Factors Affecting Logistics Service Competencies: An Empirical Study of Logistics Service Providers in China

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DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work paid or unpaid carried out by a third party is acknowledged; and, ethics, procedures and guidelines have been followed.

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GLOSSARY OF ACRONYMS

AGFI	Adjusted goodness-of-fit index
AMOS	Analysis of Moment Structure
AVE	Average Variance Extracted
BP&SOP	Business Processes and Standard Operations Procedures
CAAC	Civil Aviation Administration of China
CFI	Comparative fit index
CS	Company Size
EDI	Electronic Data Interchange
EMS	Express Mail Service
CFA	Confirmatory Factor Analysis
CR	Construct Reliability
COSCO	China Ocean Shipping (Group) Company
CRM	Customer Relationship Management
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
FDI	Foreign Direct Investment
GAC	General Administration of Customs
GPS	Global Positioning System
GOF	Goodness of Fit
GDP	Gross Domestic Product
HMR	Hierarchical Multiple Regression
HRM	Human Resource Management

ICT	Information and Communication Technology
KPI	Key Performance Indicator
L&SC	Logistics and Supply Chain
LSP	Logistics Service Provider
LE	Large Sized Enterprise
MSUGLRT	Michigan State University Global Logistics Research Team
MOFTEC	Foreign Trade and Economic Cooperation
MNC	Multinational Company
NFI	Normed fit index
PAR	Physical Assets and Resources
PASW	Predictive Analysis Software
PBP	Processes for Benchmarking Performance
PM	Performance Management
PIF	Processes for Increasing Flexibility
PIR	Processes for Increasing Responsiveness
RBV	Resource-based View
RM	Reward Management
RFID	Radio Frequency Identification
RMSEA	Root Mean-squared Error of Approximation
SARS	Servere Acute Respiratory Syndrome
SCM	Supply Chain Management
SME	Small and Medium Sized Enterprise
TDN	Transport and Distribution Network
TD	Training and Development
VIF	Variance Inflation Factor

WIM	Warehouse and Inventory Management
WMS	Warehouse Management System
WTO	World Trade Organization
3PL	Third Party Logistics

ABSTRACT

Despite the growing literature on logistics service providers (LSPs), efforts to investigate the causal links between routine business processes and standard operations procedures (BP&SOPs), human resource management (HRM) practices, and logistics and supply chain (L&SC) competencies are limited. Responding to this challenge, this research explores the effects of three BP&SOPs and three HRM practices in nurturing three specific L&SC competencies against the backdrop of a structurally fragmented Chinese logistics service industry.

Drawing on responses from 117 logistics firms to a questionnaire survey of LSPs in China conducted in 2009, this study developed a research model and formulated 36 hypotheses, linking three sets of BP&SOPs (i.e., *processes for performance benchmarking*, *increasing responsiveness*, and *increasing flexibility*) and three sets of HRM practices (i.e., *performance management*, *training & development* and *reward management*) to three distinctive L&SC competencies (i.e., *positioning*, *distribution support* and *agility*). The model also tested the moderating effects of *Guanxi* and *information & communication technology* (*ICT)* support on the relationships between the three sets of BP&SOPs and the three L&SC competencies. Confirmatory factor analysis was used to establish constructs representing dependent and independent variables. The formulated model was tested using hierarchical multiple regression analysis, controlling for the effects of firm size, physical resources and ICT.

The results of the hierarchical regression analysis confirmed 10 of the hypotheses, but did not support the remaining, unveiling some unexpected insightful information on the relationships between BP&SOPs, HRM practices and L&SC competencies. Among the three BP&SOP variables examined, only *processes for increasing responsiveness* (*PIR*) was found to have a significant positive effect on all three L&SC competencies. *Processes for increasing flexibility* (*PIF*) have a significant positive relationship only with *positioning* competency, while *processes for benchmarking performance* (*PBP*) have no effect on the three L&SC competencies.

For the three HRM practice variables, only *training and development* emerged as a significant positive predictor for all three L&SC competency variables. *Reward management* shows a

significant positive effect only on *distribution support*, while *performance appraisal* was found to be negatively related to distribution support.

The hierarchical regression analysis also found that *Guanxi* does not moderate the relationships between BP&SOPs and L&SC competencies. However, it revealed that *ICT support* has a significant positive moderating effect on the relationships between *PBP* and *distribution support*, and between *PBP* and *agility*, but imposes a negative moderating effect on the relationship between *PIR* and *agility*, and between *PIF* and *distribution support*.

The unexpected effects of BP&SOPs as well as HRM practices on *positioning*, *distribution support* and *agility* suggest that despite over three decades of open-door policy and economic reform, and ascension to the World Trade Organization, China continues to present a distinctively unique market environment. The ingredients for operational success in China differ vastly from those of the developed economies. Equally, the insignificant moderating effect of *Guanxi*, and the contrasting effects of *ICT support* on the relationships between BP&SOPs and L&SC competencies also defy established reasoning. Apart from making notable contributions to the literature on the Chinese logistics market, these findings open up fruitful avenues for further research.

Keywords: Logistics services, business processes, logistics and supply chain competencies, human resource management, Resource Based View

CHAPTER 1

OVERVIEW OF THE RESEARCH

1.1 INTRODUCTION

Resource Based View (RBV) has been applied extensively in supply chain studies to examine how firms utilize logistics resources to attain superior performance. Most of these studies (Cho, Ozment & Sink 2008; Lai et al. 2008; Shang & Marlow 2007), however, have focused on capabilities that are well-recognized supply chain imperatives, such as linkages between supply chain partners and supply chain visibilities. Relatively little attention has been directed to exploring the effects of mundane, routinized operation processes and human resource management (HRM) practices on supply chain competencies.

Logistics service providers (LSPs) routinely engage in a large array of operations. These routinized operations are socially complex, causally ambiguous, and woven into the fabric of organizations. They are a potent source of rent-generating mechanisms, which form the backbone of flexible and agile practices vital to effective logistics and supply chain (L&SC) service operations. The objectives of this study are to examine the causal linkages between routine operation processes, HRM practices, and service competencies of LSPs in China. This chapter presents an overview of this research, including background and study rationale, research objectives and research questions, research methodology, study contributions, and organization of the thesis.

1.2 BACKGROUND

The Chinese economy has been growing at about 10 percent annually during the last decade (National Bureau of Statistics of China 2009). With high economic growth and a huge market potential, China has gained a reputation as the world's manufacturing centre. The rapid expansion of its manufacturing sector for both industrial and consumer goods has resulted in an increased demand for logistics services. As a result, China's logistics service industry has been experiencing rapid growth in recent years. According to the China Logistics Industry Report (2009-2010), total logistics cost in China was valued at RMB96.65 trillion in 2009, an

increase of 7.5 percent from 2008. In the first quarter of 2010, the total logistics cost reached RMB 25.9 trillion, representing a rise of 20.8 percent compared with the same period in 2009 (China Logistics Industry Report 2009 - 2010).

The fast growth in the logistics sector creates tremendous opportunities not only for domestic LSPs but also for international LSPs to develop their business in China. There is strong evidence that large international LSPs are actively expanding their business in China. For example, Kuehne & Nagel, one of the world's largest LSPs, has established 39 branch offices in China and started to expand its business in Western China (Anonymous 2009b). DHL tripled its number of regional transportation hubs in China to 15 in 2009 (Hannon 2009). Other international LSPs, including FedEx, UPS, and CEVA, which specialize in express delivery services, have also been investing heavily in the Chinese market. For instance, FedEx opened a 155 acre Asia-Pacific hub at Baiyun International Airport in Guangzhou, one of the largest hubs outside the US, in 2008, to offer next-day delivery services to 24 Asian cities and links to its global networks (Biederman 2008).

China's logistics market is highly fragmented, consisting of more than 700,000 registered LSPs (Hu, Wang & liu 2008). The majority of domestic LSPs are small and medium sized enterprises (SMEs) with less than 500 employees (Hu, Wang & liu 2008). Moreover, most of them only provide labor-intensive, low-end services, such as transportation and warehousing (Hong, Chin & Liu 2007; Wang et al. 2008; Zhou et al. 2008). In contrast, large international LSPs operating in China are equipped with modern logistics facilities, advanced technologies, and well developed management systems (Zhou et al. 2008). As more firms in China seek third party logistics services (3PL) to gain operational efficiency as well as connection to global supply chains, LSPs operating in the legislatively complex Chinese market have been coerced to continuously explore means to improve their cost-efficiency and service responsiveness to remain operationally competitive.

1.3 RATIONALE FOR THE RESEARCH

Logistics outsourcing has become an important business strategy reputed to enable firms to reduce their operations costs (Gadde & Hulthén 2009; Hsiao et al. 2010), strengthen their core competencies, and improve their service quality (Liu et al. 2010; Wang et al. 2010). In the last two decades, the global market for outsourced logistics services has been growing rapidly

(Dapiran et al. 1996; Gadde & Hulthén 2009; Hsiao et al. 2010; Kingsley et al. 2010; Lieb 1992, 2008; Lieb & Bentz 2004, 2005; Sahay & Mohan 2006; Virum 1993). According to Capgemini (2007), more than 70 percent of firms in Western Europe, US, and the Asia-Pacific region outsource their logistics activities, which are expanding from basic transportation and warehousing functions to full logistics network control and supply chain management (SCM). The trend of using LSPs has also been on the increase in some developing countries, like Mexico, India and China (Arroyo, Gaytan & Boer 2006; Lieb 2008; Sahay & Mohan 2006).

Equally, the logistics service industry in China has also been achieving strong growth and is anticipated to continue to expand this decade (*China Logistics Yearbook* 2009). Not surprisingly, a large number of studies have investigated the Chinese logistics service industry from a range of perspectives (Goh & Ling 2003; Hong, Chin & Liu 2004, 2007; Hong & Liu 2007; Huang & Kadar 2002; Lai & Cheng 2007; Liu et al. 2010; Loo & Hong 2002; Song & Wang 2009; Su, Shi & Lai 2008; Wang et al. 2008; Wang et al. 2010; Zhou et al. 2008). Hong et al. (2007), for instance, surveyed the operational status and future prospects of LSPs in China, revealing that Chinese LSPs depend heavily on transportation and warehousing business, but lack value-added services and logistics information management. On the other hand, Hong and Liu (2007) studied logistics development in China from the perspective of the service providers. They found that though state-owned enterprises played a lead role, there is promising potential for foreign firms, such as UPS, FedEx, and DHL, to grow the market. Hong and Liu's (2007) assessment is supported by the case finding of Lai et al. (2007), who reported how a Hong Kong 3PL provider started its business in Shanghai, explored the challenges and turned threats into opportunities.

Wang et al. (2008) also make a comparative study of LSPs in Mainland China and Hong Kong. They claim that intensifying competition in the Chinese logistics market has forced mainland China's LSPs to improve customer service and operation efficiency to enhance business performance. Because the logistics industry in Hong Kong is comparatively more mature than mainland China's, Hong Kong LSPs are more capable of providing customers with tailored and value-added services and at a higher level of service quality. Similar to the findings of Hong et al. (2007), Wang et al. (2008) confirm that mainland China's LSPs focus primarily on basic, low cost and low end services.

Studies on factors affecting the operational efficiency of Chinese LSPs are also common among extant literature on the Chinese logistics market. Among them, Zhou et al. (2008), Su, Shi and Lai (2008), Song and Wang (2009) and Liu et al. (2010) are some of the more recent studies. Zhou et al. (2008) found that China's manipulated transport regulations, high underutilization of fixed assets, and relatively low logistics outsourcing rates (16 to 18 percent) are among the most dominant factors affecting the operational efficiency of Chinese LSPs. They also noted that retaining talented personnel in logistics and SCM has been a major operational challenge, with limited service offerings standing as a distinctive barrier to sales and revenue growth in logistics service operations in China.

Liu et al. (2010) investigate how 13 firm-specific capabilities - strategic management, operations management, service quality, customer relationship management (CRM), ICT, service network, HRM, business process management, marketing, inventory management, innovation, cost management, and corporate culture - contribute to LSP competitiveness in China. They found that service quality, operations management, cost management, and CRM tend to contribute more than the other factors, such as inventory management and marketing. They also found that service quality was perceived as the most important attribute, which serves as a key differentiator for LSPs to compete in China.

In their study of SCM practices of Chinese logistics firms, Su, Shi and Lai (2008) argue that Chinese firms do understand the strategic importance of SCM. Attention paid to improving logistics performance and application of ICT in supply chain operations. Su, Shi and Lai (2008) also found that, compared to manufacturing and other industries, the Chinese logistics industry had the lowest scores in business strategy, plan and execution, logistics performance, and ICT implementation. Song and Wang (2009) examined practices of logistics cost management in China, identified three critical factors impacting the effectiveness of logistics cost management: lack of effective cost measurement tools, lack of effective business processes to promote ICT integration, and shortage of professional logistics managers.

Several studies also explored the impact of technological development on logistics service operations in China in recent years (Lai et al. 2008; Lai, Zhao & Wang 2006; Lin 2007; Lin & Ho 2009; Wang et al. 2008; Wang, Lai & Zhao 2008). Unanimously, ICT has been found to offer significant competitive advantage to LSPs operations in China (Lai et al. 2008; Lai, Zhao & Wang 2006).

In short, while there is a growing literature on the logistics industry in China, the majority of these studies tend to focus on three main areas: the state of the operational practice of LSPs (Hong, Chin & Liu 2007; Hong & Liu 2007; Huang & Kadar 2002), logistics barriers and challenges LSPs faced in the Chinese market (Carter, Pearson & Li 1997; Fung et al. 2005; Goh & Ling 2003; Hong, Chin & Liu 2004; Huang & Kadar 2002; Lu & Dinwoodie 2002), and effects of individual factors, such as ICT, service quality or shortage of skilled personnel and logistics professionals, on LSPs' performance (Lai, Zhao & Wang 2006; Lin & Ho 2007; Wang et al. 2008). Very limited research has been directed to examining the internal processes adopted by LSPs to achieve service efficiencies and effectiveness, such as the routine business and operational processes LSPs put in place to respond to the service needs of their customers, and the HRM practices they employ to attract and retain logistics talent. Further, most studies on Chinese LSPs are descriptive and lack theoretical foundation. Drawing on the tenets of RBV, this research will examine the effects that two intangible resources - business processes and standard operations procedures (BP&SOPs) as well as HRM practices - have on service competencies of LSPs in China.

1.4 RESEARCH OBJECTIVES AND QUESTIONS

RBV posits that firms which have access to, and control over, rare, valuable, inimitable, and imperfectly substitutable resources could achieve sustainable competitive advantage (Fahy 2000). A firm's capabilities are developed from its resources, which can be both tangible (e.g., physical assets) and intangible (e.g., technological know-how or market intelligence) (Barney 1991; Wernerfelt 1984). In the logistics service industry, tangible physical resources would include warehouses, vehicle fleets, and ICT infrastructure, among others. Intangible resources would include business processes; social capital (i.e., established relations with business associates or networks); industry-specific knowledge, such as having quality assurance accreditation (e.g., ISO9001 and ISO14001 certificates), technical know-how, and managerial skills; and reputation. In general, tangible resources are "undifferentiated, non-firm-specific inputs" that could be readily acquired in factor or product markets (Teece, Pisano & Shuen 1997). Mere acquisition of such resources, as such, would not enable a LSP to achieve competitive advantage. In contrast to tangible resources, intangible resources are typically more firm-specific, and are difficult, if not impossible, for competitors to imitate, as they are

largely built within the specific cultural context and organizational structure of the firm (Wernerfelt 1989).

Capabilities are complex bundles of individual skills, assets and knowledge exercised through organizational processes, which enable firms to coordinate business activities and make use of resources (Amit & Schoemaker 1993; Day 1994). Distinctive capabilities are core capabilities that enable firms to outperform competitors through the use of their intangible resources, such as skills, knowledge or business processes, which are hard to be imitated or substituted by competitors (Prahalad & Hamel 1990; Teece, Pisano & Shuen 1987). In this study, L&SC competencies are defined as core capabilities that give LSPs a distinctive edge to outperform competitors. One of the objectives of this study is thus to investigate the effects that intangible resources, such as routinized operational processes, have on L&SC competencies.

The literature on Chinese logistics industry has also flagged the lack of logistics expertise as a critical issue for logistics operations in China (Bolton & Wei 2003; Hong, Chin & Liu 2007; Kerr 2005; Trunick 2003, 2004a, 2004b; Zhou et al. 2008). HRM practices, such as recruiting, training and retention of logistics expertise, have been proposed as essential aid for LSPs in China to tackle the skill shortage problem (Kam, Tsahuridu & Ding 2010; Lieb 2008). Thus, in addition to investigateing the effects of routinised operational processes on L&SC competencies, this study will also examine the relationships between HRM practices and L&SC competencies of LSPs in China.

When investigating factors affecting operational performance in China, it is hard to ignore the effects of *Guanxi*, the Chinese equivalent of social capital (Leung & Wong 2001) or relationship management (Zhang & Nattavud 2010). In conducting business in China, *Guanxi* is a valuable intangible resource. Hong, Chin and Liu (2004) argue that accumulating social capital has become a convenient way for LSPs in China to secure market share by establishing strategic partnerships. Expectedly, *Guanxi* will have a moderating effect on the relationship between routinised operational processes and L&SC competencies. Likewise, *ICT support*, which has been found to be a critical factor influencing logistics service operations in China (Lai et al. 2008; Lai, Zhao & Wang 2006), will also have a significant moderating role in the relationship between routinised operational processes and L&SC competencies. This study will examine whether *Guanxi* and *ICT support* do play a moderating role in influencing the

relationships between routinized operational processes and L&SC competencies. The key components of this study are presented in Figure 1.1.

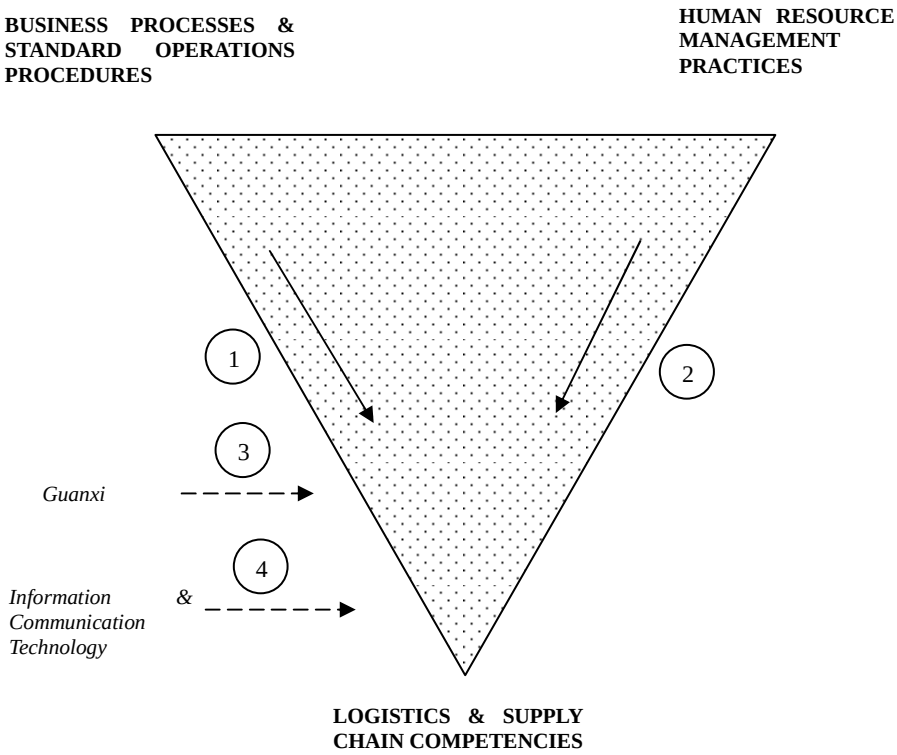

Figure 1.1: Key Components of the Study

Notes: The numbers 1-4 denote the relationships between the key components of the study

In sum, the objectives of this research are to understand how routinised operation processes and HRM practices impact on L&SC competencies of LSPs in China. To achieve the above objectives, this study formulated four research questions:

1) Do BP&SOPs positively relate to L&SC competencies of LSPs in China?

2) Do HRM practices positively relate to L&SC competencies of LSPs in China?

3) Does *Guanxi* enhance the relationship between BP&SOPs and L&SC competencies?

4) Does *ICT support* bolster the relationship between BP&SOPs and L&SC competencies?

Answers to the first question will provide insights on how LSPs can utilize BP&SOPs to increase L&SC competencies. Answers to the second question will provide insights on how

HRM practices contribute to L&SC competencies of LSPs in China. Finally, answers to the third and fourth questions will shed light on whether the use of *Guanxi* and *ICT support* could enhance the links between BP&SOPs and L&SC competencies.

1.5 RESEARCH METHOD

This research is explanatory in nature and was accomplished via a quantitative research method. A quantitative approach is considered appropriate, as this study is theory testing in nature. The hypotheses were formulated based on a review of literature built around the research questions.

A questionnaire survey was used as the instrument for data collection. The objective of the questionnaire survey was to collect data related to the factors affecting L&SC competencies of LSPs in China. General information on firms' characteristics and operational status were also captured. A pilot test was conducted to verify the content validity of the survey instrument. The LSP sample for this study was identified from the list of logistics firms appearing in the Business Directory of Global Supply Chain Council (2009) and Business Directory of A-Z Worldwide Airfreight (2009). The two directories list a total of 1,147 logistics firms operating in China in 2009. An on-line survey was conducted in July 2009. A total of 117 returned questionnaires were used for statistical analysis. Confirmatory factor analysis (CFA) was used to establish constructs representing L&SC competencies, BP&SOPs, HRM practices, *Guanxi*, and *ICT support*. Hierarchical multiple regression was used to test the causal relationships and interaction terms between the dependent and independent variables.

1.6 CONTRIBUTION OF THE STUDY

This dissertation contributes to L&SC knowledge by examining the relationships between business processes, HRM practices, and L&SC competencies in new market environments, particularly in the context of emerging markets, like China.

First, this research provides a theoretical framework to examine the key factors affecting L&SC competencies. The model explored the relationships between physical resources, BP&SOPs, HRM practices and key L&SC competencies. The moderating effects of *Guanxi*

and *ICT support* on the relationships between BP&SOPs and L&SC competencies were also examined. Empirical confirmation or disconfirmation of the relationships between BP&SOPs and HRM practices, and L&SC competencies of LSPs in China provides an important step in applying theories of logistics capabilities and competencies in an emerging market like China.

Second, in addition to contributing to theory development, this study investigates the effects that BP&SOPs have on L&SC competencies of LSPs in China. To conduct this investigation, additional measurement constructs were developed to measure BP&SOPs, as valid scales are not currently available. As a result, new scales for BP&SOPs were designed and tested.

Third, empirical evidence suggests that positive relationships exist between some control variables (i.e., transportation and warehousing facilities) and L&SC competence variables. The importance of this theoretical contribution is that it replicates the associations between physical resources and L&SC competencies that was previously conceptualized, but not empirically tested in the Chinese context.

Fourth, this dissertation contributes to applied research by indicating how LSPs in China may utilize their resources in a more cost-effective manner to improve their L&SC competencies, hence increasing their service performance.

Finally, empirical testing and validation of the research model suggest that the methods used in this research can be applied to investigate key factors influencing L&SC competencies of LSPs in emerging markets, like Mexico and India.

1.7 OUTLINE OF THESIS

The presentation of this study is divided into seven chapters.

As presented, the current chapter introduces the topic, background and rationale for the research, presents the research objectives and research questions, and outlines the research methodology, study contributions, and thesis organization.

Chapter 2 contains the literature review on existing research on LSPs focusing on China. This chapter is divided in four parts: logistics service industry in China, profile of LSPs in the

Chinese market, barriers and challenges faced by LSPs in China, and internal issues of LSPs in China.

Chapter 3 presents a theoretical conceptualization of L&SC competencies of LSPs in China, using RBV as a foundation. This chapter reviews each of the major theoretical concepts used, followed by the development of the research model and associated research hypotheses.

Chapter 4 outlines the research methodology. This chapter is divided into six major sections: research design and participants, instrument development, pilot testing, data collection and sampling procedure, data analysis procedure, and operationalisation of measurements.

Chapter 5 presents the data analysis procedures as well as results. The sample profile and current status of the responding firms are examined in the first section. The development of measurement models and establishment of psychometric properties of the latent constructs used are discussed in the second and third sections. The results of hypothesis testing are presented last.

Chapter 6 discusses the findings of the empirical data analysis. The effects of the control variables on L&SC competencies are first examined, followed by the main effects of BP&SOPs and HRM practices. Finally, the moderating effects of *Guanxi* and *ICT support* on the relationships between BP&SOPs and L&SC competencies are reviewed.

Chapter 7 concludes by looking at the implications of the findings, identifying major study limitations, and offering directions for future research.

CHAPTER 2

LOGISTICS SERVICE INDUSTRY IN CHINA

2.1 INTRODUCTION

This chapter reviews the literature on LSPs in China. It is divided into four sections: China logistics service industry, profile of LSPs in China, barriers and challenges faced by LSPs, and internal issues of LSPs in China.

2.2 LOGISTICS SERVICE INDUSTRY IN CHINA

Though China now plays an important role in the global economy and its logistics service industry has been growing rapidly, the performance of Chinese LSPs is still considered less than satisfactory on most measures (Su, Shi & Lai 2008). The logistics service industry got the lowest scores in terms of measurement and improvement of customer satisfaction, information sharing, storage control and trace, precision and adjustment of the SCM plan, and ICT operations in 22 indices while comparing to manufacturing and other industries (Su, Shi & Lai 2008).

The logistics service market in China has been described by many as comprising three distinctive characteristics: it is undeveloped and highly fragmented (Biederman 2007; Hu, Wang & liu 2008); it is beset with monopolistic regulations and local protectionism (Hong, Chin, & Liu, B 2004; Hong, Chin & Liu 2007; Loo & Hong 2002); and the costs of its operations are high by international standard (Biederman 2010; Kerr 2005; Song & Wang 2009).

2.2.1 Undeveloped and highly fragmented

Compared with other industries in China, such as manufacturing, (Su, Shi & Lai 2008) contend that the Chinese logistics service industry is comparatively less well-developed. While the industry consists of more than 700,000 registered companies (Hu, Wang & liu 2008), many derive as much as 85 percent of their revenue from basic transportation and warehousing

services (Biederman 2007) and are ignorant of modern L&SC management concepts as well as lacking in specific logistics expertise (Hu, Wang & Liu 2008). Many also do not make use of ICT to augment their logistics operations (Su, Shi & Lai 2008). In sum, the majority of Chinese LSPs are still in their early developmental stage, small in size, low in skills, and deficient in ICT use (Biederman 2007; Hu, Wang & Liu; Su, Shi & Lai 2008).

2.2.2 Monopolistic regulations and local protectionism

Regulations exert tight controls on business activities at all levels in China: national, provincial, and even at the city level (Kerr 2005). Jiang and Prater (2002) observe that the logistics service industry does not have a clear regulatory structure. The trucking, shipping, aviation, custom brokering and warehousing sectors are regulated by different Chinese government authorities: Civil Aviation Administration of China (CAAC), Foreign Trade and Economic Cooperation (MOFTEC) and General Administration of Customs (GAC). International LSPs wanting to provide a full range of logistics services face significant challenges as they have to apply for a multitude of licenses from different government agencies in the early 2000s (Hong & Liu 2007; Jiang & Prater 2002). Though the Chinese Government liberalized the regulatory structure in transportation recently, regulatory issues still ranked as one of the top three problems, together with HRM issues, and problems related to transportation infrastructure and services, faced by LSPs in China (Lieb 2008). Monopolistic regulation and lack of coordination among different government authorities and regions result in industrial as well as local protectionism, low-efficiency and duplicated infrastructure development (Kerr 2005).

In addition to ambiguous regulations (Hong & Liu 2007; Kerr 2005), foreign LSPs, in particular those seeking to establish a strong presence in China, typically face significant obstacles due to China's large geographic size and population base with a highly notable disparity in per capita gross domestic product (GDP) and disposable income between different regions (e.g., those between the coastal and western areas) (Jiang & Prater 2002). Compounded by undeveloped infrastructure networks (Goh & Ling 2003; Kam, Tsahuridu & Ding 2010) and cultural differences between regions (Jiang 2002), many foreign LSPs find the Chinese logistics market an exceedingly complex environment to operate within.

2.2.3 High logistics costs

Logistics operations in China are notably cost-inefficient (Biederman 2010; Song & Wang 2009; Zhou et al. 2008). Logistics costs are 18.1 percent of GDP, higher than any other country in the Asia-Pacific Region and double the U.S. rate of 9.4 percent (Biederman 2010). Song and Wang (2009) contend that one of the most important reasons for the high logistics cost is that Chinese firms neglect SCM concept and do not conduct systematic analysis on logistics costs. High cost presents immense challenges to the logistics industry. (Zhou et al. 2008) argue that China's inefficient logistics operations would find it difficult to meet the demand of its growing market, unless the Chinese government makes more investment in this industry and multinational companies (MNCs) or LSPs develop relevant strategies to cope with the challenges.

2.3 BRIEF PROFILE OF LSPs IN THE CHINESE MARKET

Before 1978, the Chinese government implemented the central economic system with a three-tier distribution system established to control the flow of commodities (Luk 1998). Private business was largely banned while state-owned logistics providers only offered transportation and warehousing services, but rarely performed value-added and other logistics activities (Hong, Chin & Liu 2004). After 1978, the government started to reform the logistics sector and private businesses were encouraged to engage in some logistics activities (Hong, Chin & Liu 2007). Further, prior to China's entry to World Trade Organization (WTO) in 2001, foreign participation was regulated in most logistics sectors (Loo & Hong 2002).

Based on the report of Mercer Management Consulting (2002) and China Federation of Logistics and Purchasing Commission (2002), LSPs in China can be segmented into four major groups: traditional state-owned transportation and warehousing companies; logistics companies that evolved from big state-owned companies' in-house logistics departments; private-owned Chinese logistics companies; and foreign-owned or international logistics companies (*Logistics & Distribution Industry Report* 2004). Zhang (2004), however, argues that, by ownership status, there are only three groups, since logistics companies that evolved from big state-own companies' in-house logistics department are essentially part of state-owned logistics companies. Hong and Liu (2007) concur with this classification. Further, based on the research of Lai et al. (2008) and Wang et al. (2006b), joint venture companies constitute another

group. This study classified LSPs into four groups: state-owned logistics firms, private-owned logistics firms, foreign-owned logistics firms and joint-venture companies formed by foreign and domestic firms.

2.3.1 State-owned Logistics Firms

Since 1978, the Chinese government has been embarking on a series of reform activities to establish a new logistics system, in which enterprises under all forms of ownership – state, collective, and private – are allowed equal footing to engage in logistics activities, and manufacturers are given a greater degree of autonomy to appoint logistics providers (Luk 1998). The large state-owned logistics enterprises, such as the China Ocean Shipping Company (COSCO), Sinotrans and China Post, have large scale operations. For example, the COSCO Group, China's No. 1 and world's No. 2 ocean shipping company, owns and controls over 800 modern merchant vessels with a total 56 million tons and an annual carrying capacity of 400 million tons (*COSCO Sustainable Development Report 2009*). COSCO Group's shipping lines cover over 1,600 ports in more than 160 countries and regions worldwide. Even by international standards, COSCO Group is strong in logistics facilities and resources. It operates more than 4,000 logistics vehicles, including large transport vehicles with 289 axes and with carrying capacity of 8000 tons, 2.49 million square meters of storage ground and 2.97 million square meters of warehouse (*COSCO Sustainable Development Report* 2009).

Sinotrans has become the second largest shipping company by merging, in 2008, with China Changjiang National Shipping, the largest river-shipping operator in China (Dibenedetto 2008). It is also the largest express delivery provider in China. Currently, Sinotrans has joint-venture operations with UPS and DHL. In December 2004, Sintotrans signed a USD 100 million agreement with UPS to strengthen its international express operation in the 23 biggest cities in China. It is reported that its revenue rose from USD 2.1 billion in 2003 to USD 2.7 billion in 2004. Sinotrans' net profit increased from USD 85.3 million in 2003 to USD 96.9 million in 2004, up by 14 percent after the establishment of the joint-venture operation with UPS (Anonymous 2005).

China Post is also one of world's largest companies and a vital economic spine for rural Chinese, with 70,000 postal branches and 36,000 savings outlets in China. This large enterprise is supported by the Chinese Government. For example, a new postal law was imposed to support

the creaking old monopoly and block SMEs and foreign firms from entering the domestic documentary-delivery market in April 2009 (Anonymous 2009a).

In sum, state-owned LSPs are characterized as strong in transport and warehousing assets with extensive geographical coverage, and typically maintain good relationships with central and provincial governments (Huang & Kadar 2002). However, other than the very big State-owned enterprises, like COSCO, Sinotrans and China Post, Huang and Kadar (2002) argue that most large state-owned LSPs tend to be overstaffed, lack customer orientation, and provide comparatively lower service levels than private-owned Chinese LSPs, though many have either commenced or been restructured to improve their operational efficiency and service capabilities.

2.3.2 Private-owned Logistics Firms

Since the logistics reform in the 1980s, private-owned LSPs in China started to engage in logistics activities (Hong, Chin & Liu 2007; Luk 1998). Based on a survey conducted by China Logistics and Purchasing in 2006 (Anonymous 2007), 70 percent of responding private firms were established after the mid 1990s. Only 4 percent of responding firms were established before 1990. The sales revenue of these private-owned firms grew by 30 percent annually between 1994 and 2005. Fourteen private-owned firms were among the top 50 performing logistics firms in terms of sales revenue in China in 2006 (Anonymous 2007).

China's entry into WTO created tremendous opportunities for LSPs to develop their business in the Chinese market. The knowledge of private-owned LSPs, especially their L&SC management skills and service quality, improved substantially through collaboration with large international firms. Compared with state-owned companies, private-owned LSPs are more customer-oriented and capable of providing value-added services (Anonymous 2009a; Hong & Liu 2007). These companies are characterized as light in fixed assets, with limited financial support from the Chinese government (Huang & Kadar 2002), and clustered in the coastal areas (Hong, Chin & Liu 2007). Duan (2006) argues that many of these private firms rarely provide customers with integrated logistics services because of the limited resources they could draw to support such complex operations. However, some private LSPs have transited from 'light-asset type' to 'fixed-asset type' and their operations have reached certain economic scale after more than ten years of capital accumulation and intensive investment in ICT and other physical

resources (Duan 2006). The survey conducted by China Logistics and Purchasing in 2006 (Anonymous 2007) reveals that responding firms from private-owned LSPs with total assets above RMB 2 billion account for 51.9 percent. Further, 48.1 percent of the responding private-owned logistics firms operated in more than 30 service areas. However, the scale of operation of many private-owned LSPs remains small, with 29.6 percent reporting total assets of less than RMB 50 million (Anonymous 2007).

2.3.3 Foreign-owned Logistics Firms and Joint-ventures

Foreign direct investment (FDI) has increased rapidly since China started its economic reforms and established an open-door policy in 1978. However, foreign investment in the logistics and transportation sectors was banned until the late 1980s (Li & Vellenga 1993). Since then, the development of the logistics sector has drawn much attention from the Chinese government. Logistics has been recognized as an important driver of the Chinese economy. In 1988, the Government allowed Sealand and American President Lines shipping companies to open subsidiary companies or set up joint ventures with Chinese firms for shipping-related businesses, such as cargo booking, order processing and freight-bill collection (James 1991). The less restrictive regulatory framework was applied to the entire transportation and logistics industries in 1992. Foreign firms were then allowed to enter into equity or set up joint venture operations in rail, trucking, warehousing and terminal operations. Foreign shipping companies were also permitted to operate wholly foreign-owned companies or joint venture corporations with Chinese carriers to engage in inland water transportation and related business, such as freight forwarding, in early 1990s (Shao 1992).

Many large international LSPs, such as APL, Maersk, CEVA, UPS, have since commenced operations in the Chinese market. For example, UPS started to operate in China in 1988, by partnering with Chinese state-owned Sinotrans (Jiang 2002). In April 2001, UPS became the first US cargo carrier to operate independently in China. Maersk, another large shipping company, bought 25 vessels ($750 million) and more than 10 percent of its 700,000 containers from China (Jiang 2002).

Following a consecutive strong growth in 1990s and with China’s entry into the WTO in late 2001, international LSPs have been actively expanding their market in China in the last decade, through either investing in new facilities or building strategic alliances with Chinese players

(Hannon 2009). The 'big four' international LSPs - DHL, UPS, FedEx and CEVA – have dominated the international express business in China, actively expanding their businesses from coastal cities to the inland (Leach 2010). Quoting a study by Booz Allen Hamilton, Smith (2009) reports that in 2009, DHL claimed 30 to 34 percent growth; FedEx, 19 to 21 percent; UPS, 18 to 20 percent; and CEVA, 7 to 8 percent, while China Post Express Mail Services' (EMS) market share shrunk to around 20 percent. TNT also launched a direct scheduled 747 service between Chongqing, a fast-growing high-tech manufacturing center in Western China, and Europe, through CEVA's Liege hub (Leach 2010). FedEx and UPS established new hubs in southern China's Guangdong province in 2007. FedEx introduced its hub-and-spoke system in China, operating out of its domestic hub at Hangzhou Xiaoshan International Airport. Since then, next morning delivery service has expanded from 19 cities to more than 40 cities, while second-day delivery has been available in more than 200 cities in China since 2007 (Biederman 2008).

Compared with domestic LSPs, large international LSPs have strong operational expertise, advanced ICT capabilities, and are capable of providing one-stop services to meet customers' global needs (Biederman 2008; Dolven 2002; Hannon 2009). However, they lack local knowledge (or on-the-land-capability) in China (Hayes 2006; Kadar & Huang 2002). These firms also lack local transport connectivity, and have limited social support infrastructure due to regulatory restrictions. They also lack relationships with local governments and are less capable of generating cost advantages, compared with domestic players (Barling 2005; Yee 2006).

Both international and domestic LSPs find partnering absolutely necessary to succeed in the rapidly changing and highly regulated Chinese logistics market (Hayes 2006; Huang & Kadar 2002; Razzaque & Sheng 1998). Not surprisingly, most foreign firms prefer to establish joint venture entities when entering the Chinese market (Hayes 2006). For example, DHL, the first foreign express courier company to enter the Chinese market, signed a joint venture agreement with Sinotrans to form DHL–Sinotrans International Air Courier Ltd in 1986. DHL-Sinotrans was mainland's leading express delivery company, covering 40 percent of China's air express market in the early 2000s (Hayes 2006).

