classify the ERP system used as Western developed, Chinese developed or self developed, which is the second dependent variable. To further determine whether a company is using an ERP system or not, we also ask the respondents for the modules adopted in the ERP systems. As many Chinese ERP systems are originated from accounting software but they claim they are ERP system providers, thus the adopters also claim they are using an ERP system though they only use some accounting software. We take the production planning function as the core of an ERP system, therefore, if the production planning module is not included in their systems, we regard that the company is not using ERP system (Olhager & Selldin, 2003).

4.3.2 Measures of Organizational Culture

As discussed in the literature review section, our measurement is mainly based on Hofstede et al.'s (1990) work. In the pilot test stage (with 38 companies), when we applied the original bipolar questions of Hofstede in the questionnaire, most of our respondents (three respondents in each company) reported that they had much difficulty in reading and responding to two questions in one single item, especially in Chinese. We have to explain the questions one by one for each respondent, which sharply increased the burdens to our work. Therefore, to make it more easily to manage and more easily to be understood by our respondents, we convert the original bipolar scale of Hofstede into 1 to 5 Likert like

scale, which is also consistent with other measurements in this dissertation.

The first dimension is *process versus results oriented*, which opposes a concern of the means to a concern of goals. This dimension is measured with three items adapted from Hofstede et al. (1990). They are measuring members' attitude towards unfamiliar situations, efforts they put into work and their attitude to the working day (everyday is a new challenge or everyday is the same). This dimension has also been identified in sociology as mechanistic and organic management systems (Burns and Stalker, 1961; Hofstede, 1998).

The second dimension is *employee versus job oriented*, which opposes a concern of the people to a concern of getting the job done. This dimension is measured by the members' perception that whether their personal problems are taken into account, their organizations' responsibility for their welfare and who make important decisions. This dimension corresponds to Blake and Mouton's (1964) employee orientation and job orientation while their work focuses on individuals and Hofstede et al.'s (1990) concentrate on social systems.

The third dimension is *parochial versus professional*, which opposes "units whose employees derive their identity largely from the organization" to "units in which people identify with their type of job" (Hofstede, 1998). Three items regarding of members' private lives,

conditions of being hired and the term to think are used to measure this dimension.

The fourth dimension is *open versus closed system*. This dimension describes the communication climate of an organization, which is a common concern of both human resources and public relations experts (Hofstede, 1998). We use three items concerning with the open attitude towards new comers and outsiders, how fit of the members to the organization, and how long a new comer to fit in the organization to measure this dimension.

The fifth dimension is *loose versus tight control*, which refers to the amount of internal structuring in the organization. This dimension is measured by three items regarding of the members' perception on costs, meeting time and jokes about the organization/the job. The tight-versus-loose distinction is well known from the literature on management control (Hofstede, 1998).

The sixth dimension is *normative versus pragmatic*, which deals with the popular notion of "customer orientation". This dimension is very close to "staying close to the customer" proposed by Peters and Waterman (1982). Three items regarding of the members' perception on matters of business ethics and honesty, the importance of results or right procedures, and the importance to meet the requirement of the customers are adopted to measure this dimension.

4.3.3 Measures of SCM Practices

We used Li et al.'s (2005) five dimensions of SCM practices in this dissertation. In addition, through a comprehensive review, we developed measurement items and added "internal agile manufacturing" as the sixth dimension of SCM practices for this dissertation.

The first dimension is *strategic supplier relationship*, it refers to the long-term relationship between the company and its suppliers (Li et al., 2005). Six items are adopted to measure this dimension. These items mainly focus on the activities including supplier selection, problem solving, product quality improvement, continuous improvement program, business planning, goal setting and new product development, all of which involve suppliers.

The second dimension is *customer relationship*, it consists of practices that are employed to manage customer complaints, build up long-term relationships with customers, and improve customer satisfaction (Tan et al., 1998; Li et al., 2005). Five items regarding of criteria for reliability and responsiveness setting, customer satisfaction assessment, customer expectation, customer service and importance of customer relationships are used to measure this dimension.

The third dimension is *information sharing*. It refers to "the extent to which critical and proprietary information is communicated to one's supply chain partner" (Monczka et al., 1998; Li et al., 2005). The

importance of *information sharing* in SCM has been well illustrated (Lalonde, 1998; Tompkins & Ang, 1999; Yu et al., 2001). We use six items from Li et al.'s (2005) to measure *information sharing*, these items cover acknowledgement of changing business requirement, sharing proprietary information, business knowledge exchange, information exchange for business planning, and acknowledgement of the issues that might affect the other party.

The fourth dimension is *information quality*, it includes aspects as the accuracy, timeliness, adequacy, and credibility of information exchanged (Monczka et al., 1998). Five items are used to measure this dimension, which are corresponding with the accuracy, timeliness, completeness, adequacy and credibility mentioned above.

The fifth dimension is *internal lean practices*, it includes the activities of "eliminating waste (cost, time, etc.) in a manufacturing system, characterized by reduced set-up times, small lot sizes, and pull-production" (Li et al., 2005). We use the five items from Li et al.'s work, which cover set-up time reduction, continuous quality improvement, pull production, shorter lead-times and streamlining paperwork from suppliers.

The sixth dimension is *internal agile practices*, which is corresponding with *internal lean practices*. This dimension measures the principles of agile manufacturing including reconfigurable/flexible

resources (Gupta and Mittal, 1996; Adamides, 1996; Gunasekaran, 2002; Guisinger & Ghorashi, 2004), nimble organizational structures (Sanchez and Nagi, 2001), supportive human factors (Abair, 1997; Gunasekaran, 2002; Maskell, 2001) and concurrent engineering (Gunasekaran, 2002). We developed five items to measure this dimension.

4.3.4 Measures of Supply Chain Strategies

In this dissertation, we propose the existence of the impact of organizational culture on SCM practices. In addition, we also take it into consideration that an organization's SCM practices are also influenced by its supply chain strategies (Qi et al., 2009).

Supply chain strategies is defined as "the pattern of decisions related to sourcing products, capacity planning, conversion of raw materials, demand management, communication across the supply chain, and delivery of products and services"(Narasimhan et al., 2008). In this dissertation, we adopt the measures from Qi et al.'s (2009). They used a lean scale and an agile scale to measure supply chain strategies. By adopting these scales, supply chain strategies is classified into four clusters including lean supply chain, agile supply chain, traditional supply chain and lean/agile supply chain.

For *lean scale*, we mainly used six of the seven items from Qi et al.'s work. These items cover predictability of product, waste reduction in supply chain, cost reduction through mass production, criteria of

supplier selection and stable supply chain structure. For *agile scale*, the measurement items are corresponding with the coverage of lean scale but they measure volatile demand, personalized products, flexibility and responsiveness of suppliers, large supplier base and changing supply chain structure.

4.4 Validation of the Measurement

We run through rigorous procedures in this study to ensure the validity of our measurements. As discuss above, we mainly used existing instruments that have been empirically validated. In this section, we focus on the questionnaire development and translation, pre-test and pilot test of our measurements.

Our questionnaire mainly consists of four parts namely organizational culture, SCM practices, ERP decisions and supply chain strategies. The items designed to measure organizational culture are based on Hofstede et al.'s (1990) work. As discussed above, we converted the bipolar scales into 1 to 5 Likert scales to make the questions of organizational culture be more easily understood and managed.

The measurement items for SCM practices are mainly from Li et al.'s (2005), we adopt strategic supplier relationship, customer relationship, information sharing, information quality and internal lean practices to represent SCM practices. In addition, we developed "internal

uagile practices" as one dimension of SCM practices to be corresponding with internal lean practices.

For the questions in both organizational culture and SCM practices, we are the question "to what extent are the following statements suitable descriptions of your company's realities upon its organizational culture/SCM practices". These items are five-point Likert scales with 1 = strongly disagree and 5 = strongly agree as the anchors.

The questionnaire also includes some other questions concerning the characteristics of the company, which include ownership, size (in terms of sales revenue, numbers of employees), and the profile of the respondents (we require 3 respondents in a company to accomplish the whole questionnaire, the first respondent is preferred to be CEO/production/operations/SC managers, who will answer the questions of organizational culture, SCM practices, supply chain strategies sections and performance measures; the second respondent is preferred to be the CIO or equals in the company, who will answer the questions of organizational culture and ERP related questions; the third respondent is preferred to be an experienced common (non-executive or non-managerial) employee who has worked over 3 years in the company, he or she is required to answer the questions of organizational culture only.

Most of the items in the questionnaire are from literature in English; we translated the questionnaire into Chinese and collected data in China. To make sure the questionnaire is reliable enough, we consolidated the questionnaire and asked two knowledgeable professors (one from MIS area and the other from operations management area) to review the questionnaire. Then we asked a PhD student in operations management area to translate back to English, each items in the translated English version was checked against the original English version. We found that some items need to be reworded to better indicate the original meanings of the English version. The combination of translation to Chinese and back translation to English together with the in-depth interviews provide strong evidence to support the reliability and validity of measurement in research in developing countries, particularly China (Qi et al., 2009).

We invited two professors, one from IS field and the other from OM field, who have much experience in survey-based empirical research, to do a pretest for our questionnaire. Following their comments, we did some changes in wording and grammar on our questionnaire to reduce the ambiguity and make it more understandable for our respondents.

After the pretest, we conducted a pilot study on August to September 2010 in Dongguan, Shenzhen and Foshan, where we invited 35 companies to participate in this stage. The aim of the pilot test is to ensure the wordings of the questionnaire are well understood by the

respondents. In addition, we also talked to the managers with the survey questions and ensure the content validity of the dimensions of SCM practices, especially for the newly added dimension *internal agile practices*. We visited 30 firms in the pilot test stage and other 5 questionnaire were sent to the corresponding companies and returned either with hard copies or emails. In the company visits (each took at least 60 minutes including some discussion with the respondents), we took the notes for any confusion or ambiguity in the wordings of the questions or scales, after which we modified the items if necessary. With the 35 samples, we tested the reliabilities of the items and got good results which are above 0.7 for the Cronbach's alphas. In addition, we made some changes on the wordings on the questionnaire according to the interview and feedback of the respondents, which is helpful to improve the content validity of our survey.

4.5 Data Analysis Methods

In this dissertation, we employed several statistical techniques to test the reliability and validities of the instrument. First, we conducted an exploratory factor analysis (EFA) for each construct to ensure the unidimensionality of the scales with SPSS 16.0. Moreover, we tested the reliabilities of the measures with SPSS and got the results of Cronbach's alpha to validate the measures. AMOS is adopted to perform

confirmatory factor analysis (CFA) and check the good-fit-index of the measurement model.

To test the research model and hypotheses we proposed, we adopt multinomial logistic regression (MLR) as our main technique to analyze. The rationale to adopt MLR is that our dependent variable is a categorical one. We use multiple regression to test the relationships between organizational culture and SCM practices.

Chapter 5. Data Analysis and Results

In this chapter, we employed the techniques mentioned in chapter 4 and analyzed the 190 samples of data we got from the survey. This data is used to test the research model and hypotheses we proposed in this dissertation. We also employed the subjective data in the questionnaire and present the research settings of the survey.

5.1 Profiles of the Surveyed Companies

We present a profile of the respondents to the survey in table 5.1. In the table, we indicate the position of the respondents within the company; the largest group is production and operations managers, chief executive officials, chief information officials, factory directors, supply chain managers, or purchasing managers. In every company, we also asked a common staff to answer the questionnaire of organizational culture. Therefore, the respondents cover a variety of positions from top management to common staff. We also record the years of work for the respondents and most of the respondents have worked more than 3 years. These results show that the respondents have good knowledge about the daily practices (or organizational culture) of their companies. In addition, the executives (managers) are capable of answering our questions regarding of SCM practices, ERP adoption and supply chain strategies.

Table 5.2 shows the profiles of the surveyed companies by size and ownership. In our survey, we only include those companies who had

more than 200 employees. 45.8% of the responding companies had 200 to 499 employees, 21.1% had 500 to 999 employees, and 33.1% had over 1000 employees. In terms of annual sales in 2009, 15.3% of the responding companies had annual sales less than 20 million Yuan RMB, 21.6% had annual sales between 20M to 50M RMB, 8.9% had 50M to 100M, 25.3% had 100M to 250M, 28.9% had 250M or above.

As suggested by Qi et al. (2009), the ownership of Chinese companies is an important factor that can potentially influence supply chain management. As showed in the table 5.2, our respondents cover almost all ownership types. We limited our survey within top five cities in Pearl River Delta regions, where most of the foreign companies are from Taiwan and Hong Kong, therefore, 24.7% of the respondents are Hong Kong private companies, 27.9% are Taiwan Private, 30% are local Chinese private, 5.8% are state-owned enterprises, 5.3% are foreign private companies (including Japan, USA, Korea, France, Spain etc) and 6.3% are Sino-foreign (including Sino-foreign investment, Sino-foreign cooperate) companies.

Table 5.1: Respondent Profile

Job title	Frequency	Percentage (%)
Production manager	124	32.63%
Supply chain manager	13	3.42%
CEO	31	8.16%
Factory director	36	9.47%
Purchasing Manager	32	8.42%
CIO	144	37.89%
Total	380	100
190 common staffs were asked to answer the questions on organizational culture		

Table 5.2: Company Profile

Number of employees		
	Frequency	Percentage (%)
200-499	87	45.8
500-999	40	21.1
1000-1999	22	11.6
2000-3999	20	10.5
4000 above	21	11.0
Sales in 2009		
5M-10M	23	12.1
10M-20M	6	3.2
20M-50M	41	21.6
50M-100M	17	8.9
100M-250M	48	25.3
250M-500M	21	11.0
>500M	34	17.9
Ownerships		
Domestic private	57	30.0
Hong Kong Private	47	24.7
Taiwan Private	53	27.9
State-owned enterprise	11	5.8
Foreign Private	10	5.3
Sino-Foreign	12	6.3

Following the suggestions of other scholars (Qi et al., 2009; Malhotra & Grover, 1998) we compared the industry distribution of the surveyed companies with the populations of the companies in PRD regions to examine the nonresponse, the results are showed in table 5.3. It shows that the percentages of the samples are close to the percentages of companies in the PRD region for most of the industries, A chi-square test ($\chi 2 = 0.75$) indicated that there is no significant difference between the distribution of samples and the overall population ($p=0.993>0.05$), which suggests that our samples are not biased toward any particular industry and are representative for the manufacturing industries in nine cities of PRD regions.

Table 5.3: Industrial distributions of the samples and the population[1]

Industry	Population	Sample	% of Population	% of Sample
Food, Beverage & Medicine	952	5	3.17%	2.63%
Textile, Garments, Footwear & Leather	4208	24	14.00%	12.63%
Papermaking, Paper Products & Printing	2557	15	8.51%	7.89%
Cultural, Educational and Sports Articles	900	11	2.99%	5.79%
Raw Chemical Materials and Chemical Products	2175	8	7.24%	4.21%
Metal & Plastic Products	4516	26	15.03%	13.68%
Transport Equipment	1169	8	3.89%	4.21%
Electrical Machinery and Equipment	6709	48	22.32%	25.26%
Communication Equipment, Computers and Others	6869	45	22.85%	23.68%
Total	30055	190	100.00%	100.00%

5.2 Procedures of Measurement Assessment

In this section, we will present the procedures of assessment of the measurements in this dissertation in terms of their unidimensionalities, reliabilities and validities.

Unidimensionality refers to the existence of a single trait or construct underlying a set of measures (Hattie 1985). Unidimensionality is very important which has been stated by Hattie (1985) "that a set of items forming an instrument all measure just one thing in common is a most critical and basic assumption of measurement theory". To test the unidimensionalities of the measurements, we apply exploratory factor analysis (EFA) method. We follow the rules proposed by researchers (i.e.

[1] Data source: Guangdong Bureau of Statistics · Main Indicators of Industrial Enterprises of the Nine Cities in the Pearl River Delta (2009).

Notes: The statistical coverage of industry refers to the legal person industrial enterprises with annual main business revenue over 5 Million RMB, which is consistent with our sampling criteria.

Gerbing & Anderson, 1988) and set the edge value 0.5 for each item to its target latent variable. If the factor loading of the item is less than 0.5, we will remove the item from further data analysis.

According to the scale development paradigm advocated by Gerbing & Anderson (1988), we test the reliabilities of the measurements after unidimensionality has been acceptably established. Reliability is the consistency of a set of measurements or of a measuring instrument, which indicates the degree to which the items are free from random errors. Here we use Coefficient alpha, which is the most widely used coefficient of equivalence, to examine the internal consistency of the measurements. We computed the reliabilities of all the constructs and compare the results with the edge 0.7, if they are higher than the edge, we can claim the measurements are reliable.

Construct validity is the extent to which a set of measured items actually reflect the theoretical latent construct they are designed to measure. It mainly includes convergent validity and discriminant validity, they are two techniques used to assess new measurements (Campbell & Fiske, 1959). Convergent validity is "the extent to which indicators of a specific construct 'converge' or share a high proportion of variance in common" (Gallagher et al., 2008). Discriminant validity describes "the degree to which the operationalization is not similar to (diverges from) other operationalizations that it theoretically should not be similar to"

(Gallagher et al., 2008). We use confirmative factor analysis (CFA) and average variance extracted (AVE) methods to assess the convergent and discriminant validities in this dissertation.

To examine convergent validity, we performed a CFA in which the measurements of each variable were modeled as indicators of their respective latent constructs and the correlations among these latent variables were estimated. We use the model fit indices including Chi-square/degree of freedom, root mean square error of approximation (RMSEA), non-normed fit index (NNFI), comparative fit index (CFI), and standardized root mean square residual (SRMR) to evaluate the measurement model. Following the guidelines of previous researchers (Hayduk, 1987; Scott, 1994; Bagozzi & Yi, 1988; Bentler & Bonett, 1980), if the indices (Chi-square/df~(1,5), RMSEA<0.10, NNFI>0.9, CFI>0.9, and SRMR<0.10) are fulfilled, we then calculate the AVE for each variable, if the AVE is over the edge value 0.5, we can claim the establishment of convergent validity.

For discriminant validity, we calculate the AVE of each variable and compare the AVE with the shared variance with other variables. According to Gallagher et al. (2008), AVE estimates also should be greater than the square of the correlation between that factor and other factors to provide evidence of discriminant validity. Therefore, if all

AVEs of the variables in one model are over than their responding shared variances, we can claim the discriminant validity.

5.3 Results of Measurement Assessment

In this section, we will present the assessment results of the measurements for this dissertation. In our research model, we have 13 independent variables including seven dimensions of organizational culture (22 items) and six dimensions of SCM practices (32 items). It will be very difficult if we put all the items together in a single analysis. In addition, we obviously separate the independent variables into two categories (organizational culture and SCM practices) and aim to identify and confirm the factors by applying EFA and CFA methods. Therefore, we conduct the analysis in two analyses to make the results more clear.

5.3.1 Organizational Culture

In our research model, there are six variables of organizational culture: *process versus results oriented, job versus employee oriented, professional versus parochial, open versus closed system, loose versus tight control* and *normative versus pragmatic*. We performed the EFA procedures in SPSS and got the results that EFA of all the items generated 6 factors with eigenvalues over 1 (table 5.4). These results are consistent with our postulation. The factor loadings of all items are higher than 0.5. For reliabilities, all variables have Cronbach's alpha

values that are higher than 0.7, which indicates our measurements for organizational culture are highly reliable.

Table 5.4 EFA Result of Organizational Culture

	Loose versus tight control	Open versus closed system	Employee versus job oriented	Process versus result oriented	Normative versus pragmatic	Professional versus parochial
PR1	.034	-.058	-.025	**.863**	.060	-.012
PR2	.049	-.133	.040	**.857**	.029	.029
PR3	.116	-.144	-.100	**.815**	.064	.036
EJ1	-.084	.048	**.844**	-.108	.085	.007
EJ2	-.131	.115	**.856**	.052	.014	.163
EJ3	-.237	.261	**.794**	-.024	-.082	.014
PP1	-.178	.265	.301	-.046	-.008	**.754**
PP2	.027	.197	.128	.002	.088	**.868**
PP3	.326	-.092	-.292	.139	.183	**.692**
OC1	-.035	**.893**	.134	-.091	.032	.093
OC2	-.028	**.814**	.111	-.117	.072	.171
OC3	.000	**.843**	.124	-.149	-.041	.064
LC1	**.872**	-.006	-.157	.159	-.017	-.013
LC2	**.870**	-.023	-.177	-.040	-.039	.046
LC3	**.882**	-.035	-.082	.096	.145	.033
NP1	.212	-.077	-.064	.023	**.839**	-.006
NP2	.064	-.032	.011	.042	**.888**	.123
NP3	-.203	.190	.089	.099	**.732**	.078
Variance explained	14.571%	13.659%	13.342%	12.622%	11.794%	10.531%
Cronbach Alpha	0.878	0.842	0.826	0.822	0.749	0.705

Table 5.5 AVE Result of Organizational Culture

	Loose versus tight control	Open versus closed system	Employee versus job oriented	Process versus result oriented	Normative versus pragmatic	Professional versus parochial
Loose versus tight control	0.765					
Open versus closed system	0.010	0.724				
Employee versus job oriented	0.002	0.019	0.692			
Process versus result oriented	0.046	0.140	0.064	0.714		
Normative versus pragmatic	0.026	0.111	0.007	0.013	0.676	
Professional versus parochial	0.014	0.001	0.039	0.003	0.183	0.600
Goodness-fit index of CFA: Chi-Square: 368, degree of freedom: 132, RMSEA: 0.058, NNFI: 0.904, CFI: 0.912, SRMR: 0.046						

5.3.2 SCM Practices

As discussed in the literature review and research model sections, we mainly adopted Li et al.'s (2005) work to measure SCM practices. In addition we also develop *internal agile practices* as a new dimension of SCM practices. By performing EFA with SPSS, we found that some items are to be removed from analysis as their factor loadings are less than the edge 0.5 suggested by Shevlin (1998).

To identify and confirm the factors underlying the SCM practices construct (with 32 measurement items), we employed four decision rules suggested by researchers (Straub, 1989; Wang, 2003), these rules include: (1) applying a minimum eigenvalue of 1 as a cutoff value for extraction; (2) dropping those items with factor loadings less than 0.5 on all factors or those that are over 0.5 on two or more factors; (3) a simple factor structure; and (4) exclusion of single item factors from the standpoint of parsimony. Following these rules, we repeated the iterative sequence of factor analysis and item deletion, after which it resulted in a final instrument of 28 items representing 6 distinct factors. These factors were interpreted as supplier relationship, customer relationship, information sharing, information quality, internal lean practices and internal agile practices. The factors explain 70.01 % of the variance of the dataset.

We summarized the factor loadings for the condensed 26-item instrument. The factor loadings of all the items on single factors are

higher than 0.5 (showed as table 5.6), which indicate unidimensionality of the measurements. We also calculated the Cronbach's alpha values of the six factors, all of which are higher than 0.7, this indicates that reliability of the measurements of the product characteristics is acceptable.

Table 5.6 EFA Result of SCM Practices

	Factor Loadings					
	Information quality	Customer relationships	Internal lean practices	Supplier relationships	Information sharing	Internal agile practices
SR2	.240	.312	.185	**.593**	.108	.071
SR3	.142	.317	.239	**.645**	.130	.029
SR4	.217	.191	.087	**.795**	.158	.062
SR5	.094	.186	.056	**.810**	.130	.121
SR6	.093	.079	-.031	**.738**	.263	.005
CR1	.303	**.708**	.077	.178	.216	.134
CR2	.205	**.703**	.047	.294	.122	.149
CR3	.323	**.659**	.106	.186	.226	.063
CR4	.207	**.850**	.140	.164	.112	.059
CR5	.181	**.746**	.162	.256	.157	.104
IS3	.121	-.103	.120	.135	.052	**.748**
IS4	.252	.089	.036	-.022	.179	**.754**
IS5	.179	.211	-.054	.034	.060	**.791**
IS6	.045	.208	.100	.077	.048	**.815**
LP1	.030	.075	**.759**	.124	.150	.078
LP2	.157	-.096	**.796**	.012	.187	.043
LP3	.026	.125	**.865**	.078	.023	-.028
LP4	-.057	.127	**.828**	.067	-.005	.003
LP5	.108	.345	**.573**	.096	.043	.203
IQ1	**.736**	.258	.061	.111	.181	.155
IQ2	**.805**	.287	-.003	.114	.190	.109
IQ3	**.786**	.121	.092	.193	.155	.159
IQ4	**.800**	.145	.058	.173	.112	.192
IQ5	**.808**	.257	.043	.136	.063	.104
AM1	.202	.277	.232	.120	**.702**	.120
AM2	.236	.203	.085	.216	**.831**	.016
AM3	.067	.080	.014	.301	**.623**	.249
AM4	.184	.175	.147	.194	**.899**	.056
Variance explained	13.733%	13.077%	11.675%	11.448%	10.287%	9.790%
Cronbach Alpha	0.916	0.892	0.847	0.850	0.877	0.821

Table 5.7 AVE Result of SCM Practices

	Information quality	Customer relationship	Internal lean practices	Supplier relationship	Information sharing	Internal agile practices
Information quality	0.620					
Customer relationships	0.360	0.542				
Internal lean practices	0.111	0.181	0.594			
Supplier relationships	0.078	0.095	0.044	0.520		
Information sharing	0.233	0.356	0.165	0.043	0.604	
Internal agile practices	0.293	0.275	0.144	0.102	0.235	0.595
Goodness-fit index of CFA: Chi-Square: 639.9, degree of freedom: 335, RMSEA: 0.069, NNFI: 0.902, CFI: 0.904, SRMR: 0.052						

5.3.3 Supply Chain Strategies

The final construct is supply chain strategies, which include lean supply chain and agile supply chain as discussed above. We adopted Qi et al.'s (2009) 12 measurement items in this dissertation. Therefore, two variables are measured by 12 items. We set the number of factors in data reduction as two variables to generate the expected results.

Table 5.8 EFA Result of Supply Chain Strategies

	Factor Loadings	
	Agile Supply Chain	Lean Supply Chain
LSC1	.345	**.707**
LSC2	.340	**.664**
LSC3	.170	**.674**
LSC4	.007	**.575**
LSC5	.218	**.662**
LSC6	.111	**.558**
ASC3	**.758**	.138
ASC4	**.693**	.297
ASC5	**.810**	.188
ASC6	**.844**	.159
Variance explained	27.468%	26.417%
Cronbach Alpha	0.819	0.754

Table 5.9 AVE Result of Supply Chain Strategies

	Lean Supply Chain	Agile Supply Chain
LSC	0.433	
ASC	0.259	0.506
Goodness-fit index of CFA:Chi-Square: 98.623, degree of freedom: 35, RMSEA: 0.055, NNFI: 0.915, CFI: 0.967, SRMR: 0.039		

As discussed above, the AVE for "lean supply chain" is 0.433, which is lower than the minimum requirement 0.5, therefore, we conduct another analysis by AMOS as suggested by Wu (2010). The result shows these two constructs (lean supply chain and agile supply chain) are well discriminated.