While some large state-owned logistics firms, such as COSCO Group and Sinotrans, continue to play a leading role in the Chinese logistics market, private-owned and foreign-owned LSPs have been actively expanding their businesses and service offerings in the Chinese market

(Anonymous 2007; Bangsberg 2005; Biederman 2007; Hannon 2009; Ward 2006). While State-owned logistics enterprises are strong in physical assets, private-owned Chinese LSPs and foreign LSPs are more customer oriented and are capable of providing value-added services (Hong & Liu 2007). While international LSPs have a strong grasp of modern L&SC concepts, they are being challenged by a high cost structure and they lack on-the ground capabilities, compared with domestic LSPs. In sum, each group of LSPs has its unique strengths and capabilities.

2.4 BARRIERS AND CHALLENGES FACED BY LSPS IN CHINA

A number of studies explored the barriers and challenges faced by foreign and domestic LSPs both from the perspectives of shippers and LSPs themselves (Carter, Pearson & Li 1997; Fung et al. 2005; Goh & Ling 2003; Hong, Chin & Liu 2004; Huang & Kadar 2002; Lai & Cheng 2007; Lu & Dinwoodie 2002). However, there are limited empirical findings on how these firms tackle those obstacles and improve their operational efficiency in the Chinese market. For example, Fung et al. (2005) argue that market fragmentation coupled with local protectionism is a major barrier to the involvement of foreign logistics companies, particularly in the air cargo industry, one of fastest growing sectors in the logistics service industry. These barriers range from domestic regulations, guidelines, institutions, and administrative mechanisms to infrastructure and policy constraints. Hong, Chin and Liu (2004) argue that the most serious problem influencing the development of logistics outsourcing in China is the lack of awareness of logistics concepts and inadequate multimode capabilities, underdeveloped information networks, and lack of quality logistics managers. Hong and Liu (2007) found institutional constraints and an undeveloped market mechanism as the top barriers to logistics development in China. Other constraints include cultural differences and legislation and law enforcement (Goh & Ling 2003; Langley 2007). Goh and Ling (2003) contend that Chinese government should put in place appropriate policies and regulations to facilitate a truly seamless flow of goods and information across provincial and city boundaries.

Biederman (2010) argues that China's lack of an integrated inter-modal system is still a significant challenge for raising the efficiency of the national logistics systems. Lau and Zhang (2006) indicate that some LSPs in China are unable to provide effective transportation networks, lack qualified staff and ICT support capabilities. Carter et al. (1997) identified logistics barriers U.S. firms had encountered in China from the perspective of shippers based on a survey of 800

US firms with business operations in China. They identified 37 barriers in six functional areas: purchasing, transportation services, order processing, warehousing, inventory control, and logistics services. The two most serious barriers found were undependable local carriers and non-responsive local suppliers. Other barriers in logistics services were shortage of 3PLs, complicated customs procedures, excessive customs clearing times, and lack of logistics consulting services.

Kerr (2005) pointed out ten challenges faced by the logistics service industry in China: poor infrastructure, entrenched regulation, persistent bureaucracy and deep culture, lack of logistics talent, outdated ICT infrastructure, undeveloped domestic industry, high transport costs, antiquated warehousing, socio-economic imbalances between regions, and high domestic trade barriers. Some challenges in terms of logistics infrastructure are being overcome due to the Chinese government's heavy investment in logistics infrastructure. For example, fixed assets investment in the rail sector reached RMB 252.1 billion in 2007, representing a growth of 20.7 percent from 2006 to 2007 (*China Logistics Industry Report* 2009 - 2010). However, the logistics infrastructure problems in China are expected to continue to escalate in the near future, due to rapid development in a range of manufacturing industries: auto, steel, medicine, and coal (*China Logistics Industry Report* 2009 - 2010).

A number of studies (see e.g., Huang & Kadar 2002; Trunick 2004; Walton 2004; Lieb 2008) have also examined issues foreign LSPs faced when they attempted to expand their market in China. For instance, Mercer Management Consulting (2002) conducted a survey and found that the challenges international LSPs have been facing in the Chinese market include: i) government restrictions, ii) finding qualified people, iii) regulatory issues, iv) client rigidity, and v) incompatible culture. Walton (2004) also identified a host of external factors that hinder foreign participation in the logistics sector. These include: China's lack of infrastructure (both physically and regulatory); ministerial infighting which prevents railway, aviation, customs, communications and transport authorities from creating a comprehensive unified regulatory process for companies that want to provide fully integrated, nationwide logistics service; and local protectionism of inland transport. To a certain extent, domestic LSPs also face similar challenges in various degrees (Kadar & Huang 2002)

The majority of studies on LSPs in China focus on the external issues, such as logistics barriers and challenges, discussed in this section. Internal issues, such as how LSPs develop their

BP&SOPs and how they attract logistics talent, have not been adequately documented. This research focuses on exploring the internal issues, which directly influence service competencies and indirectly affect service performance of LSPs in China.

2.5 INTERNAL ISSUES OF LSPs IN CHINA

The internal issues that LSPs face are limited service offering, lack of specialized logistics expertise, technological and cultural factors.

2.5.1 Service Offerings

In contrast with LSPs in developed countries, the service quality of Chinese LSPs is comparatively low, both in terms of the technologies used and the range of operations offered (Wang, Lai & Zhao 2008). Lack of sophisticated value-added logistics services is one of the key factors hindering sales generation and operational efficiency of Chinese LSPs (Hong, Chin & Liu 2007; Wang, Lai & Zhao 2008; Zhou et al. 2008). Partly, this is because majority of Chinese LSPs pursue cost leadership, limiting their services to a narrow range of low end activities, such as warehousing and transportation (Hong, Chin & Liu 2007; Su, Shi & Lai 2008; Wang et al. 2008; Wang, Qiang et al. 2006; Yeung et al. 2006; Zhou et al. 2008).

Yeung et al. (2006) found LSPs that differentiate their products and services tend to show higher average financial performance compared to companies that rely solely on cost advantage. Pure cost companies put emphasis on increasing their ability to deliver orders on time, increasing operational efficiency, while keeping prices competitive (Yeung et al. 2006). On the other hand, LSPs pursing a differentiation strategy typically provide products or services to suit customer requirements (Wang et al. 2008). Hong, China and Liu (2007) suggest that since China's entry into WTO, the opportunities for local logistics firms to improve themselves to meet higher-level operation standards have increased substantially. Despite that, seven out of ten LSPs investigated by Zhou et al. (2008) experienced declining efficiency during the period 2001 to 2003. Zhou et al. (2008) reason that the declining efficiency was due to a sharp fall in domestic transportation activities during the outbreak of severe acute respiratory syndrome (SARS) in 2003 and the slow adaptation of state-owned LSPs into a market-oriented economy.

2.5.2 Logistics Expertise

Recent research in SCM in China indicates that lack of logistics professionals has become an issue that can no longer be ignored (Bolton & Wei 2003; Kam, Tsahuridu & Ding 2010; Kerr 2005; Zhou et al. 2008). A survey conducted in 2002 by the Logistics Institute-Asia Pacific in Singapore in association with the Logistics Institute of the Georgia Institute of Technology indicates that both international and domestic LSPs have identified lack of talent as one of the key challenges when operating in China (Bolton & Wei 2003). Hong, Chin and Liu (2004) also found that shortage of logistics management expertise, coupled with inefficient information support systems, are important hurdles to supply chain development in China. The lack of qualified logistics personnel is expected to continue to worsen in mainland China, due to the rapid growth of the logistics service industry (Wang et al. 2006c). By contrast, LSPs in Hong Kong do not consider lack of qualified personnel to be a major issue that could affect the future of the logistics industry on the island (Yeung et al. 2006). This, rather obviously, is a reflection of the greater availability of skilled local and expatriate labor in Hong Kong, compared with the tight supply situation of skilled human power in mainland China.

Richard Armstrong, President of Armstrong and Associates (a supply chain market research and consulting firm), comments that whether a company is able to undertake any logistics project in China still depends on the strength of its contacts within the Chinese bureaucracy (Kerr 2005). This characteristic of the Chinese context increases the market value of logistics professionals with a deep understanding of the local culture. Furthermore, training remains a "black hole" in logistics in China. Kerr (2005) argues that there is little practical training in ICT skills or warehouse management in the logistics industry in China, let alone development of competencies at a strategic level. Zhou et al. (2008) further comment that building a critical mass of expertise in L&SC management is a major challenge for Chinese LSPs and explain that the short-term solution to this problem is usually partnering with a foreign-based LSP by establishing joint ventures.

2.5.3 Technological Factors

Technological factors, such as ICT, influence the service competencies of LSPs in China (Lai et al. 2008; Lin 2007). ICT and technological innovation have been found to positively impact on L&SC competencies of LSPs in China (Lai et al. 2006; Lai et al. 2008; Lin 2007; Lin & Ho

2009). Lai et al. (2006), in their survey of LSPs in China, found that ICT could significantly influence LSP's competitive advantage and the effects are nonlinear. LSP managers can expect competitive advantages from their ICT investments when ICT is deployed for higher end services at a higher usage rate. Lai et al. (2006) also found that it is essential for a firm to integrate ICT, align ICT strategy with business strategy, obtain ICT related management skills in order to achieve ICT competency. Lai et al. (2008) show that technology orientation has a significant impact on resource commitment to ICT and managerial involvement in developing ICT capability among LSPs in China. They also indicate that superior ICT capability helps reduce costs, improve innovative and customized services and service quality.

Lin and Ho (2009) investigate the factors influencing the adoption of radio frequency identification (RFID) technology in China's logistics service industry and relationship between supply chain performance and the adoption of RFID technology. Their research results reveal that the application of RFID technology in China's logistics service industry is still in the beginning phase, despite evidence that both financial and non-financial supply chain performance is positively associated with the willingness to adopt RFID technology. They found that LSPs with a stronger attitude toward adopting innovative logistics technologies will attain better supply chain performance.

Wang, Lai and Zhao (2008) also found that ICT could significantly improve LSP's financial performance, and senior management's involvement in ICT and business strategy planning is vital for ICT implementation. A survey conducted by Su, Shi and Lai (2008) reported that 39 percent of LSPs in China have established ICT systems. Most of the ICT systems adopted, however, are focused on some static and isolated functions, while more advanced ICT technologies, such as global positioning systems (GPS) and RFID have not been widely adopted by many in the logistics service industry.

Innovation is a key factor that will enable LSPs to improve their performance in China (Lin 2007; Lin & Ho 2007, 2009). Lin (2007) found that innovation in logistics technologies is dependent on organizational encouragement, quality of human resources, environmental uncertainty, and governmental support for LSPs. Lin and Ho (2007) also contend that the adoption of technological innovations is significantly influenced by technological, organizational and environmental factors, and adopting innovative technologies will increase supply chain performance for LSPs in China.

2.5.4 Cultural Factors

As discussed in Section 2.2, monopolistic regulations and local protectionism are one of distinctive characteristics of the Chinese logistics industry. Government policies and regulations on economic activities not only present an operational hindrance to LSPs, especially foreign LSPs, to operate but also increase the risks for LSPs to develop their business. Regional protectionism adds further to the political and legal barriers that debilitate the logistics service industry (Jiang & Prater 2002). Connection with government and provincial officials, therefore, has become an indispensable resource for conducting business in China. In the Confucius-based culture, *Guanxi* is an unwritten social rule and is far more pervasive than economic or legal regulations. The ability to leverage and utilize *Guanxi* determines the range and levels of economic activities and management styles of Chinese firms (Wang & Mu 2006). Zhang and Nattavud (2010) contend that strong *Guanxi* networks can help western firms to overcome Chinese government regulations related to joint-venture and enable foreign firms to utilize partner's local market knowledge. Zhang and Nattavud (2010) further add that *Guanxi* should not be regarded as an obstacle to establishing business relationships across cultures but be viewed as a tool to facilitate relationship building.

Foreign LSPs found that establishing joint-ventures with domestic players is a necessity to operate in the Chinese market, as local partners can provide strategic assets (vehicles and warehouse), customer bases, local operational knowledge and expertise, and domestic distribution networks (Anonymous 2009a; Hayes 2006). Hong, Chin and Liu (2004) also note that using *Guanxi* to accumulate social capital and build strategic partnerships with domestic LSPs have already become a convenient way for international LSPs to secure a market share in China.

2.6 SUMMARY

This chapter reviewed the logistics service industry in China. It highlighted that the Chinese logistics market has three distinctive characteristics: an undeveloped, highly fragmented market, strong regulatory and local protectionism, and high logistics costs. In this highly competitive industry in China, there are four major groups of players: state-owned LSPs, private-owned firms, foreign LSPs, domestic and foreign joint-ventures L&SC operators. Each group of LSPs has its unique strengths and limitations in terms of assets, technological

know-how, and social capital. This chapter also examined the barriers and challenged faced by LSPs in China; the external issues, such as undeveloped logistics infrastructure, entrenched regulations, outdated ICT infrastructure, and undeveloped domestic industry, which LSPs need to operate within; and the internal issues covering service offerings, logistics expertise, and technological and cultural factors. Majority of local LSPs in China do not provide sophisticated high-end value-added services. Lack of logistics expertise is regarded as one of the contributing factors hindering the development of China's logistics service industry. Technological factors, such as ICT and innovation technology, have not been embraced by most LSPs in China, though they have been found to impact positively on L&SC competencies and performance. Cultural factors, such as *Guanxi* can serve as a tool for LSPs to overcome political and legal barriers in the market.

CHAPTER 3

DEVELOPMENT OF RESEARCH MODEL

3.1 INTRODUCTION

Focusing on the extent to which firm resources could contribute to performance and competitive advantage, this chapter examines the service competencies of LSPs in China from the RBV perspective. This chapter will first review research on LSPs from the external environmental and internal organizational contexts. Second, RBV and its application on L&SC capabilities, competencies, and firm performance will be discussed. Third, hypotheses will be formulated based on an extensive review of literature related to the topic. This will be followed by a discussion of the proposed research model which tests the relationships between two sets of independent variables, BP&SOPs and HRM practices, on three dependent L&SC competencies variables: *positioning*, *distribution support* and *agility*. The moderating effect of *Guanxi* and *ICT support* on the relationships between BP&SOPs and L&SC competencies will then be examined. The key components of the literature are presented in Figure 3.1.

3.2 RESEARCH ON LSPs

As providers of logistics services¸ LSPs perform a range of logistics functions on behalf of their clients (Coyle, Bardi & Langley 2003). The logistics activities LSPs typically engage in range from transport and warehousing functions to inventory management, information related activities (e.g., tracking and tracing) and other value-added services (Berglund et al. 1999; Bowersox & Closs 1996; Coyle, Bardi & Langley 2003; Lieb 1992). With logistics outsourcing on the rise, many LSPs have moved from providing an operational supporting role to becoming a strategic supply chain partner, providing sophisticated and value-added solutions to other supply chain partners (Jayaram & Tan 2010; Marasco 2008; Selviaridis & Spring 2007; Skjoett-Larsen T 2003). In addition, the scope of services LSPs offer have also expanded to include after-sales support, customer service, and reverse logistics (Marasco 2008).

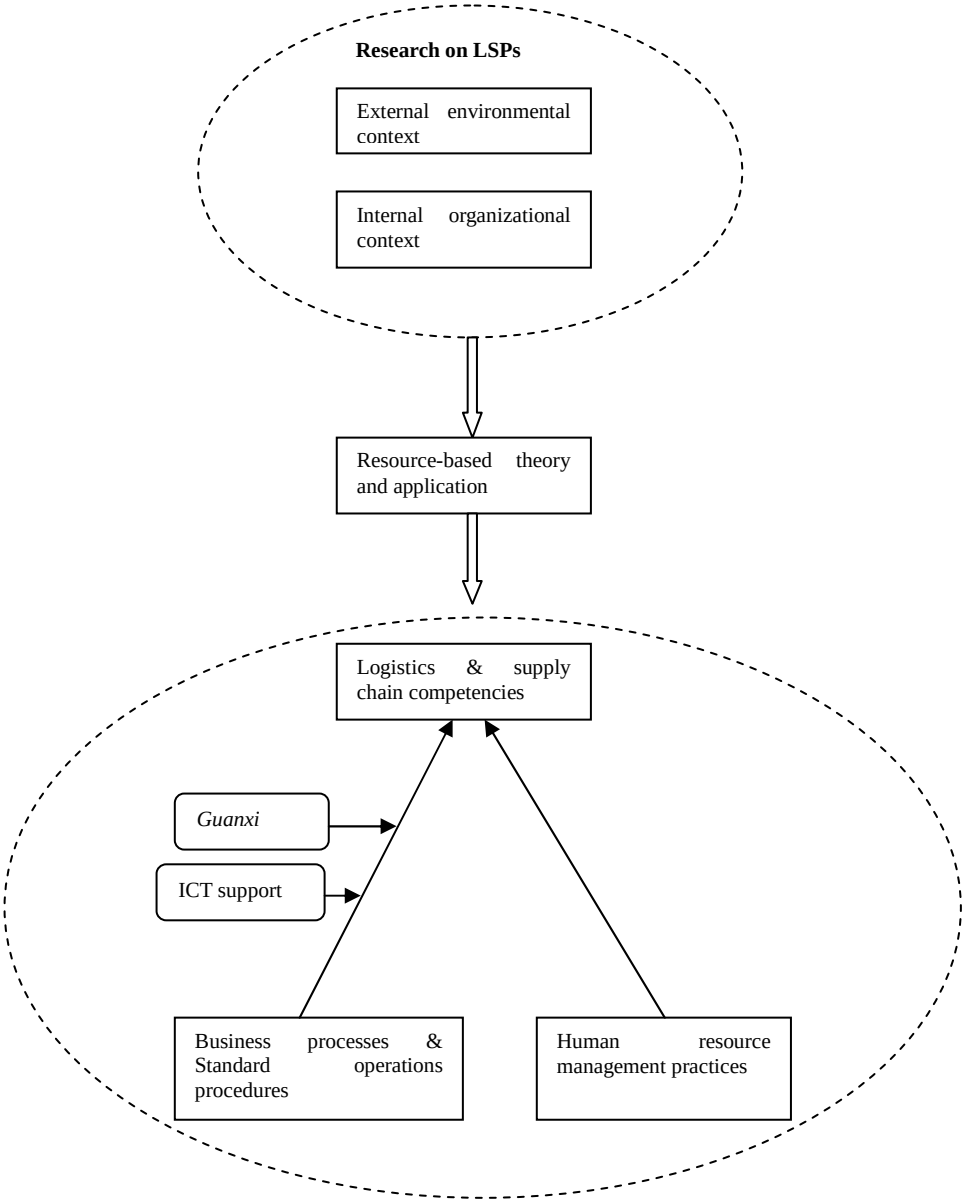

Figure 3.1: Mapping of the Literature Review

Broadly, LSPs can be segmented into two groups: operational specialists (or functional service providers) and integrated LSPs (Bowersox, Closs & Cooper 2002; Leahy, Murphy & Poist 1995; Wanke, Arkader & Hijjar 2007). The former offers specialized services, such as

transportation or warehousing, while the latter provides a larger array of logistics services that include all works necessary to service customers, from order entry to product delivery (Bowersox, Closs & Cooper 2002).

Despite the growing body of literature on LSPs, efforts to investigate how LSPs utilize resources to develop L&SC competencies have been limited (Lai, Ngai & Cheng 2004; Wong & Karia 2010; Yeung et al. 2006). Selviaridis and Spring (2007), in a comprehensive review of LSP literature, found that the majority of studies (67 percent) are conducted at the firm level, examining issues from either the shipper's or LSP's viewpoint. About a quarter of the studies (27 percent) reviewed are directed to examining different aspects of the relationships between LSPs and shippers (e.g. contracting). Very few studies (6 percent) exist at the network level (e.g. logistics triads). Selviaridis and Spring (2007) also argue that LSP studies are weakly theorized, with 69 percent of research papers having no theoretical foundation. Further development of the field requires greater emphasis on the development of theories, constructs and conceptual frameworks in order to build a conceptual foundation for subsequent empirical studies – a point echoing the earlier call by Skjoett-Larsen (2003), and Maloni and Carter (2006). This research aims to fill this gap by developing constructs and building a conceptual framework that explore the causal links between these constructs. The external and internal context-related issues impacting on LSP's performance will be discussed in the next section.

3.2.1 External Environmental Context

Yuen (2006) contends that the fast growth of LSPs in recent years is attributable to three factors: increased global competition, increasing popularity of just-in-time practices, and emerging technology. Lau and Zhang (2006) argue that the key drivers for companies engaging LSPs can be classified into three categories: economic factors, strategic factors and environmental factors. Economic factors include cost saving and capital investment reduction. Strategic factors include acceleration of business, and re-engineering processes focusing on core competencies, and flexibility enhancement. Environmental factors include ICT development, globalization, and capabilities of suppliers. Sheffi (1990) also contends that increased global competition, deregulation of the transportation industry, rising customer expectations on superior logistical services, growing focus of companies on core competencies, increasing popularity of just-in-time practices, and revolution in ICT constitute the main forces driving the fast growth of LSPs. Lewis and Talalayevsky (2000) also note that advancement in ICT has implications for

LSP development. They observe that rapid progress in ICT supports the outsourcing of logistics activities to LSPs, as ICT allows buyers and sellers of logistics services to communicate directly over data rich, easy-to-reach information channels, thereby reducing coordination costs and fostering strategic partnerships based on mutually agreed goals.

Some studies (e.g., Daugherty, Stank & Droge 1996; Rao & Young 1994) examine how organizational characteristics and strategies of users of logistics services are related to outsourcing decision. Rao and Young (1994) identified three main characteristics of shippers' business profile that drive their outsourcing decisions: (a) network complexity, i.e., geographic dispersion of the firms' trading partners; (b) process complexity, i.e., time and task compression in the logistics process; and (c) product complexity, i.e., special circumstances required by products and materials due to the complexity of the environment (e.g. temperature, and humidity) governing their transportation, storage and handling. Daugherty, Stank and Droge (1996) link the logistics outsourcing decision with shipper's organizational structure. According to Daugherty et al. (1996), organizations that have decentralized "line activities" at the business unit level outsource more in comparison to shippers that organize their activities centrally.

These studies suggest that the external market, regulatory, and legislative environments all play a role in influencing an organization's decision to outsource its logistics services, which are typically considered as non-core activities. The level of activities outsourced, however, is also dependent on the organizational characteristics and business strategies of the logistics service users.

3.2.2 Internal Organizational Context

Rapid expansion and transformation of the logistics service industry worldwide in recent years has led to a proliferation of studies on LSPs. Among them, many have directed their focus to examining how LSPs develop relevant strategies to increase capabilities and competencies (see for example Hertz & Alfredsson 2003; Lai, Ngai & Cheng 2004; Sum & Teo 1999; Wong & Karia 2010; Yeung 2006). For instance, Sum and Teo (1999) found that LSPs adopting a combination of cost and differentiation strategies consistently exhibit stronger performance than those embracing either a pure cost or pure differentiation strategy. Yeung et al. (2006) also revealed that LSPs adopting a differentiation strategy are able to obtain higher than average

financial performance compared to companies that rely solely on pure cost strategies. Carbone and Stone (2005), who examined the strategic behaviors adopted by 20 leading European LSPs, found that mergers and acquisition were the most important strategy used by these logistics firms. LSPs formed as a result of merger and acquisition tended to outperform their competitors. Carbone and Stone (2005) reason that merger and acquisition are an effective way for LSPs to access the resources and assets that they cannot accumulate on their own in a short term. Resources are the key for LSPs to compete in some particular markets. Hertz and Alfredsson (2003), however, suggest that well-performing LSPs are generally able to keep a balance between developing a range of problem-solving skills and increasing their customer adaptation capabilities.

From a survey on LSPs' capabilities from the purchasers' perspective, Daugherty, Stank and Rogers (1996) identified four major differences between high and low performing LSPs: making an effort to help in emergencies, handling change well, flexible in response to requests, and capability of providing emergency services. Lai, Ngai and Cheng (2004) found that there are four types of LSPs from the RBV point of view. Each type of LSPs exhibits different service capabilities and shows different service performance. Their research reveals that full service providers outperform the other three types of LSPs (i.e., traditional freight forwarders, transformers, and niches). Also drawing from the RBV perspective, Wong and Karia (2010) found that resource structuring and bundling are two processes that lead to competitive advantage. Other than being more effective in these two processes, most successful LSPs also put more emphasis on building up information, relational and knowledge resources.

In sum, studies that examine how LSPs develop relevant strategies to gain competitive advantages have found that high performing LSPs are typically more able to differentiate their service offerings from competitors, more able to leverage on partners' resources by forming mergers and acquisitions, more able to integrate, bundle and structure information and knowledge resources in flexible ways to solve complex problems for clients, and more capable to adapt to changes and provide emergency services. The processes by which LSPs have in place to achieve such capabilities, however, have largely not been explored. This research will address this gap in the literature.

3.3 RESOURCE-BASED THEORY AND APPLICATION

RBV prescribes that resources are the main drivers of performance (Barney 1991; Dierickx & Cool 1989; Grant 1991; Wernerfelt 1984). RBV of firms (Barney 1991, 2001; Wernerfelt 1984) contends that resources and capabilities that cannot be imitated are key sources of sustainable competitive advantage (Hoskisson et al. 1999; Oliver 1997; Prahalad & Hamel 1990).

According to RBV, firms are bundles of resources (Wernerfelt 1984). Firm resources include all input that allows the firm to work and implement its strategies (Olavarrieta 1996) and they can be tangible or intangible (Hall 1992). Firm resources may include "assets, capabilities, organizational processes, firm attributes, information and knowledge controlled by a firm" (Barney 1991, p. 101). Wernerfelt (1984, p. 172) defines firm resources as "those (tangible and intangible) assets tied semi-permanently to firms, such as brand names, in-house knowledge of technology, employment of skilled personnel, trade contracts, machinery, efficient procedure, and capital". Barney (1991) categorized firm resources into three groups: (1) physical capital resources (e.g. property, plant, equipment, and other physical technology), (2) human capital resource (e.g. know-how, insight, judgment, and experience of employees), and (3) organizational resources (e.g. organizational culture, organizational systems, intellectual property rights and other intangible resources).

RBV posits that a firm's capabilities are developed from its resources (Barney 1991; Wernerfelt 1984). Capabilities are complex bundles of individual skills, assets and accumulated knowledge exercised through organizational processes, which enable firms to coordinate activities utilizing available resources (Amit & Schoemaker 1993; Day 1994). Capabilities, from the RBV perspective, refer to the ability to harness the firm's resources through the skills of staff members or departments, through departmental interactions and organizational routines to achieve improved efficiency and effectiveness (Grant 1991). They denote a firm's ability to build business processes and operational routines to exploit its resources, bringing them "to bear on particular value-added tasks, such as JIT production" (Hart 1995, pp. 988-9). Compared to resources, capabilities are generally more complex, firm specific and poorly understood by competitors (i.e. low tacitness) (Reed & Defillippi 1990). The building of capabilities relies on accumulated skills, experiences through repeated practices, and frequent interactions. They are more difficult to substitute or imitated by competitors and have a greater

likelihood in assisting organizations to achieve sustainable competitive advantage (Collis 1994).

While resources are the building blocks of capabilities, Barney (1991) argues that not all firm resources are advantage-generating resources. Advantage-generating resources are firm-specific and should be: *valuable, scarce, imperfectly imitable and non-substitutable* (Barney 1991; Madhok & Tallman 1998; Reed & Defillippi 1990). Advantage-generating resources often come together as a bundle. They enable firms to generate rent, leverage market opportunities, neutralizing competitors' threats and increasing operational effectiveness (Barney 1991).

In short, RBV contends that a firm can build sustainable competitive advantage by strategically leveraging on resources that are valuable, rare, hard to imitate, and hard to substitute (Fahy 2000). Having resources of advantage-generating qualities, however, does not necessarily and consequentially confer competitive advantage (Castania & Helfat 1991). On the other hand, resources that lack one or more of these characteristics can still lead to competitive advantage (Carmeli & Cohen 2001). The key lies in how resources are utilized to develop "causally ambiguous" and "socially complex" processes (organizational capabilities), making them difficult to be imitated or substituted (Teece, Pisano & Shuen 1987; Winter 1987).

A dominant theory in organization studies, RBV has been extensively used in strategic management literature for analyzing business performance from the perspective of resource endowments (Barney 1991, 2001; Bharadwaj 2000; Wernerfelt 1984). In recent years, the theory has also been increasingly adopted to examine the effects of L&SC capabilities on performance (Kim 2006; Lynch, Keller & Ozment 2000; Morash, Droge & Vickery 1996; Shang & Sun 2004). Since the primary objective of this study is to examine the effects of BP&SOPs that LSPs put in place to utilize their resources in generating L&SC competencies, the RBV is considered an appropriate conceptual frame for this research.

3.4 DEVELOPMENT OF RESEARCH MODEL

3.4.1 Logistics and Supply Chain (L&SC) Competencies

In this study, L&SC competencies are defined as core distinctive capabilities LSPs need to develop using tangible or intangible resources to outperform competitors to give them a unique advantage to create value. Core distinctive capabilities are capabilities developed through the use of intangible resources - skills, knowledge, technological know-how, and business processes (Prahalad & Hamel 1990; Teece, Pisano & Shuen 1987) – which are difficult for competitors to imitate or substitute. A noted example of distinctive capabilities is the Toyota Production System (Hart 1995). Dell's Make to Order supply chain is another example (Taylor 2004).

Studies related to L&SC capabilities and competencies emerged in the 1990s (MSUGLRT1995; Morash, Droge & Vickery. 1996; Lynch, Keller & Ozment; Zhao, Droge & Stank 2001; Shang & Sun 2004; Li & Lin 2006; Shang & Marlow 2007; Cho et al. 2008). Olavarrieta and Ellinger (1997) argue that L&SC competencies are valuable, scarce and difficult to be imitated. L&SC competencies are valuable because they can help organizations achieve cost minimization and value-added maximization advantages. These competencies are scarce and inimitable because they involve integrating firm-specific physical assets, organizational routines, employee skills and knowledge into the entire spectrum of business operations, including managing relationships between different parties in a supply chain. For example, Dell's supply chain system is famous for its ability to coordinate different parties efficiently in just-in-time assembly of customized computer orders. This enables Dell to enjoy a long-term cost advantage compared with its competitors (Taylor 2004).

L&SC competencies have been widely studied and measurement scales have been developed to link capabilities and competencies with competitive advantage and superior performance (Lynch, Keller & Ozment 2000; MSUGLRT1995; Morash, Droge & Vickery 1996; Shang & Sun 2004; Zhao, Droge & Stank 2001). The MSUGLRT (1995) was among the first to develop a model of four L&SC competencies using 17 logistics capabilities. The four critical areas of logistics competencies include *positioning*, the selection of a strategic and structural approach guiding logistical operations; *integration*, concerned with techniques used in achieving internal logistics operation excellence and development of external supply chain relationships; *agility*, a

measure of a firm's ability to determine and quickly respond to changing requirement; and *measurement,* the degree to which a firm monitors internal and external operations. Each competency was conceptualized as a combination of several functional capabilities. MSUGLRT (1995) argue that these four logistics competencies could be translated into marketing and financial leadership, benefiting customers, investors, shareholders and employees, to help firms achieve superior performance and sustained competitive advantage over competitors.

Stank and Lackey (1997) adopted MSUGLRT's (1995) model to investigate the impact of these four key logistics competencies on the performance of Mexican maquiladore firms. They found that capabilities related to integration and agility competencies are particularly important to logistics performance. Their findings reveal that benefits associated with developing logistics processes enhance supply chain integration, both internally and externally. The functional teams in these firms, such as purchasing, production, distribution and sales, developed business processes to readily share information with suppliers and customers. As a result, their service performance improvement was noticeably improved, as reflected in the reduction in order cycle and increase in on-time delivery. They were also able to determine customer needs and quickly responded to change in an extremely volatile market environment. The flexible processes in manufacturing, scheduling, distribution, and employee management designed to achieve flexibility enable those firms to outperform competitors.

Morash et al. (1996) identified eight logistics capabilities: five demand-oriented capabilities and three supply-oriented capabilities. The five demand-oriented capabilities were pre-sale and post-sale customer service, delivery speed, delivery reliability, and responsiveness to target market, all of which were directed to achieving operational excellence. The three supply-oriented capabilities were widespread distribution coverage, selective distribution coverage, and low-cost distribution, which jointly reflect the value of distribution logistics during the 1990s. Of the eight capabilities identified, Morash et al. (1996) found that four - delivery speed, reliability, responsiveness, and low cost distribution - were significantly related to firm performance.

Cho et al. (2008) expand the eight items identified by Morash et al. (1996) to 11 items to investigate the relationship between a firm's logistics capabilities, logistics outsourcing and its performance in an e-commerce market environment. Their results revealed that logistics

capabilities have a positive relationship with firm performance in the e-commerce market. However, logistics outsourcing and firm performance were not found to be positively linked. Further, the association between logistics capabilities and outsourcing was not supported. Cho et al.'s (2008) findings further reveal that firms that outsourced their logistics functions did not consider their logistics capability to be equal to their non-outsourcing competitors. Outsourcing firms actually performed poorly compared with non-outsourcing firms, considering gross and net profit margin. Cho et al. (2008) explain that firms using 3PLs mainly emphasize on core competencies, cost reduction, and flexibility.

Zhao, Droge and Stank (2001) tested a model of the relationships among customer-focused capabilities, information-focused capabilities, and firm performance. They found that customer-focused capabilities were significantly related to firm performance. However, information-focused capabilities were not directly related to firm performance, but played a crucial role in facilitating the creation of specific and difficult to imitate capabilities. Zhao et al.'s (2001) findings were supported by Shang and Sun (2004), who surveyed 1,200 manufacturing firms in Taiwan to investigate the relationship between L&SC competencies and firms' performance. Shang and Sun (2004) found that information-based capability was most critical, impacting on benchmarking, flexibility and logistics performance. Further, information-based capability also affects financial performance indirectly through logistics performance.

Bowersox, Closs and Stank (2002) conceptualize customer-focused capabilities as "customer integration". Customer integration is "the competency of building lasting distinctiveness with customers of choice" (Bowersox, Closs & Stank 2002 p. 42) and involves "the identification of the long-term requirements, expectations, and preferences of current and /or potential customers and market, and focusing on creating customer value" (Bowersox, Closs & Stank 2002 p. 31). Bowersox et al. (2002) argue that customer integration consists of four capabilities: segmental focus, relevancy, responsiveness, and flexibility. Segmental focus implies that firms should identify core customers and then meet or exceed expectation by providing value-added service. Relevancy requires firms to only satisfy existing customer needs. Responsiveness suggests an ability to accommodate unique and unplanned customer requirements. Lastly, flexibility refers to the ability to adapt to unexpected operational circumstances.

Shang and Marlow (2007) examined the effects of four logistics competencies - integration and knowledge; measurement; customer-focused logistics, and agility – on logistics performance and firm performance. They conceptualize integration and knowledge competencies to include roles and responsibilities for supply chain partners, ICT and information sharing. They view customer-focused competency as an exceptional capability to embed customer requirements into strategic planning, and agility competency as being able to meet rapidly changing, unplanned customer requirements, and to respond to unexpected circumstances. Measurement competency was defined as having an excellent measurement system to gauge costs and service quality to facilitate management decision making process, cross-function collaboration, and performance metrics benchmarking. Shang and Marlow (2007) found that logistics competencies were significantly related to logistics performance, but not significantly associated with financial performance. However, logistics performance was positively associated with financial performance.

3.4.2 L&SC Competencies of LSPs in China

In the context of China's logistics service industry, three L&SC competencies that LSPs need to develop are *positioning*, *distribution support*, and *agility* competency. The importance of these three competencies is discussed in the following sections.

3.4.2.1 Positioning competency

Positioning is a key competency that LSPs need to operate effectively and competitively in the Chinese logistics market. *Positioning* competency is defined as an exceptional ability to perform an extensive range of L&SC activities in innovative ways (e.g., adding complicated and higher value-added services to supplement logistics users' operations) dissimilar from competitors. MSUGLRT (1995) suggests that *positioning* competency is a differentiator that can lead to competitive advantage. *Positioning* helps improve service quality and adds sophisticated and higher value-added services to supplement logistics users' operations, while low profit margin has driven most LSPs in China to pursue cost leadership strategies instead of differentiation strategies. Wang et al. (2006) have found that LSPs practicing both differentiation and cost leadership strategies outperform companies that had adopted only differentiation strategies, while companies using differentiation strategy were more profitable than those which focused exclusively on cost leadership. Given the dynamics of the Chinese

logistics market, *positioning* competency, therefore, is an indispensable ingredient of differentiation strategies.

As indicated in Chapter 2, China lacks LSPs that can provide customers with innovative supply chain solutions, integrated logistics services or logistics expertise in a range of industries. Though high-end or value-added service, such as assembling and re-assembling, repacking and re-labeling, purchasing, cross-docking, order processing and logistics information system design, are desirable from the perspective of shippers (Hong, Chin & Liu 2007; Wang et al. 2008), majority of the LSPs in China only offer a narrow range of low-end services, such as freight forwarding and transportation (Hong, Chin & Liu 2007; Wang et al. 2008; Wang et al. 2006b; Yeung et al. 2006). The ability to provide customers with high-end integrated logistics services, indirectly, implies a capability to deal with a wider range of logistics issues, offering innovative solutions to tackle complex supply chain problems. This is evident from the success of most large foreign LSPs, which have gained competitive advantage by providing these value-added logistics services in China (Richardson 2004). These international LSPs possess strong capital, and technology resources with extensive operational experience. Many foreign LSPs such as DHL, FedEx, and UPS, have also been developing their on-the-ground capabilities in China, such as implementing physical logistics network, express logistics centers and strategic parts centers, to augment their *positioning* competency (Richardson 2004).

3.4.2.2 Distribution support

In the context of distribution logistics, having extensive spatial reach is a desirable feature for shippers (Qureshi, Dinesh & Pradeep 2008). With an economy that is spatially defined, gaining competitive advantage in freight transport in China implies an ability to effectively provide widespread or global distribution coverage at a competitive distribution cost (Kam & Rimmer 2011). It is, therefore, no surprise to find that recent research has repeated identified widespread distribution coverage is a key quality for LSPs to compete in the Chinese market (Cho, Ozment & Sink 2008; Hong, Chin & Liu 2007; Morash, Droge & Vickery 1996; Qureshi, Dinesh & Pradeep 2008). *Distribution support*, defined as the capability to provide widespread distribution coverage at a competitive price, is especially essential for LSPs aiming to provide customers with high-end services in China (Cho, Ozment & Sink 2008; Morash, Droge & Vickery 1996). *Distribution support*, therefore, is another key competency that LSPs operating in China need to develop.

Hong, Chin and Liu (2007) also acknowledge that geographical coverage is an important consideration for LSPs in China. When foreign LSPs seek strategic alliances in China, they not only target those with strong strategic assets (i.e., transport and warehousing facilities), but also those with extensive domestic network coverage (Bolton & Wei 2003; Fung et al. 2005). Biederman (2010) also contends that LSPs in China are moving from the non-asset model to provide more of their own dedicated distribution network, in order to overcome logistics barriers, such as local protectionism and regulatory hurdles, which prevail in the Chinese market. For example, Schneider Logistics acquired the operating assets of Bayun Logistics, one of the top 30 private logistics companies in China, in order to provide end-to-end intra-China freight services in 2007 (Biederman 2010). In the international express market, the importance of distribution support as L&SC competency is underscored by the growing market share of foreign firms, such as FedEx, DHL, UPS and CEVA, in China. According to (Kong 2006), the market share of China Post EMS in the international express mail delivery dropped from its height of 90% to 30% in 2006, while that of foreign LSPs rose to 70%.

3.4.2.3 Agility

Research on *agility* began in the 1990s (Goldman, Nagel & Preiss 1995; Yusuf, Sarhadi & Gunasekran 1999). *Agility* is considered as a multi-dimensional concept that involves a wide range of organizational aspects (Li, Goldsby & Holsapple 2009). The concept of *agility* has been represented as broadly as a total integration of business components (Kidd 1994) or as narrowly as the ability to accomplish rapid changeover from the assembly of one product to the assembly of different products (Quinn et al. 1997). *Agility* has also been defined as a measure of a firm's ability to determine, and quickly respond to, changing market requirements (Stank, T, P & Lackey 1997). *Agility* enables a firm to respond in a timely and effective manner to market volatility and other uncertainties, thereby allowing the firm to establish a superior competitive position (Swafford, Ghosh & Murthy 2006). *Agility*, which encompasses expedited delivery services, rapid response to customer needs, or flexible delivery schedule, is also a competitive advantage enabler for LSPs (Cho, Ozment & Sink 2008; MSUGLRT 1995; Shang & Marlow 2007; Stank & Lackey 1997). The ability to respond to change has been found to positively impact on firm performance (Bowersox et al. 1989). For example, forecasting, just-in-time, and quick response approaches have become standard logistics practices, and have been widely adopted by many firms.

MSUGLRT (1995) first empirically developed the conceptual dimensions of *agility* into measurement scales to encompass three dimensions: accommodation, flexibility, and relevancy. MSUGLRT's (1995) measurement scales were validated by Goldsby and Stank (2000), Shang and Sun (2004), and Shang and Marlow (2007). Stank and Lackey (1997) divided agility into two dimensions: operational and personal flexibility. Li et al. (2008) extend the notion to supply chain agility, as the capabilities of a firm's supply chain to be alert and responsive to changes at three levels: strategic, operational and episodic. Li et al. (2008) regard *agility* as consisting of six sub-dimensions: strategic alertness, strategic response capability, operational alertness, operational response capability, episodic alertness, and episodic response capability (Li, Goldsby & Holsapple 2008).

According to Li et al. (2008), operational alertness emphasizes the importance of sensing emerging market trends, listening to customers, monitoring real demand through daily point-of-sale data as a basis for identifying potential demand for new products. Operational response capability refers to the ability of a firm's supply chain to respond proactively and reactively to changes in supply and demand. Episodic alertness refers to supply chain's alertness to changes arising from internal or environmental conditions that affect particular task adjustments. Episodic response capability also include supply chain's ability to use existing or acquired resources to execute episodic tasks in a timely and flexible manner (Li, Goldsby & Holsapple 2009).

As discussed in Chapter 2, undeveloped market mechanism as one of top barriers to logistics development in China. Some internal issues that LSPs are limited service offering, lack of specialized logistics expertise, technological and cultural factors. *Agility* is expected to help LSPs in China to tackle the market volatility and other uncertainties they faced in the dynamic environment of Chinese logistics service industry.

3.4.3 Business Processes and Standard Operations Procedures (BP&SOPs)

Business processes are routinised operations or standard operations procedures that are socially complex, causally ambiguous, and woven into the fabrics of organizations. Stalk et al. (1992) argue that the building blocks of corporate strategy are not products and markets but business processes. Competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to customers. Ray, Barney and

Muhanna (2004) suggest that adoption of effective *business processes* enables the competitive potential of a firm's resources and capabilities to be realized. They also suggest that intangible and tangible resources must be bundled together to enable the execution of a particular *business process*. Porter (1991) argues that resources can only be a source of competitive advantage if they are used to conduct certain activities. Barney and Wright (1998) also suggest that a firm must organize its *business processes* efficiently and effectively in order to realize the full potential of its resources and assets.

Hammer and Champy (1993) define a process as a collection of activities that takes one or more kinds of inputs to create an output that is of value to customers. The combination of processes and resources (i.e. people, material, and capitalized items) creates services (Gibb, Buchanan & Shah 2006). Ould (1995) divides operational processes into three main categories: core processes (i.e., order management), support processes (i.e., financial management and procurement) and management processes (i.e. planning, organizing and overseeing the enterprise). Core processes of conventional logistics operations would include managing and operating transport and warehousing functions, or providing value-added supply chain services. Examples of these services include assembling, repackaging, and cross-docking (Berglund et al. 1999; Lai 2004; Murphy & Daley 2001). Core processes put in place to increase customer responsiveness constitute a competency that could assist LSPs to gain competitive advantage (Morash, Droge & Vickery 1996). For instance, some successful multinational LSPs, such as UPS and DHL, use web and PC-based track and trace or process automation to increase their operational responsiveness (Wong & Karia 2010).

In Javidan's (1998) resource to competitive advantage transformation chain, *business processes* could thus be interpreted as transformation agents, converting resources into capabilities, competencies and core competencies to competitive advantage. Competitive success thus depends on how a company succeeds in transforming its key resources into strategic capabilities and competencies that consistently provide superior value to customers. The argument is also supported by Ray, Barney and Muhanna (2004) who contend that the establishment of effective and efficient business processes helps a firm realize the competitive potential of its resources and capabilities.

For LSPs, core processes would include managing and operating the transportation and warehousing function, or providing value-added services, such as assembling, repackaging, and

cross-docking (Berglund et al. 1999; Lai 2004; Murphy & Daley 2001). Therefore, designing effective core *business processes* is essential for improving the service capabilities of LSPs. How LSPs design their *business processes* for benchmarking performance, increasing responsiveness and flexibility will be discussed in the following sections.

3.4.3.1 Processes for benchmarking performance (PBP)

Benchmarking performance is a critical step in process re-engineering and it is also crucial for achieving sustainable improvement in the long term (Bowersox & Closs 1996; Trkman 2009). Benchmarking originated from the Art of War (written by Sun Tzu, Chinese General, about 500 B.C.). Sun Tzu points out that one can win a hundred battles, if one knows one's own capabilities and those of enemies. Benchmarking is a means to compare a firm's capability against those of its competitors. It can be classified into three categories: internal benchmarking, competitive benchmarking, and non-restricted or cooperative benchmarking (Shang & Marlow 2005). Internal benchmarking is not confined to comparing the performance of internal departments in the same, but also different, regions. Competitive benchmarking is defined as comparing performance with industry standards or those of competitors (Claycomb, Droge & Germain 1999). Non-restricted or co-operative benchmarking means comparing an organization with other firms in different industries, representing the top-in-class firms for particular aspects of the selected business operations (Bagchi 1996).

Recent research (Bowersox & Closs 1996; Langley, Cap & Yong 2003; Trkman 2009) identified performance measurement as one of the top three areas of logistics research needs. A performance measurement system enables a firm to monitor its internal and external operations (Novck, Rinehart & Langley 1994). Holmberg (2000) states that a performance measurement system plays an important role in managing the business because it offers the information necessary for decision making and actions. Measurement is not solely a L&SC problem, but is particularly critical when considering cross-functional or inter-organizational requirements. Keebler et al. (1999) indicate that an excellent measurement system should produce three primary benefits: reduced costs, improved service, and the generation of healthy growth. New processes must be measured for time, cost, productivity, quality, and capital, then compared with the processes they replaced (Guha et al. 1993). All processes should be benchmarked at critical steps in the processes to meet customer requirement, prevent errors, improve cycle time and increase productivity. Periodic performance evaluation enables LSPs to identify their

service gaps. An effective operational performance is reflected by measures, such as delivery performance, performance-monitoring capability, and statistical data reporting to users. Some key performance indicators (KPI), such as logistics cost reduction, on-time shipments or even customer complaints, are among the most important performance measures in logistics outsourcing (Langley, Cap & Yong 2003).

Empirical research has demonstrated that benchmarking capability is positively related to logistics competencies (MSUGLRT 1995; Stank & Lackey 1997; Shang & Sun 2004; Shang & Marlow 2004; Shang & Sun 2007). Firms with excellent business processes and operations procedures to measure costs and service quality can facilitate decision making process, promote coordination across different functions, and, therefore, enhance logistics competencies (MSUGLRT 1995; Shang & Marlow 2004). *Processes for benchmarking performance* (*PBP*) achieved using an effective measurement systems have been found to be positively associated with performance (Stank & Lackey 1997).

3.4.3.2 Processes for increasing responsiveness (PIR)

Chopra and Meindl (2006) suggest that the key issue for a firm in SCM is to maintain a balance between efficiency and responsiveness for its portfolio of products, customer segments and supply sources. *Responsiveness* refers to a firm's accommodation of unique and unexpected customer requirements (Zhao, Droge & Stank 2001). *Responsiveness* means that a firm can immediately handle or anticipate operational changes and volatile customer demand. The need to respond quickly to a request from supply chain partners has caused many firms to re-think standard management practices. The ability to respond to emergent conditions may generate greater performance payoffs than static planning which depends upon problematic long-range forecasting (Stank & Lackey 1997). As a result, initiatives developed to improve responsiveness, such as just-in-time, quick response, and efficient customer response, have been found to increase customer loyalty and price that customers are willing to pay for services (Bowersox et al. 1989).

Responsiveness has been identified as one of the key capabilities positively related to firm performance (Cho, Ozment & Sink 2008; Morash, Droge & Vickery 1996). Zhao, Droge and Stank (2001) contend that *responsiveness* is a customer-focused capability which drives firm performance. Morash, Droge and Vickery (1996) found that responsiveness to target market

together with delivery speed, reliability, and low cost distribution are positively linked to a firm's performance. Therefore, it is expected that LSPs in China with business processes and operation procedures to respond to emergent situations, referred to as *processes for increasing responsiveness* (*PIR*), would have stronger L&SC competencies than those without these processes.

3.4.3.3 Processes for increasing flexibility (PIF)

Flexibility in operation and delivery is one of the most sought-after capabilities of LSPs (Stank, Daugherty & Ellinger 1998). *Flexibility* emphasizes the ability to adapt to unexpected circumstances (MSUGLRT 1995). Increased environmental uncertainty engenders the need for flexibility to adaptively respond to unpredictable environmental changes. In a dynamic market environment, operational flexibility is not just a customer attractor but also a strong predictor of performance (Anand & Ward 2004). In SCM, a pull-based logistics system is a key source of flexibility, as pull processes refer to reactive or response-based processes reacting to customer demands. By contrast, push processes refer to anticipation-based processes as they respond to speculated (or forecasted), rather than actual, demand (Chopra & Meindl 2006).

LSPs typically regard service flexibility as an important ingredient for fostering ambitious plans of meeting customers' fast changing needs in real time. Expectedly, LSPs which are capable of providing customers with *processes for increasing flexibility* (*PIF*) in a constantly evolving market place would have a competitive edge over those less able to do so (Qureshi, Dinesh & Pradeep 2008). Stank and Lackey (1997) have demonstrated that high levels of operational flexibility demonstrated significantly positively impact on logistics firms' performance. Outside of China, *flexibility* has proven to be a key element leading to agility in L&SC competencies (MSULRT1995; Shang & Marlow 2007; Stank & Lackey 1997; Zhao, Droge & Stank 2001).In China, the capability to develop relevant business processes to tackle regulatory barriers and operational challenges is part of integrated flexibility competencies and expected to give LSPs an edge in service performance.

Based on the above discussion, effective business processes for benchmarking performance, increasing responsiveness and flexibility are expected to contribute positively to L&SC competencies. Accordingly, the following hypotheses are formulated:

H1a: *PBP* has a positive effect on the *positioning* competency of LSPs in China.

H1b: *PIR* has a positive effect on the *positioning* competency of LSPs in China.

H1c: *PIF* has a positive effect on the *positioning* competency of LSPs in China.

H2a: *PBP* has a positive effect on the *distribution support* competency of LSPs in China.

H2b: *PIR* has a positive effect on the *distribution support* competency of LSPs in China.

H2c: *PIF* has a positive effect on the *distribution support* competency of LSPs in China

H3a: *PBP* has a positive effect on the *agility* competency of LSPs in China.

H3b: *PIR* has a positive effect on the *agility* competency of LSPs in China.

H3c: *PIF* has a positive effect on the *agility* competency of LSPs in China.

3.4.4 Human Resource Management (HRM) practices

Human resources are key elements that contribute to the success of a firm's performance (Karami, Analoui & Cusworth 2004; Luthans, Hodgetts & Luthans 1997; Pearce II & Robinson 1997). From the RBV perspective (Barney 2001; Lado & Wilson 1994; Power & Waddell 2004; Wright, Dunford & Snell 2001), HRM practices are intangible resources that contribute to sustained competitive advantage by enabling the development of knowledge that is embedded in the firm's culture and history, and by virtue of this context-specificity, is largely inimitable (Lado & Wilson 1994). As a lack of logistics expertise has become a critical issue in the logistics service industry in China (Bolton & Wei 2003; Hong, Chin & Liu 2004; Kerr 2005; Trunick 2003, 2004a, 2004b; Zhou et al. 2008), making improvements in recruiting, training and retention is not only essential for LSPs to tackle the skill shortage problem, but also an important means to build competency internally.

The development of HRM practices in China can be traced back to the late 1970s. The Chinese state run-economic system began to open up and transit to market economy. This change resulted in many Chinese enterprises adopting some western style management practices, which subsequently gave rise to a greater emphasis on specialized human competencies.

Consequently, HRM processes and practices started to take roots in China, though the term was viewed primarily as synonymous to personnel management. More recently, this interpretation began to ease and the term has been used in a broader sense to include staff training and development (Zhu, Cooper & Dowling 2005), with clear evidence that traditional Chinese HRM practices have changed (Cooke 2005). What is evolving is a hybrid form of HRM 'with Chinese characteristics' that, at present, is mainly concerned with short-term issues rather than more strategic long-term development (Warner 2008a, p. 61).

The development of HRM in China has been found to be related to a number of characteristics, such as organisational ownership structure, size and location, with foreign owned, larger organisations located in the country's south likely to have more developed and sophisticated HRM practices (Warner 2008a). Strategic human resource participation and the changing business environment were also found to have the strongest influences underlying the adoption of HRM practices in China (Zhu, Cooper & Dowling 2005). A firm's ability to attract, motivate, train, appraise, reward and retain valuable employees is very important for local and foreign firms in China, given its historic development and dynamism (Ahlstrom, Bruton & Chan 2001; Zhu, Cooper & Dowling 2005). Economic and political developments in China affect the availability of labor and its characteristics. The large number of people that used to work in state-owned enterprises, the general low skill levels, high turnover rates and the cultural characteristics of *Guanxi* and harmony present unique challenges (Ahlstrom, Bruton & Chan 2001).

Drawing on the empirical and theoretical studies on HRM practices (Cutcher-Gershenfeld 1991; Delaney, Lewin & Ichniowski 1989; Pfeffer 1994), Harel and Tzafrir (1999) found six HRM practices - recruitment, selection, compensation, employee participation, internal labor market, and training – to be positively related to firm and market performance. Delaney & Huselid (1996) also found a positive association between HRM practices and firm performance measures in their survey of both profit and non-profit organizations. Their findings show that staff selection, employee skills, employee motivation, structure of jobs and work and training are positively related to organizational performance. The research of Birdi (2008), which focuses on the impact of HRM practices on employee empowerment, training and teamwork, argues that from an organizational behavior perspective, HRM practices work to develop individual knowledge and skills, as well as employee attitudes and behavior. Examining the

impact HRM practices have on the performance of enterprises in the Dhaka Export Processing Zone, Islam and Siengthai (2010) also confirm the positive relationship between HRM practices and firm performance, in the context of a less developed economy.

This research focuses on three HRM practices: *training and development (TD*), *performance management* (*PM*) and *reward management* (*RM*). The reason these three have been selected is that the three constructs are closely related to the improvement of skilled logistics work force in the Chinese context. The details are discussed below.

3.4.4.1 Performance management (PM)

Performance management (*PM*) is an HRM practice that has been identified as highly problematic in China (Huo & Von Glinow 1995). It is also an area with limited research (Hempel 2001). Most Chinese firms use non-systematic performance appraisals to assess the performance of their employees, while foreign firms tend to use collective or group-oriented appraisal approaches (Ahlstrom, Bruton & Chan 2001a). Though there has been an increase in the employment of PM and performance related rewards (mainly extrinsic) in private firms in China, this is in contrast with the practice of foreign firms (Ahlstrom, Bruton & Chan 2001a; Cooke 2005). Cooke (2005) explains that research on *PM* in China indicates that its implementation seems to suffer from similar problems found in western countries, which include systems design problem, ambiguous criteria, and insufficient or ineffective feedback mechanism.

3.4.4.2 Training and development (TD)

Research (Ahlstrom, Bruton & Chan 2001; Wilkinson, et al. 2005) indicates that firms in China face great difficulties in recruiting and retaining competent and professional staff. *Guanxi* – "a system of personal connections that carry long-term social obligations" (Wilkinson et al. 2005, p. 1889) - has been cited frequently (Ahlstrom, Bruton & Chan 2001) as an important element in staff recruitment in China. To deal with the difficulties associated with recruiting and retaining competent and professional staff in China, Wilkinson et al. (2005) explain that MNCs generally rely on *training and development* (*TD*) as well as mentoring to develop the necessary skills of local employees, rather than hiring expatriates due to the high costs associated with such appointments. Despite these efforts, however, staff may not remain within the firm due to the myriad opportunities available for qualified and skilled workers in the Chinese labor market,

making staff turnover a persistent issue (Ahlstrom, Bruton & Chan 2001). This characteristic of the Chinese labor market is not only a consequence of the structural imbalance arising from an oversupply of unskilled labor and a shortage of skilled labor (Warner 2008), but also the fallouts of market deregulation that increased competition for skilled labor (Cunningham & Rowley 2008).

Since the 1970s reforms that saw the move away from the centralized job allocation system and the resulting increase of a recruitment and selection process that allows employers and employees choice, human resource training in China, as a formal method of skill and professional development, has increased in popularity (Zhu 1998). The benefit of training is still questioned, however, as there is evidence that training does not appear to impact on job design or career development in China (Cooke 2005). Training is particularly important where supply of skilled employees remains in short supply, as is the case in China where cheap unskilled labor abounds (Cooke 2005). In such instances, foreign firms have been known to recruit on the basis of potential, rather than actual, skill and provide extensive on- and off-the-job training to develop the required skills and motivate employees (Wilkinson et al. 2005). In addition, some foreign LSPs undertake new recruiting activities to seek and develop talents, such as the use of local recruiters who know the market well, or develop international training programs linked to performance metrics, internal and external training sessions, internet training modules, and international staff exchange (Lieb 2008).

3.4.4.3 Reward management (RM)

Employee retention is another important issue in China and is especially crucial in relation to strategically important, highly skilled and trained employees(Ahlstrom, Bruton & Chan 2001; Wilkinson et al. 2005a). Unlike the days of the 'iron rice bowl', that guaranteed life-long employment (Warner 2008), the average number of years people stay in the same job in China is diminishing rapidly. Research reported in China Staff (2001, cited in Cooke 2005) indicates that, prior to the 1980s, people tended to stay in the same job for 15 to 20 years. That figure dropped to an average of 10 years in the 1980's, and was further reduced to five in the 1990's. The main reason that prompts people to change jobs is dissatisfaction with wages, a finding that confirms the importance of financial rewards in recruiting and retaining staff (Jackson & Bak 1998). Ahlstrom et al. (2001) suggest that extrinsic rewards, such as pay, working conditions and housing benefits, as well as intrinsic rewards, like job security, empowerment, participation

and increases in task significance and task identity, can improve employee retention. Hence, *reward management* (*RM*) is becoming an increasingly important human resource function in the Chinese context.

Several studies (see e.g. Bookbinder & Tan 2003; Kam, Tsahuridu & Ding 2010; Lieb 2008; Lin 2007) suggest that a work force with the appropriate talent and skills would be a positive contributing factor to service competencies of LSPs in China. Bookbinder and Tan (2003) argue that state-of-the-art equipment requires a skilled workforce. Modern logistics companies need people, who are familiar with various tools and can apply them towards productivity gains, as well as workers who go the extra mile for customer service and are motivated to ensure fewer work shortage. Better management of human resources and continuous productivity enhancement are a key factor to establish a sound logistics system not only for developed but also for developing countries. Lin (2007) found that the higher the quality of human resources, the more likely that China's LSPs will adopt innovative logistics technologies. In short, high human resource quality implies that employees are more technologically innovative, and hence, would be better able to utilize technology to increase logistics capability. Based on the above discussion, it is thus hypothesized that:

H4a: *PM* has a positive effect on the *positioning* competency of LSPs in China.

H4b: *TD* has a positive effect on the *positioning* competency of LSPs in China.

H4c: *RM* has a positive effect on the *positioning* competency of LSPs in China.

H5a: *PM* has a positive effect on the *distribution support* competency of LSPs in China.

H5b: *TD* has a positive effect on the *distribution support* competency of LSPs in China.

H5c: *RM* has a positive effect on the *distribution support* competency of LSPs in China.

H6a: *PM* has a positive effect on the *agility* competency of LSPs in China.

H6b: *TD* has a positive effect on the *agility* competency of LSPs in China.

H6c: *RM* has a positive effect on the *agility* competency of LSPs in China.

From the hypotheses formed, a research model of logistics service competencies is developed (See Figure3.2).

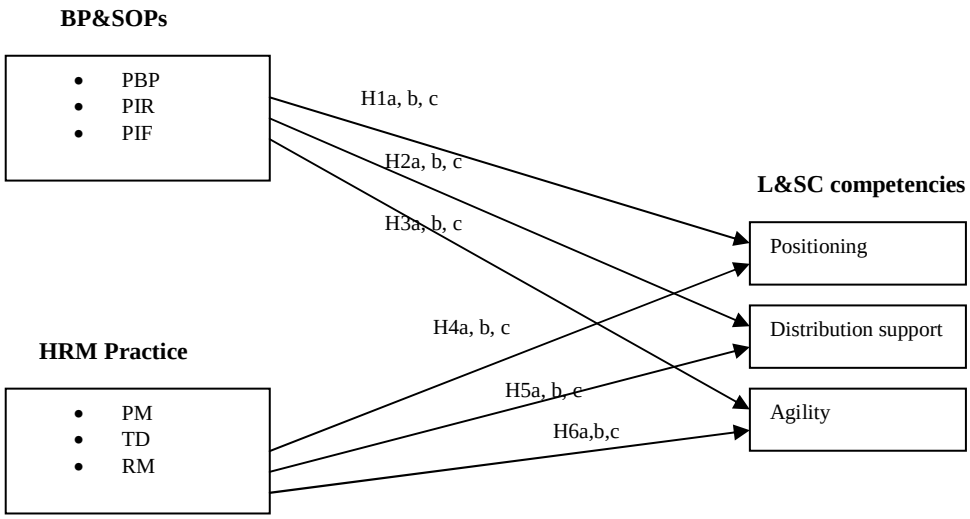

Figure 3.2: A Conceptual Model of BP&SOPs, HRM Practice and L&SC Competencies

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management

3.4.5 Moderating Effects

3.4.5.1 Using Guanxi as a moderator

Putnam (2004) refers to social capital as the collective value of all "social networks" and the inclinations that arise from these networks to do things for each other. Social capital is necessary for a country's economic success, generating economic value through institutional or individual networking where reciprocity and mutuality are central to business activity (Fukuyama 1996). Putnam (2004) further suggests that social capital in a Chinese social context is closely linked to the concept of "*Guanxi*".

The Chinese phrase of *Guanxi* consists of two characters; the character "*guan*" means a gate or a hurdle, and "*xi*" refers to a tie, a relationship, or a connection. *Guanxi* literally means "pass the gate and get connected" (Lee & Dawes 2005). *Guanxi* is essential to fulfill any task in virtually any sphere of social life in China (Gold, Guthrie & Wank 2002). In a Confucius-based culture,

Guanxi is much more important, acting as an unwritten social rule, and is far more pervasive, than economic or legal regulation (Su, Shi & Lai 2008). *Guanxi* relationships are characterized by mutual trust and willingness to engage in activities that engender mutual benefits (Li & Lin 2006). Li and Lin (2006) argue that *Guanxi* determines the economic activities and management style of Chinese firms. *Guanxi* can enhance transaction efficiency in long-term business relationships in the Chinese business world. Business behavior in the Chinese society revolves around *Guanxi*, and any business in this society inevitably face *Guanxi* dynamics: no firm can go far unless an extensive *Guanxi* is set up (Luo 1997). Luo (1997) also argues that *Guanxi* is transferable, reciprocal, intangible, essentially utilitarian rather than emotional, and virtually personal. *Guanxi* relationships between organizations are essentially established and maintained by individuals.

In a society where *Guanxi* holds the lynchpin of access to the thick of bureaucratic machinery, firms which have strong or unusual connections with local and state authorities dealing with logistics functions are expected to command a competitive edge. Equally, access to international distribution networks, financial sources, management experience, and other complementary functions to logistics also give organizations an unfair advantage. These forms of intangible resources, generally referred to as social capital (Putnam 2000, 2004), constitute one of the most sought-after assets in China (Carlisle & Flynn 2005; Putnam 2000; Szeto, Wright & Cheng 2006). Given the complementary strengths of domestic and international LSPs and the time needed to accumulate social capital, strategic partnerships between domestic and international LSPs have become a convenient way of securing market share in China (Hong, Chin & Liu 2004).

Western firms operating in China have already found that doing business effectively with their Chinese partners requires a different mindset, since eastern and western business differs in their process of building business relationships (Kotler & Turner 1985). Kotler and Turner (1985) suggest that western businessmen are likely to view buyer-seller relationships as short-term transactional ones. Western business people may decide to invest in a relationship by developing trust and commitment, if they can see the potential for long-term profit from the relationship. However, eastern business people are more likely to start with building a good relationship with partners without initially considering business benefits, or much less potential returns on investment. They consider that *Guanxi* is the first step to fulfill the transaction of

business, and then trust and commitment to the long-term relationship can be built up by maintaining *Guanxi,* which leads to business success.

Chinese LSPs in particular want partners who can provide overseas networks, financial support, management experience, and other complementary functions. Foreign companies in China look for Chinese partners who can provide customer and public relationships, strategic assets (vehicles and warehouses), local operational skills, and domestic network coverage (Anonymous 2009a; Hayes 2006; Huang & Kadar 2002; Razzaque & Sheng 1998). However, while discussion of partnership is widespread, relatively few LSPs in China appear to be actually committing themselves to specific alliances. Mercer, a global consulting firm, believes that this current lack of forward movement of building alliances is one of serious obstacles to the longer-term growth and development of 3PLs in China (Huang & Kadar 2002). While social capital or *Guanxi* is important in building long-term business relationships in China, Li and Lin (2006) warn that *Guanxi* utilization interacts with antecedents of global logistics competence. The effect of manufacturing flexibility on global logistics competence, for instance, can be mitigated when *Guanxi* is heavily used in supply networks. Li and Lin (2006) argue that *Guanxi* utilization could damage the capability of manufacturing flexibility when some preferred buyers and suppliers unexpectedly interfere in the manufacturing processes to pursue their own business goals, rather than to increase logistics efficiency of the network.

Nonetheless, Li and Lin (2006) indicate that *Guanxi* does moderate resource integration and manufacturing flexibility on global logistics competence. A strong *Guanxi* culture can strengthen the effects of resource integration. It is, therefore, expected that *Guanxi* will have a moderating effect on the relationship between BP&SOPs and the three L&SC competencies. Accordingly, the following hypotheses are proposed:

H7a: The positive relationship between PBP and *positioning* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H7b: The positive relationship between *PBP* and *distribution support* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H7c: The positive relationship between *PBP* and *agility* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H8a: The positive relationship between *PIR* and *positioning* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H8b: The positive relationship between *PIR* and *distribution support* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H8c: The positive relationship between *PIR* and *agility* competency is stronger with the moderating effect of *Guanxi* for LSPs in China

H9a: The positive relationship between *PIF* and *positioning* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H9b: The positive relationship between *PIF* and *distribution support* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

H9c: The positive relationship between *PIF* and *agility* competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

Figure 3.3 presents the proposed model and illustrates the moderating effect of *Guanxi* on the relationships between BP&SOPs and L&SC competencies.

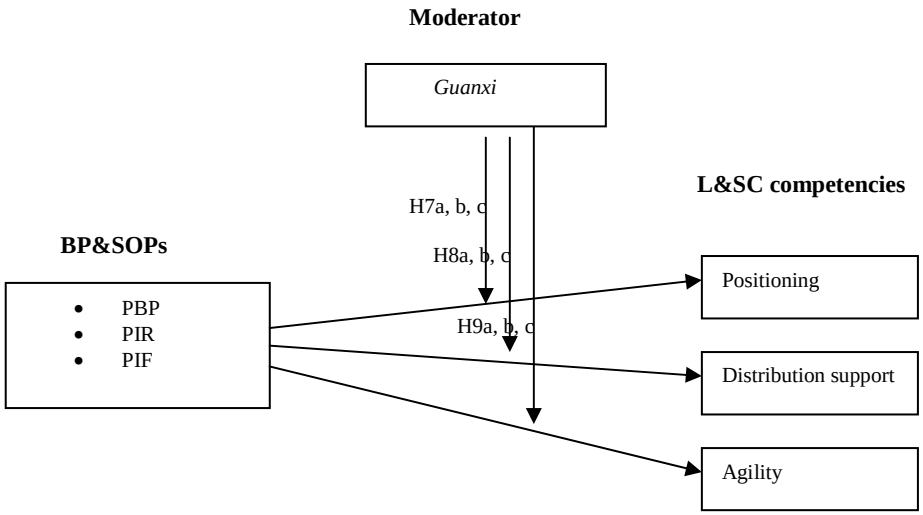

Figure3.3: Proposed Moderating Model of *Guanxi*

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderator: *Guanxi*

3.4.5.2 ICT support as a moderator

ICT is increasingly regarded as a vital resource that supports many business processes (Alshawi 2001). Byrd and Turner (2000b, p. 172) define "ICT infrastructure as the shared ICT resources consisting of the technical physical base of hardware, software, communication technologies, data, and core applications". ICT infrastructure is a set of shared physical ICT resources that form the foundation for various business applications (Duncan 1995) and is typically unique to an organization (Byrd & Turner 2000). In the logistics industry, ICT, such as Intranet, Extranet, Internet, and Electronic Data Interchange (EDI), facilitates the integration of activities in the supply chain (Angeles 2000; Calza & Passaro 1997). The importance of ICT in L&SC operations lies in ICT's contribution to the provision of timely and accurate information, enabling information to be shared both within the firm and between supply chain partners and enhancing organizational decision making (Alshawi 2001). Lai et al. (2006) also argue that ICT plays an essential role in synchronizing and coordinating complex supply chains. Bowersox et al. (1989) argue that one of the ten key differentiators between leading-edge logistics organizations and average firms is the ability and willingness to invest in state-of-the-art ICT.

Bowersox et al. (2002) outline four reasons for the increasing importance of ICT as a valuable logistics resource. First, customers appreciate timely information about order status, product availability, delivery schedules and invoice settlement, which are increasingly enhanced by rapid advances in ICT. Second, timely information is essential for inventory planning and human resource scheduling. Third, timely information increases L&SC flexibility with regard to how, when, and where resources may be utilized to gain strategic advantage. Fourth, enhanced information transfer and capability exchange utilizing the Internet is changing relationships between buyers and sellers and redefining channel relationships. Therefore, the ability to utilize ICT skills and knowledge to enhance LSC operations is fast becoming an indispensable resource for LSPs.

Lai et al. (2008) suggest that a LSP's ICT capability is one of the most critical factors affecting the decision of a logistics user to outsource to LSPs. Studies from the US (Sheffi 1990), Australia (Sohal, Millen & Moss 2002), and Singapore (Bhatnagar, Sohal & Millen 1999) found that logistics users expect to have frequent access to a LSP's advanced technological expertise and computerized systems. MSUGLRT (1995) also indicate that ICT is one of the key capabilities for logistics process integration and world-class performance. Gustin (1995) argues that ICT is critical to the successful implementation of the integrated logistics concept. Information systems provide the potential to quickly and accurately identify cost saving opportunities, and also help firms to achieve service-based differentiation. A survey conducted by Langley (2007) indicates that the majority of logistics users is dissatisfied with the ICT capabilities of their LSPs. Logistics users in China expect LSPs to offer a high level of ICT capability to provide global connectivity, supply chain visibility, and web-enabled communications (Lai et al. 2008). Hong and Liu (2007) also indicate that Chinese manufacturers need LSPs to provide ICT services for their logistics information systems and logistics system design.

Research conducted by Han, Trienekens and Omta (2009) in eastern China found that integrated logistics management and integrated ICT has an indirect impact on firm performance through quality management practices. The development of logistics information systems has paralleled the increased awareness among top firms of logistics' potential for providing competitive advantage. Innovative and progressive use of up-to-date logistics information technologies is considered essential to meet the strategic goals of integration (Gustin,

Daugherty & Stank 1995). Logistics functions must be linked and communicated with other functions, such as production and marketing internally, and the firm must also be connected with other supply chain partners, such as suppliers, customers and third-party providers externally. ICT is an enabler for this integration (Han, Trienekens & Omta 2009; Stank & Keller 2001). In short, *ICT support* is a critical factor for increasing L&SC competencies. This study argues that *ICT support* can enhance the relationships between BP&SOPs and L&SC competencies. Thus, the following hypotheses are proposed accordingly:

H10a: The positive relationship between *PBP* and *positioning* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H10b: The positive relationship between *PBP* and *distribution support* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H10c: The positive relationship between *PBP* and *agility* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H11a: The positive relationship between *PIR* and *positioning* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H11b: The positive relationship between *PIR* and *distribution support* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H11c: The positive relationship between *PIR* and *agility* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H12a: The positive relationship between *PIF* and *positioning* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

H12b: The positive relationship between *PIF* and *distribution support* competency is stronger with the moderating effect of *ICT support* for LSPs in China

H12c: The positive relationship between *PIF* and *agility* competency is stronger with the moderating effect of *ICT support* for LSPs in China.

Figure 3.4 illustrates the moderating effect of *ICT support* on the relationship between BP&SOPs and L&SC competencies.

3.4.6 Control Variables

Four control variables are used in the research model, which are *company size* (*CS*) and three physical asset variables: *warehouse and inventory management* (*WIM*), *transport and distribution network* (*TDN*), and *ICT*. *ICT* is an important physical asset and resource that LSPs in China need to develop. *ICT* and *ICT support* are considered two distinguished concepts in this study. *ICT* is used to denote the extent of a firm's investment in ICT resources, while *ICT support* refers to the ICT capability of the firm. The reasons for selecting the four control variables are discussed in the following sections.

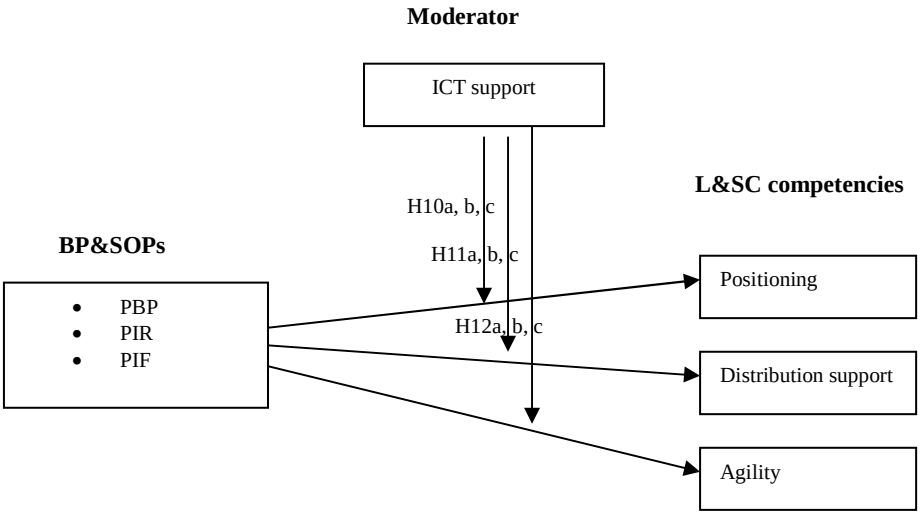

Figure 3.4: Proposed Moderating Model of ICT Support

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderator: ICT support = information and communication technology support

3.4.6.1 Company size (CS)

Hong et al. (2007), who conducted a survey on the current status and future prospects of LSPs in China, found that there is a statistically significant association between number of employees and firm ownerships among LSPs in China. Primarily, this is because the majority of the private LSPs in China are smaller in size, both in terms of employees and physical assets, compared with their state-owned counterparts. Furthermore, private LSPs in China have been found to be generally better able to service their customers than their state-owned competitors, despite their size (Hong & Liu 2007; Huang & Kadar 2002; Powers 2001). Therefore, we postulate that, in the context of China logistics service industry, there is a negative relationship between firm size and L&SC competencies: the larger the firm, the lower its L&SC competencies.

3.4.6.2 Physical assets and resources (PAR)

From the RBV point of view, physical assets and resources of LSPs are those "visible" logistics related resources, such as advanced goods-handling machinery, quality-controlled goods packing systems, modern warehouses, and secured ICT system (Barney 1991; Brumagim 1994). In addition to the lack of modern logistics infrastructure in China, LSPs in China also sustain higher levels of risks compared with their counterparts in other countries (Dolven 2002). Hence, *physical assets and resources (PAR*), such as warehousing and transportation facilities and ICT systems, are highly desired by Chinese customers (Ciuba 2004; Lu & Dinwoodie 2002). It is expected that companies equipped with modern L&SC infrastructure have an edge in delivering such services, hence increasing their chances of securing new business or expanding market share.

PAR included in this study are broadly grouped into three types: *WIM*, *TDN*, and *ICT*. *WIM* is one of the main concerns for LSPs in China. Currently, not only is there a lack of specialized warehousing facilities, but the warehousing systems in China need to be modernized with ICT facilities (Kerr 2005). Distribution centers in China are in general, 10 to 15 years behind the U.S. and are unable to serve the complex needs of customers (Anonymous 2006). Kerr (2005) also states that typical warehouses in China have low ceilings and poor lighting, using abundant manual labor. Dock-leveling is rare. Poor warehousing facilities and unskilled labor have been singled out as the main causes for the high loss and damage of goods in transportation and

storage (Dolven 2002). For instance about 30 percent of China's fruit and vegetable harvests were damaged every year due to failure to store and transport them appropriately (Kerr 2005).