5.4 Results of Model and Hypothesis Testing

After performing the data quality checking (including validity and reliability assessment of the measurements), we test the research models and hypotheses proposed in chapter 3. We conduct the testing in the following ways:

In the first step, we use binary logistic regression to test the direct effects of the specified dimensions of organizational culture and SCM practices on ERP Decision 1 for the first research model. Based on the binary logistic regression results, we use multiple regression to test the relationships between the specified dimensions of organizational culture and SCM practices. and then we examine the potential mediating role of SCM practices in the relationship between organizational culture and ERP decision one, using the methods proposed by MacKinnon (2002);

In the second step, we apply multinomial logistic regression to test the second research model, which includes direct effect of the specified dimensions of organizational culture and SCM practices on ERP Decision two; then we follow the findings of multinomial logistic regression and use multiple regression to test the relationship between organizational culture and SCM practices, also we incorporate supply chain strategies in the analysis; Based on the results, we determine the role of SCM practices playing in the relationship between organizational culture and ERP decision two, also by adopting the methods of MacKinnon (2002).

5.4.1 Direct Effects on the Decision on Using or Not Using ERP System

Regarding of ERP decision one, we postulate that three dimensions (*process versus results oriented, open versus closed system and loose versus tight control*) of organizational culture (H1) and two dimensions (*information sharing* and *internal lean practices*) of SCM practices (H3) significantly influence it, which is indicated in the first research model. In this study, we include organization's size (number of employees) as control variable. We use logistic regression as the main technique to conduct the analysis as the dependent variable (ERP decision one) is a categorical one, which has no limitation for the independent variables to be normally distributed (Tabachnick & Fidell, 2001). As the dependent

variable has two categories, we use binary logistic regression to test these direct effects.

In this section, we perform two series of binary logistic regression for ERP decision 1: one with the dimensions of organizational culture as predictors and the other with the dimensions of SCM practices as predictors. The sample is split into 50 companies who are not using any ERP system presently and 140 companies who are using ERP system. The objective of this analysis is to validate the specified dimension(s) of organizational culture and SCM practices that significantly influences ERP decision one in the first research model.

In the first set of logistic regression, we construct a series of models and aim to find out reliable predictors (independent variables) which significantly influence ERP decision one. These models are illustrated and compared in table 5.10. We list the parameters including "-2 log likelihood", "Cox & Snell R Square", "Nagelkerke R Square" (Pseudo R Square, which is similar with R Square in linear regression) and "Likelihood Ratio Tests" in the models and then use a delta Chi-Square method to compare the models.

Model 1 (M1) only includes the intercept and control variable. From table 5.11 (part M1), we can see that the overall effect of the control variable (company size) on ERP decision one is significant, which is consistent with the findings of previous studies on ERP adoption (Mabert

et al., 2003; Laukkanen et al., 2007). In the second step, we add the three specified dimensions of organizational culture and run the analysis (model as M2). The new model is still significant (P=.000). We compare the Chi-square difference of M2 and M1 (Delta Chi-Square=29.81, with D.F.=3, P<.000), this indicates that the specified dimensions of organizational culture in the first research model significantly enhances prediction of ERP decision one.

Table 5.12 summarizes the statistics for the predictors. From the standard error column (S.E.) all coefficients of the predictors are smaller than 2, which indicate there is no multicollinearity among the predictors (Hosmer& Lemeshow, 2000). From the results of Wald Test (Wald Test>2) and significance level (P<.05), we conclude that two dimensions "*process versus results oriented*" and "*open versus closed system*" significantly influence ERP decision one. Table 5.9 presents the sequential analysis results of the effects of the specified dimensions of organizational culture on ERP decision one, these results are used to validate the hypotheses proposed. In summary, we confirm that "*process versus results oriented*" and "*open versus closed system*" are significant predictors of ERP decision one while "*loose versus tight control*" is not reliable in predicting the membership of the ERP decision one.

Table 5.10: Model Comparison of Logistics Regression Analysis of ERP Decision One as a Function of Organizational Culture

Model	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Likelihood Ratio Tests			Model Comparison			
				Chi-Square	d.f.	P-value		Δ Chi-Square	Δd.f.	P-Value
M 1	177.406	.197	.287	41.601	2	.000				
M 2	147.596	.313	.458	71.411	5	.000	M2-M1	29.810	3	.000

Remarks: M 1: including intercept and control variable only M 2: including intercept, control variable and specified predictors

Table 5.11: Logistics Regression Analysis of ERP Decision One as a Function of Organizational Culture

Model	Variable	B	Standard Error	Walt Test	d.f.	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratios	
M1	Constant	3.689	1.893	1.012	1	.478	40.000		
	Company Size			26.266	2	.000			
	Size (1)	-3.574	1.035	11.924	1	.001	.028	.004	.213
	Size (2)	-1.779	1.081	2.709	1	.100	.169	.020	1.404
M2	Constant	3.222	1.821	3.130	1	.077	25.077		
	Company size			26.909	2	.000			
	Size (1)	-4.136	1.114	13.792	1	.000	.016	.002	.142
	Size (2)	-1.988	1.138	3.053	1	.081	.137	.015	1.274
	Process-Oriented	1.060	.346	9.386	1	.002	2.886	1.465	5.685
	Open System	-1.008	.307	10.745	1	.001	.365	.200	.667
	Tight Control	-.099	.267	.136	1	.712	.906	.537	1.529

Remarks: the reference category is 0, decision on not using ERP system. Size (1) refers to middle size companies, Size (2) refers to large companies.

Table 5.12: Summary of the Effects of Organizational Culture on ERP Decision One

Variable	Chi-Square to Remove	d.f.	P-value	Result
Process-Oriented	10.313	1	.001	significant
Open System	12.455	1	.000	significant
Tight Control	.138	1	.711	insignificant

In the second set of logistic regression, we examine the relationships between the specified dimensions of SCM practices and ERP decision one. The processes are very similar with that of organizational culture. The first model M3 only includes intercept and control variable (company size), the second model (M4) includes intercept, control variable and the specified predictors. The comparison and statistical results are presented in table 5.13 and 5.14.

Table 5.13: Model Comparison of Logistics Regression Analysis of ERP Decision 1 as a Function of SCM Practices

Model	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Likelihood Ratio Tests			Model Comparison			
				Chi-Square	d.f.	P-value		Δ Chi-Square	Δd.f.	P-Value
M 3	177.406	.197	.287	41.601	2	.000				
M 4	164.779	.248	.363	54.228	4	.000	M4-M3	12.627	2	.002

Remarks: M 3: including intercept and control variable only M 4: including intercept, control variable and all predictors

Table 5.14: Logistics Regression Analysis of ERP Decision 1 as a Function of SCM Practices

Model	Variable	B	Standard Error	Walt Test	d.f.	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratios	
M3	Constant	3.689	1.893	1.012	1	.478	40.000		
	Company Size			26.266	2	.000			
	Size (1)	-3.574	1.035	11.924	1	.001	.028	.004	.213
	Size (2)	-1.779	1.081	2.709	1	.100	.169	.020	1.404
M4	Constant	.956	1.699	.316	1	.574	2.601		
	Company size			24.564	2	.000			
	Size (1)	-3.480	1.048	11.020	1	.001	.031	.004	.240
	Size (2)	-1.665	1.095	2.314	1	.128	.189	.022	1.617
	Information Sharing	.920	.275	11.149	1	.001	2.509	1.462	4.304
	Internal Lean Practices	-.097	.303	.102	1	.749	.908	.502	1.643

Remarks: the reference category is 0, decision on not using ERP system. Size (1) refers to middle size companies, Size (2) refers to large companies.

Table 5.15: Summary of the Effect of SCM Practices on ERP Decision One

Dimensions	Chi-Square to Remove	d.f.	P-value	Result
Information Sharing	12.586	1	.000	significant
Internal Lean Practices	.103	1	.749	insignificant

From the presentations of table 5.13, and table 5.14 above, we conclude that the predictor "*information sharing*" reliably separates the companies using ERP systems from those who are not using ERP systems (Wald Test= 11.149, P=.001). By comparing different models (M3 and M4), we confirm that model with the specified predictors (M4) in the first research model are significantly better than the one only includes intercept and control variable (M3). Therefore, "*information sharing*" is confirmed to be the only significant predictor of SCM practices in predicting ERP decision one while other five are not reliable. Table 5.15 summarizes the results which are used to validate the hypotheses proposed.

Table 5.16 presents the mean scores of each significant predictor for the two groups: companies using ERP and companies not using ERP system.

Table 5.16: Means of Each Significant Predictor in ERP Decision One

Dimensions	Process versus results oriented	Open versus closed system	Information sharing
Using ERP	3.675	2.285	3.513
Not Using	3.265	2.846	3.015

5.4.2 Intervening Role of Information Sharing in the Decision on Using or Not Using ERP System

As discussed in chapter 3, we propose that organizational culture not only directly influences an organization's ERP decision, but also it influences the ERP decision through SCM practices. Based on the findings above, we examine how SCM practices (in terms of *information sharing*) mediates the relationship between organizational culture (in term of *process versus results oriented* and *open versus closed system*) and the decision on using or not using ERP system.

Following the guidelines of previous research works (MacKinnon et al., 2002; Baron & Kenny, 1986), a mediation analysis includes three models: a regression model, a main effect model and a mediated main effect model. In this study, the dependent variable is a categorical one, the notation should be changed in equations (1), (2), (3) and (4) as suggested by MacKinnon, Warsi, & Dwyer, 1995). Y* is the underlying latent continuous variable that is dichotomized into one of the categories of the outcome variable, where Y is the values of the dependent variable (here 0=decision on not using ERP system and 1=decision on using ERP system) , and M is the mediator in the equations. The intercept and residuals of each equation are i_i and e_i respectively.

$$Y^* = i_1 + c * X + e_1 \quad (1)$$

$$Y^* = i_2 + c'^* X + B * M + e_2 \quad (2)$$

$$M = i_3 + a * X + e_3 \quad (3)$$

$$Y^* = \ln[P(Y_0 = 1)/(1 - P(Y_0 = 1))] \quad (4)$$

To examine the mediating role of information sharing, we construct a multiple regression model (equation 3) with the two dimensions (*process versus results oriented* and *open versus closed system*) of organizational culture as independent variables and *information sharing* as dependent variable. As suggested by Qi et al.(2009), a company's supply chain strategies (SCS) significantly influences its SCM practices. Therefore, we include SCS (lean and agile supply chain in this study) as control variables in the multiple regression. The results are showed in table 5.17. The VIF values show that there is no multicollinearity among the independent variables.

Table 5.17: Multiple Regression with Information Sharing as Dependent Variable

Model	Standardized Coefficients	Std. Error	Sig.	VIF.	R-Square	F
(Constant)	1.801	.429			.18	10.129 (.000)
Lean SC	.245	.091	.002	1.411		
Agile SC	-.044	.075	.580	1.404		
Process-oriented	.250	.074	.000	1.124		
Open System	-.137	.066	.053	1.111		

Based on the result of table 5.17, we can conclude that only the *process versus results oriented* significantly (at the level of p<.000) influence *information sharing*. Therefore, the final regression equation is:

Equation 3: $M = i_3 + a * X + e_3$

*M(Information Sharing)=1.801+0.250 * Process Oriented +e_3*

To investigate the first model (equation 1), we construct a logistic regression model only including intercept, control variable (company size) and significant predictors (*process versus results oriented*), the result is showed in table 5.18 (model 1).

Finally, we construct a logistic regression model including intercept, control variable (company size) and significant predictors (*process versus results oriented* and *information sharing*) with the result showed in table 5.18 (model 2).

Table 5.18: Logistics Regression Analysis of ERP Decision One

Model	Variable	B	Standard Error	Walt Test	d.f.	Sig.	Odds Ratio	95% Confidence Interval for Odds Ratios	
1	Constant	2.976	1.686	3.115	1	.078	19.603		
	Size			26.781	2	.000			
	Size(1)	-4.156	1.119	13.785	1	.000	.016	.002	.141
	Size(2)	-2.027	1.138	3.173	1	.075	.132	.014	1.225
	Process Oriented	1.034	.336	9.469	1	.002	2.813	1.456	5.435
	Open System	-.997	.303	10.827	1	.001	.369	.204	.668
2	Constant	1.557	1.832	.723	1	.395	4.746		
	Size			25.194	2	.000			
	Size(1)	-4.358	1.212	12.931	1	.000	.013	.001	.138
	Size(2)	-2.290	1.221	3.518	1	.061	.101	.009	1.108
	Process Oriented	.891	.349	6.500	1	.011	2.436	1.229	4.831
	Open System	-1.003	.312	10.304	1	.001	.367	.199	.677
	Information Sharing	.644	.317	4.140	1	.042	1.905	1.024	3.543

Based on the results of table 5.18, the mediation models regarding of the decision on using or not using ERP system are presented as the following equations.

Equation 1: $Y^* = i_1 + c * X + e_1$

$\dot{Y}^* = -0.135 + 1.034 * Process\ Oriented + e_1$

Equation 2: $Y^* = i_2 + c' * X + B * M + e_2$

$\dot{Y}^* = -1.152 + 0.891 * Process\ Oriented + 0.644 * Information\ Sharing + e_2$

From model 2 in table 5.14, the effect of "Process Oriented" is still significant (P=.003) when the mediator (Information Sharing) is incorporated. However, the dependent variable in our study is not continuous, the two methods for calculating the mediated effect are not necessarily equivalent (a*B=c-c') as it is in ordinary regression, because the residual variances are fixed in logistic regression, the scale of Y* variable is not the same across models (MacKinnon, 2002). Therefore, the c-c' and a*B methods of estimating mediation are not equal and can be quite different. To get the true mediation effect, we follow MacKinnon and Dwyer (1993)'s suggestion and make the scale equivalent across equations by standardizing regression coefficients before mediation is estimated. As described by Winship and Mare (1983), the variance of Y* is equal to the following.

$$\sigma_{y^*}^2 = \hat{c}^2 \sigma_X^2 + \pi^2/3$$

$$\sigma_{y^*}^2 = \hat{c}'^2 \sigma_X^2 + b^2 \sigma_M^2 + 2\,\hat{c}' b \sigma_{XM} + \pi^2/3$$

$\hat{c}$ *and* $\hat{c}'$ are the original coefficients of the first and second equation respectively, σ_X^2 *and* σ_M^2 are the variances of the predictor (Process Oriented) and the mediator (Information Sharing) respectively, σ_{XM} is the covariance of the independent variable and the mediator, b is the coefficient of the mediator in the second equation, $\pi^2/3$ is the fixed variance of the residual for logistic regression in order to fix the scale of the unobserved Y* variable. Therefore, the Square roots of the variance for logistic regression (Equation 1) and (Equation 2) are 1.9862 and 2.0390. As a result, the standardized logistic regression estimates are:

$$c=1.034/1.9482=0.5307 \text{ and}$$

$$c'=0.891/2.0176=0.4416$$

Therefore, the mediation effect is c-c'=0.089, which is 16.79 % of the original total effect.