TDN is another concern of LSPs in China. Some international LSPs operating in China, like APL, have expressed concerns about cargo security in China. Pau Man, General Manager for North and East China at APL, said: "All players, big and small, are constrained by a key factor: if the people loading the trucks aren't good enough, the system breaks down. And they are usually small, independent operators, untrained and perhaps unattainable'' (Dolven 2002 p. 28). Goh and Ling (2003) further confirm that the costs incurred due to loss and damage of goods are immense and common during transport in mainland China, as vehicles used for freight transportation are usually open-backed trucks covered only by tarpaulins. With the handling of goods with hazardous components increasing in China, lack of logistics infrastructure and expertise to deal with industry-specific needs is quickly becoming a primary issue.

ICT is another physical resource that LSPs need to consider in the Chinese market. The development of ICT capability in LSPs requires various resource inputs and investment. Sum, Teo and Ng (2001) notes that ICT adoption rate of logistics user firms is low, owing to the high cost of advanced ICT applications and lack of expertise. Further, according to RBV (Barney 1991), technological resource commitment is not sufficient by itself to develop the ICT capability in LSPs. Previous studies have found that accelerated expenditure on ICT does not always result in increased firm productivity (Segar & Dean 2001). ICT resources of LSPs cannot be configured appropriately if their ICT strategies and business strategies are not aligned (Chan, Huff & Copeland 1997). Wang et al. (2008) argue that the low ICT adoption rate among logistics user firms has been a great opportunity for LSPs to exploit their advanced ICT skills. Lai et al. (2008) indicate that such capability cannot be achieved without creating and deploying unique and state of the art ICT assets (e.g. configurations of technology, infrastructure, and business processes). Boynton, Zmud and Jacobs (1994) find that effective implementation of ICT depends on the business knowledge of ICT managers, the ICT knowledge of business managers, and the exchange of knowledge between the two. In sum, *WIM*, *TDN* and *ICT* are all expected to have a positive effect on a firm's L&SC competencies.

3.5 A RESEARCH MODEL

The proposed research model consists of five key constructs: BP&SOPs, HRM practices, L&SC competencies, *Guanxi*, and *ICT Support* (See Figure 3.5). The proposed hypotheses suggest that three BP&SOPs variables - *PBP*, *PIR*, and *PIF* - would have positive effects on three L&SC competency variables: *positioning*, *distribution support*, and *agility*. Likewise, the three HRM practice variables, *PM*, *TD*, and *RM*, would have positive effects on the three L&SC competency variables. *Guanxi* and *ICT support* would have moderating effects on the relationships between BP&SOPs and L&SC competency variables. The detailed hypotheses are summarized in Table 3.1.

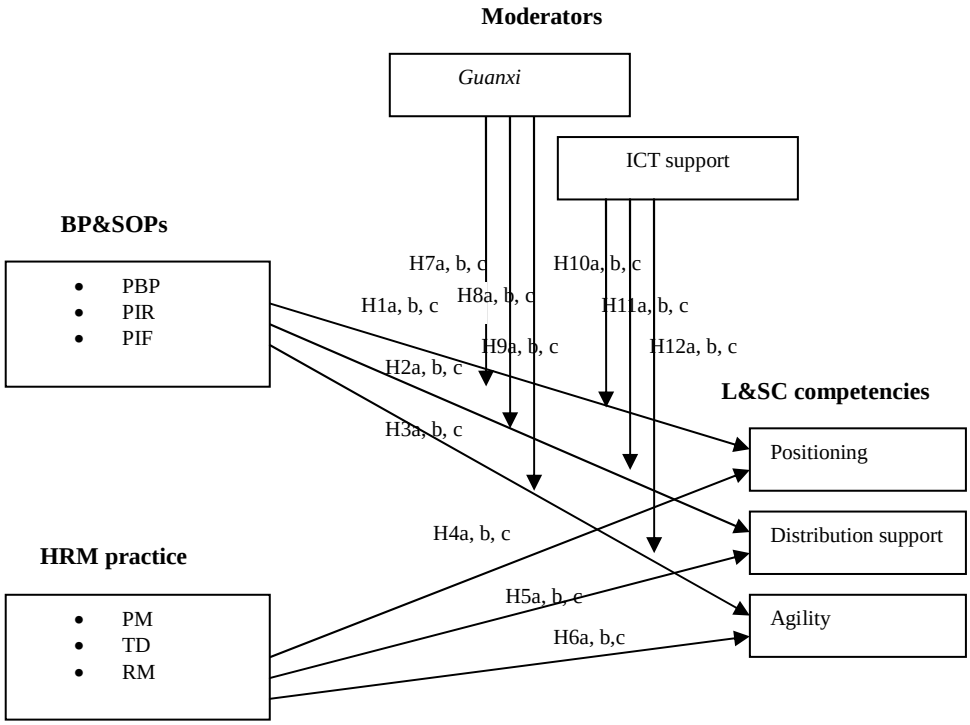

Figure 3.5: Proposed Model of L&SC Competencies of LSP

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: Guanxi; ICT support = information communication technology support

Table 3.1 Hypotheses for L&SC competencies of LSPs in China

	Item	Hypotheses
H1	H1a	PBP has a positive effect on the positioning competency of LSPs in China.
	H1b	PIR has a positive effect on the positioning competency of LSPs in China.
	H1c	PIF has a positive effect on the positioning competency of LSPs in China.
H2	H2a	PBP has a positive effect on the distribution support competency of LSPs in China.
	H2b	PIR has a positive effect on the distribution support competency of LSPs in China.
	H2c	PIF has a positive on the distribution support competency of LSPs in China.
H3	H3a	PBP has a positive effect on the agility competency of LSPs in China.
	H3b	PIR has a positive effect on the agility competency of LSPs in China.
	H3c	PIF has a positive effect on the agility competency of LSPs in China.
H4	H4a	PM has a positive effect on the positioning competency of LSPs in China.
	H4b	TD has a positive effect on the positioning competency of LSPs in China.
	H4c	RM has a positive effect on the positioning competency of LSPs in China.
H5	H5a	PM has a positive effect on the distribution support competency of LSPs in China
	H5b	TD has a positive effect on the distribution support competency of LSPs in China
	H5c	RM has a positive effect on the distribution support competency of LSPs in China
H6	H6a	PM has a positive effect on the agility competency of LSPs in China.
	H6b	TD has a positive effect the agility competency of LSPs in China.
	H6c	RM has a positive effect on the agility competency of LSPs in China.
H7	H7a	The positive relationship between PBP and positioning competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H7b	The positive relationship between PIR and positioning competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H7c	The positive relationship between PIF and positioning competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
H8	H8a	The positive relationship between PBP and distribution support competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H8b	The positive relationship between PIR and distribution support competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H8c	The positive relationship between PIF and distribution support competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
H9	H9a	The positive relationship between PBP and agility competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H9b	The positive relationship between PIR and agility competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H9c	The positive relationship between PIF and agility competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
H10	H10a	The positive relationship between PBP and positioning competency is stronger with the moderating effect of ICT support for LSPs in China.
	H10b	The positive relationship between for PIR and positioning competency is stronger with the moderating effect of ICT support for LSPs in China.
	H10c	The positive relationship between PIF and positioning competency is stronger with the moderating effect of ICT support for LSPs in China.

… Table to be continued in the next page

Table 3.1 Hypotheses for L&SC competencies of LSPs in China (Continued)

	Item	Hypotheses
H11	H11a	The positive relationship between PBP and distribution support competency is stronger with the moderating effect of ICT support for LSPs in China.
	H11b	The positive relationship between for PIR and distribution support competency is stronger with the moderating effect of ICT support for LSPs in China.
	H11c	The positive relationship between PIF and distribution support competency is stronger with the moderating effect of ICT support for LSPs in China.
H12	H12a	The positive relationship between PBP and agility competency is stronger with the moderating effect of ICT support for LSPs in China.
	H12b	The positive relationship between for PIR and agility competency is stronger with the moderating effect of ICT support for LSPs in China.
	H12c	The positive relationship between PIF and agility competency is stronger with the moderating effect of ICT support for LSPs in China.

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi;* ICT support = information communication technology support

3.6 SUMMARY

This chapter provides a review of the literature including research on LSP, RBV and its application on logistics research, and the development of the research model and hypotheses. Despite the growing body of literature on LSPs, efforts to investigate how LSPs utilize resources to develop L&SC competencies are limited. It was also found that majority of LSP research lacks theoretical foundation. Based on RBV and its application in strategic management, a research model, linking LSPs' intangible and tangible resources to their L&SC competencies, was developed. The hypotheses linking the casual relationships between the key constructs were formed. It was hypothesized that BP&SOPs (i.e., *PBP*, *PIR*, *PIF*) and HRM practices (i.e., *PM*, *TD*, *RM*) have positive relationships with positioning, distribution support and agility competencies. *Guanxi* and *ICT support* are two moderators that enhance the relationships between BP&SOPs and L&SC competencies. Size of firm and physical resources, including warehousing facilities, transport and distribution network, and ICT resource, are used as control variables in the formulated model.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter presents the research design and methodology to examine the research model and hypotheses developed. It contains six main sections: research design and participants, instrument development, pilot test, sampling and data collection method, methods of analysis, and operationalization of measurement.

4.2 RESEARCH DESIGN AND PARTICIPANTS

The primary objective of this research is to examine how BP&SOPs and HRM practices impact on L&SC competencies of LSPs in China. The selection of an appropriate research approach is vital to the success of the research project, because it would determine where the research began, how the research proceed, and what types of research techniques are appropriate (Blaikie 1993). A quantitative approach is considered appropriate for this research project due to the following reasons:

First, this study is theory testing in nature. The research questions are directed to examine the impact of BP&SOPs and HRM practices on L&SC competencies of LSPs in China. The proposed hypotheses, which provide the framework for the study, were formulated based on an extensive literature review. The quantitative approach was thus considered suitable to achieve the objectives of the study (Neuman 2003). Second, a quantitative approach has several advantages, such as relatively rapid, low cost studies of large, geographically dispersed populations, and help test measurement scales (Davis & Cosenza 1988). It also provides a better representation of population, and comparatively higher degree of generalization (Neuma 2003). Third, a review of literature shows the quantitative approach was a dominant technique used in logistics research (Maloni & Carter 2006; Selviaridis & Spring 2007). Therefore, the quantitative approach is considered an appropriate means to test the research model developed.

This research was underpinned by the positivist philosophy and a deductive approach to test the hypotheses developed in the study. Collis and Hussey (2003) suggest that the positivist philosophy enables deductive inferences about a population to be drawn from a statistical analysis of a sample. The deductive approach is suitable for hypothesis testing (Blaikie 2003).

To collect data, a key informant survey research strategy was employed in this study. Key informants are persons occupying roles that made them knowledgeable about L&SC capabilities and competencies of their firms, as well as familiar with a wide range of business operation procedures and HRM practices in the company. Key informants are able to communicate relevant information to the researcher (Campbell 1955). The key informants of the target logistics firms consisted of the CEOs, presidents, directors, and marketing or sales managers. By virtual of their positions and responsibilities within their organizations, these personnel are expected to be fully aware of the logistics service capabilities and performance of their firms. Although this technique has been criticized because of the like hood of producing unreliable or invalid data due to single respondents (Phillips 1981), there are few viable alternatives to gain information from high level management concerned (John & Torger 1982). Many studies, including those in the L&SC discipline, have utilized key informant survey for theory testing (e.g., Lai 2004; Shang & Marlow 2007; Stank & Lackey 1997).

4.3 INSTRUMENT DEVELOPMENT

A questionnaire survey was used as the instrument for primary data collection. As one of most popular methods of gathering quantitative data, the questionnaire survey allows for a large number of respondents and is less biased and less intrusive than other methods (Neuman 2003). Questionnaire survey has also been one of most commonly used instruments in measuring L&SC capabilities and firm performance (Harding 1998; Shang & Marlow 2005, 2007; Shang & Sun 2004; Yeung 2006; Yeung et al. 2006). In addition, many existing studies (e.g. Lai et al. 2008; Skjoett-Larsen 1999; Stank & Lackey 1997) utilizing RBV theory also collected primary data through questionnaire survey.

The survey questionnaire was designed with the aim of developing a sound instrument to measure the theoretical constructs effectively and to generate a high response rate. It was developed after an extensive review of the literature in international logistics, international trade and investment and Chinese business literature relevant to LSP operations in China. The

questions targeted on soliciting responses related to many of the most pressing issues identified in the literature to develop theoretical constructs concerning L&SC competencies in the Chinese market. Appendix A presents a copy of the cover letter and the survey questionnaire sent to the selected respondents. The questionnaire was written in both English and Chinese to ensure the questions asked were understandable to respondents.

Since the questions asked in the survey were conceptual in nature, a seven-point Likert Scale was employed to measure the perceptions of respondents. The seven-point Likert Scale requires respondents to indicate a degree of disagreement or agreement with respect to a set of statements concerning the research topic (Likert 1970). The Likert Scale is suitable for rating relatively large numbers of items (statements) and parametric statistical tests can be used which are more powerful than nonparametric tests (Churchill 1979; Dunn, Seaker & Waller 1994). Further, this study adopted a multi-item scale to measure the multiple dimensions embedded in the research constructs. The use of single items has a number of limitations. Single items usually have a low degree of relationship with a particular construct (Churchill 1979).

4.3.1 Scale development process

The scale development and validation used in this study followed the process proposed by Dunn, Seaker and Waller (1994) and the procedures for developing the measures were in line with Churchill's (1979). Figure 4.1 shows the procedures used for developing the robust measures.

4.3.1.1 Define constructs

To define the constructs of L&SC competencies, PAR, PBP, HRM practices, *Guanxi*, and ICT support, a broad literature review was conducted across multidisciplinary areas, including international marketing (e.g., Lee & Dawes 2005; Wong 2007), HRM (e.g., Ahlstrom et al. 2001; Zhu et al. 2005) and L&SC managment (e.g., Lai et al. 2008; Liu et al. 2010). The theoretical domain and constructs have been discussed in the literature. The operationalization of measurement constructs will be discussed in Section 4.7.

4.3.1.2 Develop potential items

The measurement items were developed from the literature review. Dunn, Seaker and Waller (1994) suggest constructs should be carefully defined based on literature and the author's understanding of the constructs in order to measure latent variables.

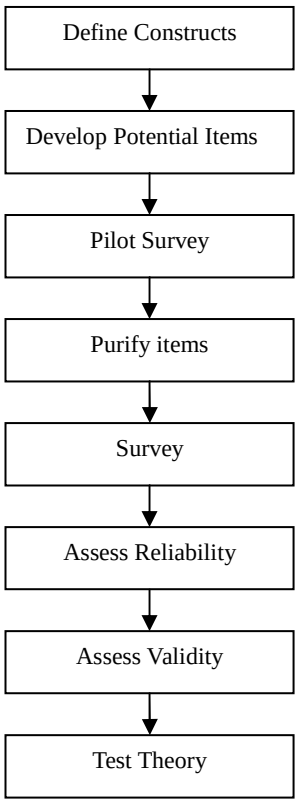

Figure 4.1: Scale Development Processes

Source: Adapted from (Churchill 1979, p. 66; Dunn, Seaker & Waller 1994, p. 156)

4.3.1.3 Pilot test and item purifications

Content validity was verified by referring to literature underpinning the relationships between BP&SOPs and HRM practices and L&SC competencies and by pre-testing the survey instrument using a pilot survey. To purify the items, Churchill (1979) suggests that scales be checked for content validity. Anderson and Gerbing (1991) suggest that it is not possible for a scale to have content validity without having substantive validity. Purifying items using a test for substantive validity is essential.

Item purification involves eliminating items that do not "agree" with the set of items under consideration. This is often done in a pre-test by using item-to-total correlations or contribution to Cronbach's α (Churchill 1979). However, correlations are typically not statistically significant because of the small sample size used in a pilot test. As a result, the researcher may be eliminating items that should not be eliminated or may be retaining items that will weaken construct validity. To overcome this problem, the pre-validated measurements tested in previous studies were employed to ensure validity of the constructs adopted for this study. The research model and questionnaire will be modified based on the comments of pilot test. Detailed procedure for the pilot test will be discussed in Section 4.4.

4.3.1.4 Assessment of reliability

Scale reliability refers to the internal consistency of a scale to measure a latent variable (Peter 1979). Internally consistent items form a homogeneous set in that they vary together statistically. Reliability assesses the consistency, not accuracy of the measurement scale (Churchill & Peter 1984). Gerbing and Anderson (1988) suggest that unidimensionality should be assessed before reliability is assessed. Unidimensionality is defined as the existence of one construct underlying a set of items (Anderson, Gerbing & Hunter 1987). Thus, unidimensionality is the degree to which items represent one and only one underlying latent variable. This study used CFA to test for unidimensionality with items loading weakly on the hypothesized factors eliminated from the scale, as per procedure suggested by Hair et al. (2006).

After testing for unidimensionality, reliability was assessed using Cronbach's α (Dunn, Seaker & Waller 1994). A higher level of Cronbach's α indicates a higher reliability of the scale. Nunnally (1978) presents a rule of thumb to assess reliability using Cronbach's α, stating that an α level higher than 0.70 indicates internal consistency among the items of a scale and an α level as low as 0.60 is acceptable. If a scale has a low α value (below 0.60 for a new scale), the correlation matrix of that scale should be examined. Items with low item-to item correlations can be deleted from the scale as long as the scale retains its content validity (Nunnally 1978). Churchill (1979) also suggests that a low Cronbach's α indicates that the sample of items performs poorly in capturing the construct. Conversely, a large α indicates that the items correlate with true scores.

4.3.1.5 Assessment of validity

The validity of a measure is the degree to which it measures what it intends to measure (Dunn, Seaker & Waller 1994). There are usually three different types of validity measures: content validity, construct validity and criterion-related validity (Dunn, Seaker & Waller 1994). Content validity is the extent to which a measure provides adequate coverage for the construct domain or essence of the domain being measured (Churchill 1979). Content validity has been discussed previously. Construct validity is the extent to which a scale measures the construct it was intended to measure. Criterion-related validity refers to how well a scale correlates with the criterion it is trying to predict. It is also called predictive validity (Dun et al. 1994).

Construct validity is typically determined by two criteria: convergent validity and discriminant validity (Bagozzi, Yi & Phillips 1991). Convergent validity is the degree to which there is agreement between two or more attempts to measure the same construct through dissimilar methods (Bagozzi, Yi & Phillips 1991). Convergent validity can be assessed through a CFA of the data. Dun et al. (1992)suggest that if the factor loadings are all statistically significant in a CFA test, then convergent validity exists. Steenkamp and Trijp (1991) also suggest that research should assess the overall fit of the measurement model, as well as the magnitude, direction, and statistical significance of the estimated parameters between latent variables and their indicators. The benchmark valued of substantial magnitude of the parameter estimate indicating convergent validity is 0.70 (Nunnally 1978).

Discriminant validity is important when constructs are highly correlated and similar in nature. Items from one scale should not load or converge too closely with items from a different scale. Different latent variables that correlate too highly may indeed be measuring the same construct rather than different constructs (Garver & Mentzer 1999). Relatively low correlations between variables indicate the presence of discriminant validity. Discriminant validity for measurement constructs were tested following the recommendation of Fornell and Larcker (1981). Chi-square test can also be used to assess discriminant validity by comparing the measurement model and the theoretical model (Garver & Mentzer 1999).

Criterion-related validity can be determined by correlating constructs to other constructs that they predict. If the criterion exists in the present, it is called concurrent validly. If the criterion exists in the future, then it is called predictive validity.(Dunn, Seaker & Waller 1994). Garver

and Mentzer (1999) suggest that criterion-related validity can be tested in the measurement model, whether the model contains the construct of interest and a construct that it should predict. Dunn, Seaker and Waller (1994) state that it is often not possible to find a reasonable criterion to judge a scale's predictive validity in the social sciences, however, the researcher should be confident that the appropriate criterion is being used before reaching a conclusion.

4.3.1.6 Testing theory

Hierarchical multiple regression method was undertaken to test the research model and the hypotheses formulated. Multiple regression allows a more sophisticated exploration of the interrelationship among a set of variables (Hair et al. 2006). There are three reasons for selecting the hierarchical multiple regression method. First, this method allows researcher to establish the percentage of variance explained by entering each set of independent variables separately in a regression equation, providing more accurate significance tests compared with the stepwise inclusion procedure (Wang et al. 2006a). Second, such variance partitioning procedures have been commonly used to assess the incremental effects of interactions and to study moderation effects in business research (Closs & Swink 2005; Su, Shi & Lai 2008; Zhu & Sarkis 2004). Third, the sample size used in multiple regressions is one of most influential element in designing the analysis (Hair et al. 2006). The effects of sample size are most directly reflected in the statistical power of the significant tests and the generalizability of the results (Hair et al. 2006). Hair et al. (2006) suggest that a general rule of thumb is to achieve a ratio of observations to independent variable of no less than 5:1, i.e., there should be at least five observations for each independent variable included in the regression equation. Although the minimum ratio of observations to independent variables is 5:1, previous studies (Tatikonda & Rosenthal 2000; Wang et al. 2008; Zhu & Sarkis 2004) have demonstrated that the desired level is between 15 and 20 observations to each independent variable.

4.3.2 Questionnaire design

The survey questionnaire used consists of two main sections (See Appendix A). Section A focused on factors affecting L&SC competencies of LSPs in China. It was divided into five parts. Part I was designed to investigate the BP&SOPs used by LSPs. Part II focused on HRM systems employed by LSPs. Part III was directed to investigate the physical assets and resources of LSPs. Part IV contained questions relating to how LSPs use *Guanxi* to promote

business relations with partners. Part V was devoted to questions relating to L&SC competencies of LSPs.

Section B seeks general information on company's characteristics, such as annual revenue; employment size; years of operations in China; and number of cities covered by the company's operations.

All questions in Section A are perceptual in nature. Respondents were asked to rate their agreement or disagreement on a series of multi-item constructs depicting the status quo of the factor being explored on a scale of one (1) to seven (7), with one (1) denoting strong disagreement and seven (7), strong agreement.

Considering the possible low response rate to the questionnaire survey, efforts were made during the questionnaire design process to attract more responses. Such efforts included keeping the questions simple and easy to understand; controlling the number of questions to a sufficient level. A cover letter was also enclosed to encourage participation. The cover letter guaranteed participants their anonymity and their freedom to withdraw at any time. It also outlined the rationale of the research, and potential benefits participants might get from the outcomes of the study.

4.4 PILOT TEST

A pilot test was conducted to verify the content validity of the instrument. As suggested by Anderson and Gerbing (1991) and Oppenheim (1992), pilot test is essential for achieving substantive validity. Participants of the pilot test were selected from ten (10) LSPs located in Shanghai, Guangzhou and Shenzhen. A survey questionnaire was sent to these participants by email, together with a cover letter explaining the purpose of the study on university letter head. The intent of the pilot study was to detect problems in the questionnaire design. Within two weeks, seven completed questionnaires were returned from the 10 selected LSPs. In general, the feedback was positive: the questions were regarded as easy to understand; and the layout was easy-to-follow. Respondents also gave suggestions for improving the questionnaire design, which are summarized as follows:

- Rewording instruction for filling out the questionnaire to increase readability and clarity. For example, adding an introductory sentence, indicating the degree of agreement or disagreement on statements to ensure that respondents understand the use and meaning of the seven-point scale.
- Rewording statements under Question 2 in Part I of Section A.
- Deleting some statements in Question 2 in Part III to avoid confusion with those in Question 3.
- Making editorial changes on a number of questions to reflect the situation in China.

The questionnaire was refined by two academics following a thorough review of the pilot test responses. A Chinese version of the survey questionnaire was produced and reviewed by a logistics professional proficient in both English and Chinese to verify the accuracy of the translation.

4.5 SAMPLING AND DATA COLLECTION METHOD

The LSP sample for this study was chosen from the list of logistics firms appearing in the Business Directory of Global Supply Chain Council (2009) and Business Directory of A-Z Worldwide Airfreight (2009). These two directories list a total of 1,147 logistics firms operating in China in 2009. An invitation email was sent to the senior executive of the sample LSPs in July 2009, requesting them to either complete an online survey located at Zoomerange Website (www.zoomerange.com) or direct someone within the organization most familiar with the information sought to do so. This procedure follows that adopted by Kaufmann and Carter (2006) as a way to reduce bias arising from single informant. The email also assured each participant of the confidentiality of their individual responses and promised an executive summary of the study results to be provided to them. Only one response was solicited from each sampled LSP. Approximately one (1) month later, a second email, identical in content to the initial one, was sent to the non-respondents, reminding them to participate in the online survey. Four weeks after the second mailing, a second reminder email was sent to the non-respondents. Through undelivered emails, 311 firms were found to be no longer in existence, reducing the effective sample size to 836 firms.

After two follow-up reminders, 126 completed questionnaires were received, giving an overall response rate of 15%. After data verification, nine (9) of the returned questionnaires were

partially completed and were excluded from the data file. Table 4.1 shows the position of the participants from the responding firms. A total of 117 responses were transferred to computer using Predictive Analysis Software (PASW) Version 18 for data analysis. With a total of 18 independent variables to be tested under the hierarchical regression model, a sample of 117 responses would give a ratio of 6.5 observations per independent variable, which exceeds the minimum of 5 observations per independent variable pointed out by Hair et al. (2006).

To detect any potential non-response bias, a test of non-response bias was conducted. Armstrong and Overton (1977) and Lambert and Harrington (1990) recommend that the last quartile or second wave of respondents' responses could be assumed to be most similar to those of non-respondents. The non-response bias was assessed by dividing the 117 responses into two groups, namely first group respondents (number of first wave = 40, 34.2%) and second group respondents (number of second wave = 77, 65.8%). The responses of the two groups to the Likert-scale items were then compared using independent group t-test procedure. The results, presented in Appendix B, show no significant differences (at $p > 0.05$) in all Likert-scale items between the two waves of respondents. Therefore, non-response bias is not a problem in this study.

Table 4.1: Position of participants from responding firms

Respondent	Number of total respondents	Percentage of respondents
Top Management (e.g., CEO, Executive Director, or General Manager)	23	19.7%
Senior Management (e.g., Logistics Manager, Marketing Manager or Operational Executive)	94	80.3%
Total	117	100%

4.6 METHOD OF DATA ANALYSIS

Before analysing the data collected, issues related to missing data were examined. The procedure of missing data analysis followed the three steps suggested by Hair et al. (2006): 1) eliminate obvious cases or variables, (2) examine pattern of missing data, and 3) determine approach to deal with missing data. The first step in the analysis involves uncovering obvious cases and or variables with significant missing data. Following the rule of thumb to delete cases

above 10 percent of missing data and variables above 15 percent of missing data suggested by Hair et al. (2006), it was found that no case or variable was above the stipulated limit. Therefore, no case or variable was deleted. The literature suggests that the modelling based imputation approach (e.g., mean imputation) is the best representation of original distribution of values with least bias (Hair et al. 2006; Tabachnic & Fidell 2001). Therefore, EM imputation was used for the treatment of system-missing data. PASW Version 18 produced a new data set with imputed missing values, which was used for further analysis.

Table 4.2 summarizes the major statistical analysis techniques employed in this study, and the corresponding objectives that each technique fulfilled. The PASW Version 18 and AMOS Version 18 were used for the statistical data analysis. Microsoft Office Excel was used to reorganize the output from PASW and to produce the tables and figures for presentation.

Table 4.2: Statistical techniques utilized in the study

Objectives	Corresponding statistical techniques
To describe company characteristics and current status of LSPs in China	Descriptive analysis
To measure internal consistency of L&SC competencies, PAR, BP&SOPs, HRM practices, *Guanxi*, and *ICT support*	Reliability test
To validate measurement models of L&SC competencies, PAR, BP&SOPs, HRM practices, *Guanxi*, and *ICT support*	Confirmatory factor analysis
To examine correlations between all the variables (i.e. both dependent and independent variables)	Pearson's bivariate correlation analysis
To test direct relationships between dependent variables (i.e. *PBP*, *PIR*, and *PIF*) and independent variables (BP&SOPs, HRM practices (Hypotheses 1 to 6)	Hierarchical multiple regression method
To test the effects of moderators on the relationships between BP&SOPs and L&SC competencies (Hypotheses 7 to 12)	Hierarchical multiple regression method

First, a descriptive analysis was performed to capture the characteristics of the responding firms. Second, reliability test was used to assess the internal consistency of the measurement scales. Third, CFA was conducted to establish constructs representing L&SC competencies, PAR, BP&SOPs, HRM practices, *ICT support*, and *Guanxi*. Fourth, bivariate correlation analysis was performed to examine the degree of association between the variables being considered. Finally, hierarchical multiple regression technique was used to test the proposed model and moderating effects using interaction terms. The detailed results for CFA and hierarchical multiple regression analysis are presented Chapter 5.

4.7 OPERATIONALIZATION OF MEASUREMENT ITEMS

This section discusses the operational definitions of the constructs used in this research. A set of items from pre-validated measurements was used to measure the dependent variables (L&SC competencies), control variables (*CS*, *WIM*, *TDN*, and *ICT*), independent variables (BP&SOPs and HRM practices), and moderators (*Guanxi* and *ICT support*).

4.7.1 Dependent Variables

By far, the largest study to examine L&SC competencies was conducted by MSUGLRT (1995), as discussed in Chapter 2. MSUGLRT (1995) grouped L&SC competencies into four areas: positioning, integration, agility, and measurement. Shang and Sun (2004) further tested these

four measurement constructs developed by MSUGLRT (1995). Shang and Marlow (2007) expand the measurement constructs developed by MSUGLRT (1995) into customer focused competence, integration and knowledge, agility, and measurement. Morash et al. (1996) divided L&SC capabilities into two categories: demand-oriented and supply-oriented capabilities. Their demand-oriented capabilities focus on customer service regarding delivery speed and reliability, and responsiveness to target market. Their supply-oriented capabilities focused on distribution support, including widespread distribution coverage, selective distribution coverage, and total cost distribution. Lynch et al. (2000) used cost leadership and differentiation strategy as two key aspects of L&SC competencies. Zhao et al. (2001) highlighted customer and information focus as two main L&SC competencies. Liu et al. (2010) developed and empirically examined 13 firm-specific capability constructs based on a survey of Chinese LSPs. A list of L&SC capabilities and competencies proposed by previous studies is summarized in Table 4.3.

Table 4.3: Dimensions of L&SC capabilities and competencies

L&SC capabilities and competencies	Dimension of capabilities or competencies	References
Demand-oriented	Pre-sale customer service, post-sale customer service, delivery speed, delivery reliability, responsiveness to target market	Morash et al. (1996)
Supply-oriented	Widespread distribution coverage, selective distribution coverage, low total cost distribution	
Positioning	Strategy, supply chain, network,	MSUGLRT (1995); Shang and Sun (2004)
Integration	Supply chain unification, information technology, connectivity, standardization, simplification, discipline	
Agility	Relevancy, accommodation, flexibility	
Measurement	Functional assessment, process assessment, benchmarking	
Positioning	Customer focus, organizational control, organizational implementation	Stank and Lackey (1997)
Integration	Connectivity, functional integration, information sharing, information technology, supplier relations	
Agility	Operational flexibility, personnel flexibility	
Measurement	Activity-based costing, benchmarking, performance assessment	
Value-added service	Service in actual sales process, distribution region, accommodate special customer service request	Lynch et al. (2000)
Process capabilities	Lowest cost logistics, reverse logistics service	
Cost leadership strategy	Invest in cost-saving technology, efficiency, redesign products and services to reduce costs, low cost strategy	
Differentiation strategy	Develop new products and services, offer specialized needs, higher quality, highly differentiated products, products distinctly different features from competitors	
Customer-focused	Segmental focus, relevancy, responsiveness, flexibility	Zhao et al. (2001)
Information-focused	Information sharing, information technology, connectivity	
Customer focused	Customer requirement planning, feedback and complaint-driven improvements	Shang and Marlow (2007)
Integration and knowledge	Knowledge transfer, supply chain unification, Information technology, connectivity, standardization, simplification, discipline	
Agility	Relevancy, accommodation, flexibility	
Measurement	Functional assessment, process assessment, benchmarking	
logistics capabilities	Pre-sale customer service, post-sale customer service, delivery speed, delivery reliability, responsiveness to target market, delivery information communication, web-based order handling, widespread distribution coverage, global distribution coverage, selective distribution coverage, low total cost distribution	Cho et al. (2008)
Firm-specific capabilities	Strategic management, operations management, service quality, IT, service network, customer relationship management, innovation, marketing, inventory management, HRM, corporate culture, business process management, cost management	Liu et al. (2010)

The L&SC competencies used in this dissertation focused on the competencies essential to LSPs competing in the Chinese market. The competencies are grouped theoretically into three constructs: *positioning*, *distribution support*, and *agility* (See Table 4.4 for the dimensions of these three constructs). There are two main reasons for selecting these competencies in this study. First, the competencies identified are considered more critical for LSPs in China. As discussed in Chapter 2, Chinese logistics service industry has its own unique characteristics. The three competencies are considered imperative for LSPs in China to overcome the regulatory barriers and operational challenges they face in the complex business environment. Second, it is expected that the logistics service market in China will continue to grow significantly in the near future. Many LSPs in China are restructuring their organizations and business processes by expanding their service portfolio or geographical coverage (Liu et al. 2010). Therefore, it is critical for LSPs to develop L&SC competencies to compete in the rapid growing market.

Positioning is defined as performing activities different from those of rivals, or performing similar activities in ways different from competitors (Porter 1996). The measurement items have been tested and validated in numerous studies (MSUGLRT 1995; Stank & Lackey 1997; Shang & Sun 2004). Differentiation strategies are essential for LSPs to position themselves in the Chinese market (MSUGLRT 1995; Lynch et al. 2000), thus providing customers with superior valuable products and services.

Distribution support is defined as a firm's ability to effectively provide widespread or extensive distribution coverage. The measurement items for this constructs have been used and tested by Morash et al. (1996) and Cho et al. (2008). The reason for selecting this construct as a dependent variable is because geographical coverage is one of most important aspects for LSPs to compete in the Chinese market due to the land size and population of China. Having the ability to provide customers with effective, widespread, and low cost distribution coverage has been found to be a key service feature for LSPs in China (Bolton & Wei 2003; Fung et al. 2005; Hong et al. 2007; Liu et al. 2010).

Table 4.4: Variable Description of dependent variables, independent variables and moderators

Variable	Item	Description	Reference	Measurement
Dependent variables:				
Positioning	P1	We are capable of providing customers with innovative supply chain solutions.	(Morash et al. 1996; Stank &Lackey 1997, Lynch et al. 2000, Zhao et al. 2000; Shang & Marlow 2007; Lin & Ho 2007, Zhou et al. 2008)	Perception measured on a 7-point Likert Scale: 1 = strongly disagree; 7 = strongly agree)
	P2	We are capable of providing an extensive range of logistics services, including value added services like bulk-breaking, consolidation and labelling.		
	P3	We are capable of accommodating unique requests by implementing pre-planned solutions.		
	P4	We are capable of providing customers with logistics expertise in a range of industries.		
Distribution Support	DS1	We are capable of providing customers with widespread or extensive distribution coverage in China.	(Morash et al. 1996;Bolton & Wei 2003; Fung et al. 2005; Hong et al. 2007; Cho et al. 2008)	
	DS2	Our transport and distribution network has helped customers achieve cost saving.		
	DS3	We are capable of providing customers with global distribution coverage.		
Agility	A1	We are capable of delivering expedited shipments to meet customer needs.	(MSUGLRT 1995; Stank & Lackey 1997, Shang & Marlow 2007; Cho et al. 2008)	
	A2	We are capable of providing rapid response to customer requests.		
	A3	We are capable of arranging a flexible delivery schedule to fit with customer's production schedule.		
Control variables:				
Company size	CS	Full-time employee number		Number
WIM	WIM1	Our warehousing system is capable of handling perishable goods.	(Kerr 2005; Anonymous 2006; Carter et al. 2007; Pearson et al. 1998; Wang et al. 2006; Hong 2007)	Perception measured on a 7-point Likert Scale: 1 = strongly disagree; 7 = strongly agree)
	WIM2	We employ advanced machinery for loading and unloading of goods.		
	WIM3	We have modernized out existing warehousing systems with air conditioning.		
	WIM4	We use a variety of packing methods to minimize loss and damage of goods.		
	WIM5	We have advanced packing methods to support our clients' operations.		
	WIM6	We have adequate warehouse facilities to support our clients' operations.		
	WIM7	We often upgrade our warehouse management computer systems.		
	WIM8	We have installed computer systems in our warehousing management systems.		

Variable	Item	Description	Reference	Measurement
	WIM9	Our warehouses have a reliable security system to protect high value goods.		
TDN	TDN1	We regularly upgrade our transport facilities.	(Carter et al. 1997; Pearson et al. 1998; Hong et al. 2007; Hong and Liu 2007)	
	TDN2	We have a distribution network in the western remote areas of China.		
	TDN3	We have established a nation-wide distribution network to service our customers.		
ICT	ICT1	We use advanced computerized documentation systems to manage order processing.	(Calza & Passaro 1997; Angeles 2000; Alshawi 2001; Bowersox et al.2002)	
	ICT2	We use state-of-the-art software to forecast and organize delivery schedules.		
	ICT3	Compared to our competitors, we invest more on computer hardware and software.		
Independent variables:				
PBP	PBP1	Customer service performance (e.g. order fill rate, cycle time) is regularly compared to industry standards or competitors.	(MSUGLRT 1995; Bowersox & Closs 1996; Stank & Lackey 1997; Keebler et al. 1999; Langley 2003; Shang & Marlow 2007	Perception measured on a 7-point Likert Scale: 1 = strongly disagree; 7 = strongly agree)
	PBP2	Operational performance (e.g. warehousing, transportation) is regularly compared to industry standards or competitors'.		
	PBP3	Functional cost performance (e.g. warehousing, transportation) is regularly compared to industry standards or competitors.		
	PBP4	We have in place benchmarking metrics to measure performance.		
PIR	PIR1	We utilize time-based logistics solutions like continuous replenishment, quick response and Just-in-time to support customers.	(Morash et al. 1996; Chopra & Meindl 2006; Zhao et al. 2001; Cho et al. 2008; Wong & Karia 2009)	
	PIR2	We are capable of providing shorter or smaller lot size shipments wherever possible.		
	PIR3	We have in place operation procedures for express deliveries.		
	PIR4	We have in place operation procedures to provide customers with door-to-door delivery services		
	PIR5	We have in place operation procedures to ensure on-time deliveries.		
PIF	PIF1	Our operation schedule is triggered by customer's requirements (e.g. a kanban system)	MSUGLRT 1995; Stank & Lackey 1997; Stank et al. 1998; Anand & Ward 2004; Shang & Marlow 2007)	
	PIF2	We have in place processes to support flexible scheduling solutions needed by our clients		
	PIF3	We have in place processes to meet changing customer requirements at short notice.		
	PIF4	We regularly review our service offerings in relation to customer requirements.		