5.4.3 Direct Effects on the Decision on Using Which Type of ERP System

In this section, we use multinomial logistic regression (MLR) as the main technique in that the dependent variable (Decision on using which type of ERP system) has three categories (using Western-based ERP system, using Chinese locally developed ERP system, and using self-developed ERP system). Based on the proposed relationships of the second research model, we conduct two series of MLR, one includes the specified dimensions of organizational culture as predictors and the other

includes the specified dimensions of SCM practices as predictors respectively.

PART ONE: Organizational Culture as Independent Variables

The comparisons in table 5.19 indicate that though the impact of company size on ERP decision two is significant, organizational culture does provide reliable power in predicting the membership of ERP decision (using Chinese locally development ERP system, using self-developed ERP system, or using Western developed ERP system). The delta Chi-square (M6-M5) validates our conclusion that model with the specified predictors is significantly improved compared with the model only with intercept and control variable. The criteria to judge the overall model fit include the Chi-square (60.024) with 8 degree of freedom and p=.000. In addition, the Pearson Chi-Square is 262.843 with significance p=.338 and Deviance Chi-square is 190.185 with significance p=.999, which indicates the overall model is excellently fit (Tabachinick and Fidell, 2001).

Table 5.19: Model Comparison of Multinomial Logistics Regression Analysis of ERP Decision Two as a Function of Organizational Culture

Model	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Likelihood Ratio Tests			Model Comparison			
				Chi-Square	d.f.	P-value		Δ Chi-Square	Δ d.f.	P-Value
M 5	254.603	.177	.209	27.189	4	.000				
M 6	194.579	.349	.413	60.024	8	.000	M6-M5	32.835	4	.000

Remarks: M 5: including intercept and control variable only M 6: including intercept, control variable and the specified predictors

Table 5.20: Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	d.f.	Sig.
Constant	194.602	.000	0	.
Tight Control	209.334	14.755	2	.001
Normative	206.460	11.881	2	.003
Company Size	216.934	22.355	4	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Table 5.21: Parameter Estimates

ERP System Used[a]		B	Std. Error	Wald	d.f.	Sig.	Exp(B)	95% Confidence Interval for Odd Ratios	
Comparison: Chinese & Western	Intercept	.346	1.979	.031	1	.861			
	Tight Control	-1.293	.402	10.317	1	.001	.275	.125	.604
	Normative	.994	.369	7.255	1	.007	2.702	1.311	5.571
	[Size=1]	2.717	.686	15.675	1	.000	15.128	3.942	58.051
	[Size=2]	1.647	.550	8.970	1	.003	5.193	1.767	15.260
	[Size=3]	0[b]	.	.	0	.	.	.	.
Comparison: self & Western	Intercept	-2.542	3.356	.574	1	.449			
	Tight Control	-1.487	.483	9.475	1	.002	.226	.088	.583
	Normative	1.571	.715	4.827	1	.028	4.811	1.185	19.535
	[Size=1]	2.498	.879	8.074	1	.004	12.158	2.171	68.103
	[Size=2]	.772	.859	.808	1	.369	2.163	.402	11.637
	[Size=3]	0[b]	.	.	0	.	.	.	.
Comparison: Chinese & Self	Intercept	2.398	2.500	.920	1	.337			
	Tight Control	-.738	.314	5.539	1	.019	.478	.258	.884
	Normative	-.330	.547	.364	1	.546	.719	.246	2.102
	[Size=1]	-.285	.727	.153	1	.695	.752	.181	3.127
	[Size=2]	-.992	.812	1.493	1	.222	.371	.075	1.821
	[Size=3]	0[b]	.	.	0	.	.	.	.

b. This parameter is set to zero because it is redundant.

The Likelihood Ratio Tests (table 5.20) provides an overall relationship between the independent variables and the dependent variable. The significance value shows if the model is significantly degraded by removal of each predictor. Using α =.01 as a criterion, two specified predictors, *loose versus tight control (p=0.001<0.01)* and *normative versus pragmatic (p=0.003<0.01)* reliably distinguish among outcomes: using Chinese locally developed ERP system, using self-developed ERP system, and using Western developed ERP system.

If an independent variable has an overall relationship to the dependent variable, it might or might not be statistically significant in differentiating between pairs of groups defined by the dependent variable. Therefore, we use the Wald test to evaluate whether or not the independent variable is statistically significant in differentiating between the two groups in each of the embedded binary logistic comparisons.

In table 5.21, we take category 3(using Western developed ERP system) as reference group. From the Wald Test results, we judge the ability of each independent variable to distinguish between the groups using Chinese locally developed ERP system and those using Western developed ERP system (in section 1), and distinguish between the groups using self-developed ERP system and those using Western developed ERP system (in section 2). In addition, to compare the groups using Chinese locally developed ERP system and those using self-developed

ERP system, we take category 1(using Chinese locally developed ERP system) as the reference and conduct a multinomial logistic regression again and get the results as table 5.21.

As suggested by Tabachinick and Fidell (2001), we should not interpret the significance of an independent variable's role in distinguishing between pairs of groups unless the independent variable also has an overall relationship to the dependent variable in the likelihood ratio test. Therefore, in table 5.21, both *loose versus tight control* (p=0.001) and *normative versus pragmatic* (p=0.007) significantly distinguish the companies who are using Chinese locally developed ERP systems and those who are using Western developed ERP systems. Also these two dimensions are found to be significantly distinguish the companies who are using self developed ERP systems and those who are using Western developed ERP systems (p=.002 and p=.028 respectively).

Finally, the parameter estimates show that only *loose versus tight control* (p=.019) is significant in distinguishing the companies who are using Chinese locally developed ERP systems and those who are using self developed ERP systems.

PART TWO: SCM Practices as Independent Variables

Similar with part one, we conduct the analysis by putting the two specified dimensions of SCM practices in the second research model as

independent variables. The results of model comparison in table 5.22 prove that the two specified dimensions of SCM practices significantly predict the members of ERP decision 2 controlling for company's size (Chi-Square=84.162, d.f.=8 and P=.000). In addition, the comparison between M7 and M8 indicates that there is no more significant predictor omitted in the second research model. As suggested by Tabachinick and Fidell (2001), the overall model with the two predictors shows excellent fit with p=.996 by Deviance criterion and with p=.866 by Pearson criterion.

Table 5.22: Model Comparison of Multinomial Logistics Regression Analysis of ERP Decision Two as a Function of SCM Practices

Model	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Likelihood Ratio Tests			Model Comparison			
				Chi-Square	d.f.	P-value		Δ Chi-Square	Δ d.f.	P-Value
M 7	252.406	.177	.209	27.189	4	.000				
M 8	190.501	.357	.424	61.905	10	.000	M8-M7	34.716	6	.000

Remarks: M 7: including intercept and control variable only M 8: including intercept, control variable and all specified predictors

Table 5.23: Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	d.f.	Sig.
Constant	190.502	.000	0	
Internal Lean Practices	192.866	2.365	2	.307
Information Quality	199.810	9.309	2	.010
Internal Agile Practices	206.368	15.867	2	.000
Company Size	216.667	26.166	4	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

Table 5.24: Parameter Estimates

ERP System Used[a]		B	Std. Error	Wald	d.f.	Sig.	Exp(B)	95% Confidence Interval for Odd Ratios	
Comparison: Chinese & Western	Intercept	4.183	2.326	3.233	1	.072			
	Internal Lean Practices	.587	.435	1.820	1	.177	1.799	.766	4.222
	Information Quality	-.621	.464	1.794	1	.180	.537	.217	1.333
	Internal Agile Practices	-1.393	.407	11.692	1	.001	.248	.112	.552
	[Size=1]	3.115	.726	18.418	1	.000	22.531	5.432	93.451
	[Size=2]	1.404	.537	6.841	1	.009	4.072	1.422	11.660
	[Size=3]	0[b]	.	.	0	.	.	.	.
Comparison: Self & Western	Intercept	-3.074	3.204	.921	1	.337			
	Internal Lean Practices	.778	.600	1.684	1	.194	2.178	.672	7.056
	Information Quality	.890	.639	1.939	1	.164	2.434	.696	8.517
	Internal Agile Practices	-1.473	.518	8.089	1	.004	.229	.083	.633
	[Size=1]	2.665	.883	9.109	1	.003	14.374	2.546	81.154
	[Size=2]	.523	.820	.406	1	.524	1.687	.338	8.415
	[Size=3]	0[b]	.	.	0	.	.	.	.
Comparison: Chinese & Self	Intercept	-7.257	2.962	6.003	1	.014			
	Internal Lean Practices	.191	.532	.129	1	.719	1.211	.427	3.432
	Information Quality	1.511	.557	7.358	1	.007	4.530	1.521	13.495
	Internal Agile Practices	-.080	.416	.037	1	.847	.923	.409	2.084
	[Size=1]	-.449	.740	.369	1	.544	.638	.150	2.722
	[Size=2]	-.881	.812	1.178	1	.278	.414	.084	2.034
	[Size=3]	0[b]	.	.	0	.	.	.	.

b. This parameter is set to zero because it is redundant.

The likelihood ratio tests (table 5.23) shows after controlling for company size, there are overall significant (p=.307; p=.01 and p=0.000 respectively) relationships between three specified independent variables: *information quality* and *internal agile practices* and ERP decision two. While *internal lean practices* is found to be insignificant, and it will excluded from further analysis.

To find out whether the two predictors is able to distinguish, we take category 3(using Western developed ERP system) and category 1(using Chinese locally developed ERP system) as the reference respectively. In table 5.24, the results of parameter estimates show that *internal agile practices* significantly (p=.001 and p=.004) distinguish the companies who are using Chinese locally developed ERP system or self developed ERP system with those who are using Western developed ERP system. While *information quality* can significantly (p=.007) distinguish the companies who are using self developed ERP system or using Chinese locally developed ERP system. In sum up, two dimensions of SCM practices (*information quality* and *internal agile practices*) are to be used to distinguish the decision on using which type of ERP system. Table 5.25 presents the mean scores for each significant predictor on using three types of ERP systems.

Table 5.25: Means of Each Significant Predictor in ERP Decision Two

Dimensions	Loose versus tight control	Normative versus pragmatic	Information Quality	Internal agile practices
Chinese	3.313	3.888	3.440	3.359
Western	3.884	3.212	3.879	3.888
Self	3.152	4.031	4.000	3.170

5.4.4 The Intervening Effect of SCM Practices

Based on the findings above, we examine how SCM practices (in terms of *information quality* and *internal agile practices*) mediate the relationship between organizational culture (in terms of *loose versus tight control* and *normative versus pragmatic*) and ERP decision two as proposed in the second research model. Following the guideline of Baron and Kenny (1986), we reconstruct the first model (Model A) only with the two dimensions of organizational culture, and then construct the second model (Model B) with the dimensions of SCM practices together. In addition, it's different from the binary logistic regression in that we have three categories in the dependent variable; therefore, we need to separate them as three pairs of comparisons (category 1 and 2, 1 and 3, 2 and 3). Based on the results of the comparisons and parameter estimates, we conduct the mediation analysis.

Model A for mediation analysis only includes two independent variables (*loose versus tight control* and *normative versus pragmatic*) and Model B includes four independent variables (two from organizational culture and two from SCM practices: *information quality* and *internal agile practices*). The likelihood ratio tests result (table 5.26)

for model B indicates that the existence between the four predictors and ERP decision two.

Table 5.26: Likelihood Ratio Tests for Model B

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	d.f.	Sig.
Intercept	1.787E2[a]	.000	0	.
Tight Control	185.004	6.345	2	.042
Normative	190.231	11.573	2	.003
Information Quality	188.519	9.860	2	.007
Internal Agile Practices	187.043	8.384	2	.015
Company Size	199.494	20.835	4	.000

The parameter estimates are summarized as the following table 5.27, Model B is classified into three comparisons as discussed above.

Table 5.27: Parameter Estimates for Model A and B

Model B		B	Std. Error	Wald	d.f.	Sig.	Exp(B)
Comparison : Chinese & Self	Intercept	-8.009	4.042	3.926	1	.048	
	Tight Control	-.472	.361	1.710	1	.191	.624
	Normative	.541	.752	.517	1	.472	1.717
	Information Quality	1.666	.592	7.919	1	.005	5.291
	Internal Agile Practices	.007	.418	.000	1	.987	1.007
	[Size=1]	-.441	.755	.342	1	.559	.643
	[Size=2]	-.779	.823	.896	1	.344	.459
	[Size=3]	0[b]	.	.	0	.	.
Comparison : Chinese & Western	Intercept	-3.326	2.445	1.850	1	.174	
	Tight Control	.684	.423	2.616	1	.106	1.982
	Normative	-1.134	.429	7.001	1	.008	.322
	Information Quality	.470	.468	1.007	1	.316	1.600
	Internal Agile Practices	1.165	.438	7.084	1	.008	3.205
	[Size=1]	-2.861	.726	15.520	1	.000	.057
	[Size=2]	-1.738	.607	8.191	1	.004	.176
	[Size=3]	0[b]	.	.	0	.	.
Comparison : Self and Western	Intercept	-4.683	4.299	1.187	1	.276	
	Tight Control	-1.156	.488	5.620	1	.018	.315
	Normative	1.675	.806	4.321	1	.038	5.337
	Information Quality	1.196	.683	3.066	1	.080	3.308
	Internal Agile Practices	-1.158	.544	4.539	1	.033	.314
	[Size=1]	2.419	.916	6.976	1	.008	11.238
	[Size=2]	.958	.894	1.149	1	.284	2.608
	[Size=3]	0[b]	.	.	0	.	.

d. This parameter is set to zero because it is redundant.