Variable	Item	Description	Reference	
PM	PM1	Salary increases are determined by annual performance appraisal results in our organization.	(Huo et al. 1995; Hempel 2001; Ahlstrom et al. 2001; Cooke 2005)	
	PM2	Promotion is determined by annual performance appraisal results in our organization.		
	PM3	We undertake annual performance appraisals of our employees.		
TD	TD1	We provide induction programs to new employees.	(Ahlstrom et al. 2001; Warner 2003; Wilkinson et al. 2005; Cunningham & Rowley 2008)	
	TD2	We provide job-related training to employees.		
	TD3	We provide career development opportunities to employees.		
RM	RM1	We offer attractive salaries to our employees.	(Ahlstrom et al. 2001; Zhu et al. 2005)_	
	RM2	We offer attractive welfare packages to our employees.		
Moderator:				Perception measured on a 7-point Likert Scale: 1 = strongly disagree; 7 = strongly agree)
Guanxi	G1	We use *Guanxi* to approach business partners from different cultures.	(Kolter & Turner 1985; Luo 1997; Li & Lin 2006; Wong 2007)	
	G2	We use *Guanxi* to stimulate trade that might not otherwise occur.		
	G3	We use *Guanxi* to get valuable industry information		
	G4	We use *Guanxi* to access specific resources.		
	G5	Our firm uses Guanxi to establish and reinforce our links with local authorities and government in China.		
	G6	We use Guanxi to cultivate customer loyalty.		
ICT support	ICTS1	Our information system could be readily adapted to our customers' and partners' needs.	Gustin et al. 1995; Lai et al. 2006; Wang et al. 2008)	
	ICTS2	Our information system is sufficiently secure to conduct business transactions.		
	ICTS3	We are capable of integrating our operations with customers or suppliers.		

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information communication technology support

Agility refers to a firm's ability to determine and quickly respond to changing customers' requirement (Stank and Lackey 1997). As discussed in Chapter 3, agile supply chain practices, such as just-in-time and quick response approaches have been widely adopted by most firms. The ability to help customer increase agility is a desirable feature for LSPs when they complete in China. The measures used to develop this construct are based on MSUGLRT (1995), Stank and Lackey (1997), Shang and Marlow (2007), and Cho et al. (2008).

4.7.2 Control Variables

Four control variables are used in the hierarchical multiple regression analysis: *CS* and three PAR variables (*WIM*, *TDN*, and *ICT*).

CS was measured by the number of full-time employees in the firm. This variable was input as the natural logarithmic transformation of the number of full-time employees (Dean & Snell 1991). Using the number of full-time employees to measure *CS* has been adopted in Hong et al. (2004) and Hong and Liu (2007). The reason for using *CS* as a control variable is that larger firms may be more likely than small ones to develop L&SC competencies, due to extra available resources. This means large firms could derive greater synergy effects from human and financial resources that lead to better performance (Wu et al. 2006). However, as pointed out in previous chapters, large asset-heavy state-owned LSPs in China face overstaffing problems and lack customer orientation, while small private-owned LSPs have been able to offer customers more agile supply chain solutions (Huang & Kadar 2002; Hong & Liu 2007). The importance of *CS*, therefore, cannot be overlooked in the context of the logistics service industry in China.

WIM refers to the warehousing and inventory management systems that LSPs utilized. As discussed in Chapter 3, high loss and damage of goods in transportation and storage is one of the main concerns of shippers in China. Therefore, this construct is adopted to account for the expected effect that LSPs with adequate modern facilities for *WIM* would outperform those with less of these facilities. The measurement scale was developed based on Carter et al. (1997), Pearson et al. (1998), and Wang et al. (2006).

TDN refers to transport and distribution network that LSPs developed. Transportation is one of the core business processes in L&SC operations. Transportation and distribution network is

also one of the key concerns of foreign LSPs aiming to expand their market in China. The scale of construct is based on Pearson et al. (1998), and Hong and Liu (2007).

ICT is defined as a set of shared physical ICT resources that LSPs utilized for their business operations. ICT resources "consist of a technical physical base of hardware, software, communication technology data, and core application, and human component of skills, expertise, competencies, commitments, values, norms, and knowledge that combine to create ICT services that are typically unique to an organization" (Byrd & Turner 2000, p. 172). The items chosen have been tested and validated in the studies of Sum, Teo and Ng (2001), Li and Lin (2006), and Wang et al. (2008).

4.7.3 Independent Variables

Independent variables consist of three BP&SOP and three HRM practice constructs as discussed in Chapter 3. The three BP&SOP constructs are *PBP*, *PIR* and *PIF* and the three HRM practice constructs are *PM*, *TD* and *RM*.

PBP is defined as processes that a firm uses to compare its performance with industry standards or those of competitors (Shang & Marlow 2007). The importance of performance measurement has been explained in Chapter 3. The measurement items employed have been tested and validated in MSUGLRT (1995), Morash et al. (1996), Stank and Lackey (1997), and Shang and Marlow (2007).

PIR is defined as processes that a firm develops to increase its responsiveness to key customers' needs. Responsiveness refer to the ability to respond to the needs and wants of customers (Closs & Swink 2005). Processes to increase responsiveness in logistics operations include measures to increase delivery speed, delivery reliability, and delivery services to target market (Morash et al. 1996), as well as approaches for just-in-time deliveries to support manufacturing (Zhu & Sarkis 2004) were adopted by LSPs as standard operation procedures. The measurement items have been tested and validated in Morash (1996), Zhu and Sarikis (2004), and Zhao et al. (2001).

PIF is defined as processes that a firm establishes to increase its ability to match changing customer requirements (Closs & Swink 2005). The flexibility construct is analogous to Upton's (1995) manufacturing range flexibility dimension. The underlying measures of this construct

include product flexibility, order flexibility, and delivery time flexibility. The measurement items used were validated and tested in Stank and Lackey (1997), Shang and Sun (2004), Closs and Swink (2005), and Shang and Marlow (2007).

PM refers to activities concerned with setting targets to assess individual performance. Such activities include monitoring progress against set targets and identifying necessary training, education and development needs as well as deciding reward and discipline actions (Cakar, Bititci & MacBryde 2003). The measurement items used have been tested and validated in Luthans et al. (1997), Harel and Tzafrir (1999), and Gomez and Lorenete (2003).

TD refers to relevant training programs offered by LSPs to maintain and develop capabilities, both individual and organizational, which are expected to contribute towards the process of organizational change (Valle, Martin & Romero 2000). There are two ways training activities influence organizational performance. First, training can improve skills and abilities relevant to employee's tasks and development; and second, training increases employee's satisfaction with their jobs and workplace (Harel & Tzafrir 1999). The measurement items chosen for *TD* have been validated and tested in Delaney and Huselid (1996), Luthans et al. (1997), Gomez and Lorenete (2003), and Birdi et al. (2008).

RM is defined as merit pay or incentive compensation systems implemented by organizations to reward employees for meeting specific goals (Delaney & Huselid 1996). RM is one of the important HRM practices, and has been found to bear a positive relationship to company performance (Delaney & Huselid 1996; Islam & Siengthai 2010). The measurement items adopted were tested and validated in Harel and Tzafrir (1999).

4.7.4 Moderators

The variable *Guanxi* refers to the use of *Guanxi* to expand a firm's networks or to enhance its relationships with business partners in the Chinese market. *Guanxi* is defined as a form of relationship marketing in China (Leung & Wong 2001). The items adopted to measure *Guanxi* were previously tested and validated by Kotler and Turner (1985), Luo (1997), Li and Lin (2006), and Wong (2007).

ICT support refers to a firm's ability to exchange, assemble, integrate, and deploy valuable information across organization boundaries and to use ICT to increase L&SC competencies.

Items measuring the ICT capability construct in this study were derived from Gustin et al. (1995), Lai et al. (2006), and Wang et al. (2008).

4.8 SUMMARY

This chapter provided a description of the research methods employed in this study. Quantitative approach was considered an appropriate method to explore the proposed hypotheses developed. The reason why questionnaire survey was used for primary data collection was discussed, followed by measurement and instrument design. The statistical techniques used in the study were also explained.

CHAPTER 5

ANALYSIS AND RESULTS

5.1 INTRODUCTION

This chapter presents the data analysis and results. A summary of the sample profile is first provided, followed by a discussion of the CFA and reliability tests performed to examine and validate the measurement models. Lastly, the results of the hierarchical multiple regression analysis conducted to test the hypothesized model are examined.

5.2 SAMPLE PROFILE

Table 5.1 shows the profiles of the responding companies and their characteristics, covering service offerings, ownerships, years of experience in logistics industry, years operated in China, geographical coverage, industries of clientele, and information systems used.

The majority of the responding firms (71.4 percent) were local Chinese LSPs, with private-owned firms accounting for almost half of the sample (48.7%), and state-owned enterprises, 15.4 percent. Foreign owned LSPs and joint venture firms constituted 24.8 percent and 11.1 percent of the sample respectively. The distribution of local Chinese, foreign and joint-venture firms is comparable to that of Wang et al. (2006b), whose sample consisted of 64.8 percent local Chinese LSPs, 14.3 percent foreign LSPs and 20.9 percent foreign and Chinese-foreign joint ventures firms. However, in terms of the split between state-owned and private-owned companies, Wang et al.'s (2006b) sample contained a smaller proportion of private-owned companies (23.8%) compared with state-owned companies (41%).

Table 5.1: Profile of Responding LSPs

Firm Characteristics	Category	Percentage (%)
Types of logistics services	Freight forward	94.0
	Transportation	91.5
	Warehousing	82.1
	Distribution	70.9
	Inventory replenishment and control	39.3
	Logistics information systems	33.6
	Value added services	41.0
	Logistics system design	19.7
	Others	17.1
Ownership	Foreign-owned	24.8
	Joint Venture	11.1
	State-owned	15.4
	Private	48.7
Years of experience in logistics industry	0 -5	21.7
	6 – 10	32.2
	11 - 15	19.1
	16 – 20	7.90
	> 20	19.1
Years operated in China	0 -5	21.7
	6 – 10	34.8
	11 - 15	24.4
	16– 20	13.9
	> 20	5.2
Number of employee in 2008	Less than 100	53.3
	100 -499	31.5
	500 – 999	9.6
	More than 1000	4.4
Annual revenue in 2008 (US$)	Less than $500K	13.3
	$500K - $ 1M	23.8
	$1M - $ 10M	21.0
	$11M - $50M	15.2
	$51M - $100M	12.4
	More than $100M	14.3
Number of cities covered in China	1 – 5	34.5
	6 – 10	31.9
	11 – 15	13.2
	16 -20	3.6
	> 20	16.8
Industries of clientele [a]	IT & Telecom	57.3
	Consumer Electronics	75.2
	Food & Beverage	31.6
	Apparel & Textile	68.4
	Automotive	59.8
	Others	29.9
Information systems used [a]	Website portal	55.6
	EDI system	46.2
	ERP system	32.5
	CRM system	47.0
	WMS system	39.3
	Others	21.4

Notes: a: The percentages in this item do not sum to 100% as multiple categories are permitted.

With regard to the type of logistics services offered, the profile of the responding LSPs in this study is very similar to those of other LSP studies in China (e.g., Wang et al. 2006; Hong, Chin & Liu 2007; Wang et al. 2008; Yeung et al. 2006): majority of LSPs only offer a narrow range of low-end services, such as freight forwarding and transportation. Freight forwarding (94%), transportation (91.5%), warehousing (82.1%) and distribution (70.9%) are the most common services provided by the responding LSPs. High-end services, such as inventory replenishment and control, logistics information systems, value-added services, and logistics system design only constituted between 33 percent and 41 percent. These findings are remarkably close to the survey result obtained by Hong, Chin and Liu (2007), with 94.6 percent of the respondents providing transport service and 85.9 percent engaging in warehousing.

On years of experience in the logistics industry, aapproximately 53.9 percent of the responding firms had less than 10 years, while 19.1 percent had more than 20 years. In terms of years of operation in the Chinese market, however, a different picture emerges. More than half of the responding firms (56.5%) were established within the past 10 years, and only 5.2 percent had over 20 years' experience operating in China. Given the predominance of local LSPs in the sample, the above results suggest that a large number of local LSPs were established only within the last 10 years, which is consistent with the survey findings of China Logistics and Purchasing (2006) that 70 percent of responding private firms were established after mid 1990s (Anonymous 2007). Partly, this is the outcome of rapid economic growth and the release of some policy barriers in China during the last decade, which have attracted many new firms to enter the market (Hong, Chin & Liu 2007). The smaller percentage (5.2%) of responding firms with more than 20 years of logistics industry experience in China also reflects the growing presence of large international LSPs entering the Chinese market in recent years.

With regard to the number of employees, the survey results show that 85 percent of the responding firms had less than 500 employees, while only 15 percent had more than 500 employees. Based on the definition and classification of SMEs provided by China's Ministry of Finance, and State Statistics Bureau (2003), LSPs with less than 500 employees are classified as SMEs and those with more than 500 employees are regarded as large sized enterprises. This finding reflects the current situation of the Chinese logistics industry, where a large number of SMEs are still in their early developmental stage: small in size, low in sills, and deficient in ICT use (Su, Shi & Lai 2008).

The survey also requested information on annual revenue based on 2008 figures. The result shows that 37.1 percent of the responding firms had annual revenue less than a million USD, 36.2 percent earned between US$ 1 million and US$10 million, with those generating above US$ 50 million forming the remaining 26.7 percent. This finding reaffirms the small scale operations of the majority of the responding firms.

The small scale operation of the majority of the responding firms is further demonstrated by the geographical coverage of their service operations. Over a third of responding LSPs operated in less than five cities, while about one third have business operations in six to 10 cities. Responding firms with operation coverage in excess of 20 cities accounted for 16.8%.

In terms of industries of customers serviced, over 75 percent of the responding firms were providing service to the consumer electronics industry. Over half of responding firms were involved in the IT and Telecom industries and more than two-third were servicing the apparel and textile industry.

As regards the information systems these responding firms adopted, Table 5.1 reveals that website portal, Customer Relationship Management (CRM) software, and Electronic Data Interchange (EDI) system were the three most preferred business operation interfaces used by the responding firms to communicate with business partners and customers. Enterprise Resource planning (ERP) system and Warehouse Management System (WMS) were next with, respectively, 32.5 percent and 39.3 percent of the responding firms utilizing them. The finding suggests that many of the responding LSPs had been investing in technological innovation, despite their small operation scale.

5.3 MEASUREMENT CONSTRUCTS

To develop the measurement constructs for all independent and dependent variables, CFA was conducted to test each measurement construct following the procedure suggested by Hair et al. (2006). In this study, the four stage process recommended by Hair et al. (2006) were employed to conduct CFA: 1) defining individual constructs; 2) developing the overall measurement model; 3) designing a study to produce empirical results; and 4) assessing measurement model validity. The validation of the measurement model is dependent on Goodness of Fit (GOF) indicators. GOF indices show how well the model reflects the data, or how well the specified model reproduces the covariance matrix among the indicator items (Hair et al. 2006). Five GOF

indices were used in this study: normed chi-square ($\chi 2/df$), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), normed fit index (NFI), and root mean-squared error of approximation (RMSEA).

Normed Chi-square ($\chi 2/df$) was selected because the sample size of this study (n=117) is within acceptable range for application of this measure (Hair et al. 2006). This fit index takes the complexity of the model into account and is considered appropriate owning to its ability to measure statistical differences between model and data, indicating model fit (Hair et al. 2006). Although there are no established guidelines for this fit, Bollen (1989) suggests that values between 1 and 3 (or less than 5) would be an acceptable fit, while values less than 1 would denote over fit.

The AGFI was also chosen in this study, as the index assesses both fit and model parsimony. AGFI compares a hypothesized model with no model at all, assessing amounts of model variation and covariation. AGFI values range from 0 to 1, with values close to 1 indicating good fit (Joreskog & Sorborn 1993). Kline (2005) suggests that values greater than or equal to 0.90 are acceptable, too.

The CFI and NFI are two of the most widely used GOF indicators (Hair et al. 2006). CFI is based on NFI. Although NFI has been the practical criterion of choice (Bentler 1992), this index tends to underestimate model fit according to sample size (Bentler 1992). CFI is capable of estimating model fit in both small and large samples. Hair et al. (2006) point out that CFI values range from 0 (poor fit) to 1 (perfect fit), with values greater than 0.90 being considered representative of a well-fitting model.

The RMSEA is a measure of discrepancy per degree of freedom (Ho 2006) and is recognized as one of the most informative criteria in covariance structure modelling. RMSEA estimates the lack of model fit in comparison with a perfect, or saturated model (Browne & Cudeck 1993). Values less than 0.05 implies good fit, while values ranging from 0.05 to 0.08 indicate mediocre fit, and values larger than 0.10 denotes poor fit (Ho 2006). The statistical software AMOS also has the ability to calculate two other values: a hypothesis test if RMSEA is a close fit, called PCCLOSE, and a confidence interval on the population value of RMSEA. PCCLOSE is a p-value, testing close fit of RMSEA. PCCLOSE $\geq$ 0.05 indicates that the close fit hypothesis can be accepted (Holmes-Smith 2007). The lower and upper limits of the confidence interval

are represented by the values of LO90 (lower limit) and HI90 (upper limit). LO90 = 0 means that the hypothesis is supported and the model is an exact fit (Holmes-Smith 2007).

Tables 5.2 and 5.3 show the results of the CFA for each latent construct. The results indicate that all constructs have unidimensional characteristics, as each single construct model fits the data well. All items also loaded significantly (t > 1.96) on their respective construct, implying convergent validity was established (Anderson & Gerbing 1991). Further, the average variance extracted (AVE), calculated as the mean variance extracted for the items loading on each construct, is higher than 0.5 for each construct suggesting adequate convergent (Hair et al. 2006). Discriminant validity for each construct was also confirmed, following the recommendation of Fornell and Larcker (1981). Table 5.4 presents the correlations among the derived constructs and the square roots of AVE value (on the diagonal). None of the correlations between the constructs were higher than square root of AVE, indicating discriminant validity.

5.3.1 CFA of L&SC Competencies

As indicated in Tables 5.2 and 5.3, the measurement construct of *positioning* was just identified with two degrees of freedom. The model fit statistics indicate a good fit between the model and sample data. All indicators are well within the thresholds of acceptable fits. The normed chi-square has a value of 1.079, which is lower than 3. The *P* value of 0.340 is clearly insignificant (> 0.05 threshold). RMSEA, LO90 of -.00, and PCLOSE of 0.439, show that the claim for exact fit is supported. Further, GFI, AGFI, NFI, and CFI are all above 0.95. The loadings on all the factors, from 0.59 to 0.86, are relatively high and the corresponding t-values are statistically significant.

The loadings of the three factors in both the latent variables of *distribution support* and *agility* are high, and corresponding t-values are statistically significant. The degree of freedom for these two constructs is equal to zero, which means that the models are saturated and thus no goodness of fit tests is available.

Table 5.2 Measurement Constructs for CFA

Item	Description	λ	T-VALUE
	Positioning		
P1	We are capable of providing customers with innovative supply chain solutions.	0.74	Scaling[a]
P2	We are capable of providing an extensive range of logistics services, including value added services like bulk-breaking, consolidation and labelling.	0.86	8.29
P3	We are capable of accommodating unique requests by implementing pre-planned solutions.	0.77	8.23
P4	We are capable of providing customers with logistics expertise in a range of industries.	0.59	6.20
	Distribution Support		
DS1	We are capable of providing customers with widespread or extensive distribution coverage in China.	0.94	11.09
DS2	Our transport and distribution network has helped customers achieve cost saving.	0.84	Scaling[a]
DS3	We are capable of providing customers with global distribution coverage.	0.78	9.70
	Agility		
A1	We are capable of delivering expedited shipments to meet customer needs.	0.92	11.86
A2	We are capable of providing rapid response to customer requests.	0.93	11.88
A3	We are capable of arranging a flexible delivery schedule to fit with customer's production schedule.	0.81	Scaling[a]
	Warehouse Inventory Management (WIM)		
WIM1	Our warehousing system is capable of handling perishable goods.	0.9	11.88
WIM2	We employ advanced machinery for loading and unloading of goods.	Dropped	–
WIM3	We have modernized our existing warehousing systems with air conditioning.	Dropped	–
WIM4	We use a variety of packing methods to minimize loss and damage of goods.	0.81	10.19
WIM5	We have advanced packing methods to support our clients' operations.	Dropped	–
WIM6	We have adequate warehouse facilities to support our clients' operations.	0.72	8.58
WIM7	We often upgrade our warehouse management computer systems.	0.83	10.66
WIM8	We have installed computer systems in our warehousing management systems.	Dropped	
WIM9	Our warehouses have a reliable security system to protect high value goods.	0.83	Scaling[a]
	Transport Distribution Network (TDN)		
TDN1	We regularly upgrade our transport facilities.	0.75	6.87
TDN2	We have a distribution network in the western remote areas of China.	0.94	6.60
TDN3	We have established a nation-wide distribution network to service our customers.	0.62	Scaling[a]
	Information and Communication Technology (ICT)		
ICT1	We use advanced computerized documentation systems to manage order processing.	0.87	7.79
ICT2	We use state-of-the-art software to forecast and organize delivery schedules.	0.92	Scaling[a]
ICT3	Compared to our competitors, we invest more on computer hardware and software.	0.52	5.51
	Processes for Benchmarking Performance (PBP)		
PBP1	Customer service performance (e.g. order fill rate, cycle time) is regularly compared to industry standards or competitors.	0.96	10.65
PBP2	Operational performance (e.g. warehousing, transportation) is regularly compared to industry standards or competitors'.	0.78	9.51
PBP3	Functional cost performance (e.g. warehousing, transportation) is regularly compared to industry standards or competitors.	Dropped	–
PBP4	We have in place benchmarking metrics to measure performance.	0.81	Scaling[a]

… Table to be continued in the next page

Table 5.2 Measurement Constructs for CFA (Continued)

Item	Description	λ	T-VALUE
	Processes for Increasing Responsiveness (PIR)		
PIR1	We utilize time-based logistics solutions like continuous replenishment, quick response and Just-in-time to support customers.	0.66	5.51
PIR2	We are capable of providing shorter or smaller lot size shipments wherever possible.	0.52	4.56
PIR3	We have in place operation procedures for express deliveries	Dropped	
PIR4	We have in place operation procedures to provide customers with door-to-door delivery services	0.76	6.19
PIR5	We have in place operation procedures to ensure on-time deliveries.	0.7	Scaling[a]
	Processes for Increasing Flexibility (PIF)		
PIF1	Our operation schedule is triggered by customer's requirements (e.g. a kanban system)	0.62	5.40
PIF2	We have in place processes to support flexible scheduling solutions needed by our clients	0.82	6.58
PIF3	We have in place processes to meet changing customer requirements at short notice.	0.78	6.55
PIF4	We regularly review our service offerings in relation to customer requirements.	0.64	Scaling[a]
	Performance Management (PM)		
PM1	Salary increases are determined by annual performance appraisal results in our organization.	0.97	14.38
PM2	Promotion is determined by annual performance appraisal results in our organization.	0.9	Scaling[a]
PM3	We undertake annual performance appraisals of our employees.	0.71	9.59
	Training and Development (TD)		
TD1	We provide induction programs to new employees.	0.67	6.87
TD2	We provide job-related training to employees.	0.99	6.60
TD3	We provide career development opportunities to employees.	0.68	Scaling[a]
	Reward Management (RM)		
RM1	We offer attractive salaries to our employees.	-	-
RM2	We offer attractive welfare packages to our employees.	-	-
	Guanxi		
G1	We use *Guanxi* to approach business partners from different cultures.	0.72	7.33
G2	We use *Guanxi* to stimulate trade that might not otherwise occur.	0.92	7.50
G3	We use *Guanxi* to get valuable industry information.		
G4	We use *Guanxi* to access specific resources.	0.73	Scaling[a]
G5	Our firm uses *Guanxi* to establish and reinforce our links with local authorities and government in China.	Dropped	–
G6	We use *Guanxi* to cultivate customer loyalty.	Dropped	-
	ICT Support		
ICTS1	Our information system could be readily adapted to our customers' and partners' needs.	0.95	8.52
ICTS2	Our information system is sufficiently secure to conduct business transactions.	0.79	9.48
ICTS3	We are capable of integrating our operations with customers or suppliers.	0.73	Scaling[a]

Notes: 1. λ denotes standardized factor loadings.

2. a: Scaling denotes standardized factor loadings value of indicator was set to 1 to enable latent factor identification.

Table 5.3 Summary of GOF indices for Measurement Models

CONSTRUCT	AVE	$\chi 2$	df	$\chi 2$ / df *(p)*	RMS EA	GFI	AGFI	NFI	CFI
Positioning	0.560	2.158	2	1.079 (0.340)	0.026	0.99	0.952	0.988	0.999
Distribution Support	0.730	0	0	-	-	1	-	1	1
Agility	0.790	0	0	-	-	1	-	1	1
WIM	0.670	4.976	5	0.995 (0.419)	0	0.984	0.952	0.987	1
TDN	0.610	0	0	-	-	1	-	1	1
ICT	0.620	0	0	-	-	1	-	1	1
PBP	0.730	0	0	-	-	1	-	1	1
PIR	0.590	2.413	2	1.207 (0.299)	0.042	0.989	0.947	0.978	0.996
PIF	0.520	3.214	2	1.607 (0.201)	0.072	0.987	0.935	0.979	0.992
PM	0.750	0	0	-	-	1	-	1	1
TD	0.630	0	0	-	-	1	-	1	1
RM	-	-	-	-	-	-	-	-	-
Guanxi	0.630	0	0	-	-	1	-	1	1
ICT support	0.690	0	0	-	-	1	-	1	1

Notes: Control variables: WIM = warehouse inventory management; TDN = transport and distribution network; ICT = information and communication technology; Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

Table 5.4: Correlation table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Dependent variables:															
(1) Positioning	.746														
(2) Distribution support	.719**	.856													
(3) Agility	.683**	.650**	.888												
Control variables:															
(4) CS	.130	0.11	-0.07	-											
(5) WIM	.559**	.437**	.416**	.160	.820										
(6) TDN	.502**	.504**	.424**	.170	.668**	.781									
(7) ICT	.428**	.335**	.398**	.100	.586**	.495**	.790								
Independent variables:															
(8) PIR	.562**	.474**	.666**	.020	.255**	.256**	.296**	.720							
(9) PIF	.578**	.424**	.510**	.100	.388**	.322**	.393**	.630**	.769						
(10) PBP	.465**	.387**	.438**	.140	.508**	.520**	.524**	.500**	.566**	.854					
(11) PM	.305**	.209*	.358**	.100	.343**	.352**	.469**	.234*	.267**	.483**	.867				
(12) TD	.555**	.450**	.494**	.070	.415**	.369**	.527**	.345**	.416**	.495**	.594**	.794			
(13) RM	.235*	.265**	.213*	.090	.247**	.210*	0.18	0.04	0.04	.320**	.483**	.433**	-		
Moderators:															
(14) *Guanxi*	.436**	.391**	.463**	-0.17	.220*	.206*	.239**	.451**	.262**	.339**	.170	.342**	.193*	0.795	
(15) ICT support	.705**	.791**	.682**	.090	.609**	.556**	.552**	.494**	.528**	.540**	.457**	.578**	.302**	.407**	0.829

Notes: 1.Control variables: WIM = warehouse inventory management; TDN = transport and distribution network; ICT = information and communication technology; Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

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

3. *. Correlation is significant at the 0.05 level (2-tailed).

4. Diagonal elements are square roots of AVE

5.3.2 CFA of Physical Resource and Assets

The proposed measurement construct of *WIM* was measured by nine items. Four items were deleted after CFA based on the modification indices. The four (4) items are: WIM2, WIM3, WIM5, and WIM8 (See Table 5.2). After deleting the four items, the model was just identified with five degrees of freedom. The normed chi-square is 0.995 with *p* value of 0.419. The GFI and AGFI are 0.984 and 0.952 respectively, which are greater than 0.95. The CFI is 1.00. The RMSEA for the default model is 0, with LO90 = 0 and PCLOSE = 0.577, showing that exact fit is supported. The loadings for the five remaining factors are high, ranging from 0.72 to 0.90. The corresponding t-values are also statistically significant. The results indicate unidimentsionality of the latent construct.

As indicated in Table 5.2, the measurement constructs of *TDN* and *ICT* are saturated as there are only three factors for each latent construct. The degree of freedom is equal to zero for these two constructs and no goodness of fit test is available. The loadings for all factors for both latent constructs are relatively high, ranging from 0.62 to 0.94 and from 0.52 to 0.92 respectively. The corresponding t-value is also statistically significant.

5.3.3 CFA of BP&SOPs

The CFA measurement models for the independent variables resulted in good fit. CFA was performed for the measurement construct of *PBP*. The model was just identified after deleting PBP3 (See Table 5.2). As only three items were left for CFA, the model is saturated, with zero degree of freedom. No goodness of fit tests is available. The factor loadings range from 0.78 to 0.60 and statistically significant t-values support the unidimensionality of the construct.

In the case of *PIR*, the GOF indices resulting from the CFA show that the model fits well with two degree of freedom. The normed chi-squared is 1.207 with *p* value of 0.299. The RMSEA value is 0.042, with LO90 = 0 and PCLOSE = 0.398, indicating good fit. The value of GFI, AGFI, and CFI are all greater than 0.95. The relative high factor loadings (between 0.52 and 0.76) and statistically significant t-values support the unidimensionality of the latent construct.

CFA was performed on the four items of the measurement construct of *PIF*. The results of GOF indices indicate the model is just identified with two degree of freedom. The normed chi-squared is 1.607, with *p* value of 0.201. The RMSEA value is 0.072, with LO90 = 0 and

PCLOSE = 0.212. The RMSEA value is greater than 0.05, but it is still acceptable (Holmes-Smith 2007). The fit indices are all above the recommended 0.90 cutoffs (Hair et al. 2006), with a GFI of 0.987, an AGFI of 0.35, and a CFI of 0.992. Furthermore, the factor loadings are relatively high, ranging from 0.62 to 0.82, with statistically significant t-values, thus supporting the unidimensionality of the latent construct.

5.3.4 CFA of HRM Practices

As indicated in Tables 5.2 and 5.3, both measurement constructs of *PM* and *TD* are saturated, as only three items were used to measure each latent construct. Therefore, no GOF indices are available. The strong factor loadings, ranging from 0.71 to 0.97 for PM and from 0.67 to 0.99 for *TD* and the statistically significant t-values suggest the unimimensionality of the latent constructs. Since only two items were used to measure *RM*, no CFA was conducted.

5.3.5 CFA of Moderators

The measurement construct of *Guanxi* was measured by six items. Three items (G3, G5 and G6) were deleted based on the modification indices during CFA. . The model became just identified after deleting the three items. The factor loadings for the three items in each latent variable are high, ranging from 0.72 to 0.92, and corresponding t-values are also statistically significant. The CFA results support the unidimensionality of the *Guanxi* construct.

The measurement construct of *ICT support* contains three items subjected to CFA. The model is saturated, so the degree of freedom is zero and no GOF tests are available. The factor loadings for the three items are statistically significant, ranging from 0.73 to 0.95 with corresponding high t-value. The results also support the unidimensionality of the construct.

5.4 RELIABILITY ASSESSMENT

The reliability of each construct was assessed using Cronbach's α and construct reliability as suggested by Hair et al. (2006). Table 5.5 shows the results of the reliability analysis. All Cronbach's α for measurement constructs of L&SC competencies, PAR, BP&SOPs, HRM practices, *Guanxi*, and *ICT support* are greater than 0.728, indicating a high reliability of scales. The detailed procedure is presented in the following section.

Table 5.5: Scale Reliabilities

Construct	Item	Item-to-total correlation	Cronbach's α if item deleted	Cronbach's α	Construct reliability
Positioning	P1	0.645	0.782	0.824	0.831
	P2	0.739	0.733	-	-
	P3	0.691	0.765	-	-
	P4	0.541	0.824	-	-
Distribution Support	DS1	0.826	0.775	0.879	0.889
	DS2	0.772	0.843	-	-
	DS3	0.735	0.863	-	-
Agility	A1	0.853	0.759	0.914	0.914
	A2	0.858	0.761	-	-
	A3	0.775	0.600	-	-
WIM	WIM1	0.838	0.873	0.908	0.911
	WIM4	0.768	0.888	-	-
	WIM6	0.690	0.906	-	-
	WIM7	0.784	0.885	-	-
	WIM9	0.776	0.887	-	-
TDN	TDN1	0.388	0.832	0.728	0.821
	TDN2	0.607	0.570	-	-
	TDN3	0.680	0.484	-	-
ICT	ICT1	0.729	0.647	0.804	0.825
	ICT2	0.751	0.622	-	-
	ICT3	0.491	0.886	-	-
PIR	PIR1	0.573	0.673	0.746	0.758
	PIR2	0.465	0.731	-	-
	PIR4	0.606	0.668	-	-
	PIR5	0.556	0.679	-	-
PIF	PIF1	0.536	0.797	0.807	0.812
	PIF2	0.713	0.712	-	-
	PIF3	0.692	0.724	-	-
	PIF4	0.561	0.790	-	-
PBP	PBP1	0.841	0.774	0.884	0.888
	PBP2	0.732	0.872	-	-
	PBP4	0.753	0.854	-	-
PM	PM1	0.689	0.934	0.895	0.901
	PM2	0.831	0.818	-	-
	PM3	0.874	0.778	-	-
TD	TD1	0.615	0.803	0.817	0.832
	TD2	0.784	0.623	-	-
	TD3	0.623	0.795	-	-
RM	RM1	0.772	-	0.871	-
	RM2	0.772	-	-	-
Guanxi	G1	0.649	0.801	0.829	0.835
	G2	0.760	0.688	-	-
	G4	0.657	0.793	-	-
ICT support	ICTS1	0.817	0.735	0.864	0.868
	ICTS2	0.725	0.823	-	-
	ICTS3	0.685	0.860	-	-

Notes: Control variables: WIM = warehouse inventory management; TDN = transport and distribution network; ICT = information and communication technology; Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance

management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

The three L&SC competency constructs - *positioning*, *distribution support*, and *agility* - have Cronbach's α of 0.824, 0.879 and 0.914 respectively. The Cronbach's α of the three PAR constructs – *WIM*, *TDN* and *ICT* - forming four of the three control variables are, respectively, 0.908, 0.728 and 0.864.

For BP&SOPs, reliability test was performed on the three constructs of *PIR*, *PIF* and *PBP*. In the process, one of the four items (PIR3) measuring *PIR* was excluded, as its item-to-total correlation was 0.297 (See Table 5.2). The other three *PIR* items, however, were retained, as their item-to-total correlation ranged from 0.465 to 0.606. The final Cronbach's α of three constructs, *PIR*, *PIF*, and *PBP*, are 0.746, 0.807 and 0.884 respectively.

For HRM practices, reliability test performed for the three constructs of *PM*, *TD*, and *RM* shows Cronbach's α of 0.895, 0.817 and 0.871 respectively. The Cronbach's α for the two moderators, *Guanxi* and *ICT support*, are 0.829 and 0.864.

Construct reliability (CR) was also used to assess the reliability of each construct. As seen in Table 5.5, the CRs[1] for all the constructs are higher than the suggested threshold of 0.70 (Hair et al. 2006), which demonstrates good reliability. Based on the psychometric properties of the constructs, it is determined that the measures were sufficient and could be employed in hypothesis testing.

5.5 HYPOTHESIS TESTING

The research model and hypotheses for factors affecting L&SC competencies of LSPs in China are illustrated in Figure 5.1 and Table 5.6. After the confirmatory factor analysis, the average of all the variables remaining for every construct was calculated to provide the value for the construct. Prior to carrying out the hierarchical regression analysis, the independent variables were checked to confirm that they did not violate the assumptions of normality,

[1] The CR for each construct was computed from the squared sum of factor loadings (L*i*) for the construct and the sum of its error variance terms (e_i) using the formular proposed by Hair et al. (2006): $$CR = \frac{\left(\sum_{i=1}^{n} L_i\right)^2}{\left(\sum_{i=1}^{n} L_i\right)^2 + \left(\sum_{i=1}^{n} e_i\right)}$$

multicollinearity, and homoscedasticity. The procedure used follows that suggested by Hair et al. (2006). To check whether the residuals have a normal distribution, scatter plots of residuals against each independent variable and predicted dependent variable were analyzed. The results indicated the residuals have normal distribution (See Appendix C).

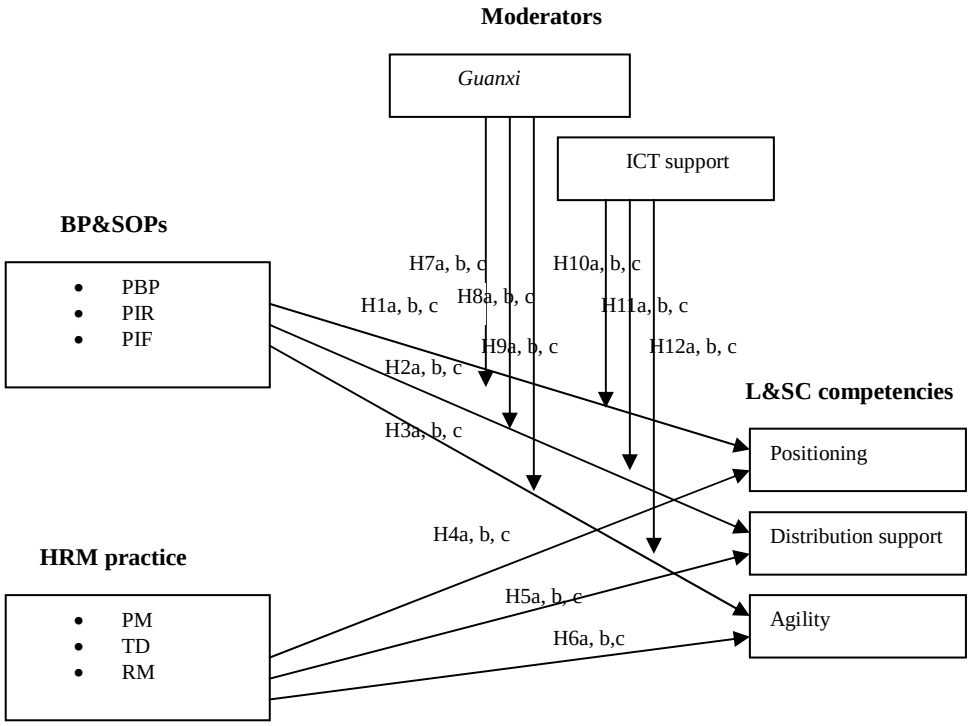

Figure 5.1: A Model of L&SC Competencies of LSPs in China

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

In moderated regression analysis, multicollinearity is a serious problem (Neter, Wasserman & Kutner 1985; Tabachnic & Fidell 2001). Cross-product terms tend to have high correlations with their component terms, leading to inflated standard errors and misinterpretation of the statistical significance of the regression terms (Jaccard, Wan & Turrisi 1990). To mitigate any potential effect of multicollinearity, all variables for the regression analysis were mean-centered (standardized), following the suggestion of Neter et al. (1985) and Tabachnic and Fidel (2001). To detect multicollinearity problem, Hair et al. (2006) recommended assessing the tolerance and variance inflation factor (VIF). Tolerance refers to the assumption that the variability in one independent variable is not explained by the other independent

variables. The VIF reveals much of the same information as the tolerance. Multicollinearity would be severe in a tolerance level of less than 0.10 or a VIF value of above 10 (Hair et al. 2006).