To examine the intervening role of *information quality* and *internal agile practices*, we then construct two multiple regression models with the two dimensions (*loose versus tight control* and *normative versus pragmatic*) of organizational culture as independent variables and *information quality* and *internal agile practices* as dependent variable respectively. Also we include SCS (lean and agile supply chain in this study) as control variables in the multiple regressions, the results are showed in table 5.28. The VIF values show that there is no multicollinearity among the independent variables.

Based on the results of Model A, Model B and two multiple regressions, we conduct the mediation effect analysis by adopting the following models.

$$Y^* = i_1 + c * X + e_1 \quad (1)$$

$$Y^* = i_2 + c'*X + B * M + e_2 \quad (2)$$

$$M = i_3 + a * X + e_3 \quad (3)$$

$$Y^* = \ln[P(Y_0 = 1)/(1 - P(Y_0 = 1))] \quad (4)$$

The coefficients of the mediation analysis models (Model A & Model B) are presented in table 5.29 for each comparison. Theoretically, there are 6 mediation analyses for the logits of the decision on using which type of ERP system. However, some independent variables are not necessarily significant in predicting the membership. Thus, we conduct the analyses by pairs. In addition, there are two possible mediators (*information quality* and *internal agile practices*), therefore, we classify the mediation according to these two mediators.

Following Winship and Mare (1983)'s guideline, the variance of Y* is equal to the following.

$$\sigma_{Y^*}^2 = \hat{c}^2\sigma_X^2 + \pi^2/3$$

$$\sigma_{Y^*}^2 = \hat{c}'^2\sigma_X^2 + b^2\sigma_M^2 + 2\,\hat{c}'b\sigma_{XM} + \pi^2/3$$

Therefore, the standardized coefficients of C, C' and B are presented in table 5.30.

Table 5.28: Multiple Regression Results

Model		Standardized Coefficients	Std. Error	Sig.	VIF.	R-Square	F
Information Quality as Dependent Variable	(Constant)	2.306	.490	.000		.145	5.704 (.000)
	Tight Control	.284	.074	.001	1.201		
	Normative	-.048	.075	.574	1.124		
	Lean SC	.202	.114	.037	1.454		
	Agile SC	-.092	.086	.330	1.391		
Internal Agile Practices as Dependent Variable	(Constant)	1.125	.515	.031		.308	15.005 (.000)
	Tight Control	.308	.078	.000	1.201		
	Normative	-.167	.079	.030	1.124		
	Lean SC	.263	.120	.003	1.454		
	Agile SC	.113	.091	.183	1.391		

Table 5.29 Coefficients of the Mediation Models

M	X	Y*	C	C'	a	B
Information Quality (IQ)	Tight Control	Category 1 & 2	-0.738	0	.284	1.666
		Category 1 & 3	-1.293	0		0
		Category 2 & 3	-1.487	-1.156		1.196
Internal Agile Practices (IAP)	Tight Control	Category 1 & 2	-0.738	0	.308	0
		Category 1 & 3	-1.293	0		0
		Category 2 & 3	-1.487	-1.156		-1.158
	Normative	Category 1 & 2	0	0	-.167	0
		Category 1 & 3	0.994	-1.134		1.165
		Category 2 & 3	1.571	1.675		-1.158

Table 5.30 Standardized Mediation Results

Mediation	Standardized Variance of Y*	Standardized Variance of Y'*	Standardized C	Standardized C'	Mediation Effect	Percentage of Mediation Effect
Category 1 & 2 (tight control)	2.1681	2.2266	-0.6619	0	Fully	100%
Category 1 & 3 (tight control)	2.1879	3.0055	-0.5910	0	Fully	100%
Category 1 & 3 (normative)	2.1879	3.0055	-0.6390	-0.4125	0.2265	35.45%
Category 2 & 3 (normative)	2.6120	2.7363	0.6015	0.3682	0.2333	38.79%
Category 2 & 3(tight control)	2.6120	2.7363	-0.8694	-0.4937	0.3757	43.21%

5.5 Summary of Hypotheses Tests

Based on the results above, the following table 5.31 presents the summary of the hypothesis tests.

Table 5.31: Summary of the Hypotheses Tests

Hypothesis		Results	Sub-hypothesis: Factors		Results
H1	Organizational Culture→ERP Decision One	Supported	H1a	Process Oriented	significant
			H1b	Open System	significant
			H1c	Tight Control	insignificant
H1'	Organizational Culture→ERP Decision Two	Supported	H1a'	Tight Control	significant
			H1b'	Normative	significant
H2	Organizational Culture→ SCM Practices	Supported	H2a	Process Oriented→Information Sharing	significant
			H2b	Open System→Information Sharing	insignificant
			H2c	Process Oriented→Internal Lean Practices	insignificant
			H2d	Open System→Internal Lean Practices	insignificant
H2'	Organizational Culture→ SCM Practices	Supported	H2'a	Tight Control→Information Quality	significant
			H2'b	Tight Control → Internal Lean Practices	insignificant
			H2'c	Tight Control→Internal Agile Practices	significant
			H2'd	Normative→Internal Agile Practices	significant
H3	SCM Practices→ERP Decision One	Supported	H3a	Information Sharing	significant
			H3b	Internal Lean Practices	insignificant
H3'	SCM Practices→ERP Decision Two	Supported	H3'a	Information Quality	significant
			H3'b	Internal Agile Practices	significant
			H3'c	Internal Lean Practices	insignificant

Chapter 6. Discussions

In this chapter, we discuss the results of data analysis for two research models respectively. The discussions focus on the two research models from three perspectives: the relationship between organizational culture and ERP decisions, the relationship between SCM practices and ERP decisions and the mediating roles of SCM practices in the relationship between organizational culture and ERP decisions.

6.1 The First Research Model

In the first research model, five out of nine hypotheses were supported. This suggests that the theoretical framework is well validated in an organizational culture, SCM practices and ERP decision (decision on using or not using ERP system) problem. Table 6.1 summarizes the proposed hypotheses in the first research model.

Table 6.1 Results of Hypotheses Proposed in the First Research Model

Hypothesis	Relationship	Result
H1a	Results Oriented → ERP Decision 1	Supported
H1b	Open System → ERP Decision 1	Supported
H1c	Tight Control → ERP Decision 1	Not supported
H2a	Results Oriented→ Information Sharing	Supported
H2b	Open System→ Information Sharing	Not supported
H2c	Results Oriented → Internal Lean Practices	Not supported
H2d	Open System→ Internal Lean Practices	Not supported
H3a	Information Sharing → ERP Decision 1	Supported
H3b	Internal Lean Practices → ERP Decision 1	Not supported

6.1.1 Effects of Organizational Culture on the Decision on Using or not Using ERP System

The results of this dissertation showed that two out of three dimensions of organizational culture (*process versus results oriented, open versus closed*

system) significantly predict the decision on using or not using ERP system. Specifically, those companies with more results oriented culture, the probability to classify them as using ERP system is higher than those who are with less results oriented culture. Similarly, companies with open system culture have the higher probability to be classified as "using ERP system".

This result is consistent with the findings of the existing literatures that organizations with results oriented and open system culture are more likely to use information technologies like ERP systems (Kitchell, 1995; Rupple & Harrington, 2001; Motwani et al., 2002; Jones & Alony, 2007).

However, *loose versus tight control* is found to be insignificant in predicting the decision on using or not using ERP system, which is not consistent with the existing literature (Raymond & Uwizeyemungu, 2007). This might due to the fact that more and more Chinese companies are becoming formalized (Schlevogt, 2001; Head, 2005). Therefore, most of these Chinese companies embody a "tight control" organizational culture with formal structures and an emphasis on the rules and policies as indicated in our findings, this on the contrary becomes a handicap for innovation initiatives like ERP system (Gregory, 1993). From our data analysis, we also found that no significant difference in the dimension *loose versus tight control* between the two groups (companies that are using and not using ERP systems). Therefore, this dimension does not significantly influence the decision on using or not using ERP system.

6.1.2 Effects of SCM Practices on the Decision on Using or not Using ERP System

Two dimensions of SCM practices (*information sharing* and *internal lean practices*) are hypothesized to significantly influence the decision on using or not using ERP system. However, only *information sharing* is found to be a significant predictor. This is consistent with the findings of existing literatures that information sharing (in general) significantly influences technology adoption (Koh & Gunasekaran, 2008; Law & Ngai, 2007; Raymond & Uwizeyemungu, 2007; Cagliano et al., 2006; Tan & Pan, 2002; Morrell & Ezingeard, 2002; Chen, 2001; Stefanou, 1999). Companies who score higher in information sharing have a higher probability to be classified into the group using ERP systems.

Unexpectedly, *internal lean practices* is found to be insignificant in distinguishing the companies who either use or not use ERP system. The non-significance effect of *internal lean practices* on the decision on using or not using ERP system may be due to the following facts: first, bias exists in our samples. We only surveyed the companies in China, where lean is still the dominant approach as much of the Chinese manufacturing is low cost focused, no matter whether they use or do not use ERP systems, our data also indicates that no difference in *internal lean practices* between the companies who are using ERP systems and those who are not (P=.623). Second, the contents of *internal lean practices* are more than continuous

improvement, which has been proved to significantly influence ERP adoption.

6.1.3 Effects of Organizational Culture on SCM Practices (Part 1)

As illustrated in table 6.1, only one hypothesis is significant for the proposed relationships between organizational culture and SCM practices. That is, *process versus results oriented* has an effect on *information sharing*. The results of table 5.17 show that the more results oriented a company's organizational culture is, the higher level that the company practices *information sharing* after controlling for supply chain strategies, which is assumed to have significant effect on SCM practices like *information sharing*. However, the dimension, *open versus closed system*, is found to be insignificant (p=.053) in affecting *information sharing*, which is inconsistent with the findings of existing literature. The reason may be the existence of supply chain strategies overwhelms the effect of organizational culture.

Regarding of the dimension *internal lean practices*, neither hypothesis is supported, which is out of our expectation. The insignificant effect may be due to several factors. First, lean is still the overwhelming approach for most of the Chinese manufacturing firms, lean becomes a strategies for most of the Chinese manufacturers, the strategic effect of lean overwhelms the effect of organizational culture. Second, the contents of *internal lean practices* in this study are broader than that in existing literatures, which

focus on continuous improvement only. Merely continuous improvement may be too weak to make the effect of organizational culture (in terms of process versus results oriented and open versus closed system) be significant.

6.1.4 Intervening Role of Information Sharing

From the results, we can see that organizational culture (in terms of *process versus results oriented* and *open versus closed system*) and SCM practices (in terms of information sharing) respectively are two significant predictors in predicting the membership of using or not using ERP system. However, the intervening effect of information sharing (after standardization) is 16.79%. The result is marginal as suggested by scholars (Foshee et al., 1998; MacKinnon, 2002). This indicates that the direct effect of organizational culture on the decision on using or not using ERP system is still significant even after considering the mediation effect of *information sharing*. Therefore, organizational culture overwhelms SCM practices in predicting the decision on using or not using ERP system.

6.2 The Second Research Model

In the second research model, seven out of nine hypotheses were supported. This suggests that the theoretical framework is well validated in an organizational culture, SCM practices and ERP decision (decision on using which type of ERP system) problem. Table 6.2 summarizes the proposed hypotheses in the second research model.

Table 6.2 Results of Hypotheses Proposed in the Second Research Model

Hypothesis	Relationship	Result
H1'a	Tight Control → ERP Decision 2	Supported
H1'b	Normative → ERP Decision 2	Supported
H2'a	Tight Control → Information Quality	Supported
H2'b	Tight Control → Internal Lean Practices	Not supported
H2'e	Tight Control → Internal Agile Practices	Supported
H2'f	Normative → Internal Agile Practices	Supported
H3'a	Information Quality → ERP Decision 2	Supported
H3'b	Internal Lean Practices → ERP Decision 2	Not supported
H3'c	Internal Agile Practices → ERP Decision 2	Supported

6.2.1 Effects of Organizational Culture on the Decision on Using Which Type of ERP System

The findings in this dissertation show that *loose versus tight control* and *normative versus pragmatic* are significant in distinguishing the companies using different types of ERP systems. Specifically, both dimensions are significant in predicting the companies who are using Western developed ERP systems and those who are using Chinese locally or self developed ERP systems. In addition, the dimension *loose versus tight control* can distinguish the companies who are using Chinese locally developed ERP systems from those who are using self developed ERP systems (refer to table 5.20). Controlling for company size, companies who are using Chinese locally or self developed ERP systems, are less tight control (scoring lower) and more pragmatic (scoring higher) compared with companies who are using Western developed ERP systems. While those companies who are using self developed ERP systems behave less tight control (scoring lower) compared with the companies who are using Chinese locally developed ERP systems. No significant difference is found between the companies

who are using Chinese locally developed and those who are using self developed ERP systems in terms of *normative versus pragmatic*.