Table 5.6: Hypotheses for L&SC competencies of LSPs in China

	Item	Hypotheses
H1	H1a	PBP has a positive effect on the positioning competency of LSPs in China.
	H1b	PIR has a positive effect on the positioning competency of LSPs in China.
	H1c	PIF has a positive effect on the positioning competency of LSPs in China.
H2	H2a	PBP has a positive effect on the distribution support competency of LSPs in China.
	H2b	PIR has a positive effect on the distribution support competency of LSPs in China.
	H2c	PIF has a positive on the distribution support competency of LSPs in China.
H3	H3a	PBP has a positive effect on the agility competency of LSPs in China.
	H3b	PIR has a positive effect on the agility competency of LSPs in China.
	H3c	PIF has a positive effect on the agility competency of LSPs in China.
H4	H4a	PM has a positive effect on the positioning competency of LSPs in China.
	H4b	TD has a positive effect on the positioning competency of LSPs in China.
	H4c	RM has a positive effect on the positioning competency of LSPs in China.
H5	H5a	PM has a positive effect on the distribution support competency of LSPs in China
	H5b	TD has a positive effect on the distribution support competency of LSPs in China
	H5c	RM has a positive effect on the distribution support competency of LSPs in China
H6	H6a	PM has a positive effect on the agility competency of LSPs in China.
	H6b	TD has a positive effect the agility competency of LSPs in China.
	H6c	RM has a positive effect on the agility competency of LSPs in China.
H7	H7a	The positive relationship between PBP and positioning competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H7b	The positive relationship between PIR and positioning competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H7c	The positive relationship between PIF and positioning competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
H8	H8a	The positive relationship between PBP and distribution support competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H8b	The positive relationship between PIR and distribution support competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H8c	The positive relationship between PIF and distribution support competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
H9	H9a	The positive relationship between PBP and agility competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H9b	The positive relationship between PIR and agility competency is stronger with the moderating effect of *Guanxi* for LSPs in China.
	H9c	The positive relationship between PIF and agility competency is stronger with the moderating effect of *Guanxi* for LSPs in China.

… Table to be continued in the next page

Table 5.6 Hypotheses for L&SC competencies of LSPs in China (Continued)

	Item	Hypotheses
H10	H10a	The positive relationship between PBP and positioning competency is stronger with the moderating effect of ICT support for LSPs in China.
	H10b	The positive relationship between for PIR and positioning competency is stronger with the moderating effect of ICT support for LSPs in China.
	H10c	The positive relationship between PIF and positioning competency is stronger with the moderating effect of ICT support for LSPs in China.
H11	H11a	The positive relationship between PBP and distribution support competency is stronger with the moderating effect of ICT support for LSPs in China.
	H11b	The positive relationship between for PIR and distribution support competency is stronger with the moderating effect of ICT support for LSPs in China.
	H11c	The positive relationship between PIF and distribution support competency is stronger with the moderating effect of ICT support for LSPs in China.
H12	H12a	The positive relationship between PBP and agility competency is stronger with the moderating effect of ICT support for LSPs in China.
	H12b	The positive relationship between for PIR and agility competency is stronger with the moderating effect of ICT support for LSPs in China.
	H12c	The positive relationship between PIF and agility competency is stronger with the moderating effect of ICT support for LSPs in China.

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

Three separate hierarchical regression analyses were undertaken to test the hypotheses using positioning, distribution support, and agility as dependent variables respectively. First, the four control variables, *CS*, *WIM*, *TDN*, and *ICT*, were brought into the regression. The three BP&SOPs independent variables (*PBP*, *PIR* and *PIF*) and three HRM independent variables (*PM*, *TD* and *RM*) were entered sequentially into the three regression equations in Steps 2 and 3. After that, the moderators of *Guanxi* and *ICT support* were input as a block. Lastly, the interaction terms of BP&SOPs x *Guanxi* (i.e., PBP x *Guanxi*; PIR x *Guanxi*; PIF x *Guanxi*), and BP&SOPs x ICT support (PBP x ICT support; PIR x ICT support; PIF x ICT support) were entered as two separate blocks in Steps 5 and 6.

As with traditional multiple regression models, the interpretation of a hierarchical regression model can be done with the coefficient of determination (R^2), the significance of the regression (F-ratio) and the significance of regression coefficient. R^2 measures the proportion of the variance of the dependent variable that is explained by the predictor variables, and varies between 0 and 1 (Hair et al. 2006). If the model is valid, a high R^2 indicates that the model has a greater explanatory power. The significance of the regression (F-ratio) specifies the significance of the overall model. In other words, if the F-test turns to be significant, then the

relationship between the dependent variable and the independent variable is linear. For the moderating effect, the evidence of moderation exists when the interaction terms account for significant incremental (step) variances in a dependent variable, either individually, signified by regression coefficient (values of the betas), or collectively, signified by the values of the incremental F-ratio (Tabachnic & Fidell 2001).

Appendix D shows that the tolerance value for each independent variable was above the ceiling tolerance value of 0.10. The VIF value of each independent variable was also below 3.137, implying the absence of serious multicollinearity. Moreover, scatterplots of residuals against each of the independent variables and predicted dependent variables were used to check homoscedasticity of residuals (See Appendix C). Overall, the results show that the independent variables do not violate the assumptions of normality, multicollinearity, and homoscedasticity.

5.5.1 Positioning Competency

The proposed multiple hierarchical regression model of *positioning* was developed and represented as follows:

$$Y_{L\&SCposiioning} = \beta_0 + \beta_1 CS + \beta_2 WIM + \beta_3 TDN + \beta_4 ICT + \beta_5 PBP + \beta_6 PIR + \beta_7 PIF + \beta_8 PM + \beta_9 TD + \beta_{10} RM + \beta_{11} UGX + \beta_{12} ICT_{support} + \beta_i \sum_{i=13}^{15} BP\&SOPs \times Guanxi + \beta_J \sum_{j=16}^{18} BP\&SOPs \times ICT_{support}$$

Figure 5.2: Proposed Multiple Hierarchical Regression Model of Positioning

Where

- $\beta 0$ = intercept of the regression plane
- $\beta 1 - \beta 4$ = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in each of the control variables (*CS*, *WIM*, *TDN*,*ICT*).
- $\beta 5 - \beta 10$ = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in each of the independent variables (*PBP*, *PIR*, *PIF*, *PM*, *TD*, *RM*).
- β 11- β12 = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in *Guanxi or ICT support.*
- β i – β j = regression coefficient specifying the change in the mean response L&SC competencies per unit increase in each of the interaction effects of *Guanxi* and *ICT support* on each of independent variables of BP&SOPs (*PBP*, *PIR*, *PIF*).

Table 5.7: Hierarchical regression result for positioning competency

	Dependent Variable: Positioning						
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Result
Control variables:							
CS	0.031	0.034	0.037	0.067	0.067	0.075	
WIM	0.346***	0.293***	0.259***	0.088	0.09	0.104	
TDN	0.207*	0.176*	0.178**	0.056	0.047	0.044	
ICT	0.119	0.022	-0.04	-0.110*	-0.117*	-0.117*	
BP&SOPs variables:							
PBP		-0.092	-0.147	-0.116*	-0.119*	-0.112	H1a is not supported
PIR		0.331***	0.317***	0.136**	0.120*	0.154**	H1b is supported
PIF		0.239**	0.216**	0.125**	0.122**	0.095	H1c is supported
HRP variables:							
PM			-0.117	-0.146**	-0.135**	-0.140**	H4a is not supported
TD			0.305***	0.159**	0.160**	0.172***	H4b is supported
RM			0.088	0.019	0.018	0.013	H4c is not supported
Moderator:							
Guanxi				0.068	0.058	0.034	H7 is not supported
ICT support				0.703***	0.704***	0.673***	H10 is not supported
PBP *x Guanxi*					-0.025	-0.028	H7a is not supported
PIR x *Guanxi*					-0.05	-0.115	H7b is not supported
PIF x *Guanxi*					0.027	0.136	H7c is not supported
PBP x ICT support						0.042	H10a is not supported
PIR x ICT support						0.076	H10b is not supported
PIF x ICT support						-0.189	H10c is not supported
R^2	0.352	0.547	0.611	0.818	0820	0.824	
Adjusted R^2	0.329	0.518	0.575	0.797	0.793	0.792	
F for the step	15.240***	15.606***	5.852***	58.935***	0.336	0.810	
F or the regression	15.240***	18.803***	16.675***	38.909***	30.598***	25.489***	
N	117	117	117	117	117	117	

Notes: 1. Control variables: WIM = warehouse inventory management; TDN = transport and distribution network; ICT = information and communication technology; Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanx*i; ICT support = information and communication technology support

2. Figures shown are standardized coefficients (i.e., beta values)

3. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

The result of the multiple hierarchical regression model of *positioning* is shown in Table 5.7. While specific hypotheses were not offered in regard to the control variables, it is noted that *WIM* and *TDN* exhibit significant relationships with positioning (ß = 0.346, $p < 0.01$; ß = 0.207, $p < 0.1$). This implies that the two control variables are significant predictors of positioning competency.

By examining the standardized regression coefficient (ß) for each of the predictor variables, it was found that *PIR* (ß = 0.331, $p < 0.01$) and *PIF* (ß = 0.239, $p < 0.05$) show significant positive relationships with positioning competency, while the effect of *PBP* is not significant. It implies that *PIR* and *PIF* are significant positive predictors for *positioning* competency. Hence, the findings support Hypotheses 1b and 1c, while Hypothesis 1a is not supported.

As for the three HRM practice variables, the hierarchical regression results show that *TD* has a statistically significant effect on *positioning* competency (ß = 0.305, $p < 0.01$), while *PM* and *RM* do not emerge as statistically significant. This finding suggests that *TD* can help LSPs in China improve employee's skills, thus enhancing LSPs' *positioning* competency. Hence, hypothesis 4b is supported, but not hypotheses 4a and 4c.

The effect of *Guanxi* as an independent variable entered in Step 4 was not shown to be statistically significant. When *Guanxi* and *ICT support* were entered in Step 4, the standardized coefficient (ß) of *PBP* emerges as negatively significant (ß = -0.116, $p < 0.10$), while *PIR* (ß = 0.136, $p < 0.05$) and PIF (ß = 0.125, $p < 0.05$) remain significant. When introducing the interaction terms of *Guanxi* with the three BP&SOPs variables (i.e., PBP x *Guanxi*; PIR x *Guanxi*; PIF x *Guanxi*) in Step 5, none of interaction terms were found to be significant. In addition, the adjusted R^2 did not increase. The results show that *Guanxi* has no interaction effect on the positive relationships between the three BP&SOPs variables and *positioning* competency. Therefore, Hypotheses 7a, 7b and 7c are not supported.

ICT support shows a statistically significant effect on *positioning* competency (ß = 0.703, $p < 0.01$). The adjusted R^2 jumped from 0.575 to 0.797, when ICT support was brought into the model. The finding implies that *ICT support* does enhance LSP's *positioning* competency. The interaction terms of *ICT support* with the three BP&SOPs, however, are not significant. The adjusted R^2 remains the same. The result shows that *ICT support* has no interaction effects on the relationships between the three BP&SOPs variables and *positioning* competency. Thus, Hypotheses 10a, 10b and 10c are not supported.

5.5.2 Distribution Support

The proposed multiple hierarchical regression model of *distribution support* was developed and represented as follows:

$$Y_{L\&SCdistribution\,support} = \beta_0 + \beta_1 CS + \beta_2 WIM + \beta_3 TDN + \beta_4 ICT + \beta_5 PBP + \beta_6 PIR + \beta_7 PIF + \beta_8 PM + \beta_9 TD + \beta_{10} RM + \beta_{11} UGX + \beta_{12} ICT_{support} + \beta_i \sum_{i=13}^{15} BP\&SOPs \times Guanxi + \beta_J \sum_{j=16}^{18} BP\&SOPs \times ICT_{support}$$

Figure 5.3: Proposed Multiple Hierarchical Regression Model of Distribution Support

where

- *β0* = intercept of the regression plane
- *β1 – β4* = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in each of the control variables (*CS, WIM, TDN, ICT*).
- *β5 – β10* = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in each of the independent variables (*PBP, PIR, PIF, PM, TD, RM*).
- *β11 - β12* = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in *Guanxi or ICT support*.
- *β*i- *βj* = regression coefficient specifying the change in the mean response L&SC competencies per unit increase in each of the interaction effect of *Guanxi or* ICT *support* on each of independent variables of BP&SOPs (*PBP*, *PIR*, *PIF*).

Table 5.8 shows that *TDN* (ß=0.369, p< 0.91) has a statistically significant relationship with distribution support. Therefore, *TDN* is a significant control factor for LSPs in China. Developing widespread extensive distribution networks is essential for LSPs to achieve distribution support competency.

When *PBP*, *PIR* and *PIF* are entered as a single block, with distribution support as the dependent variable, the analysis result reveals that *PIR* has a statistically significant effect on *distribution support* (ß = 0.331, $p < 0.01$). This is also evidenced by the change in adjusted R^2, which increased from 0.25 to 0.36, indicating that the overall explanatory power of the model increased by 11 percent. Hence, the findings support Hypothesis 2b, but not Hypotheses 2a and 2c.

The next block of variables entering in the regression model is the HRM practices variables. Both *TD* (ß = 0.253, $p < 0.05$) and RM (ß = 0.177, $p < 0.05$) have a statistically significant impact on *distribution support*. It is also noted that *PM* (-0.219, $p < 0.05$) has a negative

significant effect on *distribution support*. This appears to be counter intuitive and contradicts Hypothesis 5a. However, given the prevalence of not fully established performance appraisal systems among local LSPs, the negative relationship may be interpreted that local LSPs are confronted with ineffective performance appraisal systems to support them to gain L&SC competencies. The percentage of variance explained increased by 6 percent (from 0.36 to 0.42), when the three HRM practices variables were entered into the model. Hence, the findings support Hypotheses 5b and 5c, but not Hypothesis 5a.

Table 5.8: Hierarchical regression result for distribution support competency

	Dependent Variable: Distribution support						
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Result
Control variables:							
CS	0.015	0.023	0.023	0.049	0.038	0.062	
WIM	0.153	0.125	0.075	-0.112	-0.123	-0.045	
TDN	0.369***	0.343***	0.354***	0.220***	0.240***	0.196**	
ICT	0.061	-0.008	-0.02	-0.097	-0.090	-0.115	
BP&SOPs variables:							
PBP		-0.077	-0.13	-0.092	-0.082	-0.035	H2a is not supported
PIR		0.331***	0.327***	0.142*	0.151*	0.209**	H2b is supported
PIF		0.101	0.101	-0.004	-0.006	-0.065	H2c is not supported
HRP variables:							
PM			-0.219**	-0.255***	-0.281***	-0.256**	H5a is not supported
TD			0.253**	0.099	0.097	0.117	H5b is supported
RM			0.194**	0.122*	0.130*	0.102	H5c is supported
Moderator:							
Guanxi				0.042	0.058	0.014	H8 is not supported
ICT support				0.773***	0.757***	0.688***	H11 is partly supported
PBP x *Guanxi*					0.040	-0.014	H8a is not supported
PIR x *Guanxi*					0.089	-0.054	H8b is not supported
PIF x *Guanxi*					-0.113	0.095	H8c is not supported
PBP x ICT support						0.234**	H11a is supported
PIR x ICT support						0.181	H11b is not supported
PIF x ICT support					-0.113	-0.448***	H11c is not supported
R^2	0.275	0.397	0.474	0.716	0.720	0.746	
Adjusted R^2	0.249	0.358	0.424	0.683	0.678	0.699	
F for the step	10.606***	7.378***	5.143***	44.366***	0.427	3.361**	
F for the regression	10.606***	10.257***	9.542***	21.852***	17.278***	15.969***	
N	117	117	117	117	117	117	

Notes: 1.Control variables: WIM = warehouse inventory management; TDN = transport and distribution network; ICT = information and communication technology; Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

2. Figures shown are standardized coefficients (i.e., beta values

3. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

While entering the moderator *Guanxi* as an independent variable in Step 4, the results show that *Guanxi* has no statistically significant effect on distribution support. The control variable *TDN* remains significant (ß = 0.220, $p < 0.01$). The independent variable *PIR* remain significant (ß = 0.142, $p < 0.1$). When the three interaction terms (i.e., PBP x *Guanxi*; PIR x *Guanxi*; PIF x *Guanxi*) were entered in Step 5, the results show that individual standardized coefficients (ß) for all the three interaction terms are not significant. Further, the percentage of variance explained remains unchanged. Therefore, Hypotheses 8a, 8b and 8c are not supported.

The final model included the interaction effects of *ICT support* with BP&SOPs on distribution support. The results revealed that *ICT support* has a statistically significant effect on *distribution support* (ß = 0.773, $p < 0.01$). The standardized coefficient (ß) for PIR decreased from 0.327 to 0.142, when *Guanxi* and *ICT Support* were entered. However, *PIR* remains significant (ß = 0.142, $p < 0.1$). The adjusted R^2 also jumped from 0.424 to 0.683.

Among the interaction terms, that between *PBP* and *ICT support* was significant (ß = 0.234, $p < 0.01$). Though significant, the regression coefficient of the interaction term between *PIF* and *ICT support* was negative (ß = -0.448, $p < 0.01$). The incremental F-statistic was also significant taking the moderating effect into account. Thus Hypothesis 11a is supported, but Hypotheses 11b and 11c are not. The results suggest that *ICT support* can strengthen the relationship between *PBP* and *distribution support* competency but will weaken that between PIF and distribution support competency.

5.5.3 Agility Competency

The proposed multiple hierarchical regression model of *agility* was developed and represented as follows:

$$Y_{L\&SCagility} = \beta_0 + \beta_1 CS + \beta_2 WIM + \beta_3 TDN + \beta_4 ICT + \beta_5 PBP + \beta_6 PIR + \beta_7 PIF + \beta_8 PM + \beta_9 TD + \beta_{10} RM + \beta_{11} Guanxi + \beta_{12} ICT_{support} + \beta_i \sum_{i=13}^{15} BP\&SOPs \times Guanxi + \beta_J \sum_{j=16}^{18} BP\&SOPs \times ICT_{support}$$

Figure 5.4: Proposed Multiple Hierarchical Regression Model of Agility

where

- $\beta 0$ = intercept of the regression plane

- *β1 – β4* = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in each of the control variables (*CS, WIM, TDN,ICT*).
- *β5 – β10* = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in each of the independent variables (*PBP, PIR, PIF, PM, TD, RM*).
- *β11 – β12* = regression coefficient indicating the change in the mean response L&SC competencies per unit increase in Guanxi.
- *β*i – *βj* = regression coefficient specifying the change in the mean response L&SC competencies per unit increase in each of the interaction effect of *Guanxi* or *ICT support* on each of independent variables of BP&SOPs (*PBP, PIR, PIF*).

Table 5.9: Hierarchical regression result for agility competency

	Dependent Variable: Agility						
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Result
Control variables:							
CS	-0.158*	-0.143**	-0.146**	-0.124**	-0.139**	-0.118*	
WIM	0.160	0.124	0.102	0.014	0.004	0.072	
TDN	0.247**	0.193**	0.189**	0.126	0.138	0.062	
ICT	0.198*	0.088	0.021	-0.016	-0.021	-0.055	
BP&SOPs variables:							
PBP		-0.068	-0.149	-0.137	-0.128	-0.068	H3a is not supported
PIR		0.552***	0.546***	0.442***	0.427***	0.336***	H3b is supported
PIF		0.070	0.069**	0.027	0.020	0.021	H3c is not supported
HRP variables:							
PM			0.042	0.032	0.016	0097	H6a is not supported
TD			0.177**	0.098	0.098	0.103	H6b is supported
RM			0.083	0.044	0.056	0.047	H6c is not supported
Moderator:							
Guanxi				0.065	0.068	0.036	H9 is not supported
ICT support				0.354***	0.334***	0.412***	H12 is partly supported
PBP x *Guanxi*					0.017	-0.116	H9a is not supported
PIR x *Guanxi*					0.023	0.183	H9b is not supported
PIF x *Guanxi*					-0.104	-0.087	H9c is not supported
PBP x ICT support						0.322**	H12a is supported
PIR x ICT support						-0.400**	H12b is not supported
PIF x ICT support						0.093	H12c is not supported
R^2	0.261	0.553	0.595	0.651	0.655	0.691	
Adjusted R^2	0.235	0.524	0557	0.611	0.604	0.634	
For the step	9.902***	23.728***	3.665**	8.380***	0.364	3.820**	
F for the regression	9.902***	19.272***	15.580***	16.187***	12.785***	12.183***	
N	117	117	117	117	117	117	

Notes: 1. Control variables: WIM = warehouse inventory management; TDN = transport and distribution network; ICT = information and communication technology; Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

2. Figures shown are standardized coefficients (i.e., beta values

3. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

The result of the analysis is shown in Table 5.9. Among the control variables, it is noted that *CS* had a negative significant relationship with *agility* (ß= -0.158, p< 0.1). This implies that in the context of the logistics industry in China, the larger the company is, the lower is its *agility* competency. The result also indicates that *TDN* had a significant positive relationship with *agility* competency (ß = 0.247, $p < 0.05$), suggesting that a widespread transport distribution network could support the *agility* competency of LSPs in China. *ICT* also shows a significant relationship with *agility* (ß = 0.198, $p < 0.1$). However, the standardized coefficient (ß) of *ICT* became non-significant when the three BP&SOPs variables were entered.

As regard BP&SOPs variables, the result reveals that *PIR* has a statistically significant effect on *agility* (ß = 0.546, $p < 0.05$) and the adjusted R^2 jumped from 0.24 to 0.52. Hence, Hypothesis 3b is supported, but Hypotheses 3a and 3c are not supported.

For HRM practice variables, the results of the regression analysis show that *TD* had a positive significant effect on *agility* (ß = 0.177, $p < 0.01$). The result indicates that *TD* is essential for LSPs to develop agility competency. It is also noted that *PM* has a negative significant effect on *agility* in China. Hence, the findings support Hypothesis H6b, but Hypotheses 6a and 6c does not support.

While the moderator *Guanxi* was entered as an independent variable in Step 4, the results in Table 5.9 show that *Guanxi* has no significant effect on *agility*. *CS* is still negatively significant (ß = -0.124, $p < 0.05$). *PIR* remains statistically significant (ß = 0.442, $p < 0.01$).

When the interaction terms were entered in Step 5, the standardized coefficients (ß) of the interaction terms between BP&SOPs and *Guanxi* do not emerge as statistically significant. Further, the incremental *F* for the block of interaction terms is also not significant. It means that Hypotheses 9a, 9b, and 9c are not supported.

ICT support has a statistically significant effect on *agility* when this moderator was entered as an independent variable in Step 4 (ß = 0.354, $p < 0.01$). *CS* remains negatively significant (ß = -0.124, $p < 0.05$) and *PIR* remains positively significant (ß = 0.442, $p < 0.01$).

Table 5.9 also shows that the interaction term of *ICT support* and *PBP* has a positive significant standardized regression coefficient (ß = 0.322, $p < 0.05$). However, the interaction term of *ICT support* and *PIR* has a negative significant standardized coefficient (ß = -0.400, $p < 0.05$). In

addition, the percentage of variance explained increased from 61% to 63%. The incremental *F* for the block of interaction terms is also significant. Thus, Hypotheses 12a and 12b are supported. The standardized regression coefficient of the interaction term of *ICT support* and *PIF* is not statistically significant. Hypothesis 12c is not supported.

5.6 SUMMARY

This chapter presents the results of the data analysis. The sample profile and current situations of responding companies were first discussed. CFA were conducted to test the measurement models of three L&SC competencies, BP&SOPs, HRM practices, and two moderators. The results of hierarchical multiple regression analysis shows that physical resources, including *WIM* and *TDN*, have a significant positive relationship with positioning competency. *TDN* is also positively related to distribution support and agility. However, firm size has a significant negative effect on agility. Table 5.10 presents the overall results of the hypotheses tests based on the hierarchical regression analysis.

For the main effects of BP&SOPs, *PBP* has no effects on the three L&SC competencies. Hypotheses 1a, 2a, and 3a are not supported. However, the results show that *PIR* has significant positive effects on all three L&SC competencies. Hypotheses 1b, 2b, and 3b are supported. The results also show that *PIF* has a significant positive relationship with *positioning* competency but no significant effect on *distribution support* and *agility* competencies.

As regard the main effects of HRM practices, *PM* has significant negative relationships with positioning and *distribution support* competencies but no significant effect on agility. Hypotheses 4a, 5a and 6a are thus not supported. It is noted that *TD* has a significant positive effect on all the three L&SC competencies. Thus, Hypotheses 4b, 5b, 6b are fully supported. It is also found that *RM* has a significant positive effect on distribution support but no significant effect on *positioning* and *agility* competencies. Therefore, Hypothesis 5c is supported but not Hypotheses 4c and 6c.

Table 5.10 Hypotheses Results Summary

Hypothesis	Independent Variables	Dependent Variables	Directions	Results
1a	PBP	Positioning	−	No
1b	PIR	Positioning	+	Yes
1c	PIF	Positioning	+	Yes
2a	PBP	Distribution support	−	No
2b	PIR	Distribution support	+	Yes
2c	PIF	Distribution support	+	No
3a	PBP	Agility	−	No
3b	PIR	Agility	+	Yes
3c	PIF	Agility	+	No
4a	PM	Positioning	−	No
4b	TD	Positioning	+	Yes
4c	RM	Positioning	+	No
5a	PM	Distribution support	−	No
5b	TD	Distribution support	+	Yes
5c	RM	Distribution support	+	Yes
6a	PM	Agility	+	No
6b	TD	Agility	+	Yes
6c	RM	Agility	+	No
7a	PBP x *Guanxi*	Positioning	−	No
7b	PIR x *Guanxi*	Positioning	−	No
7c	PIF x *Guanxi*	Positioning	+	No
8a	PBP x *Guanxi*	Distribution support	−	No
8b	PIR x *Guanxi*	Distribution support	−	No
8c	PIF x *Guanxi*	Distribution support	+	No
9a	PBP x *Guanxi*	Agility	−	No
9b	PIR x *Guanxi*	Agility	+	No
9c	PIF x *Guanxi*	Agility	−	No
10a	PBP x ICT support	Positioning	+	No
10b	PIR x ICT support	Positioning	+	No
10c	PIF x ICT support	Positioning	−	No
11a	PBP x ICT support	Distribution support	+	Yes
11b	PIR x ICT support	Distribution support	+	No
11c	PIF x ICT support	Distribution support	−	No
12a	PBP x ICT support	Agility	+	Yes
12b	PIR x ICT support	Agility	−	No
12c	PIF x ICT support	Agility	+	No

Notes: Independent variables: PBP = processes for benchmarking performance; PIR = processes for increasing responsiveness; PIF = processes for increasing flexibility; PM = performance management; TD = training and development; RM = reward management, Moderators: *Guanxi*; ICT support = information and communication technology support

On the moderating effects of *Guanxi* and *ICT support*, the final results shows that *Guanxi* has no moderating effects on the relationships between all three BP&SOP variables and the three L&SC competencies. Hypotheses 7, 8 and 9 are not supported. However, *ICT support* has significant positive moderating effects on *distribution support* and *agility* associated with *PBP*. Further, *ICT support* has significant negative moderating effects on the relationships between *PIF* and *distribution support*, and *PIR* and *agility*. Therefore, Hypotheses 11a and 12a are supported but other hypotheses for the moderating effects of *ICT support* are not supported.

CHAPTER 6

INTERPRETATION AND DISCUSSION

6.1 INTRODUCTION

This chapter interprets and discusses the major research findings. It is divided into three main sections. The first section presents the effects of the control variables on the three L&SC competencies tested. The second section discusses the findings of the main effects. Finally, the moderating effects of *Guanxi* and *ICT support* are examined in the third section.

6.2 CONTROL VARIABLE RELATIONSHIPS

Figure 6.1 presented the control variable relationships. One of the notable findings of the effects of the control variables is that CS has a statistically significant negative relationship with *agility*, but its effects on *positioning* and *distribution support* are not significant. This finding suggests that, in the context of logistics operations in China, the size of a LSP has no bearing on the strength of its *positioning* competency or its ability to provide customers with *distribution support*. However, firm size appears to be an impediment to agility. The negative relationship between firm size and *agility* competency implies that the larger the firm size, the less agile are the LSPs. Given that the asset-rich, over-staff large state-owned enterprises are generally less customer responsive than the smaller private LSPs (Hong & Liu 2007; Huang & Kadar 2002), this finding is not necessary an indication that firm size will lessen *agility* competency. Rather, it is reflection of the structural characteristics of the Chinese logistics market, as has been noted in Chapter 2.

With regard to the effect of *WIM* on L&SC competencies, the results show that *WIM* is a statistically significant positive predictor for *positioning* competency. *WIM*, however, is not a significant predictor for *distribution support* and *agility*. This finding corroborates those of Ciuba (2004) and Lu and Dinwoodie (2002), suggesting that LSPs equipped with advanced warehousing and material handling facilities have an edge over their competitors in delivering customized supply chain services, increasing their *positioning* competency. While it also implies that investment in physical resources and assets, such as warehousing facilities, can

strengthen LSPs' *positioning* competency in the Chinese market, such investments would not contribute to increasing their *distribution support* and *agility* competencies. This finding also indicates that the asset-rich state-owned enterprises may be less agile than the small private LSPs; they are more capable of supporting customers with innovative supply chain solutions in a range of industries.

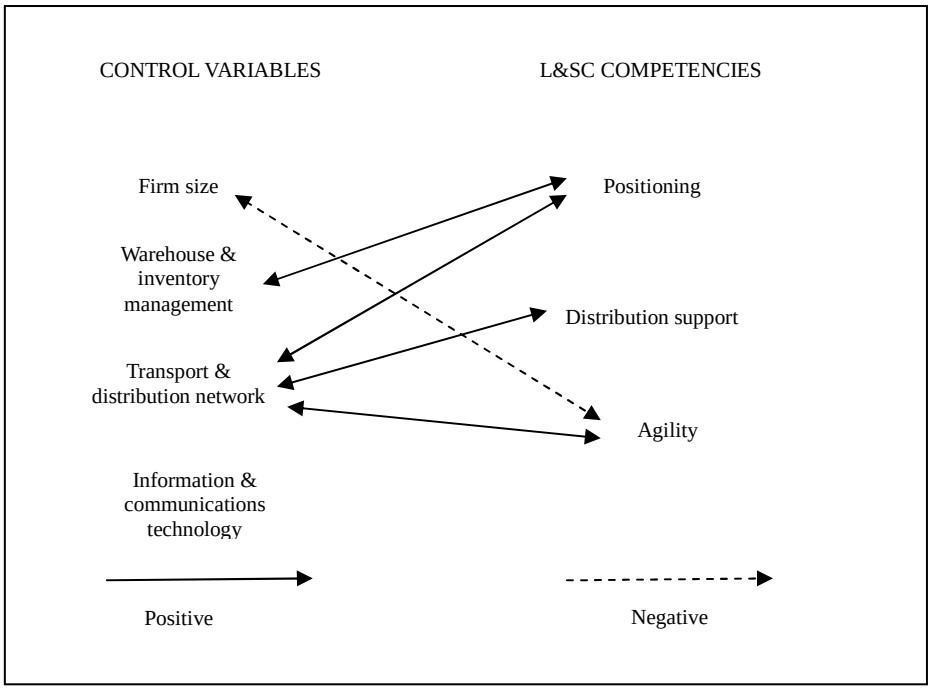

Figure 6.1: Control variables and L&SC competencies

As for the relationships between *TDN* and L&SC competencies, all three sets of results show that *TDN* is a statistically significant positive predictor for *positioning*, *distribution support*, and *agility* competencies. This finding suggests that TDN is an important physical resource vital to the development of L&SC competencies in the Chinese market. It confirms the findings of Hong et al. (2007), Qureshi et al. (2008) and Cho et al. (2008). All three studies reveal that having widespread or global distribution coverage is a key to competing in the Chinese market. The positive relationship between *TDN* and the three L&SC competencies also explains why foreign LSPs commit themselves to expanding their transport and distribution network in partnership with domestic LSPs in China (Bolton & Wei 2003; Fung et

al. 2005). For example, Kuehne & Nagel, one of the world's largest LSPs, has been actively expanding their business to southwest of China by opening a new branch in Chongqing (Anonymous 2009b). DHL also tripled its number of regional transportation hubs in China to 15 in 2009 (Hannon 2009).

On the relationship between *ICT* and L&SC competencies, the results show that *ICT* is not a statistically significant predictor for all three L&SC competencies tested. These results seem to contradict the findings of several earlier studies (Lai et al. 2008; Lai, Zhao & Wang 2006; Li & Lin 2006; Lin & Ho 2007). However, based on the sample profile of this research, in which 71.4 percent of all responding firms are local Chinese firms, it is not surprised to find that *ICT* has no significant effect on L&SC competencies. As discussed in Chapter 3, the majority of Chinese LSPs did not make heavy investment on ICT systems due to their small scale of operations. These firms also lack ICT expertise, such as logistics information system design, to provide customers with high-end supply chain services (Sum 2001; Hong & Liu 2007). In addition, some state-owned LSPs with large operation scale are still in the processes of restructuring to improve their operation efficiency and upgrading their ICT systems (Lai et al. 2006).

Further, as discussed in Chapter 3, *ICT resources* and *ICT support* are two distinctive concepts in this study. *ICT resources* are not advantage-generating assets. They can be readily acquired in product market. Therefore, merely having *ICT resources* without comparable *ICT support* capability would not necessarily help LSPs to acquire L&SC competencies, especially if its ICT strategies and its business strategies are not aligned (Chan, Huff & Copeland 1997).

6.3 MAIN EFFECTS

6.3.1 Main Effects of BP&SOPs

Hypotheses 1, 2, and 3 were framed to answer the research question, "Do BP&SOPs (i.e., *PBP*, *PIR*, and *PIF*) positively relate to the three L&SC competencies?" Three key findings emerged from the hierarchical regression analysis. Figure 6.2 shows the relationships between independent and dependent variables.

The first key finding of the main effect of BP&SOPs is that *PIR* is a positive significant predictor for all three L&SC competency variables. This finding provides empirical validation

for several previous studies (MSUGLRT 1995; Morash, Droge & Vickery 1996; Stank & Lackey 1997, Zhao et al. 2001, Shang and Marlow 2007; Cho et al. 2008), which suggest that responsiveness to market and customer needs is one of main factors contributing to L&SC competencies. Features such as delivery speed and reliability, and responsiveness to target market are key factors for developing L&SC competencies. Therefore, having relevant business processes to achieve delivery speed and ensure reliability and responsiveness are essential for LSPs to increase L&SC competencies and competitive advantage. For example, most foreign LSPs that utilized web and PC based track and trace or process automation to increase the responsive capabilities of their operational processes are able to compete strongly in the Chinese market, despite their lack of on-the-ground knowledge (Hong, Chin & Liu 2007).

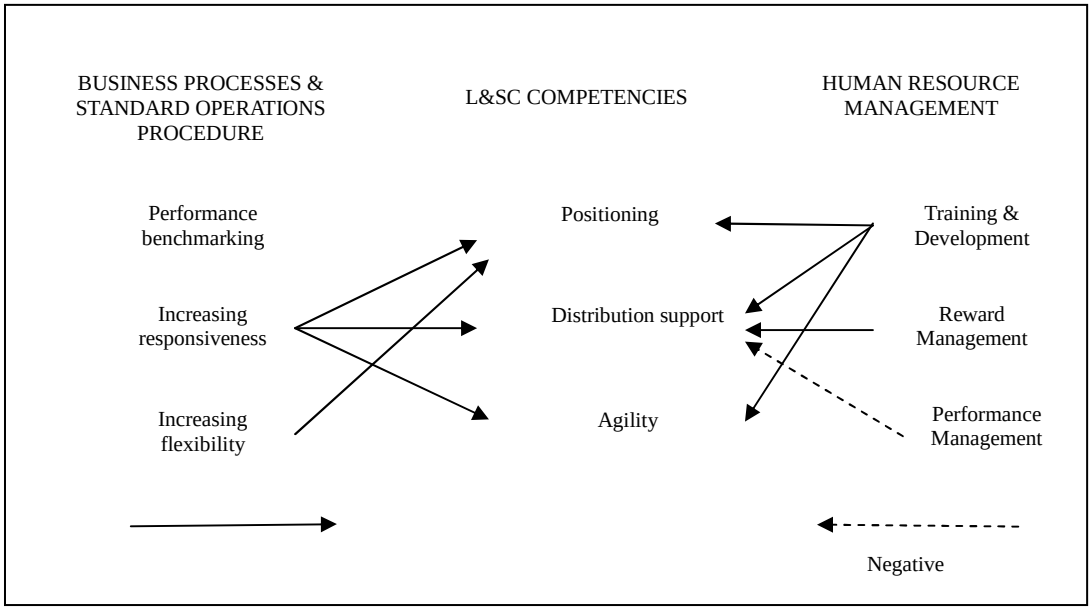

Figure 6.2: Independent variables and L&SC competencies

The second finding of the main effect of BP&SOPs on L&SC competencies is that *PIF* has a significant positive effect on *positioning* competency. This finding reveals that establishing effective BP&SOPs to increase operational and service flexibility is vital for LSPs to meet customer's fast changing needs. This result is consistent with the findings of Qureshi et al. (2008): LSPs capable of meeting customer needs flexibly can increase their L&SC competencies. It suggests that customer-triggered operation schedules, flexible scheduling

solutions, and regular review of services in relation to customer requirements are key aspects to be considered when designing relevant operation procedures to increase positioning competencies. As LSPs in China are facing many external issues, such as regulatory barriers (Hong & Liu 2007; Lieb 2008), infrastructure deficiency (Biederman 2010; Goh & Ling; Kam & Rimmer 2011), and cultural differences (Fung et al. 2005; Langley 2007), this finding indicates that innovative *PIF* is an enabler for LSPs to position themselves to tackle the regulatory barriers, and operational or environmental uncertainty in the dynamic Chinese market.