The reason that the two dimensions: *loose versus tight control* and *normative versus pragmatic*, have significant effects on the decision upon using which type of ERP system could be a result of cultural fit (Lee et al., 2007; Leidner & Kayworth, 2006; Hong & Kim, 2002). The congruence between the company's organizational culture (in terms of *loose versus tight control* and *normative versus pragmatic*) and the cultural characteristics embedded in the ERP system leads to the decision of using the particular ERP system. The results of our data analysis are consistent with our statement above: companies who are using Western developed ERP systems score highest in the dimension *loose versus tight control* and lowest in the dimension *normative versus pragmatic*; companies who are using Chinese locally developed ERP systems score the second in both dimensions while companies who are using self developed ERP systems score lowest in the dimension *loose versus tight control* and highest in the dimension *normative versus pragmatic*, which are showed in table 5.25. Our findings confirm with the existing literature that cultural fit between adopters (organizations) and technologies will have a positive effect on technology adoption.

6.2.2 Effects of SCM Practices on the Decision on Using Which Type of ERP System

From our data analysis, *information quality* and *internal agile practices* are significant in distinguishing the companies using different types of ERP systems. Specifically, *internal agile practices* can distinguish the companies who are using Chinese locally or self developed ERP systems with those who are using Western developed ERP systems while *information quality* can distinguish the companies using Chinese locally developed ERP systems and those who are using self developed ERP systems. Unexpectedly, *internal lean practices* is found to be insignificant in predicting the decision on using which type of ERP system, the underlying reason might be the fact that *lean* is still the overwhelming approach in Chinese manufacturing industries, this is also applicable among the companies who are using ERP systems, there is no significant difference among the surveyed companies in terms of *internal lean practices* (p=.849).

As discussed in the hypothesis development section, the practical compatibility between the practices of an organization and the practices embodied by the innovation (here ERP systems) will have a positive effect on technology adoption (Hurrington & Rupple, 1999). In terms of *information quality*, we found that companies who are using Western developed ERP systems score the higher while the companies who are using Chinese locally developed ERP systems score the lowest. This finding

confirms the hypothesis we proposed, Western developed ERP systems are modeled and developed on the basis of "best practices" of Western world, they require the accuracy, timeliness and completeness of information exchanged through the systems be guaranteed to make the system fully perform while Chinese locally developed ERP systems allow flexible requirement for information such as the delay input (Ross & Vitale, 2000; Sia & Soh, 2002; Soh et al., 2003). However, the difference in *information quality* between these two groups is found to be not statistically significant unexpectedly. Moreover, we also find that information quality for those companies who are using self developed ERP systems score highest in this dimension, which is unexpected. The reason may be due to the small sample size for the companies in this group.

Regarding of the dimension *internal agile practices*, companies who are using Western developed ERP systems score highest and can be differentiated from the other two groups. This implies that companies who are using Western ERP systems might possess the capabilities of being agile (score higher in using modularized production techniques, concurrent production activities, empowerment of decision making etc.) than the companies who are using Chinese locally or self developed ERP systems. In addition, this also shows that Western developed ERP systems relatively overwhelm the other two types of ERP systems in manufacturing and SCM

functions, which is consistent with the findings of existing literature (AMR Research, 2007).

6.2.3 Effects of Organizational Culture on SCM Practices (Part 2)

Six hypotheses regarding of the relationships between organizational culture and SCM practices are proposed in the second research model while three of them are supported: *loose versus tight control* has significant effect on *information quality* while both *loose versus tight control* and *normative versus pragmatic* have significant effects on *internal agile practices*. No significant effect is found from any dimension of organizational culture to *internal lean practices*.

The hypothesis regarding of *loose versus tight control* and *information quality* implies that companies scoring higher on the dimension *loose versus tight control* will score higher on *information quality* (in terms of accuracy, timeliness, adequacy, and credibility of information exchanged). Specifically, tighter control culture positively influences information quality. This conclusive remark implies that companies who emphasize on formalization, structure and control provide higher quality of information. This might be due to the fact that tight control companies may set up rules to require their employees to input the data timely, to provide complete and credible information with their partners and colleagues.

The dimension *loose versus tight control* is also found to be significantly influence *internal agile practices*. Companies score higher on

loose versus tight control will score higher on *internal agile practices*. That is, tighter control leads to higher level of *internal agile practices*. In this dissertation, agile represents the capability to be response quickly and effective to changes, which is different from the term "flexible". The result indicates that companies with tight control culture, which emphasizes the rules and formalization, will possess higher level of *internal agile practices*.

Internal agile practices is found to be significantly influenced by the dimension *normative versus pragmatic*. Companies scoring higher on *normative versus pragmatic* score lower on *internal agile practices*. This conclusion indicates that companies who emphasize more on the right procedures of doing things will possess higher level of *internal agile practices*. While the companies emphasizes on the results, they possess lower level of *internal agile practices*. This phenomenon indicates that though meeting the customers' needs become the ultimate goal for most of the companies today, companies emphasizing more on right procedures could be an advantage to achieve higher level of *internal agile practices*.

Finally, the insignificant effects of organizational culture (in terms of *loose versus tight control*) on *internal lean practices* can be explained by the fact that bias exists in our samples and lean is the overwhelming approach for Chinese manufacturing, no matter what type of organizational culture they have.

6.2.4 Intervening Roles of Information Quality and Internal Agile Practices

As the main theory proposed in this dissertation, SCM practices are assumed to play a mediating role in the relationship between organizational culture and ERP decisions. Our data analysis results indicate that both *information quality* and *internal agile practices* have mediated significant proportion of the main effects of organizational culture (in terms of *loose versus tight control* and *normative versus pragmatic*) on the decision upon using which type of ERP system, the results are showed in table 5.29 and 5.30.

When comparing the companies using Chinese locally developed ERP systems with those using self developed ERP systems, the culture's effect (*loose versus tight control*) becomes insignificant (p=.191) after including *information quality* and *internal agile practices* as mediators. However, *internal agile practices* is found to be insignificant (p=.987). Therefore, the effect of organizational culture on the decision upon using Chinese locally or self developed ERP systems is fully mediated by *information quality*.

When comparing the companies using Western developed ERP systems with those using self developed ERP systems, the culture's effects (*loose versus tight control* and *normative versus pragmatic*) are still significant (p=.018 and p=.038 respectively) after adding the possible mediators (*information quality* and *internal agile practices*). *Internal agile practices*

also significantly predicts the ERP decision (p=.033) but *information quality* does not (p=.08). In addition, *internal agile practices* is influenced by both *loose versus tight control* and *normative versus pragmatic*. Therefore, 43.21% of the effect of *loose versus tight control* on the decision upon using Western or self developed ERP systems is mediated by *internal agile practices* while 38.79% of the effect of *normative versus pragmatic* on that decision is mediated by *internal agile practices*, both mediation effects are significant according to the criteria suggested by scholars (Foshee et al., 1998; MacKinnon, 2002).

By comparing the companies who are using Chinese locally developed ERP systems and those using Western developed ERP systems, the culture's (in terms of *normative versus pragmatic*) effects is still significant (p=.008) while the effect of *loose versus tight control* is no longer significant (p=.106) after adding the possible mediators (*information quality* and *internal agile practices*). This result shows only *internal agile practices* is a significant mediator (p=.008). The effect of *loose versus tight control* is fully mediated by the mediator (*internal agile practices*) while 35.45% of the effect of *normative versus pragmatic* is mediated by *internal agile practices*.

Based on the discussion above, we can conclude that to predict the decision on using Chinese locally developed, self developed or Western developed ERP systems, both organizational culture and SCM practices are significant factors. When SCM practices are taken into consideration, the

effects of organizational culture could be fully mediated or significantly partially mediated.

To sum up, this chapter presented the data analysis results for the two research models in chapter 5. The results include three perspectives: the direct effects of organizational culture and ERP decisions, the direct effects of SCM practices and ERP decisions, and the mediating roles of SCM practices in the relationships between organizational culture and ERP decisions. These discussions are contributive to both researchers and practitioners; the contributions and implications are presented in chapter 7.

Chapter 7. Contributions and Implications

In this chapter, we present the theoretical contributions and practical implications from the data analysis results.

7.1 Theoretical Contributions and Implications

First, this dissertation has added knowledge to the existing IT-culture studies by empirically validating the impacts of organizational culture on ERP decisions, the relationships between the specific cultural factors and ERP decisions have been proposed and validated. Existing IT-culture studies have endeavored to conceptually explore the impacts of culture on IT behaviors. There are very few survey-based empirical studies conducted, which limits the applicability and generalizability of the findings. The empirical validation in this dissertation fills this deficiency.

In addition, what is more important to the literature is that this dissertation proposes and validates the existence of the mediation effects of SCM practices in the relationship between organizational culture and ERP decisions. This adds knowledge to the literature that culture not only directly influences IT behaviors, but also indirectly influences IT behaviors through management practices. Based on this, researchers can conduct further studies on other management practices that influence various IT behaviors.

Second, this dissertation also adds knowledge to ERP selection literature by empirically validating the effects of SCM practices on ERP

decisions. Previous literatures on ERP selection (or information system selection) often assume management practices of an organization will influence the selection of ERP systems; however, this proposition has not been empirically validated to our best knowledge. The findings of this dissertation also confirms the theory of innovation compatibility (Bunker et al., 2007; Karahanna et al., 2006; Harrington & Rupple, 1999) that compatibility between practices embedded in particular technology and those of the adopters will lead to positive effect in adoption (Harrington & Rupple, 1999). The empirical validation in this dissertation provides rooms and foundations for further examination of the other management practices that might influence ERP selection.

Third, validation of the relationships between organizational culture and SCM practices also advances existing knowledge of the literature by extending the research focus to SCM practices. The results of this dissertation actually fill the deficiency in SCM study by incorporating both organizational culture and supply chain strategies as antecedents and conduct empirical validation.

Methodologically, we apply the method to test mediation effect with categorical dependent variable from other disciplines (i.e. psychology and medical science) (MacKinnon, 2002). The success of applying the method in this dissertation to test mediation effects shows that future studies can

adopt similar method and include categorical dependent variable to conduct further examination in IS area.

7. 2 Practical Implications

The results of this dissertation have important managerial implications for ERP vendors, ERP consultants and especially manufacturers who are going to adopt ERP systems to facilitate their business processes.

7. 2.1 Implications for ERP Vendors

In China ERP market, there are two main streams of ERP vendors: Western ERP vendors like Oracle, SAP and Chinese local ERP vendors like UFIDA, Kingdee, Digital China etc. Our findings are helpful for these ERP vendors in the following ways.

For the Western ERP vendors, they are well known for their comprehensive functions in their ERP packages, which are based on the "best practices" in the Western world and quite different from those of the Chinese. This is one of the major reasons that many Chinese companies resist ,to using Western ERP systems as they are not often fit for their practices. Therefore, Western ERP vendors put many efforts to localize their systems to cater the needs of their clients. The findings of this dissertation are helpful in the following way for these Western vendors to localize their systems for Chinese manufacturing firms. From a cultural perspective, this study finds that companies who have a tighter control organizational culture, which emphasizes the rules and procedures, are more likely to use Western

ERP systems, compared with those companies who are either using Chinese ERP systems or self developed ERP systems. In addition, this study also finds that companies who emphasize more on "following the right procedures" are more likely to use Western ERP systems. This confirms with the findings of literature that the existence of a fit between the cultural elements embedded in the technology and the culture of the adopters will positively influence technology adoption (Leidner & Kayworth, 2006). However, Western ERP vendors cannot do much to change the organizational culture, which their potential clients have persisted for years. On the other hand, Western ERP vendors must realize and accept the facts that Chinese management practices and managerial culture are far different from that of the Western world, the origins of their ERP systems. Most of the Chinese companies cannot catch up with the standardized "best practices" embedded in their ERP systems. As reported in literature and our interviews with practitioners, the processes and functionalities in the Western ERP systems (like Oracle) are very rigid. Therefore, to make their systems more acceptable by Chinese manufacturers, Western ERP vendors should consider how to make their ERP packages more flexible in terms of the embedded processes while keeping the sophisticated functionalities in manufacturing and SCM. From the mediation analysis of our data, we can see that SCM practices play an important role for manufacturing firms in choosing ERP systems, even overwhelming the effects of organizational

culture (in terms of *loose versus tight control* and *normative versus pragmatic*). According to our discussion above, Western ERP systems have been embedded with sophisticated SCM functions, this is an advantage for those companies who also have high requirement for SCM practices like higher level of information quality, high level of internal agile practices. Western ERP vendors should maintain and enhance this advantage. Western ERP vendors should also improve their finance and accounting functions to meet the requirement of Chinese culture and laws. In our study, we found that there are quite some companies who are using Western ERP systems, they are at the same time using finance and accounting software. This to some extent implies that the finance and accounting functions are still not able to satisfy the requirement of their clients. Therefore, Western ERP vendors also need to take these into consideration when localizing their systems.

According to the report of CCW Research, Chinese ERP vendors (including UFIDA, Kingdee, Digital China, Laochao etc) have occupied 60% of the market share in China (CCW Research, 2007). To some extent, Chinese ERP vendors are quite successful. This mainly due to that the Chinese ERP vendors are more familiar with the Chinese management and culture. Their functions especially finance and accounting functions are very suitable for Chinese management, culture and laws. The operations of their systems are flexible and cater the needs of the Chinese. However, the

manufacturing and SCM functions of these Chinese locally developed ERP systems are reported as weak, which has been confirmed by the consultants and researchers. Therefore, the findings of this study can provide insights for the Chinese ERP vendors mainly come from SCM practices perspective. Chinese ERP vendors should enforce their requirement on information quality when they develop their systems. Moreover, to achieve the goal to be a "real" ERP system, Chinese ERP vendors should also enhance their functions that can facilitate and support modularized production techniques, enable concurrent production activities, empower employee to make decision and other agile practices. In addition, we also find that there are many Taiwanese companies are using Tiptop ERP systems, which are originated from Taiwan. Tiptop is a good example that combines Western standardized and advanced production management techniques with Chinese managerial culture for many Chinese ERP vendors to learn.

7. 2.2 Implications for Manufacturers

For the manufacturers who are going to adopt ERP systems, the findings of this dissertation provide insights and guidelines to make decision on choosing which type of the off-the-shelf ERP systems or even deciding to develop their own systems.

Regarding of the decision on using or not using ERP systems, the findings of this dissertation indicate that organizations with more results oriented and open system culture are more likely to use ERP systems as

these cultural characteristics well embrace the ideals of ERP systems. Therefore, companies who are going to adopt ERP system, they can also evaluate the cultural characteristics of their company to see whether their organizational culture fits with that embedded ERP or not, which have been discussed in chapter 3. In addition, the findings in this dissertation also indicate that *information sharing*, a dimension of SCM practices, influences the decision on using or not using ERP system. Therefore, when companies plan to apply ERP systems, they are suggested that an evaluation of their organizational culture as well as the level of their information sharing with partners to make a decision upon whether or not to use ERP system. In addition, the mediation result indicates that when taking organizational culture and SCM practices into consideration together, the effect of organizational culture overwhelms that of information sharing.

The findings of this dissertation are especially insightful for companies who decide to use but not decide which type of ERP system to use. The results of our data analysis indicate that companies who are using self-developed ERP systems scored lower in the dimension loose versus tight control and higher in the dimension compared with the other two groups (companies using Western developed ERP systems and companies using Chinese locally developed ERP systems). This on the other hand imply that companies with less tight control and higher pragmatic are more suitable to develop their own ERP systems according to their daily

processes and needs. Off-the-shelf ERP systems might not be suitable for these companies as they are commercialized and relatively more "formal" and rigid in terms of processes and functionalities. Companies with less tight control culture are concerned less with meeting times, rules and structures. Therefore, they are more likely to be unwilling to change their existing processes which they have persisted for years, while the implementation of those off-the-shelf ERP systems often requires companies to redesign or even reengineer their business processes. Regarding of the dimension *normative versus pragmatic*, companies using self-developed ERP systems tend to be highly pragmatic, they do not want to be limited by the fixed processes defined in those off-the-shelf ERP systems. This has also been confirmed by the practitioners in our interviews that their unwillingness to change their processes is one of the main reasons for them to develop their own ERP systems. Regarding of SCM practices, our results indicate that companies using self developed ERP systems scored lowest among the three groups using different types of ERP systems. From our interviews, we also notice that those self developed ERP systems, they usually do provide comprehensive manufacturing functionalities that support agile practices like concurrent production, modularized production techniques and cross functional teamwork. This implies the existence of the compatibility between the practices of the adopters and the practices embedded in the ERP systems. Therefore, we suggest that companies with

fewer requirements on internal agile practices consider developing their own ERP systems.

The results also show that companies who are using Western developed ERP systems scored higher in the dimension *loose versus tight control* and *normative versus pragmatic* compared with the other two groups. This indicates that these companies emphasize much on the rules, policies, structures and right procedures. As discussed in chapter 3, Western ERP systems, which are based on the Western best practices, are embedded with many predefined rules and procedures, through which efficiency can be achieved. These ERP systems embody highly tight control and high emphasis on the right procedures to get the job done. Thus, we believe the existence of cultural fit between the organizational culture of the adopters and the cultural implications embedded in the ERP systems, in terms of the dimensions *loose versus tight control* and *normative versus pragmatic*. In our interviews with the managers, most of them also reported that their companies have adopted many rules and policies to make their business be more formalized, such formalization is also a requirement from suppliers and/or customers. Therefore, companies who have an emphasis on formalized rules and policies, as well as the rightness of procedures are suggested to apply Western developed ERP systems. Regarding of SCM practices, the data of our survey indicates that companies who are using Western developed ERP systems scored highest in *information quality* and

internal agile practices. On the other hand, our discussion in chapter 3 also shows that Western developed ERP systems, they are originated from MRP and MRP2, with well supportive for agile manufacturing and having high demand on the data (in terms of timeliness, creditability, completeness etc) being entered in the systems. As a result of practical compatibility, companies have high demand on information quality and internal agile practices are suggested to use Western developed ERP systems.

From the results of data analysis we can see that companies using Chinese locally developed ERP systems tend to be formal (scoring high in terms of *loose versus tight control*), highly emphasize on meeting the customers' needs and get certain high level of *internal agile practices*. This on one hand reflects that these companies hold the belief that modern companies should be formalized with rules, policies and structures. On the other hand, meeting the customers' needs is also extremely important. These cultural elements are also embodied by the features of the Chinese locally developed ERP systems. As a kind of commercialized software system, most of these Chinese locally developed ERP systems are following the rules and mechanisms of modern enterprise management, which are consistent with their international counterparts. However, these Chinese ERP systems are more flexible in terms of processes and the portfolio of the functional modules according to the findings in our in-depth interviews with the consultants from some Chinese ERP vendors. Meeting the needs of their

clients is the most important objective of these vendors. Regarding of SCM practices (in terms of *information quality* and *internal agile practices*), those companies using Chinese ERP systems scored the middle compared with other two groups. These are also reflected in the Chinese ERP systems by their requirement of data input, as well as their limited supportive functions for agile manufacturing. Therefore, Chinese locally developed ERP are more suitable for those companies who have flexible requirement on the processes and functionalities while wanting to keep their companies being formalized.

The discussion above mainly shows the insights for the manufacturing firms directly from organizational culture and SCM practices perspectives respectively. However, the mediation analysis results indicate that culture's impact on the decision upon using which type of ERP systems is significantly mediated by SCM practices, which is a very significant finding in our study. Therefore, when taking both organizational culture and SCM practices together, the mediating role of SCM practices (in terms of information quality and internal agile practices) cannot be ignored, or even overwhelming the direct effect of organizational culture. For example, when companies want to make a decision on choosing Chinese or Western developed ERP systems, the direct effects of organizational culture shows that tighter control and more normative companies are suitable to use Western ERP systems as a result of cultural fit. However, the effect of *loose*

versus tight control becomes insignificant when taking into consideration of *internal agile practices*.

Similarly, when comparing companies using Western developed ERP systems with those using Chinese locally or self developed ERP systems, significant proportion of the effects of organizational culture (in terms of *loose versus tight control* and *normative versus pragmatic*) have been mediated by *information quality* and *internal agile practices* respectively. Therefore, these two dimensions of SCM practices should be two potent concerns for companies who are to choose Western developed ERP systems.

Chapter 8. Conclusions and Limitations

In this chapter we present the conclusions and the limitations of this study, in addition, we also propose some direction for future studies.

The main objective of this dissertation is to extend knowledge to existing IT-culture literature by incorporating SCM practices as mediators playing in the relationships between organizational culture and ERP decisions and empirically validating these relationships. We raised three research questions: (1) which organizational culture dimension(s) significantly influence an organization's ERP decisions? (2) which SCM practices significantly influence an organization's ERP decisions? and (3) are SCM practices significantly mediating the effects between organizational culture and an organization's ERP decisions? Four dimensions of organizational culture based on Hofstede et al. (1990) are found to be significant in predicting ERP decisions. One dimension (*information sharing*) of SCM practices is found to be significant in distinguishing the companies of using or using ERP system; two dimensions (*information quality* and *internal agile practices*) are significant in predicting the companies using different types of ERP systems. Thus the second research question has been answered. These three dimensions of SCM practices, which are significant in predicting either ERP decision, are found to play a mediating role in the relationships between organizational culture and ERP decisions.

However, as an exploratory study, there are some limitations in this dissertation. The first limitation of this study is the sampling process. Though we used stratified sampling method to ensure the rigorousness of the procedure, there are some problems in this study. First, the data were collected in top five cities in PRD, which only reflects the organizational culture and SCM practices of the developed areas of China, the generalizability of the findings may be restricted. Second, the profile of the ownerships shows there are very few state-owned and foreign owned companies, bias exists regarding of the representativeness in terms of the ownerships. Third, in our sample there are 40 companies not using any ERP systems, only 16 companies are using self developed ERP systems while 81 companies are using Chinese locally developed ERP systems and 43 companies are using Western developed ERP systems. The distribution of the companies who are using ERP systems reflects the actual situation of the ERP adoption in China, but the sample size for those who are using self developed ERP system is too small to make credible conclusion.

The second limitation comes from the measurements. The measurement for *internal agile practices* is newly developed by the author and it has not been empirically tested elsewhere. Therefore, its rigorousness is restricted. In addition, we only use Li et al.'s (2005) work to measure SCM practices, other practices might be ignored. In addition, their measurements have been only tested in the US, where the organizational culture might be quite

different from that of the Chinese companies; it might not be well applicable in a Chinese context.

The third limitation is from the conversion of bipolar scale into Likert scale. Due to the difficulty of our survey and the difficulty for the respondents to answer bipolar questions, we changed the original bipolar scale questions into unipolar scale questions (Likert scale). Though the results show that the Likert scale is a good proxy of the original bipolar scale, further studies are suggested to refine and use the original bipolar scale.

The fourth limitation is from the theory and research models. Organizational culture is identified as an important factor to influence ERP decisions in this dissertation. However, the antecedents of organizational culture have not been taken into consideration, which might weaken the conclusive strength of the findings. Future studies could include the factors that influence organizational culture.

Lastly, we only include company size (in terms of number of employees) as control variable, other factors like ownership and revenue might also have significant impact on ERP decisions. Future studies could introduce these factors into the research models to make the results more credible.

Moreover, this dissertation also provides rooms for researchers in information systems (IS) and operations management (OM) areas to conduct more empirical studies in related topics. Basically, these research rooms

include two perspectives, one is from the methodology and the other is from the theory.

Methodologically, future studies could consider the development of better scale. As there is a lack of the measurement of *internal agile practices*, we developed the measurement without previous empirical validation. Future studies could consider a rigorous examination to develop more reliable and valid measurement for this dimension of SCM practices.

In terms of theoretical research in the future, the first direction is related to the mediating role of SCM practices in the relationship between organizational culture and ERP decisions. Previous studies have only examined the direct effects of culture on IT behaviors; the conclusion in this dissertation may be the first empirical attempt to test the mediation effect of management practices. Future studies should test this relationship to ensure that it is a reliable and stable relationship.

The second theoretical direction could be the examination of the moderating role of management practices in the relationship between organizational culture and IT behaviors. Existing literatures have pointed out that technology have significant impacts on organizational culture (Leidner & Kayworth, 2006). The effect of culture on IT behaviors might be changed when taking management practices into consideration. Specifically, management practices might change the relationships between culture and

IT behaviors. Such examination could be of interest and significance to researchers and practitioners in IS areas.

The third theoretical direction relates to broaden the research scope to national culture level. Future studies could be conducted in different countries and incorporate measurement of national culture into the research model. For example, researchers can examine how national culture influence IT behaviors through particular management practices and make a cross-cultural comparison for various IT behaviors, which contributes a lot to existing IT-culture studies at national level. In addition, researchers can also include organizational culture at the same time with national culture and examine the mixed effects of culture (national and organizational) on IT behaviors. This will become an important attempt to fill in the gaps that existing IT-culture studies are separated as two streams. As a by-product, the effect of national culture on organizational culture is also to be examined, which can provide more insights for researchers to conduct cultural studies.

The fourth direction is from the relationship between organizational culture and SCM practices. To our knowledge, there is very little study focusing on the relationships though it is a gap need for more researches. Based on the preliminary findings upon the relationship between organizational culture and SCM practices in this dissertation, researchers in IS or OM areas could extend the conceptual model by incorporating

performance as dependent variable to fill the research gap (Naor et al., 2008).

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Appendix

Questionnaire (English Version)

Part 1- Organizational Culture:

The following statements investigate your organizational culture. Please express your view by indicating the degree of agreement with them (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) (all three respondents are required to finished this section)

G1	Our company and partners are flexible in managing terms in negotiation situations	1	2	3	4	5
G2	Our company and partners maintain harmony	1	2	3	4	5
G3	Our company and partners do favors for one another	1	2	3	4	5
G4	Our company and partners have many social interactions	1	2	3	4	5
R1	Where I work, people feel comfortable with unfamiliar situations	1	2	3	4	5
R2	Where I work, each day brings new challenge	1	2	3	4	5
R3	Where I work, people put maximal effort	1	2	3	4	5
J1	Where I work, important decisions are made by individuals	1	2	3	4	5
J2	Where I work, organization only interests in work people do	1	2	3	4	5
J3	Where I work, little concern for personal problems of employees	1	2	3	4	5
Pp1	Where I work, people's private life is their own business	1	2	3	4	5
Pp2	Where I work, job competence is the only criterion in hiring people	1	2	3	4	5
Pp3	Where I work, we think three years ahead or more	1	2	3	4	5
O1	Where I work, only very special people fit in organization	1	2	3	4	5
O2	Where I work, organization and people are closed and secretive	1	2	3	4	5
O3	Where I work, new employees need more than a year to feel at home	1	2	3	4	5
T1	Where I work, everybody is cost conscious	1	2	3	4	5
T2	Where I work, meeting times keep punctually	1	2	3	4	5
T3	Where I work, people always speak seriously of organization and job	1	2	3	4	5
N1	Where I work, be pragmatic, not dogmatic in matters of ethics	1	2	3	4	5
N2	Where I work, major emphasis is on meeting customer needs	1	2	3	4	5
N3	Where I work, results are more important than procedures	1	2	3	4	5

Part 2-Supply Chain Management Practices:

The following descriptions are about your company's supply chain management practices, to which extent you agree with the descriptions. (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) (Production manager or equal is required to finished this section)