It is interesting to note that the result shows that *PBP* has a negative effect on the three L&SC competency variables. This finding seems to contradict those of MSUGLRT (1995), Stank and Lackey (1997), Shang and Sun (2004), and Shang and Marlow (2007). The inverse relationships that *PBP* has on the three L&SC competencies imply that *PBP* have counterproductive consequences in the case of LSPs in China. Given that the Chinese logistics market has been described as structurally fragmented (Hu, Wang & Liu 2008), it may be interpreted that benchmarking is not a straight forward matter, as in the case of a mature market where performance is judged by a well-acknowledged set of subscribed performance indicators. With different groups of LSPs competing in dissimilar ways, benchmarking is a complex issue. Attempts to develop processes for benchmarking not only appear to be ineffective but could be counter-productive.

6.3.2 Main Effects of HRM Practices

Hypotheses 4, 5, and 6 were established to answer the research question, “Do HRM practices (i.e., *PM*, *TD*, and *RM*) positively related to the three L&SC competencies?” There were four key findings.

First, TD is found to be a significant positive predictor of all three L&SC competencies examined. These findings indicate that effective training programs are vital for LSPs to increase their L&SC competencies. As discussed in Chapter 3, lack of talents has been identified as one of key challenges among LSPs operating in China (Bolton & Wei 2003; Hong et al. 2004; Kerr 2005; Zhou et al. 2008). Therefore, conducting effective training programs to enhance the skills of work force would significantly contribute to building L&SC competencies in China. These findings are consistent with other research results (Bookbinder & Tan 2003; Lin 2007; Lieb 2008). Lin (2007) argues that LSPs in China can improve their

innovative abilities in logistics technologies by training and educating their employees to become high quality human resources. A noted example is TNT's initiative to establish a TNT University in China in collaboration with Shanghai Jiaotong University to run training courses for TNT employees (Kong 2006). Hu & Jiang (2006) also reported that FedEx conducted job training programs to improve their employees' skills in managing packaging security and in safe and responsible driving.

Second, it is surprising that *PM* has a significant negative effect on distribution support competency. This finding implies that *PM* is less desirable for LSPs in China, particularly for domestic LSPs. Furthermore, the implementation of standard performance measurement systems in domestic Chinese companies typically meet problems, such as systems design problems, ambiguous criteria, and insufficient feedback mechanism (Cooke 2005). Further, *PM* is a formalized transparent systems designed for measuring individual progress against set targets and identifying necessary training, education as well as deciding reward and disciplinary actions (Cakar, Bititci & MacBryde 2003). *PM* is considered a rigid management tool in highly dynamic markets, like the logistics service industry in China (Kam, Tsahuridu & Ding 2010). Such a rigid system is not considered adequate to reward high performing employees, who are career-mobile in the Chinese logistics market. Thus, it is not surprising to find that most Chinese firms use non-systematic performance appraisal, evidenced from studies by Ahlstrom, Bruton & Chan (2001) and Wilkinson et al. (2005), to deal with the issue of high staff turnover rate in China.

Third, the results reveal that *RM* has a significant positive effect on *distribution support* competency. *RM*, in the form of competitive salaries and attractive employee benefits, is a popular human resource approach to attract, retain and motivate best talent (Ahlstrom, Bruton & Chan 2001). As discussed in Chapter 3, the 'iron rice bowl' that guaranteed life long employment has changed and employee turnover rates are relatively high in China. As China moves from a centrally controlled economy to a market-oriented economy, Chinese workers have more freedom to pursue the career they like (Warner 2008). Logistics talent is a very scarce resource and employee retention is an important issue in the Chinese logistics service industry. Therefore, excellent reward systems, such as providing staffs with relatively high salary and welfare packages, excellent working conditions, or providing staffs with housing benefits are essential for LSPs to attract and retain a highly qualified and well trained

workforce to maintain strong distribution support competency (Ahlstrom, Bruton & Chan 2001; Wilkinson et al. 2005).

The last notable finding is that *PM* and *RM* show no relationship with *positioning* and *agility* competencies. This finding may be explained from at least two perspectives. First, this could be because *positioning*, which encompasses providing customers with innovative supply chain solutions, accommodating unique requests and offering logistics solutions in a range of industries, requires the joint contribution of many team members within the firm as well as parties external to the firm. This competency is hard to accomplish based on the efforts of one or two capable individuals. Likewise, *agility*, which includes capabilities like delivering expedited shipments to meet customer needs, providing rapid response to customer requests, and arranging flexible delivery schedules to fit with customers' agendas, also demands team efforts and external collaboration. In contrast, *distribution support* is very much a competency linked to the distribution network of LSPs. In short, it is likely that LSPs in China require the collaborative efforts of many parties to achieve *positioning* and *agility* competencies, but individual efforts to attain distribution support competency. *PM* and *RM* practices designed to attractive and reward individuals thus have little or no effects in nurturing team-based L&SC competencies.

A second plausible explanation is that *positioning* and *agility* competencies are more strategic and tactical in focus, the outcomes of which are less visible. On the other hand, *distribution support* is more operationally visible. Appraisal and reward systems formulated on performance indicators, expectedly, would align well with visible outcomes and less suited to assess less tangible outputs. Further, the majority of Chinese LSPs are involved in transport and warehousing. Individuals excelling in these operation-based activities, which help LSPs to achieve *distribution support* competency, are thus highly visible in the industry. Given that degree of competencies is commonly assessed by the extent to which ex ante objectives are realized in ex post results McGratch et al. (1995), *PM* and *RM* practices designed to retain and reward high performing staff would thus be more effective in nurturing competencies reflected in visible outcomes, like *distribution support*.

6.4 INTERACTION EFFECTS

6.4.1 Interaction Effects of Guanxi

Hypotheses 6, 7, and 8 were framed to answer the research question, "Does *Guanxi* enhance the relationships between BP&SOPs and L&SC competencies?" The results show that *Guanxi* has no effects in moderating the relationships between BP&SOPs and the three L&SC competency variables. This finding vividly contradicts the research of many who have investigated the effects of *Guanxi* on doing business in China, represented by, for instance, Luo (1997) and Carlisele & Flynn (2005). They suggest that *Guanxi*, generally referred to as social capital, are the most sought-after assets in China. The art of using *Guanxi* has long been established as an important ingredient in building long-term business relationships in the Chinese business world (Kotler & Turner 1985). *Guanxi* is widely acknowledged as an expected norm, an unwritten social rule, which is far more pervasive than economic or legal regulations in doing business in China (Su, Shi & Lai 2008). Using *Guanxi* to gain access to financial sources, distribution networks, management experience and other complementary business functions are common practices for LSPs to secure market share in China, as evidenced from the concerted efforts made by foreign LSPs to establish strategic partnerships with influential domestic players (Hayes 2006; Huang & Kadar 2002).

Though *Guanxi* can enhance a firm's competitive advantage in the relational society in China, Li & Lin (2006) note that how *Guanxi* utilization in a supply network relates to logistics competence is still unclear. In their study of building global logistics competence with Chinese manufacturing suppliers, Li and Lin (2006) found that the effect of manufacturing flexibility on global logistics competency can be mitigated, or may even be damaged, when *Guanxi* is heavily used or overused in a supply network. Li and Lin (2006) explain that this is because some buyers and suppliers in a supply network may use *Guanxi* to interfere in the manufacturing processes to pursue their own business goals, rather than increasing logistics efficiency of the network. Li and Lin's (2006) findings suggest that there could also be a down side to the use, or overuse, of *Guanxi,* which may neutralize its positive contributions.

6.4.2 Interaction Effects of ICT support

Hypotheses 10, 11, and 12 were developed to answer the research question, "Does *ICT support* bolster the relationship between BP&SOPs and L&SC competencies?" The

hierarchical regression results produce three major findings. Figure 6.3 illustrate the interaction effects of ICT support.

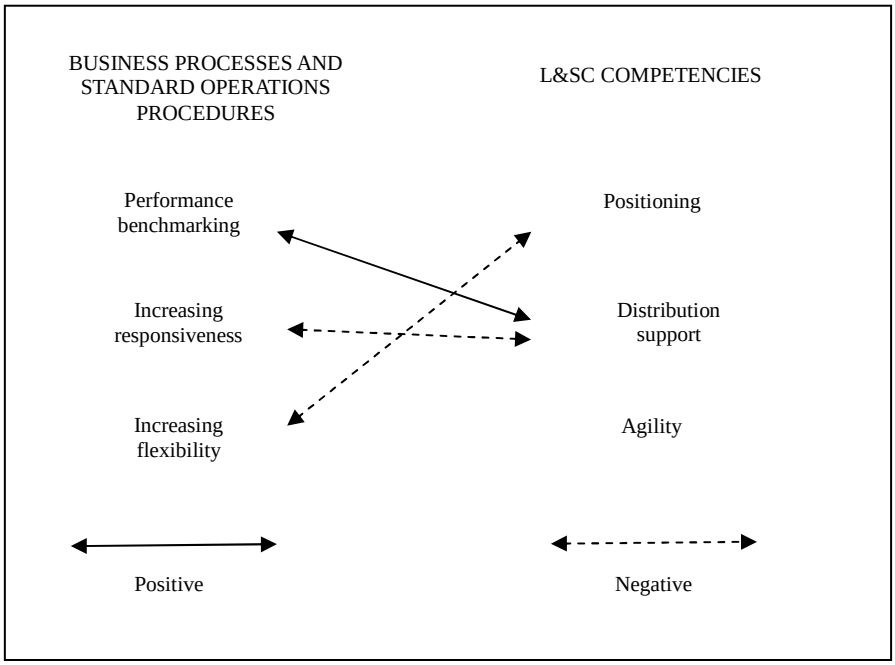

Figure 6.3: Moderating effects of ICT support

One of the three findings in terms of *ICT support* is its positive moderating effect on *distribution support* and *agility* competencies associated with *PBP*. Though the majority of domestics LSPs in China did not have fully established standard operation procedures like their counterparts in the developed economies, *ICT support* remains a valuable resource to support LSPs to establish standard operation procedures to measure their performance. The reason may be because benchmarking processes require data support, data integration and market intelligence, which are key factors in enhancing benchmarking capability. The integrity of these data forms the basis upon which a range of key performance indicators, such as logistics cost reduction and on-time shipments, are built to assess operation performance. *ICT support* plays the facilitating role of producing, integrating and even interpreting these key performance indicators (Bowersox, Closs & Cooper 2002; Lai, Zhao & Wang 2006). Not surprisingly, the relationships between *PBP* and *distribution support*, and *PBP* and *agility*, become stronger with *ICT support*.

The hierarchical regression analysis also shows that *ICT support* had a significant negative moderating effect on the relationship between *PIF* and *distribution support* competency,

which was in the opposite direction of the research hypothesis. The strong negative regression coefficient shown for the interaction term between *PIF* and *ICT support* indicates that *ICT support* could decrease the competency of *distribution support* associated with *PIF*.

As discussed in the literature review, *ICT support* is an enabler for logistics integration. Logistics function, such as *distribution support*, must be linked and communicated with other functions, like production and marketing, internally, and with other supply chain channel partners externally (Trkman 2009). These linkages require a well-developed set of procedures where the application of *ICT resources* would greatly enhance functionalities.

However, *PIF*, as a logistics competency, is usually accomplished by combining different business activities innovatively according to the exigencies of the situation. *PIF* is an activity-driven, complex and sophisticated process. In a highly dynamic market like China, *PIF* does not normally follow a single standardized process (Kam & Rimmer 2011). This is especially the case with the small private-owned LSPs. To adaptively respond to unpredictable environmental changes, processes established for achieving *PIF* necessarily involve a high degree of variation. Rather obviously, the non-standardized PIF processes of many Chinese LSPs has led to the finding that *ICT support* has not been effective in augmenting the relationship between *PIF* and *distribution support*. This argument is supported by the finding of Keil et al. (2001), who observed that *ICT support* works well only under circumstances when processes are standardized. This finding, indirectly, also reflects that of Langley (2007), who found that ICT was least important in emerging markets, like China, where majority of logistics users are dissatisfied with the ICT capabilities of LSPs. It is likely that the *ICT support* capability of most domestic LSPs in China has not reached a level that can enhance the effect of *PIF* on *distribution support*.

The result also reveals that *ICT support* has a significant negative moderating effect on the relationship between *PIR* and *agility*. As with the case of the moderating effect of *ICT support* on the relationship between *PIF* and *distribution support*, this finding also contradicts those of Bowersox et al. (2002) and Lai et al. (2006), who found that ICT plays an essential role in synchronizing and coordinating complex supply chains. Because the role of *ICT support* in L&SC operations lies mainly in the provision of timely and accurate information, enabling information sharing within the firm and between supply chain partners, and enhancing organizational decision making (Alshawi 2001), *ICT support* may only be effective if firms

already have BP&SOPs established to effectively utilize the capabilities of ICT systems. This finding is supported by Lai et al. (2006), who claim that the effects of ICT on L&SC competencies are nonlinear. LSPs need to integrate ICT, align ICT strategy and business strategy, obtain ICT related management skills to achieve ICT competency. Su, Shi and Lai (2008) further support that most of ICT systems adopted by LSPs in China are confined to some tactical and isolated functions. More advanced ICT technologies, such as GPS and RFID, have not being widely practiced in their operations. Since many LSPs in China do not have established BP&SOPs to effectively operate their ICT infrastructure, *ICT support* could lead to a situation of information overload, which dampens, rather than enhances, operation responsiveness. A counter-productive effect *ICT support* has on the relationship between *PIR* and *agility* competency thus ensues.

Further, like *PIF*, *PIR* is also an activity-driven, complex and sophisticated process. As discussed previously, achieving delivery speed, securing reliability and responsiveness is usually not the outcome of a single, standardized process. In a highly dynamic market where complex business activities with high degrees of variation proliferate, *ICT support* may produce a counter-productive effect on the relationships between *PIR* and *agility*.

6.5 SUMMARY

This chapter interpreted the major findings of the hierarchical regression analysis. First, the finding reveals that, among the control variables, firm size has a statistically significant negative relationship with *agility*: the larger the firm size, the less is its *agility* competency. It was also found that modern warehousing facilities create operational advantage for LSPs to compete in China, especially for increasing *positioning* competency. *TDN*, among the physical resources examined, is most effective in contributing to building L&SC competencies.

Second, the main effects of BP&SOPs and HRM practices on L&SC competencies show that LSPs capable of increasing responsiveness and providing customers with flexible solutions do contribute to some L&SC competencies. Conducting effective training program can enhance the skills of workforce, and contribute to building L&SC competencies. The results also reveal that a formalized performance management systems designed to measure individual progress against set targets is not adequate to retain high performing employees. However,

establishing effective reward systems can help LSPs to attract highly qualified and skilled logistics personnel.

Third, *Guanxi* shows no moderating effect on the relationships between BP&SOPs and L&SC competencies. However, *ICT support* does enhance the relationships between *PBP* and *distribution support*, and between *PBP* and *agility*. However, *ICT support* has significant negative moderating effects on the relationships between *PIF* and distribution support, and between *PIR* and *agility*.

CHAPTER 7

IMPLICATIONS, CONCLUSIONS, AND LIMITATIONS

7.1 INTRODUCTION

This chapter concludes by discussing the implications of the findings and the contributions of the study to knowledge on the logistics industry of China. Apart from highlighting its contributions, study limitations are also identified and directions for future research outlined.

7.2 IMPLICATIONS

Despite the growing recognition that BP&SOPs are firm-specific capabilities developed through a long process of routinisation (Javidan 1998; Ray, Barney & Muhanna 2004), not many LSPs in China are able to appreciate the effects of these routines in building L&SC competencies. Likewise, while western HRM practices have taken roots in many Chinese organizations, many LSPs in China continue to experience difficulties in adapting these practices to the Chinese environment (Cooke 2005). Responding to these challenges, this research explores the roles of three BP&SOPs (*PBP*, *PIR* and *PIF*) and three HRM practices (*TD*, *RM* and *PM*) in nurturing three specific L&SC competencies (*positioning*, *distribution support* and *agility*) against the backdrop of a structurally fragmented Chinese logistics service industry. Additionally, it also examines the moderating effects of *Guanxi* and *ICT support* on the relationships between the three BP&SOPs and each of the three L&SC competencies.

A total of 36 hypotheses were formulated and tested using hierarchical regression analysis. As discussed in the previous chapter, the results of the hierarchical regression analysis confirm 10 of the hypotheses, but did not support the remaining, unveiling some insightful information on the relationships between BP&SOPs, HRM practices and L&SC competencies in the Chinese context. These findings have far-reaching implications for logistics and supply chain research and management in China, with significant practical value.

7.2.1 Implications for Research and Practice

First, this study reveals that formalized benchmarking performance system does not contribute to building L&SC competencies in the structurally fragmented Chinese logistics market. Different groups of LSPs compete in dissimilar ways, making benchmarking a highly complex issue. In fact, inappropriate benchmarking could produce counter-productive effects, dampening a LSP's positioning competency. From an operational point of view, this finding suggests that LSPs in China would be better off developing less conventional measures for performance benchmarking to adapt to the unique Chinese logistics market environment.

Second, the significant positive effects of *PIR* on the three L&SC competencies imply that having innovative business processes to increase delivery speed, reliability, and responsiveness are key for LSPs to achieve L&SC competencies in the Chinese market. Likewise, the significant positive effect *PIF* has on positioning competency suggests that developing demand-driven *PIF* can help LSPs in China to develop a competitive edge to differentiate themselves, to flexibly accommodate regulatory barriers and operational or environmental uncertainty in the dynamic Chinese market. Much of the on-the-ground knowledge many local LSPs possess are keys to building both *PIR* and *PIF* competencies.

Third, the positive effects of *TD* on the three L&SC competencies imply that on-the-job training is an effective means to upgrade the skills of workforce, hence increasing L&SC competencies. The most important HRM practice to attract and retain logistics expertise is to continue to provide job-related training to give employees better opportunities to develop their careers.

Fourth, lack of qualified and skilled personnel will remain a critical issue in the logistics industry in China in the coming decade. While formalized *RM* systems appear to reinforce the growth of *distribution support* competency, the negative effect of *PM* on *distribution support* implies that managers ought to realize that a formalized performance management system would work against the development of the same competency. Adopting formal *RM* systems might assist LSPs in China to recruit appropriate talents and skills to grow their distribution support competency, having structured, western-style *PM* would not help these firms to retain high performing employees. In fact, the hierarchical regression result from this study suggests that the more organized the *PM* systems in an organization, the more likely would the organization *loose* its distribution support competency. In the dynamic Chinese market,

alternative Chinese based, rather than formal western-style, performance appraisal systems, are needed. To retain high performing employees, and hence L&SC competencies, innovative *PM* approaches geared to meeting the aspirations of the Chinese workforce should be considered to make it hard for competitors to imitate. In this regard, exploring Chinese-specific *PM* approaches would constitute a fruitful area for future research on HRM practices in China.

Fifth, this study finds that *Guanxi* has no moderating effect on the relationships between all three BP&SOPs and the three L&SC competencies tested. Previous literature (Li &Lin 2006; Su, Shi & Lai 2008), however, argue that *Guanxi* has already become an expected norm, an unwritten social rule, which is far more pervasive than economic or legal regulation in the context of China. *Guanxi* holds the key to financial sources, distribution networks, and management experience (Carlisle & Flynn 2005; Szeto, Wright & Cheng 2006). This finding does not deny that *Guanxi* is an important cultural factor in the logistics service market in China. However, the contribution of *Guanxi* toward building L&SC competencies may not lie in moderating the effects of BP&SOPs on L&SC competencies, as this study has hypothesized. While yet to be investigated, *Guanxi* may be an important mediator in the link between BP&SOPs and L&SC competencies.

Finally, this study found that *ICT support* has a significant positive moderating effect on the relationships between *PBP* and *distribution support*, and between *PBP* and *agility*. This finding ratifies those of earlier studies (Han, Trienekens & Omta 2009; Lai et al. 2008), confirming the ability to utilize ICT skills and knowledge to enhance L&SC competencies is fast-becoming an indispensable resource for LSPs in China. However, this study also reveals that *ICT support* has a negative moderating effect on the relationships between *PIR* and *agility*, and between *PIF* and *distribution support*. The negative moderating effect *ICT support* has on the two latter relationships is counter-intuitive, throwing into questions the long-held belief about the positive impact of *ICT support* on increasing operational efficiency (e.g., (Bowersox, Closs & Cooper 2002; Lai, Zhao & Wang 2006). Further, the dissimilar effects that ICT support could engender in moderating the relationships between different BP&SOPs and L&SC competencies suggest that *ICT support* is not necessarily a worthwhile investment in all aspects of L&SC operations. The contrasting findings signal a need to further investigate the role of *ICT support* in L&SC operations in China.

In sum, this study shows that not all widely acclaimed BP&SOPs are equally potent in building L&SC competencies in China. The empirical findings offer valuable managerial insights into the cost-effectiveness of three business and operational processes, *PBP*, *PIR* and *PIF*, as well as three HRM practices, *TD*, *RM* and *PM*, on the three L&SC competencies examined. Among the three BP&SOPs investigated, *PIR*, processes in increasing responsiveness, is the most valuable. *PIR* contributes positively toward strengthening all three L&SC competencies: *positioning*, *distribution support* and *agility*. *PIF*, processes for increasing flexibility, is only effective in developing *positioning* competency. Contrary to findings of previous studies (e.g., MSUGLRT1995; Shang & Marlow 2007), *PBP*, processes for benchmarking, has no significant effect on all three L&SC competencies.

Similarly, not all HRM practices are equally effective in contributing to developing L&SC competencies. While *TD*, training and development, emerges as a vital factor in building L&SC competencies, both *RM*, reward management, and *PM*, performance management, have their limitations. *RM* is effective only in nurturing distribution support competency. *PM*, on the other hand, was found to have a dampening effect on distribution support competency.

Equally refreshing is the insignificant moderating effect of *Guanxi* on the relationships between BP&SOPs and the three L&SC competency variables, despite the importance of *Guanxi* in the conduct of business in China. From a research perspective, this finding signals a need to further investigate the role of *Guanxi* on the relationship between BP&SOPs and L&SC competencies. From a managerial perspective, this finding cautions the overuse and abuse of *Guanxi*, which could lead to counter-productive effects, as Li and Lin (2006) have also shown.

The same may also be said of the contrasting moderating effects *ICT support* has on the relationships between the three BP&SOP variables and the three L&SC competency variables. Given the unconventional regulatory environment and the highly dynamic market competition LSPs in China have to endure, many of the less expected findings unearthed in this study clearly suggest that some of the long held principles in L&SC management do not apply in the case of China.

7.2.2 Contributions

Since China's entry into the WTO, competition has become more intense in the logistics service industry. In order to survive in a highly dynamic industry, LSPs operating in the Chinese market have been pursuing a range of cost reduction and service differentiation strategies (Wang, Lai & Zhao 2008) to remain competitive. The effectiveness, as well as limitations, of these strategies has been well documented (e.g., Wang, Lai & Zhao 2008). Cost reduction strategies have reached a point where little room is left for further enhancement. Service differentiation has become one of the most potent weapons LSPs use to gain competitive advantages in China (Yeung et al. 2006). While many aspects of service differentiation have been examined (Yeung et al. 2006; Lai et al. 2004) together with the types of L&SC competencies to achieve those differentiated services, less is known about the factors that contribute to the building of those competencies. The unexpected effects of BP&SOPs as well as HRM practices on *positioning*, distribution support and *agility* competencies found in this study are major contributions to an existing gap in extant literature on the logistics industry in China. In a similar vein, the insignificant moderating effect of *Guanxi*, and the contrasting effects of *ICT support*, on the relationships between BP&SOPs and L&SC competencies are also notable contributions.

From a theoretical perspective, this research also confirms that RBV is a promising paradigm for supply chain research in China. It contributes to a better conceptual and operational understanding of how logistics firms in China could utilize their resources to develop capabilities and competencies, hence achieving competitive advantage. The findings show positive relationships between *TDN* and the three L&SC competencies of *positioning*, *distribution support* and *agility*, as well as between *WIM* and *positioning* competency. While these relationships flow directly from the tenets of RBV, they have not been empirically tested in the context of the logistics industry in China. These findings underscore the importance of possessing or having access to extensive distribution networks nationally and globally as a primary resource for LSPs to compete in the Chinese market. They also highlight the importance of having modern warehousing and material handling facilities in gaining *positioning* competency, as reflected in the heavy investments most major foreign LSPs, such as DHL, FedEx and UPS, have committed to building express logistics centers and strategic parts centers, in China (Richardson 2004). These findings exemplify the

practical significance of the study in providing valuable information on how LSPs may direct their resource investment accordingly.

7.3 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

In empirical studies, there are always rooms for further investigation. This study is no exception, despite its many important contributions. Highlighting its limitations opens up avenues for further studies as well as enabling the findings to be generalized within the context of those limitations.

First, this study used single informant in its survey of LSPs. Gerhart et al. (2000) point out that a single informant can cause bias in the result due to only one rater. Though informants in this study were predominantly executive managers or personnel likely to be most familiar with all aspects of the organization examined (Starbuck & Mezias 1996; Wang et al. 2006b), reporting bias remains due to the particular position of the informants in the organization (Phillips 1981). In short, bias is unavoidable when the same respondent reported and evaluated the perceptions of the entire firm. One way to overcome single rater bias in surveys of organizations is to collect data from several informants within the same organization to obtain a more encompassing view (Oleary-Kelly & Vokurka 1998). Future studies on LSPs may consider using multiple informants to increase the validity of the measures derived from the collected data

Second, this study has explored antecedents to L&SC competencies purely based on internal organizational processes and standard operations procedures of LSPs. Many studies (e.g., Hammer & Champy 1993; Han, Trienekens & Omta 2009) have found that organizational processes integrated with those of external supply chain partners are also sources of competitive advantage. In a relational society like China, externally integrated processes may be as important as internally established operations procedures in contributing to the development of L&SC competencies. Exploring the extent to which externally integrated processes could contribute to building L&SC competencies in China, or other parts of the world, would be a fruitful area for further investigation.

Third, although validity and reliability assessment showed strong support for all the constructs used in this study, there remain issues in definition and measurement items employed to develop BP&SOP, HRM practice and L&SC competency constructs. By building

its constructs based on those developed in studies framed within the context of the LSP industries in developed economies; this study has found that many of the hypothesized relationships were not supported. Future research, therefore, may benefit from creating new measurement items to develop constructs that reflect the unique practices of China's logistics industry.

Fourth, this study has found that *Guanxi* contributed no significant moderating effect in augmenting the relationships between BP&SOPs and L&SC competencies. While many explanations are plausible for this unexpected finding, which challenges conventional understanding about the importance of *Guanxi* in China, the negative effect relating to the overuse and abuse of *Guanxi* remain less well unexplored. As Li and Lin (2006) have found, overuse of *Guanxi* can compromise the effect of manufacturing flexibility on global logistics competency. Because of the overarching importance of *Guanxi* in business operations in China, future research may be rewarded by operationalising the *Guanxi* construct through the inclusion of items that reflect the overuse or abuse of *Guanxi* to gain further understanding on the impacts *Guanxi* has in logistics operations in China. Additionally, different variable specifications, such as prescribing a non-linear function for the *Guanxi* variable, or alternative model structures, like inputting a mediating, rather than a moderating, role for *Guanxi,* may have to be attempted to comprehensively examine the multiple roles *Guanxi* may have in linking BPSOPs to L&SC competencies.

Fifth, the results and implications of this research are limited by the research methodology used and the method of analysis employed. Future studies could consider the use of mix methods, i.e., combining quantitative models with qualitative-based methodologies, such as case study method, to seek more in-depth explanations on the results of statistical tests on the hypothesized relationships.

Sixth, future research efforts may be directed to compare the performance of various LSP groups (e.g., SMEs versus large logistics enterprises or foreign versus domestics LSPs). Factors affecting L&SC competencies of various LSP groups can also be explored. Because each group of LSPs has their unique capabilities, examining the relationships between BP&SOPs and L&SC competencies within each LSP group could lead to greater insights on how different groups develop their unique BP&SOPs and HRM practices to increase their L&SC competencies.

Finally, this study was conducted within the context of the Chinese logistics market. Its findings have demonstrated that despite over three decades of open-door policy and economic reform, and ascension to the WTO, China continues to present a distinctively unique market environment with ingredients for operation success vastly different from those of the developed economies. While the generalization of its findings to other contexts remains to be ascertained, a cross-country research may be an appropriate project to determine whether the research model developed in this study can be applied to situations in other emerging markets, like Mexico and India. Clearly, many other opportunities for validating and expanding the findings of the present study exist. This study, in a small way, has opened up a number of horizons for further research into the logistics market of China.

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APPENDIX A

SURVEY QUESTIONNAIRE

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Dear Sir/Madam,

Survey on Effects of Logisics and Supply Chain Competence on Performance of Logistics Service Providers (LSPs) in China

You are invited to participate in a survey on the *Effect of Logistics and Supply Chain Competence on Performance of Logistics Service Providers (LSPs)* in China.

This survey aims to investigate the extent to which LSPs' logistics and supply chain competencies may influence performance. Respondents are invited to answer questions based on their experience or knowledge of their firm. The present study aims to improve understanding of how logistics and supply chain capabilities and competencies impact on business development in China. Complete confidentiality to the survey is assured. Responses will only be aggregated for statistical analysis in the current PhD study.

The attached questionnaire will take approximately 20 minutes to complete. We appreciate the time and effort you will be taking to respond to the survey. Should you have any questions about the questionnaire or procedures, you may contact me by email: mingjuan.ding@rmit.edu.au. If you have any complaints about your participation in this survey, you may directly contact the Secretary, Portfolio Human Research Ethics Sub-committee, Business Portfolio, RMIT on telephone: (61-3) 9925 5594 or email: rdu@rmit.edu.au

Thank you very much for your support.

Yours sincerely

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中文翻译

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亲爱的先生/女士：

您好！我们以墨尔本皇家理工大学商学院的名义热诚邀请您参加***“关于物流和供应链管理与能力对物流公司绩效的影响”***项目的调研。

该调研目的为调查物流服务方的物流供应链资质能力对公司绩效的影响。被调查方邀请基于本人经验及对公司了解情况回答有关问题。通过该问卷调查，可以对物流和供应链相关因素如何对公司业务在中国的发展达成更深刻的了解。被调查方提供的信息将完全保密，并仅用于博士论文数据分析。

该问卷需大约 20 分钟完成。 我们真诚感谢您对该问卷的回复。如您对该问卷有任何问题和建议，请和我本人联系。如您对该项目有任何建议请直接和商学院调研项目管理机构联系 。 联系方式为：电话：（61-3）9925 5594 或电子邮件：rdu@rmit.edu.au.

衷心感谢您的参与！

丁明娟

墨尔本皇家理工大学商学院管理系
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Questionnaire（调查问卷）

Survey on Effects of Logisics and Supply Chain Competence on Performance of Logistics Service Providers (LSPs) in China

关于物流和供应链管理与能力对物流公司绩效的影响在中国的调查

This questionnaire consists of two (2) sections. Section A highlights some key performance factors of logistics firms in China. Section B includes company profile information. This survey will take approximately 20 minutes to complete. Please indicate your degree of agreement or disagreement on the following statements. Please use the following scale and if an element is not applicable to your firm, leave it blank (该问卷包括两部分。A 部分关于影响物流公司绩效的主要因素。B 部分关于公司基本情况。该问卷需大约 30 分钟完成。请从数字“1” 和“7”之间选择您赞同程度。如情况不适合贵公司，不必选择可留空白。

1	2	3	4	5	6	7
Strongly disagree	**Disagree**	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Agree**	**Strongly agree**
坚决不同意	**不同意**	**基本不同意**	**中立**	**基本同意**	**同意**	**坚决同意**

Section A: Factors that impact on the performance of Logistics Service Providers (LSPs) operation in my organization （A 部分：关于影响物流公司（LSPs）绩效的主要因素）

Part One: Business Processes and Standard Operation Procedures
第一部分：商务流程和标准化操作流程

1.	We utilize time-based logistics solutions like continuous replenishment, quick response and Just-in-time to support customers. 我们采用时效性物流方案如连续供货，快速反馈策略或及时应变系统来服务客户。	1	2	3	4	5	6	7
2.	We are capable of providing shorter or smaller lot size shipments wherever possible. 我们能够根据需要提供小批量及时发运。	1	2	3	4	5	6	7
3.	We have in place operation procedures for express deliveries. 我们建立了快递业务运作程序。	1	2	3	4	5	6	7
4.	We have in place operation procedures to provide customers with door-to-door delivery services（ 我们对客户提供门对门交货服务）.	1	2	3	4	5	6	7
5.	We have in place operation procedures to ensure on-time deliveries. 我们建立了运作程序保证按时交货。	1	2	3	4	5	6	7
7.	Our operation schedule is triggered by customer’s requirements (e.g. a kanban system) 我们的交货计划是根据客户需求来安排的（如看板系统）。	1	2	3	4	5	6	7
8.	We have in place processes to support flexible scheduling solutions needed by our clients （我们建立了专业流程供客户灵活日程安排）.	1	2	3	4	5	6	7
9.	We have in place processes to meet changing customer requirements at short notice. 我们建立了专门流程随时改变计划安排来满足客户即时要求。	1	2	3	4	5	6	7
10.	We regularly review our service offerings in relation to customer requirements. 我们定期审查计划来满足客户需求。	1	2	3	4	5	6	7
11.	We have in place benchmarking metrics to measure performance. 我们建立评估机制来评估绩效。	1	2	3	4	5	6	7
12	Customer service performance (e.g. order fill rate, cycle time) is regularly compared to industry standards or competitors. 我们对客户服务绩效（定单完成率、定货周期）定期和同行业或竞争对手进行比较。	1	2	3	4	5	6	7
13.	Functional cost performance (e.g. transportation, sales) is regularly compared to industry standards or competitors’. 我们对成本绩效（交通、销售）定期和行业标准或竞争对手进行比较。	1	2	3	4	5	6	7
14.	Operational performance (e.g. warehousing, transportation) is regularly compared to industry standards or competitors’. 我们对运行绩效（仓库、交通）定期和行业标准或竞争对手进行比较。	1	2	3	4	5	6	7

Part Two: Human Resource Practice
第二部分：人力资源运作

1.	We offer attractive salaries to our employees（公司薪金政策对员工具有吸引力）.	1	2	3	4	5	6	7
2.	We offer attractive welfare packages to our employees 公司福利政策对员工有吸引力。	1	2	3	4	5	6	7
3.	We undertake annual performance appraisals of our employees. 我们对员工进行年度绩效评估。	1	2	3	4	5	6	7
4.	Promotion is determined by annual performance appraisal results in our organization. 公司提拔晋升是由年度绩效结果决定的。	1	2	3	4	5	6	7
5.	Salary increases are determined by annual performance appraisal results in our organization (工资增加是由年度绩效结果来决定的).	1	2	3	4	5	6	7
6.	We provide job-related training to employees（我们提供员工工作相关培训）.	1	2	3	4	5	6	7
7.	We provide career development opportunities to employees. 我们提供员工职业发展机会。	1	2	3	4	5	6	7
8.	We provide induction programs to new employees. 我们提供新员工熟悉新职务的培训。	1	2	3	4	5	6	7

Part Three: Physical Assets and Resource
第三部分：有形资产和资源利用

1.	We have adequate warehouse facilities to support our clients' operations. 我们建立了足够容量的仓库设施来服务客户。	1	2	3	4	5	6	7
2.	We employ advanced machinery for loading and unloading of goods. 我们拥有先进的设备来装卸货物。	1	2	3	4	5	6	7
3.	We have advanced packing, re-packing, and unpacking facilities. 我们拥有先进设施对货物进行包装、重新包装服务。	1	2	3	4	5	6	7
4.	We use a variety of packing methods to minimize loss and damage of goods. 我们采取的包装方法可以使货物损失或丢失最小化。	1	2	3	4	5	6	7
5.	We have installed a computer system in our warehouse for bar-coding or inventory counting（我们安装了计算机系统进行编码扫描和对存货进行计数管理）。.	1	2	3	4	5	6	7
6.	We often upgrade our warehouse management computer systems. 我们升级仓库计算机系统。	1	2	3	4	5	6	7
7.	We have modernized our existing warehousing systems with air-conditioning. 我们对现有的仓库进行现代化装备如安装空调设施。	1	2	3	4	5	6	7
8.	Our warehousing system is capable of handling perishable goods. 我们的仓库系统能保证减少易碎品损失。	1	2	3	4	5	6	7
9.	Our warehouses have a reliable security system to protect high value goods. 我们的仓库系统能保护高价值物品。	1	2	3	4	5	6	7
10.	We regularly upgrade our transport facilities（我们定期对运输车辆进行维修）.	1	2	3	4	5	6	7
11.	We use advanced computerized documentation systems to manage order processing. 我们建立了计算机处理文件系统来管理定单。	1	2	3	4	5	6	7
12.	We use state-of-the-art software to forecast and organize delivery schedules. 我们拥有先进的软件来预测和管理交货日程安排。	1	2	3	4	5	6	7
12.	Compared to our competitors, we invest more on computer hardware and software. 和竞争对手相比，我们更多投资于计算机硬件和软件。	1	2	3	4	5	6	7
14.	We have established a nation-wide distribution network to service our customers. 我们建立了全国性的配送网络来服务客户。	1	2	3	4	5	6	7
15.	We have a distribution network in the western remote areas of China. 我们在中国西部地区建立了供应网络。	1	2	3	4	5	6	7

Part Four: Social Capital

第四部分：社会资本

1.	We use *Guanxi* to approach business partners from different cultures. 我们利用关系来和不同文化背景的商务伙伴进行沟通。	1	2	3	4	5	6	7
2.	We use *Guanxi* to stimulate trade that might not otherwise occur. 我们利用关系来刺激本不可能达成的贸易合作。	1	2	3	4	5	6	7
3.	We use *Guanxi* to get valuable industry information. 我们利用关系来获取有价值的行业信息。	1	2	3	4	5	6	7
4.	We use *Guanxi* to access specific resources（我们利用关系来接近特定资源）.	1	2	3	4	5	6	7
5.	Our firm uses *Guanxi* to establish and reinforce our links with local authorities and government in China (公司和中国政府和地方机构建立了良好的关系).	1	2	3	4	5	6	7
6.	We use *Guanxi* to cultivate customer loyalty. 我们利用关系发展提高客户忠诚度。	1	2	3	4	5	6	7

Part Five: Logistics and Supply Chain Competence
第五部分：物流供应链资质能力

1.	We are capable of providing rapid response to customer requests. 我们能够对客户要求做出快速反应。	1	2	3	4	5	6	7
2.	We are capable of delivering expedited shipments to meet customer needs. 我们能够满足客户紧急发货要求。	1	2	3	4	5	6	7
3.	We are capable of arranging a flexible delivery schedule to fit with customer's production schedule （我们能够安排灵活计划方案来满足客户生产需要）.	1	2	3	4	5	6	7
4.	We are capable of providing an extensive range of logistics services, including value added services like bulk-breaking, consolidation and labelling. 我们能够提供一系列综合服务如分装、综合发运和贴标签服务。	1	2	3	4	5	6	7
5.	We are capable of providing customers with widespread or extensive distribution coverage in China （我们能够提供客户全国范围内综合配送服务）.	1	2	3	4	5	6	7
6.	We are capable of providing customers with global distribution coverage. 我们能够提供客户全球配送服务。	1	2	3	4	5	6	7
7.	Our transport and distribution network has helped customers achieve cost saving. 我们的交通和配送网络能帮助客户节约成本。	1	2	3	4	5	6	7
8.	We are capable of accommodating unique requests by implementing pre-planned solutions （我们能够通过预先计划满足客户特殊要求）.	1	2	3	4	5	6	7
9.	We are capable of providing customers with innovative supply chain solutions. 我们能够提供客户创新性供应链方案。	1	2	3	4	5	6	7
10.	We are capable of providing customers with logistics expertise in a range of industries. 我们能够提供客户行业物流专门知识。	1	2	3	4	5	6	7

Section B: Company Profile Information
B 部分：公司基本情况

1. **Which type of logistics services does your company provide to customers (Please choose as many as possible)？公司提供客户以下哪种服务（请尽多选择）？**

Freight forward 货代 ☐ Transportation 运输 ☐ Warehousing 仓储 ☐ Distribution 配送 ☐ Inventory

Replenishment and control 库存管理 ☐ Logistics information systems 物流信息系统 ☐ Value added services

增值服务 ☐ Logistics system design 物流系统设计 ☐ 其它 ☐ please specify: 请特别注明……

2. **Which of the following best describes the ownership of your organization?**
请问公司所属性质？

Foreign owned 独资企业 ☐ Joint Venture 合资企业 ☐ State-owned 国有企业 ☐ Private 私有企业 ☐

Formed from in-house logistics department ☐ 由内部物流部门演化而成

3. **Years of experience in logistics industry 贵公司在物流行业的年数:** ……. Years.