SR1	We consider quality as our number one criterion in selecting suppliers	1	2	3	4	5
SR2	We regularly solve problems jointly with our suppliers	1	2	3	4	5
SR3	We have helped our suppliers to improve their product quality	1	2	3	4	5
SR4	We have continuous improvement programs that include our key suppliers	1	2	3	4	5
SR5	We include our key suppliers in our planning and goal-setting activities	1	2	3	4	5
SR6	We actively involve our key suppliers in new product development processes	1	2	3	4	5
CR1	We frequently interact with customers to set reliability, responsiveness, and other standards for us	1	2	3	4	5
CR2	We frequently measure and evaluate customer satisfaction	1	2	3	4	5
CR3	We frequently determine future customer expectations	1	2	3	4	5
CR4	We facilitate customers' ability to seek assistance from us	1	2	3	4	5
CR5	We periodically evaluate the importance of our relationship with our customers	1	2	3	4	5
IS1	We inform our partners in advance of changing needs	1	2	3	4	5
IS2	We require our partners share proprietary information with us	1	2	3	4	5
IS3	We require our partners keep us fully informed about issues that affect our business	1	2	3	4	5
IS4	We require our partners share business knowledge of core business processes with us	1	2	3	4	5
IS5	We and our partners exchange information that helps establishment of business planning	1	2	3	4	5
IS6	We and our partners keep each other informed about events or changes that may affect the other partners	1	2	3	4	5
LP1	Our company reduces set-up time	1	2	3	4	5
LP2	Our company has continuous quality improvement program	1	2	3	4	5
LP3	Our company uses a 'Pull' production system	1	2	3	4	5
LP4	Our company takes efforts to maintain all our equipment regularly	1	2	3	4	5
LP5	Our company pushes suppliers for shorter lead-times	1	2	3	4	5
IQ1	Information exchange between our partners and our company is accurate	1	2	3	4	5
IQ2	Information exchange between our partners and our company is complete	1	2	3	4	5

IQ3	Information exchange between our partners and our company is adequate	1	2	3	4	5
IQ4	Information exchange between our partners and our company is reliable	1	2	3	4	5
IQ5	Information exchange between our partners and our company is timely	1	2	3	4	5
AM1	Our company often uses modularized or reconfigurable production technology	1	2	3	4	5
AM2	Our company often conducts concurrent execution of various production activities	1	2	3	4	5
AM3	Our company often empowers employees to make decisions	1	2	3	4	5
AM4	Our company often encourages employees work in teams and build up cross functional teams	1	2	3	4	5
AM5	Our company often provides multi-skilled training for employees	1	2	3	4	5

Part 3 – Supply Chain Strategies:

The following statements are descriptions of supply chain strategies. To what extent do you agree that the supply chain of your company's major product/product mix has the following characteristics? (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) (Production manager or equal is required to finished this section)

1.	Our supply chain supplies predictable products	1	2	3	4	5
2.	Our supply chain reduces any kind of waste as much as possible	1	2	3	4	5
3.	Our supply chain reduces costs through mass production	1	2	3	4	5
4.	Our supply chain needs to maintain a long and rigid relationship with a small number of suppliers	1	2	3	4	5
5.	Our supply chain selects the suppliers based on their performance on cost and quality	1	2	3	4	5
6.	Our supply chain structure seldom changes	1	2	3	4	5
7.	Our supply chain always faces the volatile customer demand	1	2	3	4	5
8.	It is necessary for our supply chain to maintain a higher capacity buffer to respond to volatile market	1	2	3	4	5
9.	Our supply chain provides customer with personalized products	1	2	3	4	5
10.	Our supply chain selects the suppliers based on their performance on flexibility and responsiveness	1	2	3	4	5
11.	Our supply chain needs to maintain a short and flexible relationship with a large number of suppliers	1	2	3	4	5
12.	Our supply chain structure often changes in order to cope with volatile market	1	2	3	4	5

Part 4: ERP Decisions (this section is for CIO or equal)

1. Has your company adopted any ERP system?
   a. Yes, please specify the name of your ERP system_____
   b. No (please briefly specify the reasons for not use ERP system)
2. What modules of ERP system are used in your company?

Module Name	
Production Management	
Purchase Management	
Human Resources Management	
Finance/accounting Management	
Order Management	
Distribution/logistics Management	
Inventory Management	
Others (please specify)	

3. Please specify the organizational scope of your selected ERP system.

Department	**Division**	**Entire company**	**Multiple companies**	**Other**

4. Please specify the geographical scope of your selected ERP system.

Single site	**Multi-sites**	**National**	**Worldwide**

Part 5: Company Profiles

1. Company Name:_____
2. Setup Year_____ Years of running in this region_____
3. Ownership of the company

Ownership		**Ownership**	
State Owned		Sino-Foreign	
State Holding		Taiwan Private	
Domestic Private		Foreign Private	
Hong Kong Private			

4. The **number** of your company's employees

   ☐ 200 - 499 ☐ 500-999 ☐ 1000-1999 ☐ 2000-3999
   ☐ 4000 -4999 ☐ >5000

5. What is your company's **annual sale** in 2009? (RMB $ million)

   ☐ <5M ☐ 5M-10M ☐ 10M-20M ☐ 20M-50M
   ☐ 50M-100M ☐ 100M – 250 M ☐ 250M-500M ☐ >500M

调查问卷（中文版）

第一部分：企业文化

企业文化也被称为“组织文化”，是用来区分来自不同组织成员的一种群体属性。企业文化具有难以改变等特点。以下是关于贵公司企业文化方面的陈述，请就下列陈述表达你的同意程度（请选择1至5其中一个答案）。1=非常不同意；2=不同意；3=中立；4=同意；5=非常同意。

G1	我们公司与合作伙伴在谈判中能灵活处理相关谈判条款	1	2	3	4	5
G2	我们公司与合作伙伴保持和谐	1	2	3	4	5
G3	我们公司与合作伙伴互相关照	1	2	3	4	5
G4	我们公司与合作伙伴有很多社交活动	1	2	3	4	5
R1	在我工作的地方，人们安然面对不熟悉的情况	1	2	3	4	5
R2	在我工作的地方，每天都有新的挑战	1	2	3	4	5
R3	在我工作的地方，人们都尽最大努力工作	1	2	3	4	5
J1	在我工作的地方，重要的决策往往由个人来制定	1	2	3	4	5
J2	在我工作的地方，组织只对人们所做的工作感兴趣	1	2	3	4	5
J3	在我工作的地方，员工的个人问题很少受到关注	1	2	3	4	5
Pp1	在我工作的地方，人们的私生活是他们个人的事情	1	2	3	4	5
Pp2	在我工作的地方，工作能力是聘请员工的唯一标准	1	2	3	4	5
Pp3	在我工作的地方，我们作三年或更长远的计划	1	2	3	4	5
O1	在我工作的地方，只有小部分人适合这个组织	1	2	3	4	5
O2	在我工作的地方，组织与人们都相对保守和保密的	1	2	3	4	5
O3	在我工作的地方，新员工需要一年或以上的时间才能适应	1	2	3	4	5
T1	在我工作的地方，每个人都有成本意识	1	2	3	4	5
T2	在我工作的地方，开会是准时的	1	2	3	4	5
T3	在我工作的地方，人们都很认真地谈论组织和工作	1	2	3	4	5
N1	在我工作的地方，人们以务实、而不是教条式的态度处理道德问题	1	2	3	4	5
N2	在我工作的地方，我们主要强调满足客户的需要	1	2	3	4	5
N3	在我工作的地方，结果远比过程重要	1	2	3	4	5

第二部分：供应链管理实践

供应链管理是指从原材料的供应到产品销售给客户全过程的物流与信息流的有效控制与管理。以下是关于贵公司在客户关系管理、供货商关系管理、信息共享、精益生产及敏捷制造的供应链管理实践的具体做法，请结合贵公司目前的实际情况表达您的观点。（请选择 1 至 5 其中一个答案）。1=非常不同意；2=不同意；3=中立；4=同意；5=非常同意。

SR1	我们把质量作为选择供货商的首要条件	1	2	3	4	5
SR2	我们经常和供货商共同解决问题	1	2	3	4	5
SR3	我们帮助供货商提高其产品质量	1	2	3	4	5
SR4	我们有主要供货商参与的持续改善计划	1	2	3	4	5
SR5	我们让主要的供货商参与制定计划和确定目标活动	1	2	3	4	5
SR6	我们积极地让主要供货商参与新产品开发流程	1	2	3	4	5
CR1	我们经常就制定可靠性，响应度和其他标准与客户进行交流	1	2	3	4	5
CR2	我们经常量度和评估客户满意度	1	2	3	4	5
CR3	我们经常确定客户未来的要求	1	2	3	4	5
CR4	我们为客户寻求我方的协助提供便利					
CR5	我们定期评估与客户关系的重要性					
IS1	我们将改变中的业务需求事先通知合作伙伴	1	2	3	4	5
IS2	合作伙伴与我们共享专有信息	1	2	3	4	5
IS3	合作伙伴完全知会可能会影响我们业务的事情	1	2	3	4	5
IS4	合作伙伴与我们共享核心业务流程的商业知识	1	2	3	4	5
IS5	我们与合作伙伴互相交换信息，以帮助制定商业计划	1	2	3	4	5
IS6	我们与合作伙伴互相让对方知会可能影响另一方的事件或变化	1	2	3	4	5
LP1	我们公司努力减少准备时间	1	2	3	4	5
LP2	我们公司实施持续质量改善计划	1	2	3	4	5
LP3	我们公司使用“拉”式生产系统 (订单驱动)	1	2	3	4	5
LP4	我们公司敦促供货商缩短交货时间	1	2	3	4	5
LP5	我们公司理顺简化供货商的订货，收货及其他文书工作	1	2	3	4	5
IQ1	合作伙伴与我们之间的信息交换是及时的	1	2	3	4	5
IQ2	合作伙伴与我们之间的信息交换是准确的	1	2	3	4	5
IQ3	合作伙伴与我们之间的信息交换是完整的	1	2	3	4	5
IQ4	合作伙伴与我们之间的信息交换是适当的	1	2	3	4	5
IQ5	合作伙伴与我们之间的信息交换是可靠的	1	2	3	4	5
AM1	我们公司经常采用模块化的生产技术(工艺)	1	2	3	4	5
AM2	我们公司经常同步执行各种生产活动	1	2	3	4	5
AM3	我们公司经常授权员工作决策	1	2	3	4	5
AM4	我们公司经常鼓励员工以跨职能的团队方式工作	1	2	3	4	5
AM5	我们公司经常为员工提供多种技能培训	1	2	3	4	5

第三部分：供应链战略

下列陈述是关于供应链管理策略的一些描述，您认为贵公司针对主要产品或产品组合（其产值在公司总产值中所占的比例最高）的供应链是否具备下列特征？（请选择 1 至 5 其中一个答案）。1=完全不具备；2=不具备；3=不一定；4=具备；5=完全具备。

1. 我们的供应链主要是基于平稳的，预测准确度较高的客户需求提供产品	1	2	3	4	5
2. 我们的供应链要尽可能的减少浪费（库存，过剩的产能等）以追求较高的效率	1	2	3	4	5
3. 我们的供应链追求大批量生产以降低成本	1	2	3	4	5
4. 我们的供应链与少数供货商维持长久与固定的关系	1	2	3	4	5
5. 我们的供应链在选择供货商时主要根据其在成本和质量上的表现	1	2	3	4	5
6. 我们的供应链结构很少发生变化和调整	1	2	3	4	5
7. 我们的供应链主要是基于客户经常变化和很难预测的需求来提供产品	1	2	3	4	5
8. 我们的供应链保证一定的剩余能力或者产品以及零部件的库存以便应对市场的变化	1	2	3	4	5
9. 我们的供应链主要是为顾客提供个性化的产品	1	2	3	4	5
10. 我们的供应链在选择供货商时主要依据其对市场变化的反应速度上的表现	1	2	3	4	5
11. 我们的供应链与较多的供货商保持短期且灵活的关系以适应市场变化	1	2	3	4	5
12. 我们的供应链结构要经常调整和变化以适应不同市场环境的要求	1	2	3	4	5

第四部分：ERP 决策

以下问题是关于贵公司在应用企业资源计划(ERP)系统的实际情况，请根据贵公司的实际作答。

1. 贵公司目前是否使用企业资源计划（ERP）系统？(请选择)

使用了 ERP 系统 (请说明系统名称)	没有使用 ERP 系统 (请直接跳到第三部分)

2. 贵公司具体使用了该 ERP 系统的哪些模块？

模块名称	是否采用(请打勾)	模块名称	是否采用(请打勾)
财务会计		库存管理	
物料管理		物流管理	
生产计划/管理		资产管理	
采购管理		质量管理	
订单管理		人力资源管理	

3. 贵公司实施上述 ERP 系统的组织范围包括:

仅限于几个部门	分公司 (分厂)	整个公司 (工厂)	多个公司 (工厂)	其它

4. 贵公司实施上述 ERP 系统的地域范围包括:

单个地区	多个地区	全国	全球

第五部分: 公司资料

1. 公司名(敬请填写具体名称，以便进行统计分析):_ _____ _ ____
2. 贵公司在该地区经营年份_____
3. 贵公司的所有制成分是 (请选择)

所有制成分	请选择	所有制成分	请说明外资方
国有独资企业		中外合资企业	
国有控股企业		中外合作企业	
民营企业		外国独资企业	
香港独资企业		台湾独资企业	

4. 贵公司的员工人数:
   200-499 ( ) 500-999 ( ) 1,000-1,999 ( )
   2,000-3,999 ( ) 4,000-4,999 ( ) 5,000 或更多 ( )
5. 贵公司在 2009 年的营业额大概是是多少 (以人民币计算)
   小于 5 百万( ) 5 百万到 1000 万 ( )
   2000 万到 5000 万 ( ) 5000 万 到 1 亿( )
   1 亿到 2.5 亿 ( ) 2.5 到 5 亿 ( ) 5 亿或以上 ( )