4. **How many years has your company operated in China**? **贵公司在中国发展多长时间:** : …… Years.

5. **What is the estimated annual turnover of your company last year?**
贵公司在中国去年的销售额有多少 :

Less than US$ 500K（少于 500K 美金）☐ US$500K-US$1M (500K 美金-1M 美金) ☐ US$1M-US$10M（1M 美

金-10M 美金）☐ US$11M-US$50M （11M 美金-50M 美金） ☐ US$51M-$100M （51M 美金-100M 美金）

☐ More than US$100M （多于 100M 美金）☐

6. **How many equivalent full time employees does you company have 贵公司在中国员工人数** ?

(a) BEFORE the economic recession （经济危机前）: ……...
(b) AFTER the economic recession （经济危机后）:…….

7. **How many locations does your company have in China 贵公司在中国已发展市场的城市数**

目: :…….

8. **Which of the following industries best describes your major clientele? (Please choose as many as applicable) 公司主要客户所在的行业（请尽多选择）?**

IT & Telecom 计算机通信☐ Consumer electronics 消费品电器☐ Food & beverage 饮食☐ Apparel & Textile

服装 ☐ Automotive 汽车行业☐ Chemical 化学品☐ Fast moving consumer goods (FMCG) 快速流动消费

品 ☐ Pharmaceutical 制药业 ☐ Agriculture 农业 ☐ Others: 其它 ☐ please specify: 请特别注

明……..

9. **Please tick the following logistics information system used by your company (Please choose as many as applicable) 请选择贵公司使用以下哪些物流信息系统（请尽多选择）?**

Website portal 门户网站 ☐ EDI 电子数据交换 ☐ Enterprise Resource Planning (ERP) 企业资源 计划系统

☐ Customer Relationship Management (CRM) 客户管理系统 ☐ Warehouse Management system (WMS)

仓库管理系统 ☐ Others: 其它 ☐ please specify: 请特别注明……..

10. **Did your company obtain ISO9001 or ISO14001 standards certificate?**
贵公司是否取得 ISO9001 或 ISO14001 标准资质?

ISO9001 standard （ISO9001 标准）: Yes /No: ……　　ISO14001 standard （ISO1001 标准）: Yes/No: …… Or others (其它) ……

*** Thank you very much for your help ***谢谢您的合作!!!

Appendix B

RESULT OF AN INDEPENDENT GROUPS T-TEST FOR LIKERT-SCALE ITEMS

Table 4.5: Independent T-test for Likert-scale items

Item	Description	Wave	N	Mean	Std. Deviation	T-value	Sig. (2-tailed)
1	We utilize time-based logistics solutions like continuous replenishment, quick response and Just-in-time to support customers.	1	40	5.650			
		2	77	5.675	1.460	-0.097	0.923
2	We are capable of providing shorter or smaller lot size shipments wherever possible.	1	40	6.000			
		2	77	5.779	1.340	0.939	0.350
3	We have in place operation procedures for express deliveries.	1	40	4.325			
		2	77	4.857	1.900	-1.775	0.079
4	We have in place operation procedures to provide customers with door-to-door delivery services.	1	40	6.275			
		2	77	6.364	1.219	-0.488	0.626
5	We have in place operation procedures to ensure on-time deliveries.	1	40	6.000			
		2	77	5.870	1.220	0.582	0.562
6	Our operation schedule is triggered by customer's requirements (e.g. a kanban system).	1	40	5.975			
		2	77	5.935	1.310	0.187	0.852
7	We have in place processes to support flexible scheduling solutions needed by our clients.	1	40	5.750			
		2	77	5.623	1.463	0.509	0.612
8	We have in place processes to meet changing customer requirements at short notice.	1	40	5.375			
		2	77	5.286	1.295	0.378	0.706
9	We regularly review our service offerings in relation to customer requirements.	1	40	5.575			
		2	77	5.546	1.318	0.118	0.907
10	We have in place benchmarking metrics to measure performance.	1	40	5.175			
		2	77	5.520	1.430	-1.324	0.188

Item	Description	Wave	N	Mean	Std. Deviation	T-value	Sig. (2-tailed)
11	Customer service performance (e.g. order fill rate, cycle time) is regularly compared to industry standards or competitors.	1	40	4.975			
		2	77	5.195	1.561	-0.813	0.418
12	Functional cost performance (e.g. transportation, sales) is regularly compared to industry standards or competitors.	1	40	5.150			
		2	77	5.156	1.369	-0.022	0.982
13	Operational performance (e.g. warehousing, transportation) is regularly compared to industry standards or competitors'.	1	40	5.025			
		2	77	5.169	1.527	-0.549	0.584
14	We offer attractive salaries to our employees.	1	40	5.125			
		2	77	5.143	1.137	-0.081	0.936
15	We offer attractive welfare packages to our employees.	1	40	5.250			
		2	77	5.195	1.214	0.240	0.810
16	2-16. We undertake annual performance appraisals of our employees.	1	40	5.825			
		2	77	5.844	1.430	-0.092	0.926
17	Promotion is determined by annual performance appraisal results in our organization.	1	40	5.375			
		2	77	5.558	1.497	-0.769	0.444
18	Salary increases are determined by annual performance appraisal results in our organization.	1	40	5.425			
		2	77	5.623	1.466	-0.880	0.381
19	We provide career development opportunities to employees.	1	40	5.550			
		2	77	5.688	1.085	-0.711	0.478
20	We provide induction programs to new employees.	1	40	5.175			
		2	77	5.530	1.420	-1.322	0.189
21	2-19. We provide job-related training to employees.	1	40	5.825			
		2	77	5.623	1.299	0.925	0.357
22	Our warehousing system is capable of handling perishable goods.	1	40	4.825			
		2	77	4.831	1.738	-0.021	0.983
23	We employ advanced machinery for loading and unloading of goods.	1	40	5.000			
		2	77	4.610	1.739	1.299	0.197
24	We have modernized our existing warehousing systems with air-conditioning.	1	40	4.575			
		2	77	4.766	1.824	-0.608	0.544
25	We use a variety of packing methods to minimize loss and damage of	1	40	5.150	1.777	0.299	0.766

	goods.	2	77	5.065			
Item	**Description**	**Wave**	**N**	**Mean**	**Std. Deviation**	**T-value**	**Sig. (2-tailed)**
		1	40	4.725			
26	We have advanced packing, re-packing, and unpacking facilities.	2	77	4.740	1.768	-0.053	0.958
	We have adequate warehouse facilities to support our clients'	1	40	4.575			
27	operations.	2	77	4.844	1.986	-0.841	0.402
		1	40	4.700			
28	We often upgrade our warehouse management computer systems.	2	77	5.000	1.924	-0.986	0.326
	We have installed a computer system in our warehouse for bar-coding	1	40	4.475			
29	or inventory counting.	2	77	4.896	2.000	-1.344	0.182
	Our warehouses have a reliable security system to protect high value	1	40	5.075			
30	goods.	2	77	4.961	1.623	0.407	0.685
		1	40	4.925			
31	We regularly upgrade our transport facilities.	2	77	5.091	1.774	-0.528	0.599
		1	40	5.012			
32	We have a distribution network in the western remote areas of China.	2	77	4.611	1.843	-1.140	0.196
	We have established a nation-wide distribution network to service our	1	40	4.575			
33	customers.	2	77	4.948	1.738	-1.294	0.198
	We use advanced computerized documentation systems to manage	1	40	5.250			
34	order processing.	2	77	5.571	1.918	-1.175	0.242
	We use state-of-the-art software to forecast and organize delivery	1	40	4.700			
35	schedules.	2	77	5.091	1.829	-1.441	0.152
	Compared to our competitors, we invest more on computer hardware	1	40	4.300			
36	and software.	2	77	4.909	1.363	1.200	0.277
		1	40	5.475			
37	We use *Guanxi* to approach business partners from different cultures.	2	77	5.429	1.552	0.190	0.850
		1	40	4.975			
38	We use *Guanxi* to stimulate trade that might not otherwise occur.	2	77	4.935	1.493	0.157	0.875
		1	40	6.600			
39	We use *Guanxi* to get valuable industry information.	2	77	5.026	9.727	1.406	0.162

		1	40	5.200			
40	We use *Guanxi* to access specific resources.	2	77	4.974	1.224	0.964	0.337
Item	**Description**	**Wave**	**N**	**Mean**	**Std. Deviation**	**T-value**	**Sig. (2-tailed)**
	Our firm uses Guanxi to establish and reinforce our links with local	1	40	5.400			
41	authorities and government in China.	2	77	5.455	1.374	-0.234	0.816
		1	40	5.675			
42	We use Guanxi to cultivate customer loyalty.	2	77	5.481	1.023	1.020	0.310
	We are capable of providing customers with innovative supply chain	1	40	5.225			
43	solutions.	2	77	5.364	1.441	-0.574	0.567
	We are capable of providing an extensive range of logistics services,	1	40	5.700			
44	including value added services like bulk-breaking, consolidation and labelling.	2	77	5.701	1.400	-0.005	0.996
	We are capable of accommodating unique requests by implementing	1	40	5.525			
45	pre-planned solutions.	2	77	5.533	1.261	-0.039	0.969
	We are capable of providing customers with logistics expertise in a	1	40	5.625			
46	range of industries.	2	77	5.753	1.427	-0.615	0.540
	We are capable of providing customers with widespread or extensive	1	40	5.325			
47	distribution coverage in China.	2	77	5.533	1.639	-0.792	0.430
	Our transport and distribution network has helped customers achieve	1	40	5.625			
48	cost saving.	2	77	5.571	1.234	0.262	0.794
	We are capable of providing customers with global distribution	1	40	5.400			
49	coverage.	2	77	5.377	1.533	0.090	0.928
	We are capable of delivering expedited shipments to meet customer	1	40	5.925			
50	needs.	2	77	5.883	1.047	0.242	0.809
		1	40	5.965			
51	We are capable of providing rapid response to customer requests.	2	77	5.935	1.310	0.187	0.853
	We are capable of arranging a flexible delivery schedule to fit with	1	40	5.753			
52	customer's production schedule.	2	77	5.423	1.463	0.509	0.602

Appendix C

SCATTERPLOTS OF RESIDUAL

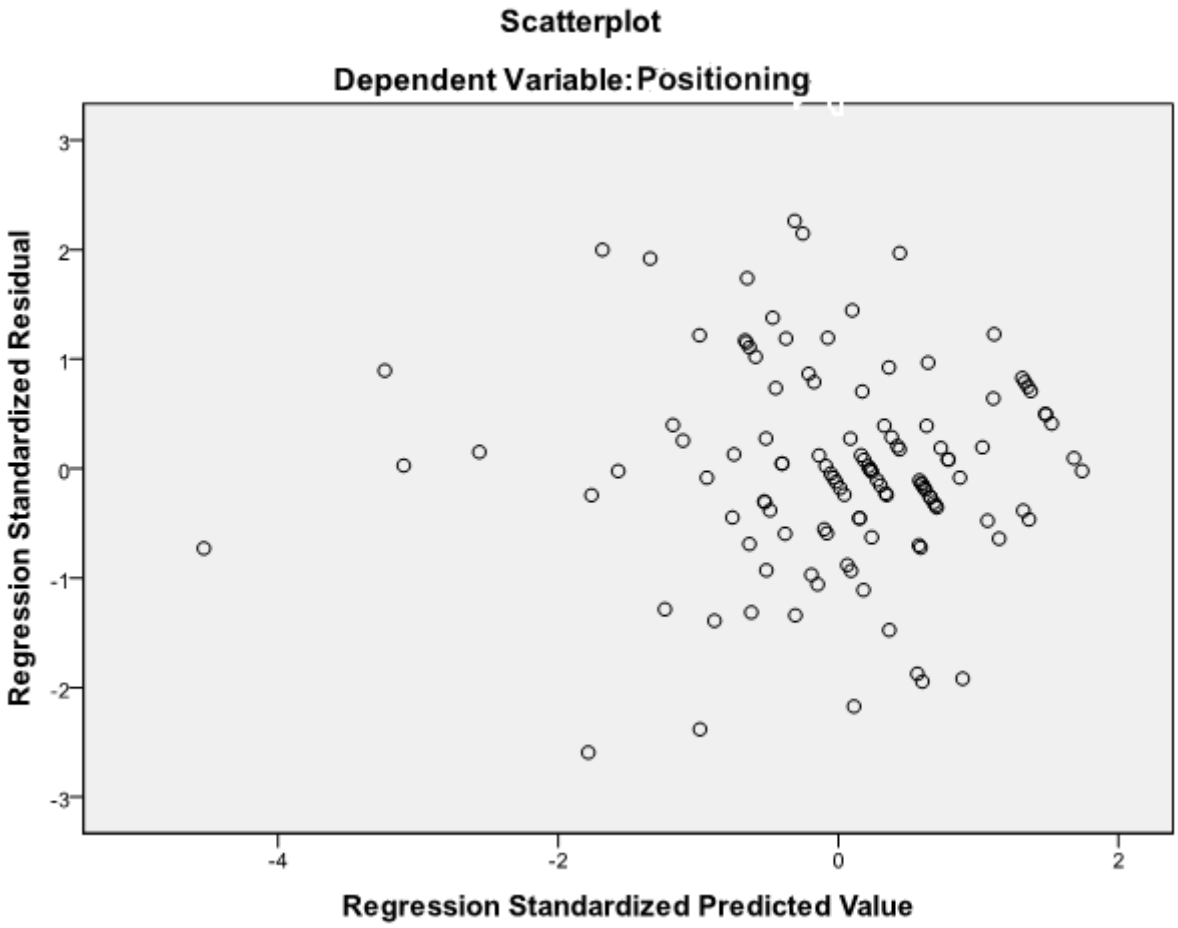

Figure: 5.5: Scatterplot of Dependent Variable: L& SC Solution

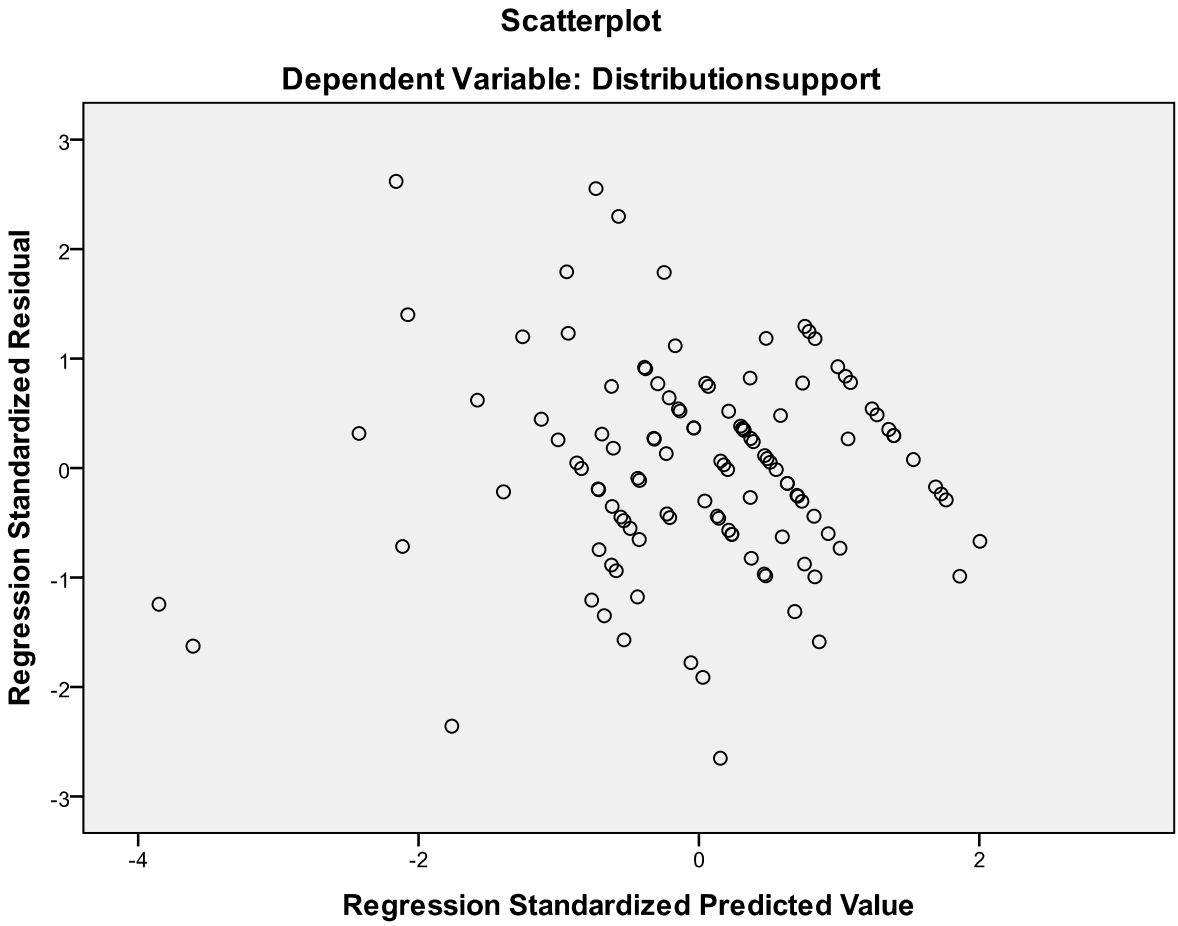

Figure: 5.6: Scatterplot of Dependent Variable: Distribution Support

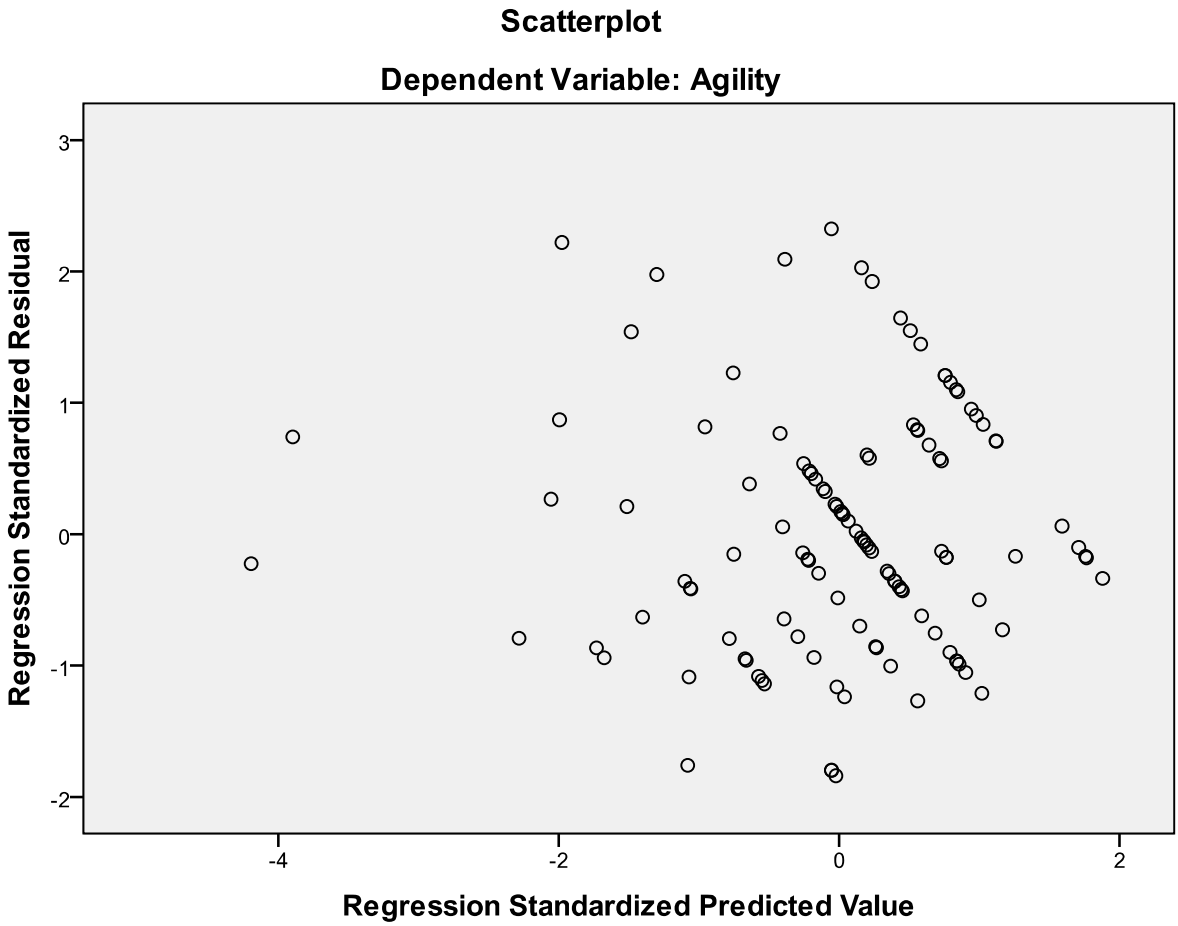

Figure: 5.7: Scatterplot of Dependent Variable: Agility

APPENDIX D

COLLINEARITY DIAGNOSTICS MATRIXES

Table 5.10: Collinearity Diagnostics Matrix of Dependent Variable: Positioning

		Partial	Part	Tolerance	VIF
1	(Constant)				
	Companysize_SD	0.038	0.03	0.967	1.034
	WIM_SD	0.282	0.236	0.466	2.145
	TDN_SD	0.184	0.151	0.533	1.876
	ICT_SD	0.117	0.095	0.637	1.57
2	(Constant)				
	Companysize_SD	0.049	0.033	0.96	1.042
	WIM_SD	0.281	0.197	0.451	2.216
	TDN_SD	0.182	0.124	0.501	1.996
	ICTS_SD	0.024	0.016	0.578	1.731
	PBP_SD	-0.095	-0.064	0.486	2.056
	PIR_SD	0.347	0.249	0.566	1.766
	PIF_SD	0.243	0.169	0.5	2
3	(Constant)				
	Companysize_SD	0.058	0.036	0.957	1.045
	WIM_SD	0.267	0.173	0.443	2.257
	TDN_SD	0.198	0.126	0.499	2.004
	ICT_SD	-0.045	-0.028	0.499	2.003
	PBP_SD	-0.153	-0.097	0.434	2.305
	PIR_SD	0.356	0.238	0.561	1.783
	PIF_SD	0.232	0.149	0.473	2.114
	PM_SD	-0.135	-0.085	0.525	1.904
	TD_SD	0.323	0.213	0.487	2.055
	RM_SD	0.114	0.071	0.654	1.529
4	(Constant)				
	Companysize_SD	0.107	0.066	0.903	1.108
	WIM_SD	0.267	0.169	0.443	2.259
	TDN_SD	0.197	0.122	0.499	2.006
	ICT_SD	-0.051	-0.031	0.499	2.005
	PBP_SD	-0.174	-0.108	0.43	2.323
	PIR_SD	0.28	0.178	0.492	2.031
	PIF_SD	0.255	0.161	0.468	2.137
	PM_SD	-0.112	-0.069	0.518	1.932
	TD_SD	0.295	0.188	0.473	2.113
	RM_SD	0.091	0.055	0.645	1.551
	*Guanxi*_SD	0.206	0.129	0.685	1.46
5	(Constant)				
	Companysize_SD	0.147	0.063	0.903	1.108
	WIM_SD	0.132	0.057	0.416	2.404
	TDN_SD	0.09	0.039	0.481	2.079
	ICT_SD	-0.178	-0.077	0.493	2.028

		Partial	Part	Tolerance	VIF
	PBP_SD	-0.175	-0.076	0.428	2.336
	PIR_SD	0.215	0.094	0.475	2.103
	PIF_SD	0.193	0.084	0.454	2.202
	PM_SD	-0.238	-0.104	0.514	1.945
	TD_SD	0.244	0.107	0.458	2.183
	RM_SD	0.035	0.015	0.639	1.565
	*Guanxi*_SD	0.13	0.056	0.667	1.5
	ICTsupport_SD	0.714	0.436	0.384	2.605
6	(Constant)				
	Companysize_SD	0.143	0.061	0.826	1.211
	WIM_SD	0.132	0.057	0.398	2.513
	TDN_SD	0.075	0.032	0.45	2.224
	ICT_SD	-0.184	-0.079	0.463	2.159
	PBP_SD	-0.178	-0.077	0.42	2.38
	PIR_SD	0.184	0.079	0.439	2.277
	PIF_SD	0.19	0.082	0.451	2.217
	PM_SD	-0.211	-0.092	0.464	2.157
	TD_SD	0.247	0.108	0.457	2.186
	RM_SD	0.033	0.014	0.606	1.649
	*Guanxi*_SD	0.109	0.047	0.634	1.576
	ICTsupport_SD	0.708	0.426	0.366	2.732
	PBPx*Guanx*i_SD	-0.032	-0.013	0.283	3.533
	PIRx*Guanxi*_SD	-0.059	-0.025	0.252	3.971
	PIFx*Guanxi*_SD	0.03	0.013	0.218	4.587
7	(Constant)				
	Companysize_SD	0.159	0.068	0.804	1.243
	WIM_SD	0.143	0.061	0.34	2.939
	TDN_SD	0.066	0.028	0.403	2.482
	ICT_SD	-0.183	-0.078	0.443	2.256
	PBP_SD	-0.163	-0.069	0.388	2.578
	PIR_SD	0.218	0.094	0.369	2.71
	PIF_SD	0.144	0.061	0.418	2.394
	PM_SD	-0.21	-0.09	0.412	2.427
	TD_SD	0.264	0.115	0.448	2.233
	RM_SD	0.024	0.01	0.584	1.711
	Guanxi_SD	0.058	0.025	0.536	1.866
	ICTsupport_SD	0.671	0.38	0.319	3.137
	PBPx*Guanxi*_SD	-0.033	-0.014	0.243	4.118
	PIRx*Guanxi*_SD	-0.114	-0.048	0.176	5.67
	PIFx*Guanxi*_SD	0.115	0.049	0.127	7.902
	PBPxICTsuppport_SD	0.046	0.019	0.209	4.783
	PIDPxICTsuppport_SD	0.067	0.028	0.136	7.363
	PIFxICTsuppport_SD	-0.152	-0.064	0.116	8.617

Table 5.11: Collinearity Diagnostics Matrix of Dependent Variable: Distribution Support

		Partial	Part	Tolerance	VIF
1	(Constant)				
	Companysize_SD	0.017	0.015	0.967	1.034
	WIM_SD	0.122	0.104	0.466	2.145
	TDN_SD	0.301	0.269	0.533	1.876
	ICT_SD	0.057	0.049	0.637	1.57
2	(Constant)				
	Companysize_SD	0.028	0.022	0.96	1.042
	WIM_SD	0.108	0.084	0.451	2.216
	TDN_SD	0.298	0.243	0.501	1.996
	ICT_SD	-0.008	-0.006	0.578	1.731
	PBP_SD	-0.069	-0.054	0.486	2.056
	PIR_SD	0.305	0.249	0.566	1.766
	PIF_SD	0.092	0.071	0.5	2
3	(Constant)				
	Companysize_SD	0.032	0.023	0.957	1.045
	WIM_SD	0.069	0.05	0.443	2.257
	TDN_SD	0.326	0.25	0.499	2.004
	ICT_SD	-0.02	-0.014	0.499	2.003
	PBP_SD	-0.117	-0.086	0.434	2.305
	PIR_SD	0.32	0.245	0.561	1.783
	PIF_SD	0.095	0.069	0.473	2.114
	PM_SD	-0.214	-0.159	0.525	1.904
	TD_SD	0.236	0.176	0.487	2.055
	RM_SD	0.211	0.157	0.654	1.529
4	(Constant)				
	Companysize_SD	0.069	0.049	0.903	1.108
	WIM_SD	0.065	0.047	0.443	2.259
	TDN_SD	0.326	0.247	0.499	2.006
	ICT_SD	-0.024	-0.017	0.499	2.005
	PBP_SD	-0.132	-0.095	0.43	2.323
	PIR_SD	0.256	0.19	0.492	2.031
	PIF_SD	0.112	0.081	0.468	2.137
	PM_SD	-0.197	-0.144	0.518	1.932
	TD_SD	0.211	0.155	0.473	2.113
	RM_SD	0.195	0.142	0.645	1.551
	*Guanxi*_SD	0.157	0.114	0.685	1.46
5	(Constant)				
	Companysize_SD	0.087	0.047	0.903	1.108
	WIM_SD	-0.134	-0.072	0.416	2.404
	TDN_SD	0.276	0.153	0.481	2.079
	ICT_SD	-0.126	-0.068	0.493	2.028
	PBP_SD	-0.113	-0.06	0.428	2.336
	PIR_SD	0.18	0.098	0.475	2.103
	PIF_SD	-0.005	-0.003	0.454	2.202
	PM_SD	-0.325	-0.183	0.514	1.945
	TD_SD	0.124	0.067	0.458	2.183

		Partial	Part	Tolerance	VIF
	RM_SD	0.18	0.097	0.639	1.565
	*Guanxi*_SD	0.064	0.034	0.667	1.5
	ICTsupport_SD	0.668	0.479	0.384	2.605
6	(Constant)				
	Companysize_SD	0.065	0.034	0.826	1.211
	WIM_SD	-0.145	-0.078	0.398	2.513
	TDN_SD	0.291	0.161	0.45	2.224
	ICT_SD	-0.115	-0.062	0.463	2.159
	PBP_SD	-0.099	-0.053	0.42	2.38
	PIR_SD	0.186	0.1	0.439	2.277
	PIF_SD	-0.008	-0.004	0.451	2.217
	PM_SD	-0.34	-0.191	0.464	2.157
	TD_SD	0.123	0.066	0.457	2.186
	RM_SD	0.188	0.101	0.606	1.649
	*Guanxi*_SD	0.086	0.046	0.634	1.576
	ICTsupport_SD	0.654	0.458	0.366	2.732
	PBPx*Guanx*i_SD	0.04	0.021	0.283	3.533
	PIRx*Guanxi*_SD	0.084	0.045	0.252	3.971
	PIFx*Guanxi*_SD	-0.099	-0.053	0.218	4.587
7	(Constant)				
	Companysize_SD	0.11	0.056	0.804	1.243
	WIM_SD	-0.052	-0.026	0.34	2.939
	TDN_SD	0.24	0.125	0.403	2.482
	ICT_SD	-0.151	-0.077	0.443	2.256
	PBP_SD	-0.043	-0.022	0.388	2.578
	PIR_SD	0.244	0.127	0.369	2.71
	PIF_SD	-0.083	-0.042	0.418	2.394
	PM_SD	-0.31	-0.165	0.412	2.427
	TD_SD	0.153	0.078	0.448	2.233
	RM_SD	0.152	0.078	0.584	1.711
	*Guanxi*_SD	0.021	0.011	0.536	1.866
	ICTsupport_SD	0.61	0.389	0.319	3.137
	PBPx*Guanxi*_SD	-0.014	-0.007	0.243	4.118
	PIRx*Guanxi*_SD	-0.045	-0.023	0.176	5.67
	PIFx*Guanxi*_SD	0.067	0.034	0.127	7.902
	PBPxICTsuppport_SD	0.208	0.107	0.209	4.783
	PIRxICTsuppport_SD	0.131	0.067	0.136	7.363
	PIFxICTsuppport_SD	-0.289	-0.152	0.116	8.617

Table: 5.12: Collinearity Diagnostics Matrix of Dependent Variable: Agility

		Partial	Part	Tolerance	VIF
1	(Constant)				
	Companysize_SD	-0.177	-0.155	0.967	1.034
	WIM_SD	0.126	0.109	0.466	2.145
	TDN_SD	0.205	0.18	0.533	1.876
	ICT_SD	0.181	0.158	0.637	1.57
2	(Constant)				
	Companysize_SD	-0.206	-0.141	0.96	1.042
	WIM_SD	0.124	0.083	0.451	2.216
	TDN_SD	0.201	0.137	0.501	1.996
	ICT_SD	0.1	0.067	0.578	1.731
	PBP_SD	-0.07	-0.047	0.486	2.056
	PIR_SD	0.528	0.416	0.566	1.766
	PIF_SD	0.074	0.049	0.5	2
3	(Constant)				
	Companysize_SD	-0.218	-0.142	0.957	1.045
	WIM_SD	0.106	0.068	0.443	2.257
	TDN_SD	0.205	0.133	0.499	2.004
	ICT_SD	0.023	0.015	0.499	2.003
	PBP_SD	-0.153	-0.098	0.434	2.305
	PIR_SD	0.541	0.409	0.561	1.783
	PIF_SD	0.074	0.047	0.473	2.114
	PM_SD	0.048	0.031	0.525	1.904
	TD_SD	0.191	0.124	0.487	2.055
	RM_SD	0.105	0.067	0.654	1.529
4	(Constant)				
	Companysize_SD	-0.182	-0.117	0.903	1.108
	WIM_SD	0.103	0.065	0.443	2.259
	TDN_SD	0.204	0.131	0.499	2.006
	ICT_SD	0.02	0.012	0.499	2.005
	PBP_SD	-0.166	-0.106	0.43	2.323
	PIR_SD	0.487	0.352	0.492	2.031
	PIF_SD	0.089	0.057	0.468	2.137
	PM_SD	0.066	0.041	0.518	1.932
	TD_SD	0.167	0.107	0.473	2.113
	RM_SD	0.088	0.056	0.645	1.551
	*Guanxi*_SD	0.141	0.09	0.685	1.46
5	(Constant)				
	Companysize_SD	-0.196	-0.118	0.903	1.108
	WIM_SD	0.016	0.009	0.416	2.404
	TDN_SD	0.147	0.088	0.481	2.079
	ICT_SD	-0.018	-0.011	0.493	2.028
	PBP_SD	-0.15	-0.09	0.428	2.336
	PIR_SD	0.459	0.305	0.475	2.103
	PIF_SD	0.031	0.018	0.454	2.202
	PM_SD	0.039	0.023	0.514	1.945
	TD_SD	0.111	0.066	0.458	2.183
	RM_SD	0.06	0.035	0.639	1.565

		Partial	Part	Tolerance	VIF
	*Guanxi*_SD	0.09	0.053	0.667	1.5
	ICTsupport_SD	0.348	0.219	0.384	2.605
6	(Constant)				
	Companysize_SD	-0.21	-0.126	0.826	1.211
	WIM_SD	0.004	0.003	0.398	2.513
	TDN_SD	0.155	0.092	0.45	2.224
	ICT_SD	-0.024	-0.014	0.463	2.159
	PBP_SD	-0.14	-0.083	0.42	2.38
	PIR_SD	0.434	0.283	0.439	2.277
	PIF_SD	0.023	0.013	0.451	2.217
	PM_SD	0.019	0.011	0.464	2.157
	TD_SD	0.112	0.066	0.457	2.186
	RM_SD	0.074	0.043	0.606	1.649
	*Guanxi*_SD	0.092	0.055	0.634	1.576
	ICTsupport_SD	0.325	0.202	0.366	2.732
	PBPx*Guanxi*_SD	0.016	0.009	0.283	3.533
	PIRx*Guanxi*_SD	0.02	0.012	0.252	3.971
	PIFx*Guanxi*_SD	-0.082	-0.048	0.218	4.587
7	(Constant)				
	Companysize_SD	-0.187	-0.106	0.804	1.243
	WIM_SD	0.075	0.042	0.34	2.939
	TDN_SD	0.071	0.039	0.403	2.482
	ICT_SD	-0.066	-0.037	0.443	2.256
	PBP_SD	-0.076	-0.042	0.388	2.578
	PIR_SD	0.345	0.204	0.369	2.71
	PIF_SD	0.025	0.014	0.418	2.394
	PM_SD	0.112	0.062	0.412	2.427
	TD_SD	0.124	0.069	0.448	2.233
	RM_SD	0.065	0.036	0.584	1.711
	*Guanxi*_SD	0.048	0.027	0.536	1.866
	ICTsupport_SD	0.386	0.233	0.319	3.137
	PBPx*Guanxi*_SD	-0.103	-0.057	0.243	4.118
	PIRx*Guanxi*_SD	0.137	0.077	0.176	5.67
	PIFx*Guanxi*_SD	-0.056	-0.031	0.127	7.902
	PBPxICTsuppport_SD	0.256	0.147	0.209	4.783
	PIRxICTsuppport_SD	-0.256	-0.147	0.136	7.363
	PIFxICTsuppport_SD	0.057	0.032	0.116	8.617